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**AVIONICS INTERFACE DATA SUMMARIES:  
A-10A, EF-111A, F-4E, F-4G, F-15A,  
F-16A, F-111A, F-111E, F-111F, RF-4C**

**October 1979**

**Prepared for  
DEPUTY FOR AVIONICS CONTROL  
AERONAUTICAL SYSTEMS DIVISION (ASD/AX)  
WRIGHT-PATTERSON AFB, OHIO  
under Contract F33657-79-C-0567**

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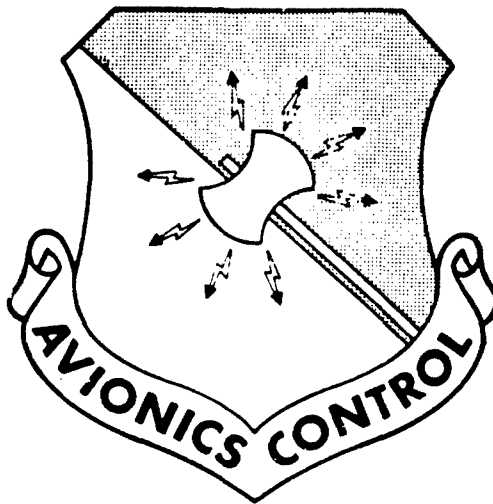
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**AVIONICS INTERFACE DATA SUMMARY  
FOR  
A-10A**



**October 1979**

**Issued by  
The Deputy for Avionics Control  
ASD/AX  
A Joint AFSC/AFLC Organization**

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## FOREWORD

This document is one of a series of reports that describe Avionics interfaces for various USAF aircraft. It was prepared for the Deputy for Avionics Control, Aeronautical Systems Division (ASD/AX), Wright-Patterson AFB, Ohio by ARINC Research Corporation, Annapolis, Maryland under Contract F33657-79-C-0567.



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## 1. INTRODUCTION

This document contains summary configuration data relevant to the integration of additional avionics into the A-10A aircraft.

The applicable Technical Orders are included in the references listed in Section 10.

This document will be revised periodically as additional modification are planned and incorporated into the aircraft. Queries regarding information contained herein should be addressed to:

The Deputy for Avionics Control  
Code: ASD/AXP  
Wright-Patterson AFB, Ohio

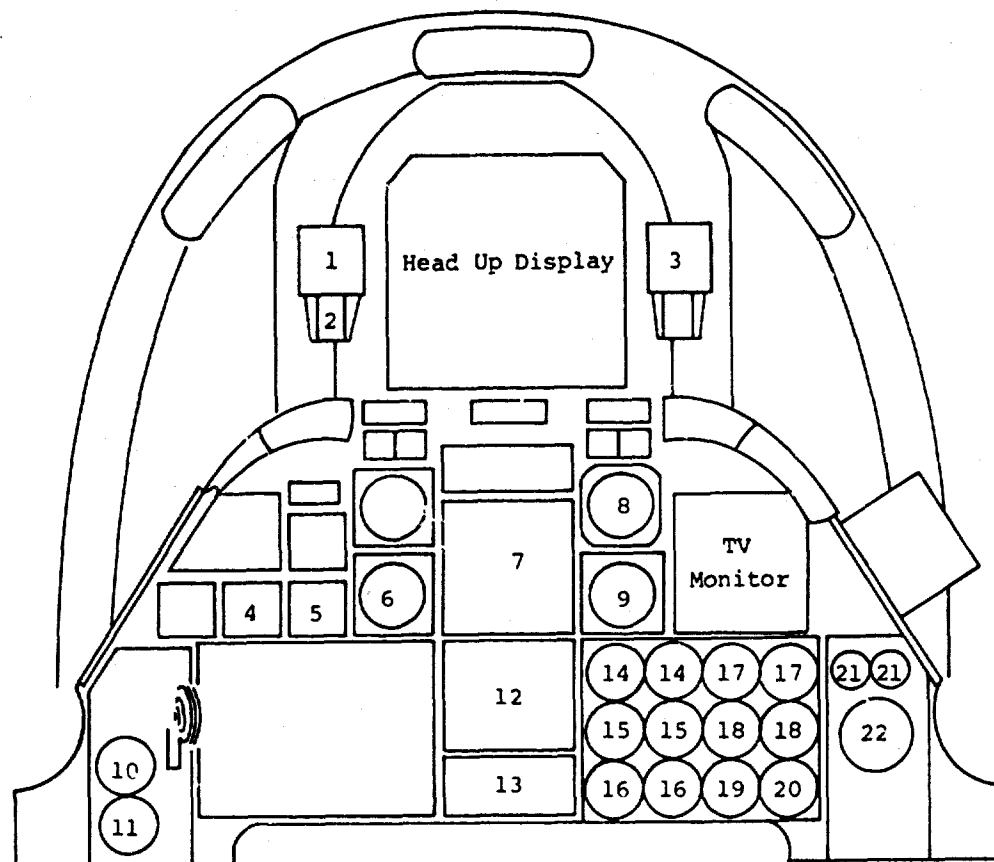
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## 2. COCKPIT SPACE

### 2.1 Cockpit Layout

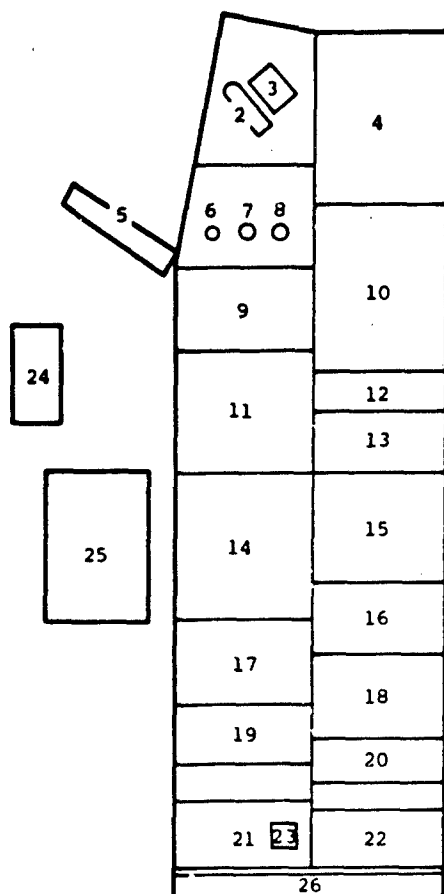
Figures 2-1 through 2-3 show the current cockpit arrangement for the production version of the A-10A. We expect at least one more iteration of the arrangement shown, including incorporation of the ALE-40 Chaff Dispenser Control Unit. Although a few blank panels are noted, the space available is extremely limited at the present time.





- |                                          |                                                      |
|------------------------------------------|------------------------------------------------------|
| 1. Accelerometer                         | 13. Navigation Mode Select Panel                     |
| 2. Angle of Attack Indexer               | 14. Interstage Turbine Temperature Indicator (L & R) |
| 3. Standby Compass                       | 15. Gas Generator Speed Indicator (L & R)            |
| 4. Clock                                 | 16. Engine Oil Pressure Indicator (L & R)            |
| 5. Angle of Attack Indicator             | 17. Fan Speed Indicator (L & R)                      |
| 6. Airspeed Indicator                    | 18. Fuel Flow Indicator                              |
| 7. Attitude Director Indicator (ADI)     | 19. APU Tachometer                                   |
| 8. Vertical Velocity Indicator           | 20. APU Temperature Indicator                        |
| 9. Altimeter                             | 21. Hydraulic Pressure Indicator (Sys L & R)         |
| 10. Flap Position Indicator              | 22. Fuel Quantity Indicator                          |
| 11. Blank                                | 23. Standby Attitude Indicator                       |
| 12. Horizontal Situation Indicator (HSI) |                                                      |

Figure 2-1. INSTRUMENT PANEL (TYPICAL)



1. Deleted
2. Emergency Brake Handle
3. Seat Height Adjustment Switch
4. Fuel System Control Panel
5. Manual Canopy Opening Assist Handle
6. Indexer and A/R Status Lights  
Dimming Control
7. Signal Lights Lamp Test Button
8. Fire Detector and Flead Air Leak Test  
Button
9. Stability Augmentation System Panel (SAS)
10. Throttle Quadrant
11. IFF Control Panel
12. TV Monitor Control Panel
13. VHF/AM Radio Control Panel
14. Emergency Flight Control Panel
15. UHF Radio Control Panel
16. VHF/TM Radio Control Panel
17. Intercom Control Panel
18. HF/VHF Radio Control Panel
19. CIPHONY Panel (Prior to serno 75-00280)
20. Antenna Select Panel (Serno 75-00280 and  
subsequent)
21. Antenna Select Panel (Prior to serno  
75-00280)
22. CIPHONY Panel (Serno 75-00280 and  
subsequent)
23. Utility Light
24. Anti-G Suit Valve Test Button
25. Armament Override Switch
26. Modification Placard
27. Piddle Pak Stowage
28. Piddle Pak Disposal

Figure 2-2. LEFT CONSOLE (TYPICAL)

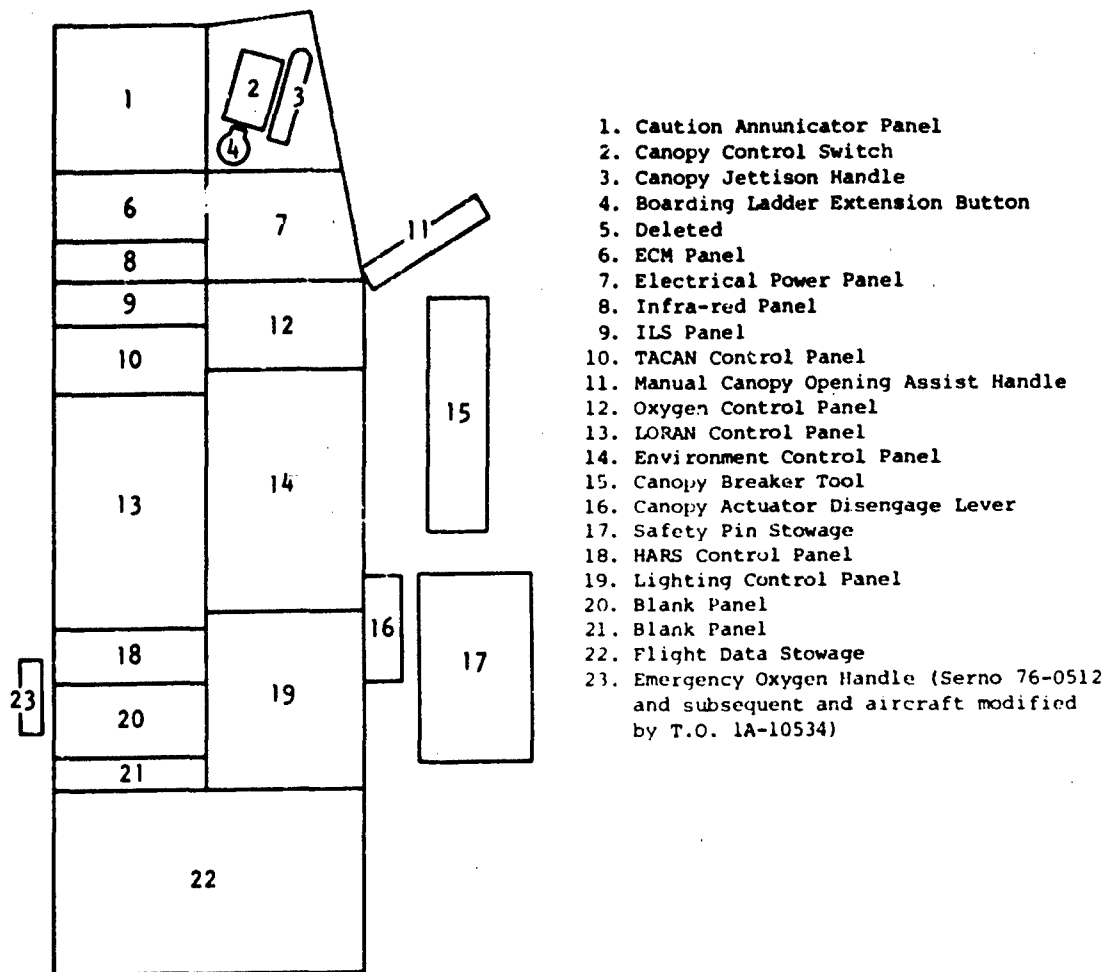


Figure 2-3. RIGHT CONSOLE (TYPICAL)

### 3. AVIONICS SPACE

Some of the alternatives for providing space in the A-10A are compiled in the Form, Fit, and Environmental (F<sup>2</sup>E) Summary (Table 3-1). Figure 3-1 shows the approximate location of these spaces and is keyed to this table.

The following basic points should be made relative to the data presented in the tables:

- A moderate amount of space is available in an equipment compartment if the HF radio is not installed. However, the Compass Tie Program is competing strongly for that space.
- The A-10 SPO indicates the existence of space in the tail area. However, overall aircraft weight-distribution considerations are critical.
- Moderate space is available if the recording and data conversion LRUs of the Velocity Gravity Height (VGH) system are removed.
- Plans for 1985 usage of the VGH measurement system need to be identified. Moderate space is available if the system is removed. Current plans call for only 20 percent of the aircraft to have the system installed, though all have the space allocated and 50 percent have Group A wiring.
- A small space becomes available if the IFF system is installed within the cockpit.
- In the A-10A, normal equipment cooling is not environmentally controlled outside the cockpit. There are plans to expand the cooling capacity to accommodate the INS, but the limit for heat dissipation (after INS requirements are satisfied) is about 1,200 watts as currently envisioned.

| Table 1.1. F <sup>2</sup> E SUMMARY - A-10A      |                                                                               |                                                                                                                                                                      |                                                                                                                               |                                                                                                                                                                      |                                                                                                                                   |
|--------------------------------------------------|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| F <sup>2</sup> E Criteria                        | Available Space                                                               |                                                                                                                                                                      |                                                                                                                               |                                                                                                                                                                      |                                                                                                                                   |
| Location Reference and Description               | A<br>Access Door 106<br>Adjacent to<br>Compass Tio                            | B<br>Aft Fuselage -<br>Tail Section<br>Exact Location<br>TBD                                                                                                         | C<br>Fuselage Right Fwd<br>of Wing<br>Access Door F10<br>Remove Recorder and<br>Signal Data Converter<br>of VGH System        | D<br>Fuselage Right Fwd<br>of Wing<br>Access Door F40<br>Remove Transducer<br>of VGH System                                                                          | E<br>Fuselage Right Fwd<br>of Wing<br>Access Door F44<br>Remove Gyro, Strain<br>Gage Ampl, and<br>Accelerometers of<br>VGH System |
| Rectangular Size *<br>(H, W, D)                  | 12" 12" 20" 1.7 Ft <sup>3</sup><br>Below Eght Shelf                           | TBD<br>But Should<br>Exceed 1 Ft <sup>3</sup>                                                                                                                        | 10.0' 28.8" 8.0"<br>1.3 Ft <sup>3</sup>                                                                                       | TBD                                                                                                                                                                  | TBD                                                                                                                               |
| Volume                                           | 1.4 Ft <sup>3</sup> Above<br>Eght Shelf                                       |                                                                                                                                                                      |                                                                                                                               |                                                                                                                                                                      |                                                                                                                                   |
| Type Cooling<br>Available                        | Cool Ram Air Blown<br>through Compartment                                     | Currently<br>Convection<br>Only                                                                                                                                      | Cool Ram Air Blown<br>through Compartment                                                                                     | Cool Ram Air Blown<br>through Compartment                                                                                                                            | Cool Ram Air Blown<br>through Compartment                                                                                         |
| Temperature-Altitude                             | MIL-E-5400 Class 2<br>-54°C to +71°C CTS<br>30 Min @ +95°C<br>70,000 Ft Limit | MIL-E-5400 Class 2<br>-54°C to +71°C CTS<br>30 Min @ +95°C<br>70,000 Ft Limit                                                                                        | MIL-E-5400 Class 2<br>-54°C to +71°C CTS<br>30 Min @ +95°C<br>70,000 Ft Limit                                                 | MIL-E-5400 Class 2<br>-54°C to +71°C CTS<br>30 Min @ +95°C<br>70,000 Ft Limit                                                                                        | MIL-E-5400 Class 2<br>-54°C to +71°C CTS<br>30 Min @ +95°C<br>70,000 Ft Limit                                                     |
| Vibration (Normal<br>Mount Values)               | Design - .01g <sup>2</sup> /Hz<br>Endurance - .06g <sup>2</sup> /Hz           | Design - .12g <sup>2</sup> /Hz<br>Endurance - .5g <sup>2</sup> /Hz                                                                                                   | Design - 0.03g <sup>2</sup> /Hz<br>Endurance - 0.20g <sup>2</sup> /Hz                                                         | Design - 0.01g <sup>2</sup> /Hz<br>Endurance - 0.01g <sup>2</sup> /Hz                                                                                                | Design - 0.01g <sup>2</sup> /Hz<br>Endurance - 0.01g <sup>2</sup> /Hz                                                             |
| Possible Can <sup>2</sup> dates<br>for the Space |                                                                               | None Known                                                                                                                                                           | None Known                                                                                                                    | None Known                                                                                                                                                           | None Known                                                                                                                        |
| Remarks                                          | Existing as HF Radio<br>Probably Will Not Be<br>Installed.                    | SPO Indicated that<br>Air Conditioning<br>Installation Would<br>Be Relatively Easy<br>and Efficient but Due<br>to C.G. Consideration<br>Ballast Could Be<br>Problem. | VGH System Not Scheduled<br>for Removal/Replacement.<br>50% A-10 Aircraft Have<br>Group A.<br>20% Have Group B<br>Components. | Velocity Gravity Height (VGH) Measurement<br>System Not Scheduled for Removal. 100% A-10<br>Aircraft Will (Group A). But only 20% Will Have<br>Components (Group B). |                                                                                                                                   |

\* When LRU is currently installed, the dimensions given represent dimensions of LRU; when no LRU is installed, the dimensions given are those of the available space.

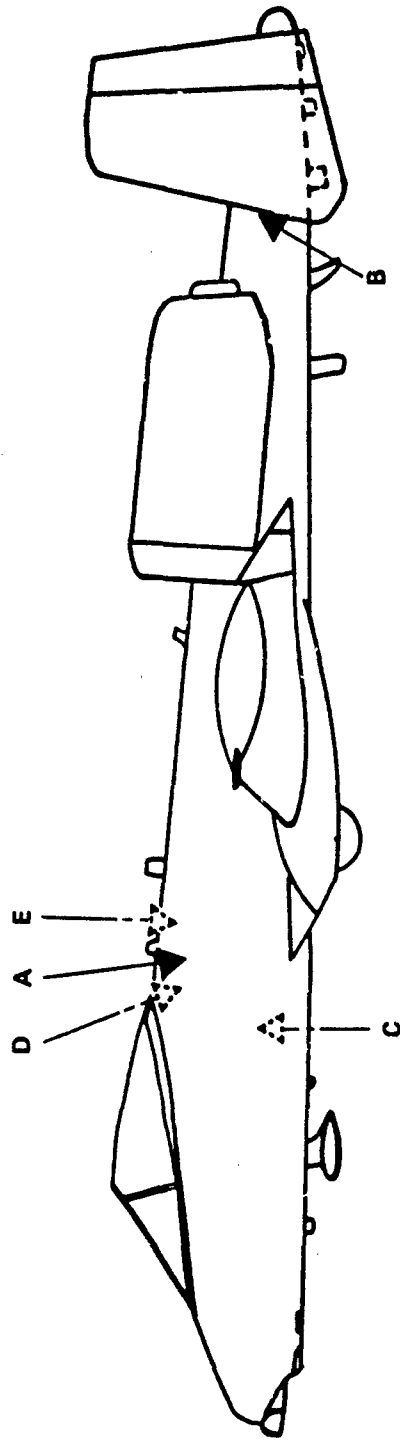


Figure 3-1. A-10A SPACE LOCATIONS

#### 4. ELECTRICAL POWER SYSTEM

The electrical power system provides 115/200 V, 400 Hz, three-phase ac and 28 Vdc power to operate the various A-10A aircraft systems. The overall system is composed of two independent systems (left and right). Table 4-1 lists the particulars of the ac and dc components of each independent system and the emergency power capabilities.

Each independent ac system drives a converter to provide the dc power for each system. Under normal operation the ac generators each drive their main ac buses while only one system (usually the left) drives the ac essential bus.

In the event of complete in-flight loss of normal ac power, or on the ground with no external power applied to the aircraft, emergency power is supplied by a system consisting of a battery and inverter. This system supplies power to the ac and dc essential buses and the battery bus.

| Table 4-1. A-10A ELECTRICAL POWER SYSTEM |                                                                 |                                                                                                        |
|------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| AC Power                                 | DC Power                                                        | Emergency Power                                                                                        |
| 40 kVA each independent system           | Maximum of 100-ampere<br>28 Vdc from each independent ac system | 24 V, 34 ampere-hour battery with inverter unit capable of 750 VA<br>115/200 Vac, 400 Hz, phase output |

## 5. ENVIRONMENT CONTROL SYSTEM

The Environment Control System includes the cockpit air conditioning system, avionics compartment environment control, cockpit pressurization system, and a number of other aircraft environment-related systems.

The cockpit air conditioning system operates on bleed air extracted from the main engines or auxiliary power unit (APU). A maximum airflow of 21.3 lb./min. is provided on a hot day (125°F) at sea level and V maximum. This airflow rate is adequate to cool the cockpit to 92°F. The A-10 APU provides sufficient capacity to cool the cockpit to 79°F on a 125°F day during ground operations. Ram-air ventilation is also available to the cockpit.

The avionics and equipment compartments use electrically operated exhaust blowers located in each compartment for cooling during ground operations; these compartments use ram-air cooling for flight operations. The ram-air cooling is accomplished without cockpit controls. At present, both the ground- and air-cooling modes have sufficient capacity to maintain equipment ambient temperatures within safe limits.

In addition to the ram-air cooling of the avionics compartments, above 10,000 feet cockpit air is ventilated into the forward right-hand equipment compartment by the cabin pressure regulator. This vented cockpit air assists in cooling the electrical and electronic equipments.

Table 5-1 illustrates the maximum ground power dissipation capability of the avionics compartments. The primary cooling design criterion for the A-10A was to limit the maximum compartment ambient temperature to 160°F during all flight conditions and during continuous ground operations. A total of eight inlets and six identical cooling fans are required for cooling a maximum of 5.8 kW during ground static conditions (hot day, 125°F, sea level).

Future cooling requirements are not completely defined. Flight testing of a technique to cool the Inertial Navigation System (INS), located in fuselage compartment 44, should be completed in late 1979. Current plans call for cockpit discharge air as the primary cooling medium. However, if this air was to become too warm, air orifice would open to extract cooling air directly from the cockpit air conditioning supply ducts to supply the INS compartment. The orifice would direct cooling air from the cockpit supply air supply at a 1 lb./min. flow rate.



| Table 5-1. MAXIMUM GROUND POWER DISSIPATION FOR AVIONICS COMPARTMENTS |                       |                                  |                                  |                                  |                                  |                    |                           |                  |                        |                                     |
|-----------------------------------------------------------------------|-----------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|--------------------|---------------------------|------------------|------------------------|-------------------------------------|
| Avionics Area                                                         | Compartments Included | Fuselage Station 268/286 (Watts) | Fuselage Station 296/314 (Watts) | Fuselage Station 314/344 (Watts) | Fuselage Station 344/365 (Watts) | Solar Load (Watts) | Total Dissipation (Watts) | Number of Inlets | Number of Cooling Fans | Minimum* Cooling Airflow (lb./min.) |
| Upper Right                                                           | F-40, 42, 44          | 65                               | 403                              | 665                              | 143                              | 75                 | 1,351                     | 2                | 1                      | 9.1                                 |
| Lower Right                                                           | F-10, 12, 14          | 0                                | 330                              | 630                              | 375                              | 0                  | 1,335                     | 2                | 1                      | 9.0                                 |
| Upper Left                                                            | F-101, 103, 105       | 70                               | 1,128                            | 769                              | 245                              | 75                 | 2,187                     | 2                | 2                      | 14.8                                |
| Lower Left                                                            | -                     | -                                | -                                | -                                | -                                | -                  | 100                       | **               | -                      | -                                   |
| Inverter                                                              | F-61                  | -                                | -                                | -                                | -                                | -                  | 805 <sup>+</sup>          | 1                | 1                      | 5.45                                |
| Battery                                                               | F-65                  | -                                | -                                | -                                | -                                | -                  | 30                        | 1                | 1                      | -                                   |
|                                                                       |                       |                                  |                                  |                                  |                                  |                    | 5,808                     | 8                | 6                      | -                                   |

\*Ambient 125°F @ Sea Level pressure.

\*\*Induced draft cooled.

<sup>+</sup>Power dissipation is 40 watts with inverter off.

## 6. CURRENT AVIONICS

Tables 6-1 through 6-19 and 9-1 through 9-4 contain LRU data relating to the A-10A avionics systems that make up the current or near-term configuration. Where no entries are shown, the data were not available for this report. Antenna locations are depicted in Section 7, Figure 7-1. Data pertaining to future avionics modifications are presented in Section 9.

| Table 6-1. A-10A AVIONICS CONFIGURATION DATA: VHF/AM RADIO SYSTEM, WILCOX 807A (AN/ARC-134) NSN: 5821-00-937-1086* |              |                             |                     |      |      |                       |                 |                |                      |                  |                |          |
|--------------------------------------------------------------------------------------------------------------------|--------------|-----------------------------|---------------------|------|------|-----------------------|-----------------|----------------|----------------------|------------------|----------------|----------|
| Name                                                                                                               | Nomenclature | Location                    | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |                      | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                                    |              |                             | H                   | W    | D    |                       |                 | AC             | DC                   |                  |                |          |
| Receive-Transmit Unit                                                                                              | VHF/AM-807A  | F4J                         | 7.75                | 5.0  | 14.6 | 566                   | 15.9            | --             | 28V, 300W (Max Code) |                  | Convection     | Shock    |
| Control Unit                                                                                                       | 97733-100    | Cockpit Left Console        | 3.0                 | 5.75 | 6.0  | 104                   | 2.0             |                |                      |                  | Convection     | Console  |
| Antenna                                                                                                            | DW-C50-1     | Bottom Rear Fuselage Center |                     |      |      |                       |                 |                |                      |                  | Convection     |          |
| Shock Mount                                                                                                        | 88246        | F4J                         |                     |      |      |                       |                 | --             | --                   |                  | Convection     | Hard     |
| *NSNs for ARC-134A are 5821-00-879-1377 and -181-0430.                                                             |              |                             |                     |      |      |                       |                 |                |                      |                  |                |          |

| Table 6-2. A-10A AVIONICS CONFIGURATION DATA: VHF/FM RADIO SET, AM/ARC-131, NSN: 5821-00-937-4686 |               |                                  |                     |      |      |                       |                 |                |                      |                  |                               |          |
|---------------------------------------------------------------------------------------------------|---------------|----------------------------------|---------------------|------|------|-----------------------|-----------------|----------------|----------------------|------------------|-------------------------------|----------|
| Name                                                                                              | Nomenclature  | Location                         | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |                      | Heat Dissipation | Cooling Method                | Mounting |
|                                                                                                   |               |                                  | H                   | W    | D    |                       |                 | AC             | DC                   |                  |                               |          |
| Receive-Transmit Unit                                                                             | VHF/FM-622A   | F103                             | 7.9                 | 6.0  | 15.8 | 749                   | 25.2            | --             | 28V, 112W (Max Mode) |                  | Convection w/ Internal Blower | Shock    |
| Mount                                                                                             | 709116-401    | F103                             |                     |      |      |                       |                 | --             | --                   |                  | Convection                    | Hard     |
| Control Unit                                                                                      | C-921/FM-622A | Cockpit Left Console             | 3.0                 | 5.75 | 6.4  | 11.0                  | 2.0             | --             | 28V                  |                  | Convection                    | Console  |
| Antennas (2) Coax                                                                                 | 4375-1/1C     | Bottom of Fuselage Rear          |                     |      |      |                       |                 |                |                      |                  |                               |          |
| Homing                                                                                            | AS-1922/AR    | Bottom of Fuselage Forward Wings |                     |      |      |                       |                 |                |                      |                  | Convection                    | Hard     |

| Table 6-3. F-10A AVIONICS CONFIGURATION DATA: UHF RADIO SET, AR/ARC-164(V) NSR.*                                          |              |                                   |                     |      |      |                       |                 |                     |       |                             |                |          |
|---------------------------------------------------------------------------------------------------------------------------|--------------|-----------------------------------|---------------------|------|------|-----------------------|-----------------|---------------------|-------|-----------------------------|----------------|----------|
| Name                                                                                                                      | Nomenclature | Location                          | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power      |       | Heat Dissipation            | Cooling Method | Mounting |
|                                                                                                                           |              |                                   | H                   | W    | D    |                       |                 | AC                  | DC    |                             |                |          |
| Main Receiver-Transmit Unit                                                                                               | RT-1168**    | Cockpit Left Console              | 4.9                 | 5.75 | 8.6  | 242                   | 9.25            | 400W 5V Panel Light | 27.5V | 110W TX Mode<br>35W RX Mode | Convection     | Console  |
| Guard Receiver-Transmit Unit                                                                                              | RT-1145**    | Cockpit Left Console              | 4.7                 | 5.0  | 8.25 | 194                   | 8.10            | --                  | 27.5V |                             | Convection     | Console  |
| Control Unit                                                                                                              | C-9533**     | Cockpit Left Console              | 4.9                 | 5.75 | 5.3  | 149                   | 4.32            |                     |       |                             | Convection     | Console  |
| Indicator Unit                                                                                                            | ID-1961A     | Cockpit Main Instrument Panel     | 2.25                | 2.4  | 5.9  | 32                    | 0.90            |                     |       |                             | Convection     | Panel    |
| Antenna Selector                                                                                                          | C-4808/ARC   | Cockpit Left Console Access-F 103 |                     |      |      |                       |                 |                     |       |                             | Convection     | Console  |
| UHF Blade Antennas (2)                                                                                                    |              | Co-located with TACAM Antennas    |                     |      |      |                       |                 |                     |       |                             | Convection     | Hard     |
| *ARC-164(VI); 5821-01-008-4600; V14: -4601; V15: -4599; V24: -4603; V3: -4604; V4: -4598.<br>**All contained in one unit. |              |                                   |                     |      |      |                       |                 |                     |       |                             |                |          |

| Table 6-4. A-10A AVIONICS CONFIGURATION DATA: UHF-DF NSN: THD |              |              |                           |                           |                           |                       |                           |                |    |                  |                |          |
|---------------------------------------------------------------|--------------|--------------|---------------------------|---------------------------|---------------------------|-----------------------|---------------------------|----------------|----|------------------|----------------|----------|
| Name                                                          | Nomenclature | Location     | Dimensions (Inches)       |                           |                           | Volume (Cubic Inches) | Weight (Pounds)           | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                               |              |              | H                         | W                         | D                         |                       |                           | AC             | DC |                  |                |          |
| Relay-Amplifier Assembly<br><br>Direction Finder              | QA-8697/ARD  | Left Console |                           |                           |                           |                       |                           |                |    |                  |                |          |
|                                                               | PN DF-301E   | F3           | Approx-<br>imately<br>5.0 | Approx-<br>imately<br>5.0 | Approx-<br>imately<br>6.0 | 150                   | Approx-<br>imately<br>5.0 |                |    |                  |                |          |

| Table 6-5. A-10A AVIONICS CONFIGURATION DATA: HF RADIO SET, AN/ARC-154 (NOT INSTALLED - SPACE ONLY)* NSN: TBD |              |          |                     |     |     |                       |                 |                |     |                  |                |          |
|---------------------------------------------------------------------------------------------------------------|--------------|----------|---------------------|-----|-----|-----------------------|-----------------|----------------|-----|------------------|----------------|----------|
| Name                                                                                                          | Nomenclature | Location | Dimensions (Inches) |     |     | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |     | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                               |              |          | H                   | W   | D   |                       |                 | AC             | DC  |                  |                |          |
| HF Radio Set                                                                                                  | TBD          | TBD      | TBD                 | TBD | TBD | TBD                   | TBD             | TBD            | TBD | TBD              | TBD            | TBD      |
| *Probably will not be installed.                                                                              |              |          |                     |     |     |                       |                 |                |     |                  |                |          |

| Table 6-6. A-10A AVIONICS CONFIGURATION DATA: INTERCOMMUNICATIONS SET, AN/AIC-18 SEM: 5831-00-116-6503* |              |              |                     |      |      |                       |                 |                                 |               |                  |                |          |
|---------------------------------------------------------------------------------------------------------|--------------|--------------|---------------------|------|------|-----------------------|-----------------|---------------------------------|---------------|------------------|----------------|----------|
| Name                                                                                                    | Nomenclature | Location     | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power                  |               | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                         |              |              | H                   | W    | D    |                       |                 | AC                              | DC            |                  |                |          |
| Intercom Station                                                                                        | C-2105( )    | Access F103  | 3.6                 | 5.1  | 4.4  | 81                    | 2.4             | --                              | 27.5V<br>5.3W |                  | Convection     |          |
| Control Panel                                                                                           | C-3942(P)    | Left Console | 3.75                | 5.75 | 6.75 | 146                   | 4.0             | 6Vac<br>2.4W<br>Lights<br>400Hz | 27.5V<br>5.3W |                  | Convection     | Console  |

\*Also 5831-00-668-8778.



| Table 6-7. A-10A AVIONICS CONFIGURATION DATA: CRYPTOGRAPHIC EQUIPMENT NEM, TWO |              |                      |                     |      |     |                       |                 |                |                   |                          |                |          |
|--------------------------------------------------------------------------------|--------------|----------------------|---------------------|------|-----|-----------------------|-----------------|----------------|-------------------|--------------------------|----------------|----------|
| Name                                                                           | Nomenclature | Location             | Dimensions (Inches) |      |     | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |                   | Heat Dissipation         | Cooling Method | Mounting |
|                                                                                |              |                      | H                   | W    | D   |                       |                 | AC             | DC                |                          |                |          |
| Secure Speech Device Remote Control Unit                                       | TSEC/KY-28   | Cockpit Left Console | 7.8                 | 5.0  | 9.1 | 355                   | 15              | --             | 28Vdc<br>40 Watts | 100RTU/Hours<br>25 Watts | Convection     | Console  |
|                                                                                | C-8057/ABC   |                      | 2.6                 | 5.75 | 2.3 | 35                    | --              | 28Vdc          |                   | Convection               |                |          |

| Table 6-8. A-10A AVIONICS CONFIGURATION DATA: PITOT-STATIC SYSTEM - FLIGHT AND NAV INSTRUMENTS NSN: TBD |              |                                  |                     |   |   |                       |                 |                |    |                  |                |          |
|---------------------------------------------------------------------------------------------------------|--------------|----------------------------------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                                    | Nomenclature | Location                         | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                         |              |                                  | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| Attitude Direction Indicator                                                                            |              | Cockpit Main Instrument Panel    |                     |   |   |                       |                 |                |    |                  | Convection     | Console  |
| Horizontal Situation Indicator                                                                          | AQU-6A       | Cockpit Main Instrument Panel    |                     |   |   |                       |                 |                |    |                  | Convection     | Console  |
| Magnetic Compass                                                                                        | AQU-1/A      | Cockpit Right Side of Windshield |                     |   |   |                       |                 |                |    |                  | Convection     | Console  |
| Angle of Attack Indicator                                                                               |              | Cockpit Main Instrument Panel    |                     |   |   |                       |                 |                |    |                  | Convection     | Console  |
| Clock                                                                                                   | ABU-11/A     | Cockpit Instrument Panel         |                     |   |   |                       |                 |                |    |                  | Convection     | Console  |
| Accelerometer                                                                                           | ABU-4A/A     | Left Side of Windshield          |                     |   |   |                       |                 |                |    |                  | Convection     | Console  |
| NAV Mode Select Panel                                                                                   |              | Main Instrument Panel            |                     |   |   |                       |                 |                |    |                  |                |          |
| Standby Attitude Indicator                                                                              |              | Main Instrument Panel            |                     |   |   |                       |                 |                |    |                  |                |          |
| Airspeed Indicator                                                                                      |              | Instrument Panel                 |                     |   |   |                       |                 |                |    |                  |                |          |
| Altimeter                                                                                               | AAU-19/A     | Instrument Panel                 |                     |   |   |                       |                 |                |    |                  |                |          |
| Altitude Computer                                                                                       | CPU-46A      | F40                              |                     |   |   |                       |                 |                |    |                  |                |          |

| Table 6-9. A-10A AVIONICS CONFIGURATION DATA: ANGLE OF ATTACK SYSTEM, COUNTING ACCELEROMETER SYSTEM, AND VELOCITY GRAVITY HEIGHT SYSTEM. REF: TWO |              |                         |                     |   |   |    |                       |                 |                |  |                  |                |          |
|---------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-------------------------|---------------------|---|---|----|-----------------------|-----------------|----------------|--|------------------|----------------|----------|
| Name                                                                                                                                              | Nomenclature | Location                | Dimensions (Inches) |   |   |    | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |  | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                                                                   |              |                         | H                   | W | D | AC |                       |                 | DC             |  |                  |                |          |
| Vert Velocity Indicator                                                                                                                           |              | Instrument Panel        |                     |   |   |    |                       |                 |                |  |                  |                |          |
| AOA Transmitter                                                                                                                                   |              | Left Side Fuselage      |                     |   |   |    |                       |                 |                |  |                  |                |          |
| AOA Indicator                                                                                                                                     |              | Instrument Panel        |                     |   |   |    |                       |                 |                |  |                  |                |          |
| AOA Approach Indicator                                                                                                                            |              | Left Side of Windshield |                     |   |   |    |                       |                 |                |  |                  |                |          |
| Counting Accelerometer System                                                                                                                     |              |                         |                     |   |   |    |                       |                 |                |  |                  |                |          |
| Accelerometer Transmitter                                                                                                                         |              | F44                     |                     |   |   |    |                       |                 |                |  |                  |                |          |
| Accelerometer Indicator                                                                                                                           |              | F10                     |                     |   |   |    |                       |                 |                |  |                  |                |          |
| Velocity Gravity Height System                                                                                                                    |              |                         |                     |   |   |    |                       |                 |                |  |                  |                |          |
| Vert Accelerometer                                                                                                                                | TRU-106/A1   | F44                     |                     |   |   |    |                       |                 |                |  |                  |                |          |
| Transceiver Accelerometer                                                                                                                         | TRU-107/A    | F44                     |                     |   |   |    |                       |                 |                |  |                  |                |          |
| Strain Gauge Amplifier                                                                                                                            | ASU-18/A     | F44                     |                     |   |   |    |                       |                 |                |  |                  |                |          |
| Signal Data Recorder                                                                                                                              | RSU-553      | F10                     |                     |   |   |    |                       |                 |                |  |                  |                |          |
| Signal Data CONV-MUX                                                                                                                              | BCU-68/A     | F10                     |                     |   |   |    |                       |                 |                |  |                  |                |          |
| Transducer                                                                                                                                        | TRU-164/A    | F40                     |                     |   |   |    |                       |                 |                |  |                  |                |          |
| Rate Gyro                                                                                                                                         | SBU-11/A     | F44                     |                     |   |   |    |                       |                 |                |  |                  |                |          |

| Table 6-10. A-10A AIONICS CONFIGURATION DATA; TACAN, AN/ARN-118(V) (INSTALLED ON A-10A AFTER T.O. 1A-10-538, REPLACING AN/ARN-84) NSN: 5826-01-015-0834 |                              |                       |                           |      |      |                       |                 |                                         |                  |                  |                                 |          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------------------|---------------------------|------|------|-----------------------|-----------------|-----------------------------------------|------------------|------------------|---------------------------------|----------|
| Name                                                                                                                                                    | Nomenclature                 | Location              | Dimensions (Inches)       |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power                          |                  | Heat Dissipation | Cooling Method                  | Mounting |
|                                                                                                                                                         |                              |                       | H                         | W    | D    |                       |                 | AC                                      | DC               |                  |                                 |          |
| Transceiver Unit                                                                                                                                        | RT-1159/A                    | F103                  | 6.4                       | 7.5  | 14.6 | 745                   | 26.5            | 115V<br>400Hz<br>15<br>250VA<br>Maximum | 28V              |                  | Convection with Internal Blower | Shock    |
| Digital-to-Analog Adapter Mount Base                                                                                                                    | AK-9577/A                    | F103                  | 6.8                       | 1.7  | 13.1 | 154                   | 5.1             | 26V<br>400Hz                            | --               |                  | Convection                      | Shock    |
|                                                                                                                                                         | MT-4680/A<br>OR<br>MT-4682/A | F103                  | 6.6 (Maximum Dimension)** | 11.7 | 20.5 | 504*                  |                 |                                         | 28V, 28V Maximum |                  | Convection                      | Console  |
| Control Unit**                                                                                                                                          | C-100XX/A                    | Cockpit Right Console | 3.0 or 2.25               | 5.75 | 5.4  | 94 or 70              | 2.0             |                                         |                  |                  | Convection                      | Console  |
| *Only 2.1" added height when packaged with above two units.<br>**Replaces J- Control Unit Space - two Options on height dimension.                      |                              |                       |                           |      |      |                       |                 |                                         |                  |                  |                                 |          |

| Table 6-11. A-10A AVIONICS CONFIGURATION DATA: TACAM, AM/ARM-84(V)* NEW 5826-00-357-2886<br>(INSTALLED ON A-10A BEFORE T.O. 11-10-518; REPLACED BY AM/ARM-118) |              |                          |                        |   |   |                             |                    |                   |    |                     |                   |          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------------------|------------------------|---|---|-----------------------------|--------------------|-------------------|----|---------------------|-------------------|----------|
| Name                                                                                                                                                           | Nomenclature | Location                 | Dimensions<br>(Inches) |   |   | Volume<br>(Cubic<br>Inches) | Weight<br>(Pounds) | Aircraft<br>Power |    | Heat<br>Dissipation | Cooling<br>Method | Mounting |
|                                                                                                                                                                |              |                          | H                      | W | D |                             |                    | AC                | DC |                     |                   |          |
| Transceiver<br>Unit                                                                                                                                            | RT-1127      | F103                     |                        |   |   |                             |                    |                   |    |                     |                   | Shock    |
| Data Converter<br>Assembly                                                                                                                                     | CV-1135      | F103                     |                        |   |   |                             |                    |                   |    |                     |                   | Shock    |
| Mount                                                                                                                                                          | MT-4616      | F103                     |                        |   |   |                             |                    |                   |    |                     |                   | Hard     |
| Control Unit                                                                                                                                                   | C-9475       | Cockpit Right<br>Console |                        |   |   |                             |                    |                   |    |                     | Convection        | Console  |
| *To be replaced with AM/ARM-118(V).                                                                                                                            |              |                          |                        |   |   |                             |                    |                   |    |                     |                   |          |

| Table 6-12. A-10A AVIONICS CONFIGURATION DATA: ILS AN/AM-108 USE: TBD |              |                       |                     |      |      |                       |                 |                |                  |                  |
|-----------------------------------------------------------------------|--------------|-----------------------|---------------------|------|------|-----------------------|-----------------|----------------|------------------|------------------|
| Name                                                                  | Nomenclature | Location              | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |                  | Heat Dissipation |
|                                                                       |              |                       | H                   | W    | D    |                       |                 | AC             | DC               |                  |
| Receiver                                                              | R-1871       | F103                  | 5.1                 | 3.4  | 11.5 | 229                   | 7.0             | --             | 28V, 45W Maximum | Convection       |
| Control Unit                                                          |              | Cockpit Right Console | 2.25                | 5.75 | 6.0  | 78                    | 2.0             |                |                  | Convection       |
| Flight Director Computer                                              | CPU-80A      | F103                  |                     |      |      |                       |                 |                |                  |                  |
| Glide/Slope Antenna                                                   |              |                       |                     |      |      |                       |                 |                |                  |                  |
| Localizer Antenna                                                     |              |                       |                     |      |      |                       |                 |                |                  |                  |
| Marker Beacon Antenna                                                 |              |                       |                     |      |      |                       |                 |                |                  |                  |
| Console                                                               |              |                       |                     |      |      |                       |                 |                |                  |                  |

| Table 6-13. A-10A AVIONICS CONFIGURATION DATA: HEADING ATTITUDE REFERENCE SYSTEM NHM: TWO |              |                          |                     |   |   |                       |                 |                |    |                  |                |          |
|-------------------------------------------------------------------------------------------|--------------|--------------------------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                      | Nomenclature | Location                 | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                           |              |                          | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| Displacement Gyro                                                                         | CH-1466      | F42                      |                     |   |   |                       |                 |                |    |                  |                |          |
| Amplifier-Electronic Control                                                              | AM-6851      | F42                      |                     |   |   |                       |                 |                |    |                  |                |          |
| Controller-Compass System                                                                 | C-1005       | Right Console            |                     |   |   |                       |                 |                |    |                  |                |          |
| Magnetic Azimuth                                                                          |              | Inside Left Vertical Fin |                     |   |   |                       |                 |                |    |                  |                |          |

| Table 6-14. A-10A AVIONICS CONFIGURATION DATA: IFF SYSTEM, AN/APX-101 MSN: 5895-01-016-6739 |              |                             |                     |      |      |                       |                 |                           |              |                  |                |          |
|---------------------------------------------------------------------------------------------|--------------|-----------------------------|---------------------|------|------|-----------------------|-----------------|---------------------------|--------------|------------------|----------------|----------|
| Name                                                                                        | Nomenclature | Location                    | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power            |              | Heat Dissipation | Cooling Method | Mounting |
|                                                                                             |              |                             | H                   | W    | D    |                       |                 | AC                        | DC           |                  |                |          |
| Transponder                                                                                 | RT-1063B     | F103                        | 5.8                 | 6.0  | 10.8 | 377                   | 17.3            | --                        | 28V<br>63.5W |                  |                |          |
| Control Panel                                                                               | C-6280A/APX  | Left Console                | 5.25                | 5.75 | 3.1  | 94                    | 3.0             | 400Hz,<br>6VAC, 1A        | 28V<br>0.2A  |                  |                | Console  |
| Transponder Computer                                                                        | KIT-1A/TSEC  | F99                         | 6.5                 | 5.0  | 8.2  | 267                   | 11.0            | 115V, 1;<br>400Hz,<br>30W | --           | 30W              | Convection     | Shock    |
| Antenna Selector Switch                                                                     |              | Left Console                |                     |      |      |                       |                 |                           |              |                  |                |          |
| Upper Antenna                                                                               |              | Top Fuselage Behind Cockpit |                     |      |      |                       |                 |                           |              |                  |                |          |
| Lower Antenna                                                                               |              | Bottom Fuselage Rear        |                     |      |      |                       |                 |                           |              |                  |                |          |



| Table 6-15. A-10A AVIONICS CONFIGURATION DATA: RADAR BEACON SYSTEM, AM/UPN-25 MEM: 5895-00-137-0439 |              |                                       |                     |     |     |                       |                 |                |     |                  |                |          |
|-----------------------------------------------------------------------------------------------------|--------------|---------------------------------------|---------------------|-----|-----|-----------------------|-----------------|----------------|-----|------------------|----------------|----------|
| Name                                                                                                | Nomenclature | Location                              | Dimensions (Inches) |     |     | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |     | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                     |              |                                       | H                   | W   | D   |                       |                 | AC             | DC  |                  |                |          |
| Receiver-Transmit Unit<br>Code Selector Box<br>Antenna                                              | RT-655       | Behind Panel E6 on Right Vertical Fin | 2.9                 | 3.4 | 4.0 | 39                    | 3.3             | --             | 28V |                  | Convection     | Hard     |
|                                                                                                     |              | Right Vertical Fin                    |                     |     |     |                       |                 |                |     |                  | Convection     | Hard     |
|                                                                                                     |              |                                       |                     |     |     |                       |                 |                |     |                  | Convection     | Hard     |

| Table 6-16. A-10A AVIONICS CONFIGURATION DATA: FIRE CONTROL SYSTEMS TARGET ID SYSTEM, LASER PAVE POINT SYSTEM AM/AAS-35(V), MAVERICK MONITOR, AND GUN SYSTEM ELECTRONICS SEM.* |                 |                           |                     |   |   |                       |                 |                |    |                  |                |          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------------------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                                                                                                           | Nomenclature    | Location                  | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                                                                                                |                 |                           | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| Target ID System                                                                                                                                                               |                 |                           |                     |   |   |                       |                 |                |    |                  |                |          |
| Control Panel                                                                                                                                                                  | PN627115100     | Pedestal Cockpit          |                     |   |   |                       |                 |                |    |                  |                |          |
| POD Assembly                                                                                                                                                                   | PN160891701-1   | Lower Fuselage Right Side |                     |   |   |                       |                 |                |    |                  |                |          |
| Detector, Laser                                                                                                                                                                | PN62721100-019  | Lower Fuselage Right Side |                     |   |   |                       |                 |                |    |                  |                |          |
| Adapter, Control Detector                                                                                                                                                      | PN627215100-019 | P10                       |                     |   |   |                       |                 |                |    |                  |                |          |
| Maverick/MK-84 TV System                                                                                                                                                       |                 |                           |                     |   |   |                       |                 |                |    |                  |                |          |
| Display                                                                                                                                                                        | PM102704        | Main Instrument Panel     |                     |   |   |                       |                 |                |    |                  |                |          |
| Control                                                                                                                                                                        | PM102707        | Left Console              |                     |   |   |                       |                 |                |    |                  |                |          |
| Inter Standard Control                                                                                                                                                         | PM924131001     | P14                       |                     |   |   |                       |                 |                |    |                  |                |          |
| Gun Electronics                                                                                                                                                                |                 |                           |                     |   |   |                       |                 |                |    |                  |                |          |
| Electronic Gun Control Unit                                                                                                                                                    | PM1320101       | P14                       |                     |   |   |                       |                 |                |    |                  |                |          |
| Data for these components are classified.                                                                                                                                      |                 |                           |                     |   |   |                       |                 |                |    |                  |                |          |

For AAS-35(V)1, 1230-01-008-7266.

\*For AAS-35(V)1, 1230-01-008-7266.

| Table 6-17. A-10A AVIONICS CONFIGURATION DATA: RADAR MONITORING AND WARNING SYSTEM, AM/ALR-46(V) NSM: SWS-00-091-8623 |               |                       |                     |     |      |                       |                 |                        |      |                  |                |          |
|-----------------------------------------------------------------------------------------------------------------------|---------------|-----------------------|---------------------|-----|------|-----------------------|-----------------|------------------------|------|------------------|----------------|----------|
| Name                                                                                                                  | Nomenclature  | Location              | Dimensions (Inches) |     |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power         |      | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                                       |               |                       | H                   | W   | D    |                       |                 | AC                     | DC   |                  |                |          |
| Amplifier-225 Degree Detector                                                                                         | AM-6639       | Aft Radome            | 6.7                 | 1.7 | 7.6  | 87                    | 3.5             | --                     | ±12V |                  | Convection     | Hard     |
| Amplifier-315 Degree Detector                                                                                         | AM-6639       | Aft Radome            | 6.7                 | 1.7 | 7.6  | 87                    | 3.5             | --                     | ±12V |                  | Convection     | Hard     |
| Indicator-Control                                                                                                     | ID-1902       | Main Instrument Panel |                     |     |      |                       |                 |                        |      |                  | Convection     |          |
| Indicator-Azimuth                                                                                                     | IP-957/APR-36 | Main Instrument Panel |                     |     |      |                       |                 |                        |      |                  | Convection     | Panel    |
| Digital Signal Analyzer                                                                                               | CM-442        | F103                  |                     |     |      |                       |                 | 115V<br>400Hz<br>2.5A  | --   |                  | Convection     |          |
| Receiver-Countermeasure                                                                                               | R-1854        | F103                  | 4.0                 | 1.6 | 10.8 | 259                   | 8.0             | 115V<br>400Hz<br>0.25A | --   |                  | Convection     | Hard     |
| Amplifier-45 Degree Detector                                                                                          | AM-6639       | Forward Radome        | 6.7                 | 1.7 | 7.6  | 87                    | 3.5             | --                     | ±12V |                  | Convection     | Hard     |
| Amplifier-135 Degree Detector                                                                                         | AM-6639       | Forward Radome        | 6.7                 | 1.7 | 7.6  | 87                    | 3.5             | --                     | ±12V |                  | Convection     | Hard     |
| Antennas (4)                                                                                                          |               |                       |                     |     |      |                       |                 |                        |      |                  |                | Hard     |

| Table 6-18. 3-10A AVIONICS CONFIGURATION DATA: ECM SYSTEM |                                                                   |               |                     |   |   |                       |                 |                |    |                  |                          |                            |
|-----------------------------------------------------------|-------------------------------------------------------------------|---------------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|--------------------------|----------------------------|
| Name                                                      | Nomenclature                                                      | Location      | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method           | Mounting                   |
|                                                           |                                                                   |               | H                   | W | D |                       |                 | AC             | DC |                  |                          |                            |
| Control Panel - ECM<br>ECM PODS                           | AM/ALQ-119(V)-10, -12<br><br>AM/ALQ-131 (Terminal Threat Warning) | Right Console |                     |   |   |                       |                 |                |    |                  | Convection<br>Convection | On Pylon Stations 1 and 11 |
| Data for this equipment are Classified.                   |                                                                   |               |                     |   |   |                       |                 |                |    |                  |                          |                            |

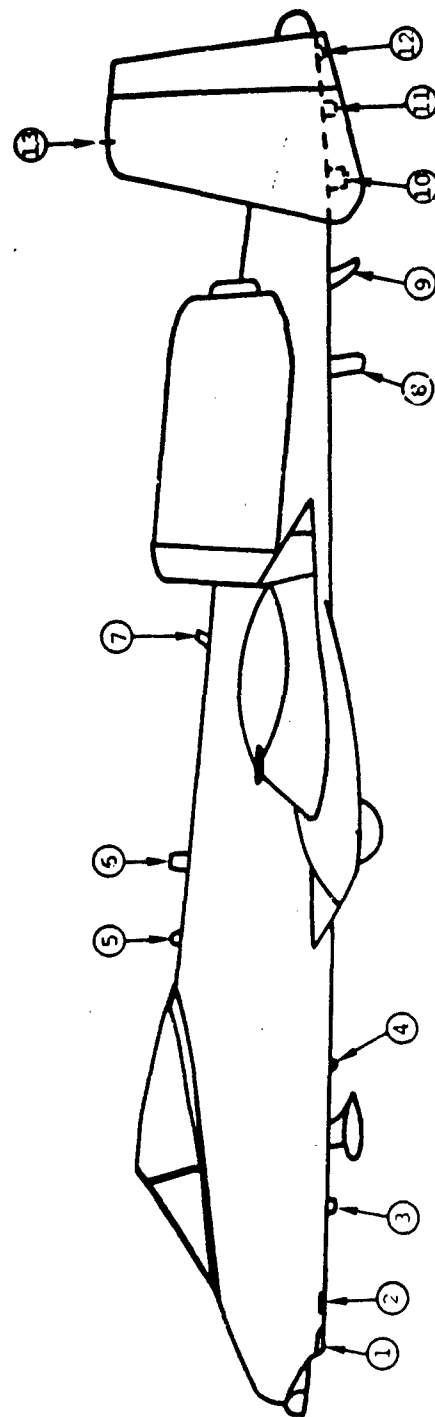
| Table 6-13. A-10A AVIONICS CONFIGURATION DATA: STABILITY AUGMENTATION SYSTEM NSN: TBD |              |              |                     |   |   |                       |                 |                |    |                  |                |          |
|---------------------------------------------------------------------------------------|--------------|--------------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                  | Nomenclature | Location     | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                       |              |              | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| Computer-Stability Augment<br>Control Panel-Stability Augment                         | PM292E790G4  | F42          |                     |   |   |                       |                 |                |    |                  |                |          |
|                                                                                       | PM123D6220G1 | Left Console |                     |   |   |                       |                 |                |    |                  |                |          |

## 7. ANTENNAS

Figure 7-1 shows the approximate location of the antennas of the A-10A.

The A-10A antenna nomenclature is as follows:

| <u>Figure 7-1</u><br><u>Legend</u> | <u>Antenna</u>    | <u>Nomenclature</u>     |
|------------------------------------|-------------------|-------------------------|
| 1                                  | RHAW              | 58-871502-7             |
| 2                                  | UHF/ADF           | OA-8697/ARD(DMN 15-5)   |
| 3                                  | UHF/TACAN         | DMCN 18-4               |
| 4                                  | VHF/FM Homing     | AS-1922/ARC             |
| 5                                  | IFF               | AT741BA                 |
| 6                                  | UHF/TACAN         | DMCN 18-4               |
| 7                                  | LORAN/GPS Antenna | Unknown                 |
| 8                                  | VHF/FM            | 4375-1/1C(777-1950-001) |
| 9                                  | VHF/AM            | DM-C50-1                |
| 10                                 | L-Band RHAW       | 11D28500                |
| 11                                 | IFF               | AT741BA                 |
| 12                                 | RHAW              | 53-871502-7             |
| 13                                 | X-Band Beacon     | AS2038/UPN              |



- |                          |                                       |
|--------------------------|---------------------------------------|
| 1. RHAW Antenna          | 8. VHF/FM Antenna                     |
| 2. UHF ADF Antenna       | 9. VHF/AM Antenna                     |
| 3. UHF/TACAN Antenna     | 10. L-Band RHAW Antenna               |
| 4. VHF/FM Homing Antenna | 11. IFF Antenna                       |
| 5. IFF Antenna           | 12. RHAW Antenna                      |
| 6. UHF/TACAN Antenna     | 13. X-Band Radar Antenna (RH Fin)     |
| 7. LORAN or GPS Antenna  | ILS system antenna locations are TBD. |

Figure 7-1. ANTENNA LOCATIONS

## 8. INTERFACE DATA

This section contains examples of interface signal characteristics. These data were extracted from applicable sections of the Interface Control Drawings (ICDs) for integration of GPS user equipment in the A-10 aircraft. Each sheet discussed a particular signal. The top line contains the signal name, type of signal (digital, analog, discrete or synchronous), signal source and load, and whether the signal is an input or output of the GPS user equipment. A functional description follows, together with a description of the signal's characteristics.



# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM | TO          |
|-------------|---------|-----|------|-------------|
| Bearing     | Synchro | 0   | UE   | Pilot's HSI |

## Functional Description

Provides angular information to the bearing pointer to display relative bearing of the aircraft's present position to selected waypoint.

## Signal Characteristics

RANGE:  $0^{\circ}$  to  $360^{\circ}$   
 ACCURACY:  $\pm 0.5^{\circ}$   
 INDEX REFERENCE: Aircraft Heading  
 POSITIVE DIRECTION SENSE: Increasing Bearing  
 SCALE FACTOR:  $1^{\circ} = 1^{\circ}$   
 RESOLUTION  $\pm 0.5^{\circ}$

## Electrical Characteristics

LOAD: 1) Pilot's HSI (AQU-6/A), 3-Wire Synchro (see page 10-3)  
 SOURCE: (TBD-1)

## Interconnection Data

(TBD-1)

A/C: A-10A  
 REF: AQU-6/A, MIL-I-83034

|     |             |
|-----|-------------|
| A   | ICD-GPS-002 |
| REV | 10-2        |

# ELECTRICAL CHARACTERISTICS

| LOAD 1                                             |             |         |
|----------------------------------------------------|-------------|---------|
| MSI (AQU-6/A), 3-Wire Synchro, EP AY500-S or equal |             |         |
| Rotor                                              |             |         |
| Input Voltage                                      | 26          | Volts   |
| Frequency                                          | 400         | Cycles  |
| Resistance (DC)                                    | 530         | Ohms    |
| Brush Contact Resistance                           | 0.5         | Ohms    |
| Stator                                             |             |         |
| Input Voltage                                      | 11.8        | Volts   |
| Input Current                                      | 20          | ma      |
| Input Power                                        | 0.090       | Watts   |
| Resistance (DC)                                    | 188         | Ohms    |
| Rotor Output Voltage                               | 19          | Volts   |
| Phase Shift (S to R)                               | 15          | Degrees |
| Accuracy (Max)                                     | 15          | Minutes |
| Null Voltage (Max)                                 | 50          | mv      |
| Impedance                                          |             |         |
| Zso                                                | 222 + j470  | Ohms    |
| Zro                                                | 940 + j2260 | Ohms    |
| Zrss                                               | 1050 + j450 | Ohms    |

|             |           |            |
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| REV         | ISSUED BY | DATE       |
| A           |           |            |
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| SCALE       | REV       | SHEET 10-3 |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME  | TYPE     | I/O | FROM | TO          |
|--------------|----------|-----|------|-------------|
| Bearing Flag | Discrete | O   | UE   | Pilot's HSI |

## Functional Description

Provides a discrete signal to operate the bearing warning flag. The flag is normally out of view when the bearing pointer is operating and the bearing data is valid. The flag appears when the bearing information is not valid or the device supplying the bearing data is not operating.

## Signal Characteristics

RANGE: 28 Vdc ground applied = out-of-view  
28 Vdc ground not applied = in-view

## Electrical Characteristics

LOAD: 1) Pilot's HSI (AQU-6/A), Shutter Mechanism  
Meter movement (28 Vdc)

SOURCE: (TBD-1)

## Interconnection Data

(TBD-2)

A/C: A-10A  
REF: AQU-6/A, MIL-I-83034

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|------|------|-------------|-------------|
| REV  | DATE | DESCRIPTION | ICD-GPS-002 |
| A    |      |             |             |
| DATE | REV  | DATE        | 10-4        |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME     | TYPE    | I/O | FROM | TO          |
|-----------------|---------|-----|------|-------------|
| Distance, Units | Synchro | 0   | UE   | Pilot's HSI |

## Functional Description

Provides angular information to rotate the units digit in the range window. Displays aircraft present position distance to selected waypoint in 1nm increments (0.5nm indexed). Driven independently of other digits, but read in conjunction with them in order to provide the least significant digit.

## Signal Characteristics

RANGE: 0 to 9 (0° to 360°)  
 ACCURACY:  $\pm 0.1$  ( $\pm 3.6^\circ$ )  
 INDEX REFERENCE: 0  
 POSITIVE DIRECTION SENSE: To decreasing values (distance to go)  
 SCALE FACTOR:  $36^\circ = 1$  numeral  
 RESOLUTION:  $\pm 3.6^\circ$

## Electrical Characteristics

LOAD: 1) Pilot's HSI (AQU-6/A), 3-Wire Synchro, Clifton CRC-8-A-1 or equal (See page 10-8).

SOURCE: (TBD-1)

## Interconnection Data

(TBD-2)

A/C: A-10A  
 REF: AQU-6/A, MIL-I-83034

|       |       |      |             |
|-------|-------|------|-------------|
| REV   | ISSUE | DATE | DESCRIPTION |
| A     |       |      | ICD-GPS-002 |
| SCALE | REV   | DATE | 10-5        |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME    | TYPE    | I/O | FROM | TO          |
|----------------|---------|-----|------|-------------|
| Distance, tens | Synchro | 0   | UE   | Pilot's HSI |

## Functional Description

Provides angular information to rotate the tens digit in the range window. Displays aircraft present position distance to selected waypoint in 10nm increments. Driven independently of other distance digits but read in conjunction with them.

## Signal Characteristics

RANGE: 0 to 9 ( $0^{\circ}$  to  $360^{\circ}$ )  
 ACCURACY:  $\pm 0.1$  ( $\pm 3.6^{\circ}$ )  
 INDEX REFERENCE: 0  
 POSITIVE DIRECTION SENSE: To decreasing values (distance to go)  
 SCALE FACTOR:  $360^{\circ} = 1$  numeral  
 RESOLUTION:  $\pm 3.6^{\circ}$

## Electrical Characteristics

LOAD: 1) Pilot's HSI (AQU-6/A), 3-Wire Synchro, Clifton CRC-8-A-1 or equal (see page 10-8)

SOURCE: (TBD-1)

## Interconnection Data

(TBD-2)

A/C: A-10A  
 REF: AQU-6/A); MIL-I-83034

|       |                 |              |
|-------|-----------------|--------------|
| A     | DATE REPT. ISS. | ISSUING ORG. |
|       |                 | ICD-GPS-002  |
| SCALE | REV             | SHEET 10-6   |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME        | TYPE    | I/O | FROM | TO          |
|--------------------|---------|-----|------|-------------|
| Distance, hundreds | Synchro | 0   | UE   | Pilot's HSI |

## Functional Description

Provides angular information to rotate the hundreds digit in the range window. Displays aircraft present position distance to the selected waypoint in 100nm increments. Driven independently of the other distance digits, but read in conjunction with them in order to provide the most significant digit for the distance value.

## Signal Characteristics

RANGE: 0 to 9 ( $0^{\circ}$  to  $360^{\circ}$ )  
 ACCURACY:  $\pm 0.1$  ( $\pm 3.6^{\circ}$ )  
 INDEX REFERENCE: 0  
 POSITIVE DIRECTION SENSE: To decreasing values (distance to go)  
 SCALE FACTOR:  $36^{\circ} = 1$  numeral  
 RESOLUTION:  $\pm 3.6^{\circ}$

## Electrical Characteristics

LOAD: 1) Pilot's HSI (AQU-6/A), 3-Wire Synchro, Clifton CRC-8-A-? or equal (see page 10-8)

SOURCE: (TBD-1)

## Interconnection Data

(TBD-2)

A/C: A-10A  
 REF: AQU-6/A, MIL-I-83034

|      |       |      |             |
|------|-------|------|-------------|
| REV  | ISSUE | DATE | DESCRIPTION |
| A    |       |      | ICD-GPS-002 |
| DATE | REV   | DATE | 10-7        |

# ELECTRICAL CHARACTERISTICS

| LOAD 1                                                                                                                                                                                                         |                                                                                                                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| HSI, AQU-6/A, Distance Display, 3-Wire<br>Synchro, Clifton Type CRC-8-A-1 or equal                                                                                                                             |                                                                                                                                              |
| Primary Winding<br>Primary Voltage (400 Hz)<br>Secondary Voltage<br>Input Current<br>Input Power<br>Accuracy<br>Impedance, Zro<br>Impedance, Zso<br>Rotor DC Resistance<br>Stator DC Resistance<br>Phase Shift | Rotor<br>26 Volts<br>11.8 Volts<br>100 ma<br>.54 Watts<br>30 Minutes<br>54 + j260 Ohms<br>12 + j45 Ohms<br>37 Ohms<br>12 Ohms<br>8.5 Degrees |

|       |                |                |
|-------|----------------|----------------|
| DATE  | DATE, NAME AND | REVISIONS, NO. |
| A     |                | ICD-GPS-002    |
| SCALE | REV            | SHEET 10-8     |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM        | TO |
|-------------|---------|-----|-------------|----|
| Course Set  | Synchro | I   | Pilot's HSI | UE |

## Functional Description

Provides an electrical reference signal of the course manually selected by the Course Set control on the HSI. This signal will be used by the UE as a reference for positioning the course deviation and To-From indicators on the HSI.

## Signal Characteristics

RANGE:  $0^{\circ}$  to  $360^{\circ}$   
 ACCURACY:  $\pm 0.5^{\circ}$   
 INDEX REFERENCE: Aircraft Heading  
 POSITIVE DIRECTION SENSE: Increased Heading  
 SCALE FACTOR:  $1^{\circ}$   $\div$   $1^{\circ}$   
 RESOLUTION:  $\pm 2.5^{\circ}$

## Electrical Characteristics

(Continued on next page)

SOURCE: Pilot's HSI Course Resolver,  
 Eclipse Pioneer Type AY221-5-B

LOAD: (TBD-1)

## Interconnection Data

(TBD-2)

A/C: A-10A  
 REF: AQU-6/A, MIL-I-83034

|   |           |             |
|---|-----------|-------------|
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# ELECTRICAL CHARACTERISTICS

| SOURCE 1                                                         |                  |  |
|------------------------------------------------------------------|------------------|--|
| HSI, AQU-6/A, Course Resolver, Eclipse<br>Pioneer Type AY221-5-B |                  |  |
| Input Voltage                                                    | 26 Vac. 400 Hz   |  |
| Input Current                                                    | 12 ma            |  |
| Input Power                                                      | 100 mw           |  |
| Output Voltage                                                   | 17.2 Vac         |  |
| Phase Shift (Lead)                                               | 10 degrees       |  |
| DC Resistance, Rotor                                             | 400 Ohms         |  |
| DC Resistance, Stator                                            | 175 Ohms         |  |
| Zro                                                              | 700 + j2100 Ohms |  |
| Zso                                                              | 345 + j1220 Ohms |  |
| Accuracy                                                         | 20 minutes       |  |

|       |      |     |      |     |             |       |
|-------|------|-----|------|-----|-------------|-------|
| DATE  | CODE | REV | DATE | REV | DATE        | REV   |
| A     |      |     |      |     | ICD-GPS-002 |       |
| SCALE |      | REV |      |     | DATE        | 10-10 |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME          | TYPE   | I/O | FROM | TO                |
|----------------------|--------|-----|------|-------------------|
| Horizontal Deviation | Analog | 0   | UE   | Pilot's HSI & ADI |

## Functional Description

Provides a variable d.c. signal that indicates the displacement of the aircraft to the left or right of a selected course. The displacement represented by the indicating device will be controlled by UE software and will be dependent upon aircraft flight phase. Deflection of the indicating device may represent angular displacement (e.g., 10° for a TACAN approach: 2.5° for ILS) or distance. For an area navigation systems, the Area Navigation Subcommittee of the Air Transport Association's Air Traffic Control Committee has recommended the following ranges for the flight modes indicated: a) Enroute: 2-6 miles full scale, b) Terminal: 1-2 miles full scale and c) Approach: 600-3000 feet full scale. Choice of presentation (distance/degrees) and scales are (TBD-3).

## Signal Characteristics

RANGE: 0 to + 150  $\mu$ a  
 RESOLUTION: 5  $\mu$ a  
 ACCURACY: + 10  $\mu$ a  
 INDEX REFERENCE: Selected course  
 POSITIVE DIRECTION SENSE: Fly right (+)  
 SCALE FACTOR: 75  $\mu$ a/dot on the indicator  
 Distance/angular displacement scale factor (TBD-3)

## Electrical Characteristics

LOAD: 1) Pilot's HSI (AQU-6/A); course bar mechanism, 1000 ohms  $\pm$  3%  
 2) Pilot's ADI (ARU-2B/A), 1000 ohms  $\pm$  3%

SOURCE: (TBD-1)

## Interconnection Data

(TBD-2)

A/C: A-10A  
 REF: AQU-6/A, MIL-I-83034  
 ARU-2B/A, MIL-I-27193

|             |      |     |     |      |       |
|-------------|------|-----|-----|------|-------|
| REV         | DATE | BY  | REV | DATE | BY    |
| A           |      |     |     |      |       |
| ICD-GPS-002 |      |     |     |      |       |
| REV         | REV  | REV | REV | REV  | REV   |
|             |      |     |     |      | 10-11 |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE   | I/O | FROM | TO          |
|-------------|--------|-----|------|-------------|
| To-From     | Analog | 0   | UE   | Pilot's HSI |

## Functional Description

Provides a d.c. analog signal to drive the To-From indicator. If the aircraft is flying toward the waypoint and has not intercepted a reference line perpendicular to the aircraft ground track and through the waypoint, the indication will be TO. Once past the waypoint reference line, the indication will be FROM as long as this waypoint is still selected.

## Signal Characteristics

RANGE: TO = + 225 ua maximum  
 BLANK = no signal  
 FROM = -225 ua maximum

## Electrical Characteristics

LOAD: 1) Pilot's HSI (AQU-6/A). Meter movement, 200 ohms  $\pm$  15%  
 SOURCE: (TBD-1)

## Interconnection Data

(TBD-2)

A/C: A-10A  
 REF: AQU-6/A, MIL-I-83034

|   |             |             |
|---|-------------|-------------|
| A | ICD-GPS-002 |             |
|   | REV         | SHEET 10-12 |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME   | TYPE     | I/O | FROM | TO          |
|---------------|----------|-----|------|-------------|
| Distance Flag | Discrete | 0   | UE   | Pilot's HSI |

## Functional Description

Provides a discrete signal to operate the distance warning flag. The flag is normally out of view when the range indicator is operating and the range data is valid. The flag covers the range indicator when the distance information is not valid or the device supplying the distance data is not operating.

## Signal Characteristics

RANGE: 28 Vdc ground applied = out-of-view  
28 Vdc ground not applied = in-view

## Electrical Characteristics

LOAD: 1) Pilot's HSI (AQU-6/A), Distance Shutter Mechanism,  
Meter movement (28 Vdc)

SOURCE: (TBD-1)

## Interconnection Data

(TBD-2)

A/C: A-10A  
REF: AQU-6/A, MIL-I-83034

|             |      |      |      |      |      |      |      |      |      |
|-------------|------|------|------|------|------|------|------|------|------|
| REV         | DATE | BY   | CHKD | DATE | BY   | CHKD | DATE | BY   | CHKD |
| A           |      |      |      |      |      |      |      |      |      |
| 1CD-GPS-002 |      |      |      |      |      |      |      |      |      |
| NO.         | REV  | DATE | BY   | CHKD | DATE | BY   | CHKD | DATE | BY   |
|             |      |      |      |      |      |      |      |      |      |
| 10-13       |      |      |      |      |      |      |      |      |      |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME               | TYPE     | I/O | FROM | TO                |
|---------------------------|----------|-----|------|-------------------|
| Horizontal Deviation Flag | Discrete | 0   | UE   | Pilot's HSI & ADI |

## Functional Description

Provides a discrete signal to operate the deviation warning flag or circuit when the deviation data is unreliable or a malfunction has occurred in the course deviation circuitry.

## Signal Characteristics

RANGE: Deviation signal valid: 245-500 mv.  
Deviation signal invalid: <180 mv.

## Electrical Characteristics

LOAD: 1) Pilot's HSI (AQU-6/A), Suppressed zero meter movement, 1000 ohms, 3%  
2) Pilot's ADI (ARU-2B/A), 1000 ohms, 3%  
SOURCE: (TBD-1)

## Interconnection Data

(TBD-2)

A/C: A-10A  
REF: AQU-6/A, MIL-I-83034  
ARU-2B/A, MIL-I-27193

|       |       |          |             |
|-------|-------|----------|-------------|
| DATE  | ISSUE | REVISION | DESCRIPTION |
| A     |       |          | ICD-GPS-002 |
| SCALE | REV   | SHEET    | 10-14       |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM | TO  |
|-------------|---------|-----|------|-----|
| INS Update  | Digital | 0   | UE   | INS |

## Functional Description

GPS output data will be provided to the INS (when installed) for use in alignment and other uses as required.

Output Data: a) Latitude e) Altitude  
b) Longitude f) Time  
c) N-S Velocity  
d) E-W Velocity

## Signal Characteristics

MIL-STD-1553 or ARINC Specification 419.

## Electrical Characteristics

(TBD-1)

## Interconnection Data

(TBD-1)

A/C: A-10A  
REF:

|       |      |      |             |
|-------|------|------|-------------|
| DATE  | CODE | REV  | ISSUING     |
| A     |      |      | ICD-GPS-002 |
| SCALE | REV  | DATE | 10-15       |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME        | TYPE   | I/O | FROM | TO  |
|--------------------|--------|-----|------|-----|
| Vertical Deviation | Analog | O   | UE   | ADI |

## Functional Description

Provides a variable d.c. signal that indicates the displacement of the aircraft above or below a desired flight path. The displacement represented by the indicating device will be controlled by UE software and will be dependent upon aircraft flight phase. Deflection of the indicating device may represent angular displacement (e.g., 0.5° for ILS) or distance. For an area navigation systems, the Area Navigation Subcommittee of the Air Transport Association's Air Traffic Control Committee has recommended the following ranges for the flight modes indicated: a) Enroute: 200-2000 feet full scale, b) Terminal: 60-200 feet full scale and c) Approach: 40-100 feet full scale. Choice of presentation (distance/degrees) and scales are TBD-3.

## Signal Characteristics

RANGE: 0 to + 150  $\mu$ a  
 RESOLUTION: 3  $\mu$ a  
 ACCURACY: + 10  $\mu$ a  
 INDEX REFERENCE: Desired flight path  
 POSITIVE DIRECTION SENSE: Fly Down (+)  
 SCALE FACTOR: 75  $\mu$ a/dot on the indicator  
 Distance/angular displacement scale factor TBD-3

## Electrical Characteristics

LOAD: 1) Pilot's ADI (ARU-2B/A), 1000 ohms  $\pm$  3%  
 SOURCE: (TBD-1)

## Interconnection Data

(TBD-2)

A/C: A-10A  
 REF: ARU-2B/A, MIL-I-27193

|       |       |             |
|-------|-------|-------------|
| DATE  | ISSUE | REVISION    |
| A     |       | ICD-GPS-002 |
| SCALE | REV   | PAGE 10-16  |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME             | TYPE     | I/O | FROM | TO          |
|-------------------------|----------|-----|------|-------------|
| Vertical Deviation Flag | Discrete | 0   | UE   | Pilot's ADI |

## Functional Description

Provides a discrete signal to operate the deviation warning flag or circuit when the deviation data is unreliable or a malfunction has occurred in the course deviation circuitry.

## Signal Characteristics

RANGE: Deviation signal valid: 245-500 mv.  
Deviation signal invalid: <180 mv.

## Electrical Characteristics

LOAD: 1) Pilot's ADI (ARU-2B/A), Suppressed Zero Meter Movement,  
1000 Ohms  $\pm$  3%

SOURCE: (TBD-1)

## Interconnection Data

(TBD-2)

A/C: A-10A  
REF: ARU-2B/A, MIL-I-27193

|       |      |        |             |
|-------|------|--------|-------------|
| DATE  | CODE | REV    | ISSUED      |
| A     |      |        | ICD-GPS-002 |
| SCALE | REV  | ISSUED | 10-17       |



# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME      | TYPE               | I/O | FROM                                 | TO |
|------------------|--------------------|-----|--------------------------------------|----|
| Magnetic Heading | Analog,<br>Synchro | I   | Heading Attitude<br>Reference System | UE |

## Functional Description

Provide angular reference signal of aircraft heading relative to magnetic north.

## Signal Characteristics

RANGE: 0° to 360°  
 ACCURACY: + 0.5%  
 INDEX REFERENCE: Magnetic North  
 POSITIVE DIRECTION SENSE: Nose Right  
 SCALE FACTOR: 10 = 1  
 RESOLUTION: (TBD-2)

## Electrical Characteristics

SOURCE: 1) Heading Attitude Reference System, 3-Wire Synchro

LOAD: (TBD-1)

## Interconnection Data

(TBD-2)

A/C: A-10A  
 REF:

|       |           |             |
|-------|-----------|-------------|
| DATE  | ISSUED BY | ISSUING NO  |
| A     |           | ICD-GPS-002 |
| SCALE | REV       | SHEET 10-18 |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME    | TYPE    | I/O | FROM               | TO |
|----------------|---------|-----|--------------------|----|
| True Air Speed | Synchro | I   | Airspeed Indicator | UE |

## Functional Description

Provides an input of true airspeed in synchro format.

## Signal Characteristics

SCALE RATE:  $334.285^\circ$  for 500 knots  $V_c$  (0.66857 $^\circ$ /knot)

Display to electrical angle output

ACCURACY:  $\pm 1.5$  knots

## Electrical Characteristics

### SOURCE:

Electrical Zero: 50 knots

Rotor Excitation: 26 Vrms, 400 Hz

Stator Output: 3.9 Vrms max, 400 Hz

line-to-line open

circuit @ 57 $^\circ$  phase

Rotor Res.(DC): 54 ohm I/O%

Rotor Imp.(Z):  $216 + j302$

Stator Res.(DC): 249 ohms  $\pm 15\%$

Input Cur., rotor: 0.060 amps

Input Pwr., rotor: 0.800 W

Stator Load: 10K $\Omega$ /leg matched (min.)

LOAD: (TBD-1)

## Interconnection Data

(TBD-3)

A/C: A-10A

REF: MIL-I-83152B

|      |           |              |
|------|-----------|--------------|
| DATE | ISSUE NO. | REVISION NO. |
| A    |           | ICD-GPS-002  |
| DATE | REV       | DATE 10-19   |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME    | TYPE  | I/O | FROM               | TO |
|----------------|-------|-----|--------------------|----|
| Blanking Pulse | Pulse | I   | IFF, AN/APX-101(V) | UE |

## Functional Description

Provides a blanking pulse to protect UE from damage while other L band systems are transmitting.

## Signal Characteristics

SIGNAL TYPE: Positive Pulse  
 AMPLITUDE: 0 to +40 volts  
 FREQUENCY RANGE: 20,000 PPS (max.)  
 DUTY CYCLE: 15% (max.)  
 LOGIC ONE LEVEL (SUPPRESSION): +20 to +40 volts  
 LOGIC ZERO (NON-SUPPRESSION):  $0 \pm 0.5$  volts  
 START TIME: See next page  
 STOP TIME: See next page

## Electrical Characteristics

SOURCE: IFF (AN/APX-101), Receiver-Transmitter  
 RT-1063B/APX-101(V), R = 100 Ohms  $\pm 10\%$   
 LOAD: 300 to 2,200 Ohms shunted by 1850 Pf

## Interconnection Data

WIRE TYPE: RG-58C/U Coaxial Cable

A/C: A-10A  
 REF:

|       |                |             |
|-------|----------------|-------------|
| DATE  | ISSUE IDENT NO | ISSUANCE NO |
| A     |                | ICD-GPS-002 |
| SCALE | REV            | SHEET 10-20 |

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8-20

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME                   | TYPE  | I/O | FROM               | TO |
|-------------------------------|-------|-----|--------------------|----|
| Blanking Pulse<br>(continued) | Pulse | I   | IFF, AN/APX-101(V) | UE |

## Signal Characteristics (continued)

START TIME: The suppression pulse shall rise to 7.5 volts minimum at least 0.5 usec but not more than 3.0 usec before the RF output pulse has reached 10% of its amplitude. For auxiliary trigger and Mode 4 replies, the pulse shall rise to 7.5 volts minimum less than 0.5 usec before the RF output pulse has reached 10% of its amplitude. Maximum rise time (10-90%) shall be 0.5 usec.

STOP TIME: The suppression pulse shall be less than 1.0 volt, 3.0 usec after the 10% amplitude point of the trailing edge of the last RF framing pulse of the reply pulse train or after the 10% amplitude point of the trailing edge of each RF output pulse resulting from the auxiliary trigger input.

A/C: A-10A  
REF:

|       |      |       |       |             |
|-------|------|-------|-------|-------------|
| DATE  | CODE | REV   | NO    | ISSUING NO  |
| A     |      |       |       | ICD-GPS-002 |
| SCALE | REV  | SHEET | 10-21 |             |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME         | TYPE               | I/O | FROM              | TO |
|---------------------|--------------------|-----|-------------------|----|
| Barometric Altitude | Analog.<br>Synchro | I   | Altitude Computer | UE |

## Functional Description

Provides an input of pressure altitude in synchro format for use by the system when operating with less than full navigation capability.

## Signal Characteristics

RANGE: -1000 to +70,000 feet  
 ACCURACY:  $\pm 100$  feet at 50,000 feet  
 INDEX REFERENCE: 29.92 inches Hg.  
 SCALE FACTOR: Output 1:  $36^\circ$  per 1,000 feet  
 Output 2:  $36^\circ$  per 1,000 feet  
 Output 3:  $36^\circ$  per 100 feet  
 Output 4:  $1.869^\circ$  per 1,000 feet

## Electrical Characteristics (Continued next page)

SOURCE: Altitude Encoder, Altitude Transducer  
 Computer, Type CPU-46/A10, P/N A43700-00-050  
 (Vollsman), 3-wire Synchro, P/N 100GZ-88-A1  
 (Eclipse-Pioneer) or equal  
 LOAD: (TBD-1)

## Interconnection Data

(TBD-2)

A/C: A-10A  
 REF: T.O. 5F5-4-13-13  
 MIL-C-27889

|       |      |     |      |    |             |       |
|-------|------|-----|------|----|-------------|-------|
| QWL   | CODE | REV | DATE | NO | REVISION    | NO    |
| A     |      |     |      |    | ICD-GPS-002 |       |
| SCALE |      | REV |      |    | SHEET       | 10-22 |

# ELECTRICAL CHARACTERISTICS

| LOAD 1                                                           |  |
|------------------------------------------------------------------|--|
| Synchro Transmitter, Eclipse-Pioneer<br>P/N 100GZ-88-A1 or Equal |  |
| (TBD-2)                                                          |  |

|       |                |       |             |
|-------|----------------|-------|-------------|
| DATE  | LOCAL USE ONLY | DATE  | ICD-GPS-002 |
| A     |                |       |             |
| SCALE | REV            | SHEET | 10-23       |

| SIGNAL NAME | TYPE    | I/O | FROM | TO |
|-------------|---------|-----|------|----|
| INS Data    | Digital | I   | INS  | UE |

Functional Description

GPS will require the following data from the INS in order to lock-on to satellites rapidly and to maintain stabilization for the high AJ antenna:

|                      |               |                     |
|----------------------|---------------|---------------------|
| a) True Air Speed    | e) X Velocity | i) Roll             |
| b) Pressure Altitude | f) Y Velocity | j) Magnetic Heading |
| c) Latitude          | g) Z Velocity | k) True Heading     |
| d) Longitude         | h) Pitch      |                     |

Signal Characteristics

MIL-STD-1553 or ARINC Specification 419

Electrical Characteristics

(TBD-1)

Interconnection Data

(TBD-1)

A/C: A-10A

REF:

|          |     |              |
|----------|-----|--------------|
| <b>A</b> |     | ICD-GPS-002  |
| SCALE    | REV | PAGE 1 10-24 |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM | TO |
|-------------|---------|-----|------|----|
| Pitch       | Synchro | I   | HARS | UE |

## Functional Description

Provides an input of aircraft pitch attitude in synchro format to the UE.

## Signal Characteristics

RANGE: + 90°  
 ACCURACY: + 0.5°  
 INDEX REFERENCE: 0° Pitch  
 POSITIVE DIRECTION SENSE: Nose Up  
 SCALE FACTOR: 10 = 10

## Electrical Characteristics

SOURCE: (TBD-2)  
 LOAD: (TBD-1)

## Interconnection Data

(TBD-1)

A/C: A-10A  
 REF:

|             |             |      |
|-------------|-------------|------|
| REV         | DESCRIPTION | DATE |
| A           |             |      |
| ICD-GPS-002 |             |      |
| REV         | DATE        |      |
|             | 10-25       |      |



# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM | TO |
|-------------|---------|-----|------|----|
| Roll        | Synchro | I   | HARS | UE |

## Functional Description

Provides an input of aircraft roll attitude in synchro format to the UE.

## Signal Characteristics

RANGE:  $0^{\circ}$  to  $360^{\circ}$   
 ACCURACY:  $\pm 0.5^{\circ}$   
 INDEX REFERENCE:  $0^{\circ}$  Roll  
 POSITIVE DIRECTION SENSE: Right Wing Down  
 SCALE FACTOR:  $1^{\circ} = 1^{\circ}$

## Electrical Characteristics

SOURCE: (TBD-2)  
 LOAD: (TBD-1)

## Interconnection Data

(TBD-1)

A/C: A-10A  
 REF:

|       |      |             |             |
|-------|------|-------------|-------------|
| REV   | DATE | DESCRIPTION | ICD-GPS-002 |
| A     |      |             |             |
| SCALE | REV  | SHEET       | 10-26       |

## 9. FUTURE MODIFICATIONS

Table 9-1 presents planned or tentative Class V modifications. Only those systems not previously addressed in Section 6 are included. Tables 9-2 through 9-4 present limited LRU data on the ARC-186 VHF radio, the Inertial Measurement Unit, and the Compass Tie System.

| Table 9-1. A-10A CLASS V AVIONICS MODIFICATIONS |                                                                                                                                                                            |
|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Terminology/Nomenclature                        | Remarks                                                                                                                                                                    |
| Inertial Navigation System                      | Selection of the F <sup>3</sup> /INS compatible system is to be made in the near future. See Table 9-2.                                                                    |
| Chaff Dispenser/ALE-40                          | Will be incorporated in the near term.                                                                                                                                     |
| VHF AM/FM Radio/ARC-186                         | Two will be installed. One will replace the VHF AM radio before production begins. The other will replace the VHF FM radio under a retrofit activity later. See Table 9-3. |
| Global Positioning System                       | Space located-three dimensional, continuous, worldwide precision positioning system.                                                                                       |
| Compass Tie/ALR-69                              | Updated RHAW system with jammer power management capability. (Uncertain modification for A-10A at this time.)                                                              |

| Table 9 2. A-10A AVIONICS CONFIGURATION DATA: VHF AM/FM RADIO SET AN/ARC-186*                                                                                                                                                                                                                                                                                                                        |              |                         |                     |      |                                                   |                       |                 |                                |                                                    |                  |                |             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-------------------------|---------------------|------|---------------------------------------------------|-----------------------|-----------------|--------------------------------|----------------------------------------------------|------------------|----------------|-------------|
| Name                                                                                                                                                                                                                                                                                                                                                                                                 | Nomenclature | Location                | Dimensions (Inches) |      |                                                   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power                 |                                                    | Heat Dissipation | Cooling Method | Mounting    |
|                                                                                                                                                                                                                                                                                                                                                                                                      |              |                         | H                   | W    | D                                                 |                       |                 | AC                             | DC                                                 |                  |                |             |
| Receiver**<br>Transmitter<br>(Quantity 2)                                                                                                                                                                                                                                                                                                                                                            |              | +                       | 4.75                | 5.0  | 9.5                                               | 226                   | 6.5 Each        | 5Vac<br>Panel<br>Light-<br>ing | 29V<br>0.71 RX<br>50W<br>4.0A TX<br>150W<br>(Each) |                  | Convection     | On Adapters |
| Control Unit<br>(Quantity 2)                                                                                                                                                                                                                                                                                                                                                                         |              | Cockpit Left<br>Console | 2.25                | 5.75 | 6.6                                               | 85                    | 3 Each          |                                |                                                    |                  | Convection     | Console     |
| AM Adapter<br>(Used in ARC-<br>134 VHF/AM<br>Replacement)                                                                                                                                                                                                                                                                                                                                            | 998G-3       | +                       | 1.5                 | 4.35 | 12.6                                              | 82                    | 5               |                                |                                                    |                  | --             | Shock       |
| FM Adapter<br>(Used in ARC-<br>131 VHF/AM<br>Replacement)                                                                                                                                                                                                                                                                                                                                            | 998G-1       | +                       | 1.25                | 5.0  | 13.6                                              | 85                    | 5               |                                |                                                    |                  | --             | Shock       |
| FM Mounting<br>Module (Appli-<br>cable to VHF/<br>FM Replacement<br>Only)                                                                                                                                                                                                                                                                                                                            |              | +                       | 3.0                 | 3.0  | 4.5<br>(Included within FM<br>Adapter Dimensions) | 41                    | 2               |                                |                                                    |                  | Convection     | Shock       |
| *This list includes the total ARC-186 installation (2 systems). One P/T, one control, and the AM adapter replace the original VHF AM Radio. The remain-<br>ing items will replace the VHF FM radio during retrofit.<br>**Each P/T will have both AM and FM capability.<br>The first ARC-186 system P/T unit will be located behind access F40. The second system will be located behind access F103. |              |                         |                     |      |                                                   |                       |                 |                                |                                                    |                  |                |             |

| Table 9-3. A-10A AVIONICS CONFIGURATION DATA: INERTIAL MEASUREMENT UNIT DATA (SUPPLIED BY A-10 SPO) |              |          |                     |     |      |                       |                 |                                                                                                                                                                 |                                               |                  |                         |          |
|-----------------------------------------------------------------------------------------------------|--------------|----------|---------------------|-----|------|-----------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|------------------|-------------------------|----------|
| Name                                                                                                | Nomenclature | Location | Dimensions (Inches) |     |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power                                                                                                                                                  |                                               | Heat Dissipation | Cooling Method          | Mounting |
|                                                                                                     |              |          | H                   | W   | D    |                       |                 | AC                                                                                                                                                              | DC                                            |                  |                         |          |
| Inertial Measurement Unit                                                                           |              |          | 9.1                 | 7.9 | 15.6 | 1121                  | 35 Maximum      | 115V<br>3ø<br>400Hz<br>øA<br>140VA<br>Start<br>280VA<br>Steady<br><br>øB, C<br>710VA<br>Start<br>70VA<br>Steady<br><br>26Vac<br>40VA<br>Start<br>35VA<br>Steady | 28V<br>240W<br>IP AC<br>Power<br>Lost<br>Only |                  | Forced Air Conditioning |          |

| Table 9-4. A-10A AVIONICS CONFIGURATION DATA: COMPASS TIE |              |          |                     |      |        |                       |                 |                |         |                  |                |          |
|-----------------------------------------------------------|--------------|----------|---------------------|------|--------|-----------------------|-----------------|----------------|---------|------------------|----------------|----------|
| Name                                                      | Nomenclature | Location | Dimensions (Inches) |      |        | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |         | Heat Dissipation | Cooling Method | Mounting |
|                                                           |              |          | H                   | W    | D      |                       |                 | AC             | DC      |                  |                |          |
| Compass Tie                                               |              |          |                     |      |        |                       |                 |                |         |                  |                |          |
| Signal Processor                                          | ALR-69       | F-103    | 5.0                 | 7.59 | 14.808 | 562.9                 | 25              | 115v<br>3.5A   |         | 175              | Forced Air     | Shock    |
| FSRS:                                                     |              |          |                     |      |        |                       |                 |                |         |                  |                |          |
| Controller                                                | C-10373      | F-105    | 7.0                 | 5.0  | 12.39  | 433.7                 | 22.3            | 115v3ø 1.1A/ø  | 28v, 1A | 357              | Forced Air     | Shock    |
| Receiver                                                  | R-2094       | F-105    | 6.0                 | 4.0  | 10.77  | 258.5                 | 15              | FM Controller  |         |                  | Forced Air     | Hard     |
| Transmission                                              | CU-2220      | F-105    | 2.0                 | 6.0  | 8.98   | 107.8                 | 4.1             | 115v<br>.35A   |         | 25               | Forced Air     | Hard     |
| Line Coupler                                              |              |          |                     |      |        |                       |                 |                |         |                  |                |          |
| E/J Receivers<br>(See ALR-46,<br>Table 6-17)              | AM-6639      |          |                     |      |        |                       |                 |                |         |                  | HA             | HA       |
| C/D Receiver                                              | AM-6971      | F-103    | 4.0                 | 6.0  | 10.6   | 254.4                 | 7.5             | FM CM-479      |         | 20               | HA             | Hard     |
| Antenna Switch                                            | MT-1989      | F-105    | 1.13                | 3.5  | 2.5    | 9.89                  | 1.0             | FM Controller  |         | -                | Convection     | Hard     |

## 10. DATA SOURCES

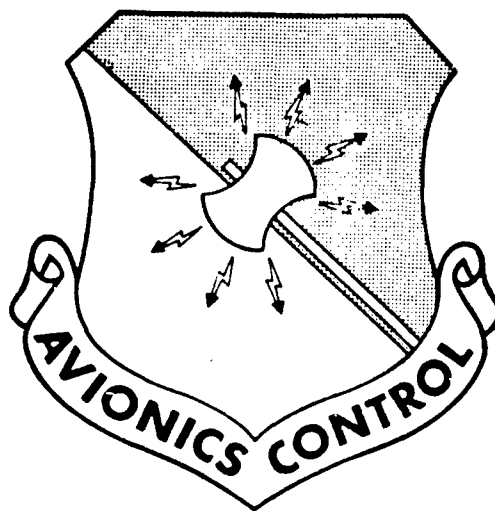
The following sources of data were used in preparing this summary:

- Information contained in the JTIDS Aircraft Configuration Data Summary - A-10A. (Source ASD/XRE)
- A-10 System Program Office
- ICD-TPS-002, GPS Phase II User Equipment Interface Requirements for the A-10A Aircraft
- Letter from ASD/YXEA to ASD/EN, 1 February 1978, Subject "A-10A Avionics"
- Avionics Planning Baseline Document, October 1978
- Rockwell International/Collins ARC-186 VHF Radio Description Data
- ARINC Research Informal Report - Technical Report, Preliminary JTIDS Configuration Data Analyses, May 1978
- ASD YXEA Letters, 19 September 1978, ALR-69 Installation Drawings

### List of Technical Orders

| <u>Technical Order<br/>Number</u> | <u>Title</u>                 | <u>Change</u> | <u>Date</u> |
|-----------------------------------|------------------------------|---------------|-------------|
| 1A-10A-01                         | List of Publications         |               | 4/1/77      |
| 1A-10A-1                          | Flight Manual                |               | 3/30/79     |
| 1A-10A-1-1                        | Flight Manual                | 2             | 9/15/77     |
| 1A-10A-2-1-1                      | General Manual               | Basic         | 1/25/77     |
| 1A-10A-2-110-1                    | Wiring Diagrams              | 3             | 10/15/77    |
| 1A-10A-2-34TS-1                   | Navigation/Instrument System | 2             | 7/15/77     |
| 1A-10A-2-26MS-1                   | Fuel System                  | Basic         | 3/1/77      |
| 1A-10A-2-27MS-1                   | Flight Control               | 2             | 3/1/77      |
| 1A-10A-2-94MS-1                   | Fire Control                 | Basic         | 9/1/77      |
| 1A-10A-2-94MS-2                   | Armament                     | Basic         | 1/3/77      |
| 1A-10A-2-21MS-1                   | Environmental Control System | 2             | 3/15/77     |
| 1A-10A-2-34MS-1                   | Instrument System            | 1             | 5/20/77     |
| 1A-10A-4-27                       | Flight Controls              | Basic         | 2/1/77      |
| 1A-10A-4-1                        | Parts Index                  | Basic         | 12/15/77    |
| 1A-10A-4-23                       | Parts-Communications         | 1             | 11/1/77     |
| 1A-10A-4-34                       | Parts-Instrument System      | 1             | 11/15/77    |
| 1A-10A-4-93                       | Parts-Electronic Warfare     | 1             | 11/1/77     |
| 1A-10A-21                         | Inventory                    | 1             | 3/15/77     |
| 12R2-ARC164-2                     | Radio Set                    | Basic         | 6/20/76     |
| 12R5-ARN118-1                     | TACAN Navigational Set       | Basic         | 10/15/76    |
| 12P4-2APX101-2                    | Radio                        | Basic         | 9/1/75      |

**AVIONICS INTERFACE DATA SUMMARY  
FOR  
EF-111A**



**October 1979**

**Issued by  
The Deputy for Avionics Control  
ASD/AX  
A Joint AFSC/AFLC Organization**

## FOREWORD

This document is one of a series of reports that describe Avionics interfaces for various USAF aircraft. It was prepared for the Deputy for Avionics Control, Aeronautical Systems Division (ASD/AX), Wright-Patterson AFB, Ohio by ARINC Research Corporation, Annapolis, Maryland under Contract F33657-79-C-0567.





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## 1. INTRODUCTION

This document contains configuration data relating to the integration of additional avionics into the EF-111A aircraft.

This document will be revised periodically as additional modifications are planned and incorporated into the aircraft. Queries regarding information contained herein should be addressed to:

The Deputy for Avionics Control  
Code: ASD/AXP  
Wright-Patterson AFB, Ohio

This document was compiled from Air Force source materials by ARINC Research Corporation under Contract F33657-79-C-0567.

The applicable Technical Orders are included in the references listed in Section 10.

## 2. COCKPIT SPACE

### 2.1 Introduction

The cockpit in the EF-111A is divided into six main areas: the left and right instrument panel; the left, center, and right consoles (Figures 2-1, 2-2, 2-3); and the back wall. Changes from the current prototype configuration to the production configuration are as follows:

- Left Console
  - HF radio control panel moved from left rear wall to center console
- Center Console
  - KY-28 control panel demoded
  - CVDS control panel demoded
  - HF communication control added
  - IFF control added
  - TV monitor demoded, flight test only
- Right Console
  - IFF control removed from right rear wall and put on center console
  - Instrumentation control panel demoded
- Left Instrument Panel
  - No changes
- Right Instrument Panel
  - Instrumentation test panel demoded

### 2.2 Possible Control and Display Space

The changes that may be made for the production configuration produce several space options. If the IFF control panel is moved back to its original position on the right back wall, a large space would be available on the center console. Another possibility would be the relocation of the HF Communications Control from the center console to the left rear wall.

The only blank panel space available without relocation is 1-7/8 inch high in the left console, behind the pilot's shoulder line and 1-1/2 inch high in the right console, behind the EWO's shoulder line.

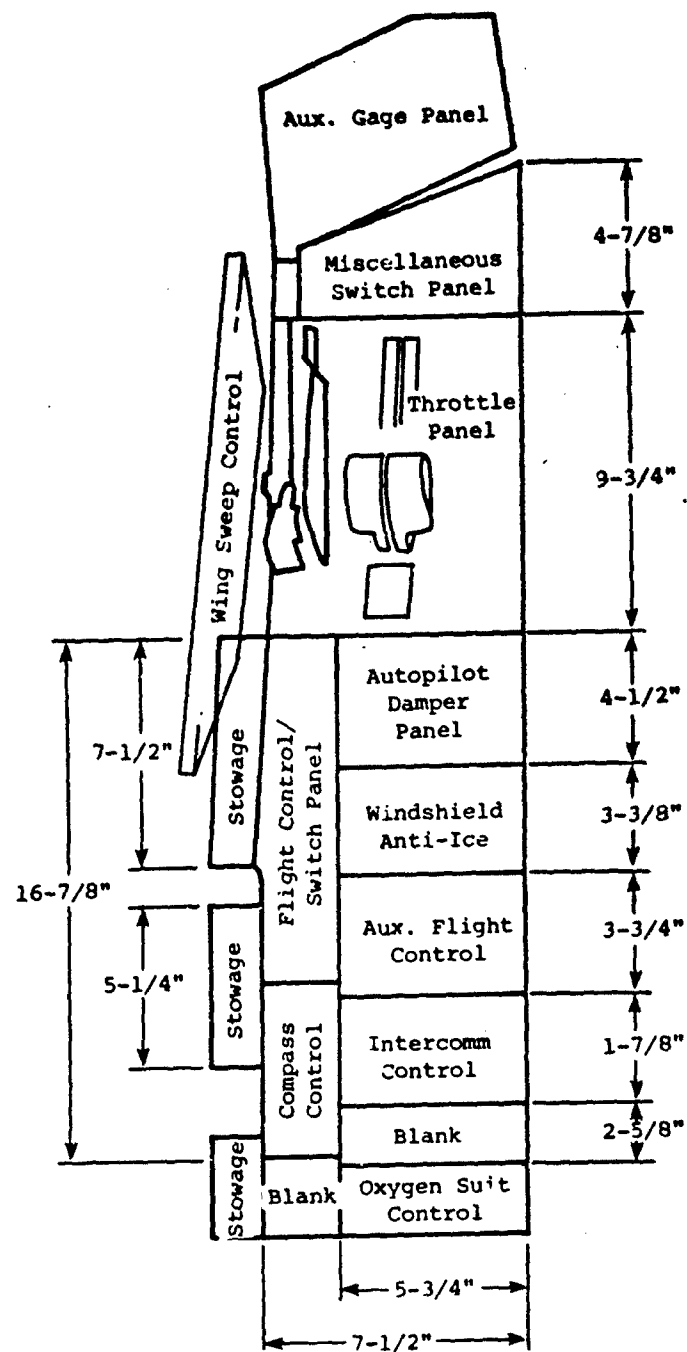


Figure 2-1. PROPOSED PRODUCTION EF-111A LEFT CONSOLE

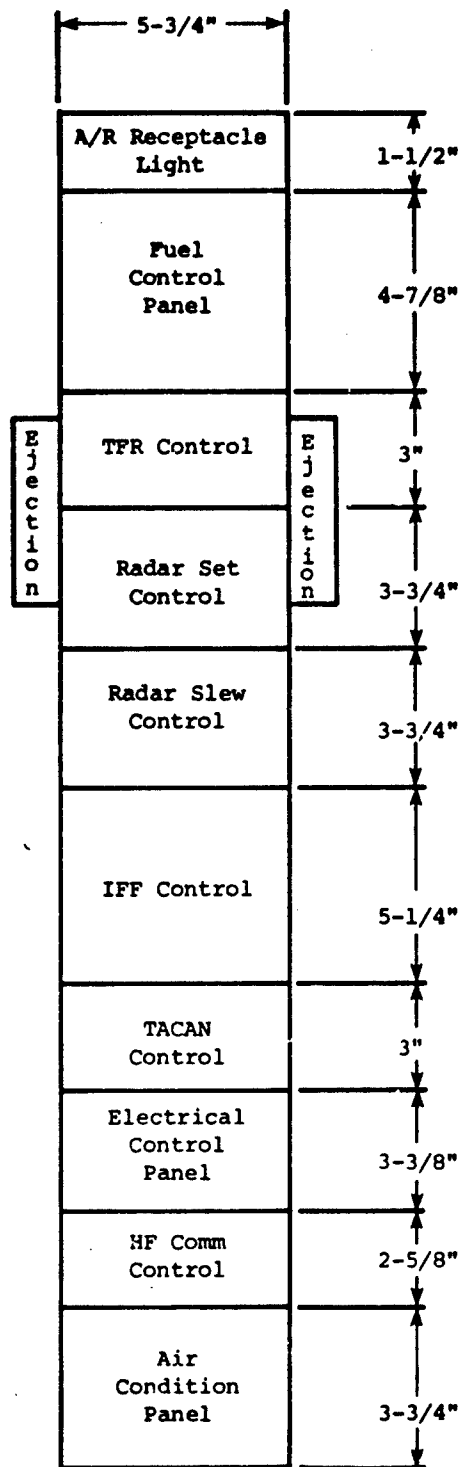


Figure 2-2. PROPOSED PRODUCTION EF-111A CENTER CONSOLE



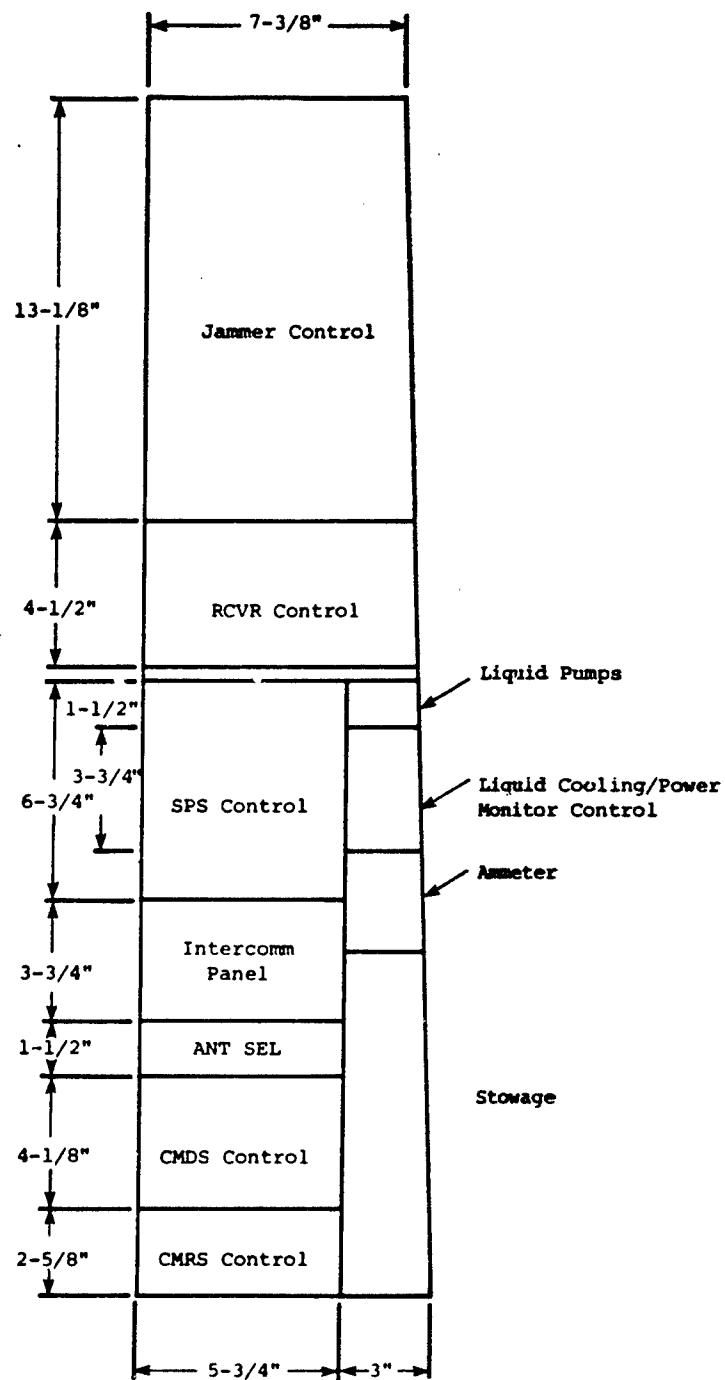


Figure 2-3. PROPOSED PRODUCTION EF-111A RIGHT CONSOLE

### 3. AVIONICS SPACE

#### 3.1 Right Forward Equipment Bay

All potentially available avionics space is in the forward, right hand equipment bay under access doors 1201 and 1202 (as illustrated in Figure 3-1). Some of the alternatives for providing space in the EF-111A into which LRUs might be placed are compiled in the Form, Fit, and Environmental (F'E) Summary, Table 3-1.

#### 3.2 Other Locations

No other available locations have been identified from examination of the available drawings and discussions with the EF-111A SPO personnel.

### Potential Available Space

| Table 3-1. F <sup>2</sup> E SUMMARY - "P-111A"                        |                                              |                                          |                                                      |                                               |                                             |                                                |                                             |                                                   |  |
|-----------------------------------------------------------------------|----------------------------------------------|------------------------------------------|------------------------------------------------------|-----------------------------------------------|---------------------------------------------|------------------------------------------------|---------------------------------------------|---------------------------------------------------|--|
| F <sup>2</sup> E Criteria                                             | Potential Available Space                    |                                          |                                                      |                                               |                                             |                                                |                                             |                                                   |  |
|                                                                       | A                                            | B                                        | C&I                                                  | D                                             | E                                           | F                                              | G                                           | H                                                 |  |
| Location Reference and Description                                    | A<br>ARC-108<br>Door 1202 1202               | B<br>Demol<br>Strike Camera<br>Door 1201 | C&I<br>APX-64<br>IFF<br>Door 1201                    | D<br>ARC-112HF<br>Amp-Pwr Supply<br>Door 1201 | E<br>ARC-112HF<br>Rear-Xerox<br>Door 1201   | F<br>PH Leads<br>Recorder<br>Door 1201         | G<br>APX-107 Dual<br>Altimeter<br>Door 1201 | H<br>Demol<br>Ballistics<br>Computer<br>Door 1201 |  |
| Rectangular Size *<br>(H, W, D - Inches)<br>Volume (Ft <sup>3</sup> ) | 7.2 X 9.5 X 17.5<br>0.7 Ft <sup>3</sup>      | 10 X 10 X 17<br>1.0 Ft <sup>3</sup>      | 8.6 X 6.7 X 20.2<br>4 X 4 X 6<br>0.7 Ft <sup>3</sup> | 9.5 X 9.9 X 20.2<br>1.1 Ft <sup>3</sup>       | 11 X 12.9 X<br>18.4<br>1.5 Ft <sup>3</sup>  | 9 X 14 X 17<br>1.2 Ft <sup>3</sup>             | 6 X 11.5 X 14<br>0.6 Ft <sup>3</sup>        | 9.9 X 12 X<br>14.5<br>1.1 Ft <sup>3</sup>         |  |
| Type of Ceiling Available                                             | Forced Air Available                         |                                          |                                                      | Forced Air Available**                        |                                             |                                                |                                             |                                                   |  |
| Temperature-Altitude Variation                                        | Class 2, Min-S400 Normal Eght Area           |                                          |                                                      | Class 2, MILE-S400 Normal Eght Area           |                                             |                                                |                                             |                                                   |  |
| Possible Candidates for this Space                                    | None Known                                   | ECM                                      | None Known                                           | None Known                                    | None Known                                  | None Known                                     | None Known                                  | ECM                                               |  |
| Remarks                                                               | RT-1108/ARC-104 in Cockpit Volume of ARC-109 | Weapons Removed                          | Replace with APX-101 IFF Transponder                 | Replace HF Cannon with Single LRU in Loc. D   | Replace HF Cannon with Single LRU in Loc. D | Every Other Aircraft is Equipped with Recorder | Replace with 2 APX-104 Altimeters, Stashed  | Weapons Removed                                   |  |

\*Where LRU is currently installed, the dimensions given represent dimensions of LRU; when no LRU is installed, the dimensions given are those of the aircraft's space.

where LRU is currently installed, the dimensions given represent dimensions of LRU; when no LRU is installed, the dimensions given are those of the model's space.

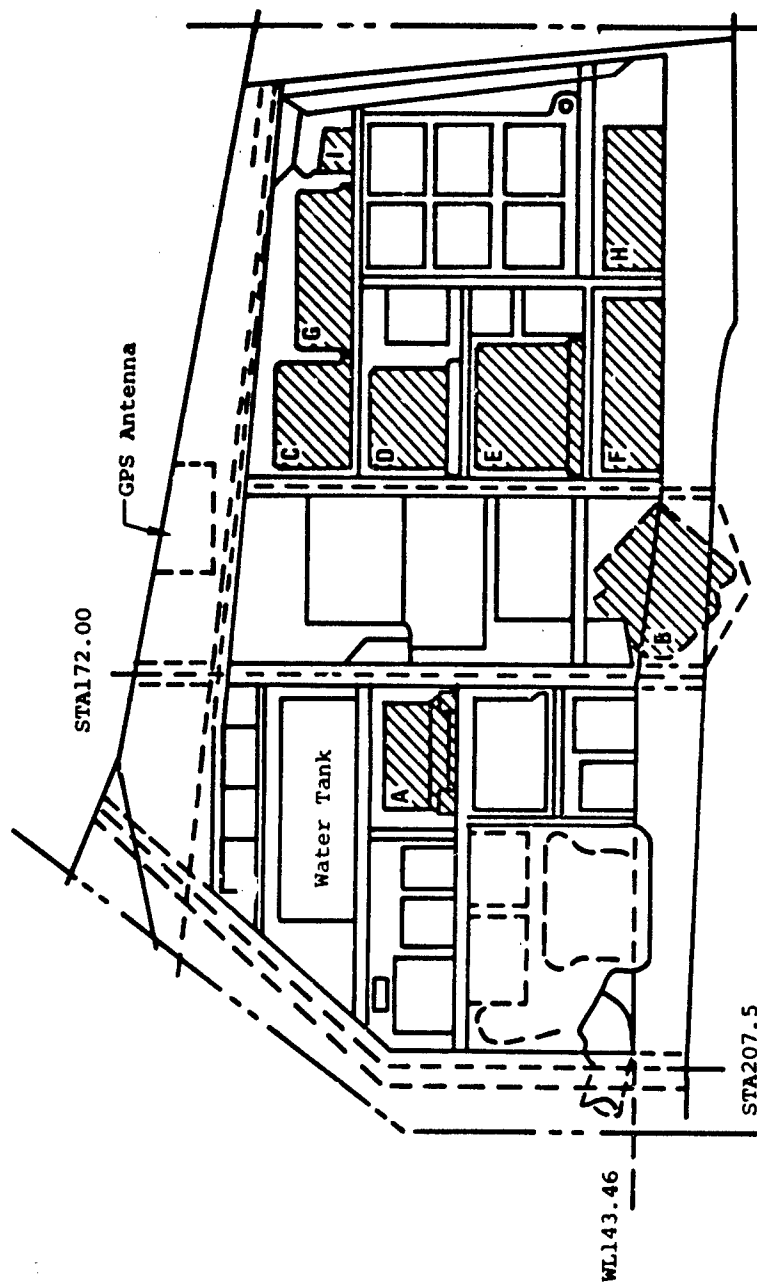


Figure 3-1. RIGHT FORWARD EQUIPMENT BAY, EF-111A

#### 4. ELECTRICAL POWER SYSTEM

##### 4.1 Introduction

115 volt, three phase, 400 cycle ac power and 28 volt dc power is provided for the electrical power system in the EF-111A. This power is generated by two 90 kVA ac generator drive assemblies, one mounted on each engine. These generators are supplemented by two transformer rectifier units that convert the power to 28 volts dc. The electrical power and lighting system consists of the following systems:

- Main ac power system
- External ac power and monitor system
- Emergency ac power system
- Dc power system
- Exterior lighting system
- Interior lighting system
- Warning and caution system

##### 4.2 Power Requirements

In the EF-111A, as well as the F-111A, there is a basic avionics electrical power requirement of 40 kVA, assuming that the removal of attack equipment offsets the added ECM equipment. Ten ALQ-99 jammers require 125 kVA of electrical power. This requires a total load of 165 kVA, leaving a 15 kVA growth capability.

##### 4.3 Power Generation and Distribution

The main sources of electrical power are 90 kVA indirect drive generators. These generators replace the two 60 kVA generators in the F-111A. Both are 90 kVA constant speed drive generators. The control units for these generators are in the forward equipment bay. The electrical power distribution system is functionally identical to that of the F-111A. The only differences are the Jammer Subsystem (JSS) monitoring and control unit and an increase in feeder cable size.

##### 4.4 Emergency ac Power System

The 10 kVA emergency ac power system provides electrical power for operation of safety-of-flight equipment in the event the main ac power system fails or hydraulic power is applied to the aircraft without electrical power, or both. The emergency ac power generator is operated by the utility hydraulic system.

#### 4.5 DC Power System

The dc power system supplies the aircraft with the necessary 28-volt direct current power. The main dc power system uses two ac-to-dc power converters to supply the main and essential dc buses. The aircraft battery ensures that standby power is available to power engine starts, aircraft position lights, and pylon refuel/defuel valves without external power units.

## 5. ENVIRONMENTAL CONTROL SYSTEM

### 5.1 General

The Environmental Control System (ECS) in the EF-11A contains an air cycle cooling section (AACS) and a liquid thermal transport section (TTS). The AACS, which utilizes the open bootstrap air cycle configuration for heat exchange, provides conditioned air to the cockpit and to the various avionics and equipment bays for both force-cooled equipment and compartment cooling. The TTS, which has two closed, self-contained recirculating liquid coolant loops, is utilized to remove the heat from the jamming subsystem transmitters and the ALQ-137 Self-Protection System.

### 5.2 Cabin Air Conditioning

The cabin cooling and heating requirements are satisfied by an air flow from the AACS; the actual airflow rate is determined by the flow schedule at the flow control system. From the cockpit, the cooling air is dumped into the forward equipment bay at an exhaust temperature of 80°F.

### 5.3 Avionics Air Conditioning

The AACS provides conditioned air to the avionics to meet the minimum requirements for compartment cooling and force-cooled equipment. The forward equipment bay (FEB) heat load has grown by 2,974 watts (from 13,494 watts), because of increased wiring losses and the addition of ambient-cooled equipment. Because the FEB ambient temperature is raised by less than 10°F, this heat increase is not considered significant in view of the 32.8 lbs/min. of conditioned air being supplied to the FEB and nose radome. Table 5-1 illustrates the power dissipation required in the various areas of the aircraft served by the AACS and TTS.

Table 5-1. EF-111A COOLING POWER ALLOCATIONS

| Compartment            | Cooling Power (Watts) |              | Equipment Forced-Air Cooling lbs/min |                   | Compartment Air†† @40°F - lbs/min |                | Allowable Temperature (°F)## |
|------------------------|-----------------------|--------------|--------------------------------------|-------------------|-----------------------------------|----------------|------------------------------|
|                        | Liquid Cooled         | Air Cooled** | Required at 40°F                     | Supplied† at 40°F | SL @ MIL PWR                      | 40,000 Ft Vmax |                              |
| Weapons Bay Upper      | 0                     | 5,816        | 23.4                                 | 24.7              | 2.3                               | 2.3            | 160/185                      |
| Weapons Bay Lower      | 106,300               | 3,000        | 7.5                                  | 7.9               | 14.5                              | 14.5           | 160/185                      |
| Fin Fairing            | 0                     | 1,290        | 8.1                                  | 9.3               | 1.2                               | 1.2            | 160/185                      |
| Cabin                  | 0                     | 2,197        | 3.2                                  | 4.0               | 32.1*                             | 45.6#          | 80                           |
| Nose Radome*           | 0                     | 278          | 1.1                                  | 1.8               | 0                                 | 0              | 270/270                      |
| Forward Equipment Bay* | 0                     | 13,494       | 22.8                                 | 31.0              | 0                                 | 0              | 160/160                      |
| Aft Check Area Left    | 0                     | 140          | 0                                    | 0                 | 1.0                               | 1.0            | 160/160                      |
| Right                  | 0                     | 48           | 0                                    | 0                 | 1.0                               | 1.0            | 160/160                      |
| Speed Bumps            | 2,625                 | 205          | 0                                    | 0                 | 0                                 | 0              | 400/500 (estimated)          |
| Totals                 | 108,925               | 26,468       | 66.1                                 | 78.7              | 52.1                              | 66.6           | -                            |

\*Equipment airflows include compartment cooling air.

\*\*Does not include wiring losses (2,974 watts) or radiating horn dissipations (2,100 watts).

††Air supplied at both sea level at military power and 40,000 ft. at Vmax.

‡‡Supplied flows above ram air temperature of 130°F only. Flows are for standard hot day operation.

#Cabin flow is a function of flight condition.

##Temperatures indicate maximum continuous rating/intermittent rating.



## 6. CURRENT AVIONICS

Tables 6-1 through 6-21 contain LRU data relating to the EF-111A systems that make up the current or near-term configuration. Where no entries are shown, the data were not available for this report. Data pertaining to future avionics modifications are presented in Section 9.

| Table 6-1. EF-111A AVIONICS CONFIGURATION DATA: UHF COMMUNICATION SET, AN/ARC-109 MSM: 5821-00-496-9236 |                |           |                     |      |       |                       |                 |                    |    |                         |                |                     |
|---------------------------------------------------------------------------------------------------------|----------------|-----------|---------------------|------|-------|-----------------------|-----------------|--------------------|----|-------------------------|----------------|---------------------|
| Name                                                                                                    | Nomenclature   | Location  | Dimensions (Inches) |      |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power     |    | Heat Dissipation        | Cooling Method | Mounting            |
|                                                                                                         |                |           | H                   | W    | D     |                       |                 | AC                 | DC |                         |                |                     |
| UHF Communication                                                                                       | AN/ARC-109     |           |                     |      |       |                       | 38.8            | 150                |    | 150 W                   |                | MT-3322/<br>ARL-109 |
| Rcvr-Trans                                                                                              | RT-749/ARL-109 | Door 1202 | 6.87                | 8.87 | 14.87 | 946.1                 | 28.7            | 115 VAC,<br>400 Hz |    | 370 W<br>(Transmitting) |                |                     |
| Control                                                                                                 | C-6364/ARL-109 | Cockpit   | 4.87                | 5.75 | 5.1   | 142                   | 4.4             |                    |    |                         |                |                     |
| Antenna Selector                                                                                        | C-4808         | Door 1202 | 3.0                 | 3.25 | 4.5   | 41.1                  | 1.5             |                    |    |                         |                | MT-1932/<br>A       |
| Antenna                                                                                                 | AS-1918        |           |                     |      |       |                       | 1.0             |                    |    |                         |                | Hard                |

| Table 6-2. EF-111A AVIONICS CONFIGURATION DATA: HF COMMUNICATION SET, AN/ARC-112 NSN: 5821-00-496-9235 |                       |           |                     |       |       |                       |                 |                |    |                  |                |                |
|--------------------------------------------------------------------------------------------------------|-----------------------|-----------|---------------------|-------|-------|-----------------------|-----------------|----------------|----|------------------|----------------|----------------|
| Name                                                                                                   | Nomenclature          | Location  | Dimensions (Inches) |       |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting       |
|                                                                                                        |                       |           | H                   | W     | D     |                       |                 | AC             | DC |                  |                |                |
| HF Communication Control Panel                                                                         | AN/ARC-112            |           |                     |       |       |                       |                 |                |    |                  |                |                |
| Amplifier Power Supply                                                                                 | C-6454/ARC-112        | Cockpit   | 2.62                | 5.75  | 5.0   | 75.3                  | 1.8             |                |    |                  |                | Mount Included |
| Recv-Trans                                                                                             | AM-4239/ARC-112       | Door 1201 | 8.5                 | 9.25  | 17.87 | 1.05                  | 40              |                |    | 955 W            |                | Mount Included |
| Antenna Coupler Set                                                                                    | RT-759/ARC-112        | Door 1201 | 10.0                | 11.62 | 16.0  | 1859                  | 42.5            |                |    |                  |                |                |
| Antenna Loop Control                                                                                   | AN/ARC-112 (OA-7149A) |           | 6.0                 | 5.0   | 12.62 | 378.6                 |                 |                |    |                  |                |                |
| Coupler                                                                                                | C-6455/ARC-112        | Door 1202 | 15.25               | 6.5   | 1.75  | 173.5                 | 7.4             |                |    |                  |                | MT-3357        |
| Antenna                                                                                                | LJ-1402/ARC-112       |           | 10.25               | 10.0  | 12.75 | 1307                  | 14.8            |                |    |                  |                | Hard           |
|                                                                                                        | AN/ARC-112            |           |                     |       |       |                       |                 |                |    |                  |                |                |

| Table 6-3. EP-111A AVIONICS CONFIGURATION DATA: INTERCOM. SET, AM/AIC-25 |                                                           |          |                     |      |      |                       |                 |                |      |                  |                |          |
|--------------------------------------------------------------------------|-----------------------------------------------------------|----------|---------------------|------|------|-----------------------|-----------------|----------------|------|------------------|----------------|----------|
| Name                                                                     | Nomenclature                                              | Location | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |      | Heat Dissipation | Cooling Method | Mounting |
|                                                                          |                                                           |          | H                   | W    | D    |                       |                 | AC             | DC   |                  |                |          |
| Intercom. Set Control                                                    | AM/AIC-25<br>7BD<br>C6567/AIC-25<br>MSM: 5831-00-880-2834 | Cockpit  | 3.75                | 5.75 | 5.62 | 121.2                 | 4.2             |                | 0.02 | 20 W             |                |          |
|                                                                          |                                                           |          | 4.38                | 3.62 | 5.12 | 81.2                  | 2.7             |                |      |                  |                |          |
| Intercom. Station                                                        | C-6624/AIC-25<br>MSM: 5831-00-880-2835                    |          |                     |      |      |                       |                 |                |      |                  |                |          |

| Table 6-4. EP-111A AVIONICS CONFIGURATION DATA: UHF-ADF, AN/ARA-50 NSM: 5826-00-883-5777 |                             |           |                     |       |       |                       |                 |                |      |                            |
|------------------------------------------------------------------------------------------|-----------------------------|-----------|---------------------|-------|-------|-----------------------|-----------------|----------------|------|----------------------------|
| Name                                                                                     | Nomenclature                | Location  | Dimensions (Inches) |       |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |      | Heat Dissipation           |
|                                                                                          |                             |           | H                   | W     | D     |                       |                 | AC             | DC   |                            |
| UHF-ADF Amplifier Relay Assembly                                                         | AN/ARA-50<br>AM-3624/ARA-50 | Door 1202 | 6.6                 | 7.1   | 8.0   | 375                   | 5.4             | 0.04           | 0.01 | 50 W                       |
| UHF/ADF Loop Antenna                                                                     | AS-909/ARA-48               |           | 3.5                 | 10.25 | 10.25 | 368                   | 10              |                |      |                            |
|                                                                                          |                             |           |                     |       |       |                       |                 |                |      | Forced Air                 |
|                                                                                          |                             |           |                     |       |       |                       |                 |                |      | MT-19551<br>ARA-50<br>Hard |

| Table 0-5. EF-111A AVIONICS CONFIGURATION DATA: FLIGHT INSTRUMENTS |                                     |                      |                     |      |       |                       |                 |                |                 |                  |                |          |
|--------------------------------------------------------------------|-------------------------------------|----------------------|---------------------|------|-------|-----------------------|-----------------|----------------|-----------------|------------------|----------------|----------|
| Name                                                               | Nomenclature                        | Location             | Dimensions (Inches) |      |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |                 | Heat Dissipation | Cooling Method | Mounting |
|                                                                    |                                     |                      | H                   | W    | D     |                       |                 | AC             | DC              |                  |                |          |
| Attitude Director Indicator                                        | ARI-11/A<br>NSN: 6610-00-424-874    | Cockpit              | 5.25                | 5.0  | 10.68 | 280.4                 | 8.1             |                |                 | 35/10 W          |                |          |
|                                                                    | ARI-42/A-2<br>NSN: 6610-00-200-8744 | Cockpit              | 2.40                | 2.40 | 7.61  | 43.8                  | 2.5             | 0.002          | 0.034/<br>0.008 | 36/10 W          |                |          |
|                                                                    | AQH/A<br>TBD                        | Cockpit              | 4.25                | 5.00 | 8.37  | 178                   | 8.0             |                |                 | 54 W             |                |          |
|                                                                    | Total/Selected Fuel Quantity        | Cockpit              | (7.0 diameter)      |      |       | 3.14                  | 1.5             |                |                 |                  |                |          |
|                                                                    | Recorder Flight Load Type           | HXK-316/A2406<br>TBD | Door 1104           |      |       |                       |                 |                |                 |                  |                |          |

| Table 6-6. EF-111A - FLIGHT DIRECTOR COMPUTER MSN: 610-00-116-4591; 610-00-920-8874 |              |           |                     |     |      |                       |                 |                |       |                  |                |          |
|-------------------------------------------------------------------------------------|--------------|-----------|---------------------|-----|------|-----------------------|-----------------|----------------|-------|------------------|----------------|----------|
| Name                                                                                | Nomenclature | Location  | Dimensions (Inches) |     |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |       | Heat Dissipation | Cooling Method | Mounting |
|                                                                                     |              |           | H                   | W   | D    |                       |                 | AC             | DC    |                  |                |          |
| Flight Director Computer                                                            | CPU-76/A     | Door 1101 | 7.35                | 5.5 | 9.48 | .393                  | 10.0            | 0.016          | 0.085 | 26W              |                |          |

| Table 7-7. EF-111A AVIONICS CONFIGURATION DATA: RADAR ALTIMETER AM/APM-167 NSN: 5841-00-772-1819 |                 |           |                     |     |      |                       |                 |                |      |                  |                |          |
|--------------------------------------------------------------------------------------------------|-----------------|-----------|---------------------|-----|------|-----------------------|-----------------|----------------|------|------------------|----------------|----------|
| Name                                                                                             | Nomenclature    | Location  | Dimensions (Inches) |     |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |      | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                  |                 |           | H                   | W   | D    |                       |                 | AC             | DC   |                  |                |          |
| Radar Altimeter                                                                                  | AM/APM-167      |           |                     |     |      |                       |                 |                |      |                  |                |          |
| Rcvr/Trans                                                                                       | RT-771/APM-167  | Door 1201 |                     | 7.5 | 14.5 | 707                   | 11.0            | 0.086          | 0.01 | 192 W            |                | Shock    |
| Antenna                                                                                          | AS-1758/APM-167 |           | 4.5                 | 4.5 | 9.25 | 187                   | 1.1             |                |      |                  |                | Hard     |
| Radar Altimeter Indicators                                                                       | K5186000100     | Cockpit   |                     |     |      |                       | 1.6/1.8*        |                |      |                  | Convection     |          |
| Radar Altimeter Low Warning Lamp                                                                 |                 | Cockpit   |                     |     |      |                       |                 |                |      |                  | Convection     |          |
| *Two Indicators.                                                                                 |                 |           |                     |     |      |                       |                 |                |      |                  |                |          |



| Table 6-8. EF-111A AVIONICS CONFIGURATION DATA: CENTRAL AIR DATA COMPUTER, CC0004-1 NSN: TBD |              |           |                     |   |   |                       |                 |                |    |                  |                |          |
|----------------------------------------------------------------------------------------------|--------------|-----------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                         | Nomenclature | Location  | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                              |              |           | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| CADC                                                                                         | CC0004-1     | LOOR 1101 |                     |   |   |                       | 47.0            | 0-.081         |    | 68 W             |                | Shock    |

| Table 6-7. EF-111A AVIONICS CONFIGURATION DATA: INERTIAL NAVIGATION SYSTEM, AN/AJQ-20A NSN: 6605-00-170-6701 |                |           |                     |   |     |                       |                 |                |    |                  |                |          |
|--------------------------------------------------------------------------------------------------------------|----------------|-----------|---------------------|---|-----|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                                         | Nomenclature   | Location  | Dimensions (Inches) |   |     | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                              |                |           | H                   | W | D   |                       |                 | AC             | DC |                  |                |          |
| Stabilized Platform<br>Plus Valve Transmitter<br>Navigation Computer                                         | MX-6767/AJQ-20 | Door 11c2 |                     |   |     |                       | 75.0            |                |    | 275 W            |                |          |
|                                                                                                              | TRU-79/A       |           | (4.0 diameter)      |   | 2.0 | 25.1                  | 1.8             |                |    |                  |                |          |
|                                                                                                              | CP-812/AJQ-20  | Cockpit   |                     |   |     |                       | 77.8            |                |    | 281 W            |                |          |

| Table 6-10. EP-111A AVIONICS CONFIGURATION DATA: ILS AM/ARM-58 NSN: 5826-00-883-5795* |                |           |                     |      |      |                       |                 |                |        |                  |                |          |
|---------------------------------------------------------------------------------------|----------------|-----------|---------------------|------|------|-----------------------|-----------------|----------------|--------|------------------|----------------|----------|
| Name                                                                                  | Nomenclature   | Location  | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |        | Heat Dissipation | Cooling Method | Mounting |
|                                                                                       |                |           | H                   | W    | D    |                       |                 | AC             | DC     |                  |                |          |
| ILS                                                                                   | AM/ARM-58      |           |                     |      |      |                       |                 |                |        |                  |                |          |
| Rcvr Localizer                                                                        | N-843/ARM-58   | Door 2204 | 7.75                | 6.87 | 5.01 | 267                   | 7.9             |                | .02    | 48 W             |                |          |
| Rcvr                                                                                  | R-844/ARM-58   | Door 2204 | 9.75                | 6.87 | 5.01 | 336                   | 9.6             |                | 220 mA | 48 W             |                |          |
| Control                                                                               | C-6376/ARM-58A |           | 3.0                 | 5.75 | 5.0  | 86.3                  | 1.1             |                |        |                  | Convection     |          |
| MEP. BOH. Antennas                                                                    |                | Door 1101 |                     |      |      |                       | 1.0             |                |        |                  |                | Hard     |
| Glide Slope Antennas                                                                  |                | Door 1101 |                     |      |      |                       | 0.8             |                |        |                  |                | Hard     |
| Localizer Antennas                                                                    |                |           |                     |      |      |                       |                 |                |        |                  |                | Hard     |

| Table 6-11. EF-111A AVIONICS CONFIGURATION DATA: TACAM, AB/ARM-118 MSN: 5826-01-015-0839 |                    |           |                     |      |      |                       |                 |                |        |                  |                |                 |
|------------------------------------------------------------------------------------------|--------------------|-----------|---------------------|------|------|-----------------------|-----------------|----------------|--------|------------------|----------------|-----------------|
| Name                                                                                     | Nomenclature       | Location  | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |        | Heat Dissipation | Cooling Method | Mounting        |
|                                                                                          |                    |           | H                   | W    | D    |                       |                 | AC             | DC     |                  |                |                 |
| TACAM                                                                                    | AB/ARM-118         |           | 8.9                 | 11.7 | 20.5 |                       |                 | 0.250          | 0.0616 | 100W             |                | MT-4682A 118    |
| Revr-Mstr                                                                                | PT-1159(A)/ARM-118 |           | 6.8                 | 7.5  | 14.6 | 745                   | 26.5            |                |        |                  |                |                 |
| D/A                                                                                      | MS9577             |           | 6.9                 | 1.7  | 11.1 |                       | 5.0             |                |        |                  |                |                 |
| Control                                                                                  | C-10058/ARM-118    |           | 3.0                 | 5.75 | 5.4  |                       |                 |                |        |                  |                |                 |
| Antenna RF Switch                                                                        | SA521/A            | Cockpit   | 2.7                 | 3.2  | 3.2  | 27.7                  |                 |                |        | 28W              |                | MT-1993A A Hard |
| Antenna TACAM Blade                                                                      | AS-1918            | Door 1101 |                     |      |      |                       |                 |                |        |                  |                |                 |

| Table 6-12. EF-111A: INTERFERENCE BLANKER NSN: TNO |              |           |                     |      |     |                       |                 |                |       |                  |                |          |
|----------------------------------------------------|--------------|-----------|---------------------|------|-----|-----------------------|-----------------|----------------|-------|------------------|----------------|----------|
| Name                                               | Nomenclature | Location  | Dimensions (Inches) |      |     | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |       | Heat Dissipation | Cooling Method | Mounting |
|                                                    |              |           | H                   | W    | D   |                       |                 | AC             | DC    |                  |                |          |
| Interference Blanker                               | MX-9879/A    | Coor 1102 | 4.25                | 10.0 | 4.5 | 191                   | 6.0             |                | 0.046 | 40W              |                |          |



| Table 6-11. EP-111A AVIONICS CONFIGURATION DATA: TERRAIN FOLLOWING RADAR SYSTEM, AM/APQ-110 MSM: 5841-00-772-1811 |                 |             |                     |      |       |                       |                 |                |    |                  |                |          |
|-------------------------------------------------------------------------------------------------------------------|-----------------|-------------|---------------------|------|-------|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                                              | Nomenclature    | Location    | Dimensions (Inches) |      |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                                   |                 |             | H                   | W    | D     |                       |                 | AC             | DC |                  |                |          |
| TF Computer                                                                                                       | CP-799/APQ-110  | Nose Radome |                     |      |       |                       | 13.8            |                |    | 90 W             |                | Rack     |
| Antenna Rcvr.                                                                                                     | AS-2136/APQ-128 |             |                     |      |       |                       | 27.9            |                |    |                  |                | Rack     |
| TF Indicator                                                                                                      | IP-773/A-Q-110  | Cockpit     |                     |      |       |                       | 23.7            |                |    | 126 W            |                | Rack     |
| TF Radar Set Control                                                                                              | C-6456/APQ-110  | Cockpit     | 3.0                 | 5.75 | 7.11  | 126.1                 | 2.6             |                |    |                  |                | 11 W     |
| Amplifier Power Supply                                                                                            | AP-4240/APQ-110 | Door 1201   | 6.0                 | 6.75 | 17.61 | 713                   | 17.6            |                |    |                  |                | Rack     |
| Sync. Matr.                                                                                                       | SM-379/APQ-110  | Door 1201   |                     |      |       |                       | 26.8            |                |    |                  |                | Rack     |

| Table 6-15. E-111A AVIONICS CONFIGURATION DATA: ATTACK RADAR NSM, TBO |                 |             |                     |       |      |                       |                 |                |       |                  |                |          |
|-----------------------------------------------------------------------|-----------------|-------------|---------------------|-------|------|-----------------------|-----------------|----------------|-------|------------------|----------------|----------|
| Name                                                                  | Nomenclature    | Location    | Dimensions (Inches) |       |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |       | Heat Dissipation | Cooling Method | Mounting |
|                                                                       |                 |             | H                   | W     | D    |                       |                 | AC             | DC    |                  |                |          |
| Attack Radar                                                          | AM/APQ-160      |             |                     |       |      |                       |                 |                |       |                  |                |          |
| Antenna Assembly                                                      | AS-1749/APQ-113 | Nose Radome | 25.4                | 14.8  | 32.3 | 28,550                | 54.5            | 1.637          | .1    |                  |                |          |
| Antenna Control                                                       | C-6498/APQ-113  | Nose Radome | 7.9                 | 11.24 | 26.5 | 2,353                 | 18.0            |                |       | 98 W             |                | Rack     |
| Modulator Reverser Transmitter                                        | MD-608/APQ-113  | Door 1101   | 20.27               | 12.75 | 19.3 | 4,968                 | 160             |                |       |                  |                | Rack     |
| Synchronizer Electronic                                               | SN-180/APQ-113  | Door 1101   | 13.25               | 13.09 | 19.3 | 3,347                 | 60              |                |       | 392 W            |                | Rack     |
| Radar Set Control                                                     | C-6499/APQ-113  | Cockpit     | 3.75                | 5.75  | 5.21 | 112.3                 | 3.1             |                |       |                  |                | Rack     |
| Indicator Azimuth Elevation Range                                     | IP-1260/A       | Cockpit     | 10.94               | 6.5   | 25.0 | 1778                  | 37.0            | 135 W          | 0.007 | 179 W            |                | Rack     |
| Control Indicator                                                     | C-10255/APQ-160 | Cockpit     | 3.75                | 5.75  | 2.5  | 53.9                  | 2.3             |                |       |                  |                | Rack     |



| Table 6-16. EF-111A AVIONICS CONFIGURATION DATA: RADAR WARNING RECEIVER SET (IR), AN/ALR-23 ASN: 5865-00-104-9842 |                                       |           |                     |      |       |                       |                 |                |      |                  |                |                            |
|-------------------------------------------------------------------------------------------------------------------|---------------------------------------|-----------|---------------------|------|-------|-----------------------|-----------------|----------------|------|------------------|----------------|----------------------------|
| Name                                                                                                              | Nomenclature                          | Location  | Dimensions (Inches) |      |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |      | Heat Dissipation | Cooling Method | Mounting                   |
|                                                                                                                   |                                       |           | H                   | W    | D     |                       |                 | AC             | DC   |                  |                |                            |
| RWR. (IR)<br>Video Signal Processor                                                                               | AN/ALR-23<br>CH-319(XA-21)/<br>ALR-23 | Door #101 | 7.76                | 7.00 | 16.25 | 680                   | 68.29           | 1.35           | 12   | 729 W            |                | CH-542/<br>XA-1/<br>ALR-23 |
|                                                                                                                   |                                       |           |                     |      |       |                       | 21.37           |                | 33 W |                  |                |                            |
| Scanner Search/<br>Track                                                                                          | CV-1853/ALR-23(V)                     | Pin       | (7.63 diameter)     |      |       | 185                   | 27.02           |                |      | 60 W             |                |                            |
| Cryogenic Converter                                                                                               | MX-6708(XI-21)/<br>ALR-23             | Pin       | (6.80 diameter)     |      |       | 235                   | 16.0            | 0.460          |      | 500 W            |                |                            |
| CH Control                                                                                                        | C-6474/ALR-23                         | Cockpit   | 2.5                 | 5.75 | 2.62  | 37.7                  | 1.13            |                |      | 136 W            |                | Panel                      |

| Table 6-17. EF-111A AVIONICS CONFIGURATION DATA: RADAR WARNING RECEIVER SET, AN/ALR-62(V) NSM: 5865-01-048-9989 |                   |           |                     |      |       |                       |                 |                |     |                  |                |                    |
|-----------------------------------------------------------------------------------------------------------------|-------------------|-----------|---------------------|------|-------|-----------------------|-----------------|----------------|-----|------------------|----------------|--------------------|
| Name                                                                                                            | Nomenclature      | Location  | Dimensions (Inches) |      |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |     | Heat Dissipation | Cooling Method | Mounting           |
|                                                                                                                 |                   |           | H                   | W    | D     |                       |                 | AC             | DC  |                  |                |                    |
| Rev. Set                                                                                                        |                   |           |                     |      |       |                       |                 |                |     |                  |                |                    |
| Multi Channel Revr.                                                                                             | R-2058/ALR-62(V)  |           | 8.06                | 9.8  | 12.15 | 960                   | 115.6           | 0.66           | 0.1 | 912 W            |                | 1                  |
| Dual Channel Revr.                                                                                              | R-2059/ALR-62(V)  | Door 1102 | 5.28                | 6.08 | 20.03 | 643                   | 52.0            |                |     | 480 W            |                | MT-4910/<br>AIR-62 |
| Digital Processor                                                                                               | CN-474/ALR-62     | Door 1102 | 8.06                | 4.78 | 21.03 | 816                   | 19.2            |                |     | 25 W             |                |                    |
| Indicator Unit Control                                                                                          | IP-1293/ALR-62(V) | Cockpit   | 5.50                | 3.75 | 15.37 | 317                   | 29.8            |                |     | 135 W            |                |                    |
|                                                                                                                 |                   |           |                     |      |       |                       | 11              |                |     | 72 W             |                |                    |

| Name               | Nomenclature    | Location  | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |       | Heat Dissipation | Cooling Method | Mounting |
|--------------------|-----------------|-----------|---------------------|------|------|-----------------------|-----------------|----------------|-------|------------------|----------------|----------|
|                    |                 |           | H                   | W    | D    |                       |                 | AC             | DC    |                  |                |          |
| Amplifier RF (Low) | AM-6938/ALQ-137 | Door 1101 | 8.3                 | 10.9 | 22.6 | 2045                  | 63.8            | 2.64           |       | 2000 W           |                | Rack     |
| RCVR (Low)         | R-2060/ALQ-137  | Door 1101 | 7.8                 | 12.8 | 25.8 | 2576                  | 71.2            |                | 0.125 |                  |                | Rack     |
| Amplifier RF (Hd)  | AM-6939/ALQ-137 | Door 1101 | 8.3                 | 10.9 | 22.7 | 2054                  | 70.0            | 3.02           |       | 2840 W           |                | Rack     |
| RCVR (Hd)          | R-2061/ALQ-137  | Door 1101 | 7.8                 | 12.8 | 25.8 | 2576                  | 81.7            |                | 0.125 |                  |                | Rack     |
| Amplifier RF (Hl)  | AM-6862/ALQ-137 | Door 1201 | 8.3                 | 10.9 | 21.8 | 1972                  | 69.5            | 1.5            |       | 1425 W           |                | Rack     |
| RCVR (Hl)          | R-2062/ALQ-137  | Door 1201 | 7.8                 | 12.8 | 21.9 | 2186                  | 67.2            | 0.075          |       |                  |                | Rack     |
| Amplifier RF (Hl)  | AM-6863/ALQ-137 |           | (9.9 diameter)      |      |      | 467                   | 78.2            | 1.5            |       | 1425 W           |                | Rack     |
| RCVR (Hl)          | R-2063          |           | (9.9 diameter)      |      |      | 467                   | 81.1            |                | 0.075 |                  |                | Rack     |

| Table 6-19. EF-111A AVIONICS CONFIGURATION DATA: JAMMING SYSTEM, AM/ALQ-99(V) MSM, YMD |                    |             |                     |       |      |                       |                 |                |       |                  |                |          |
|----------------------------------------------------------------------------------------|--------------------|-------------|---------------------|-------|------|-----------------------|-----------------|----------------|-------|------------------|----------------|----------|
| Name                                                                                   | Nomenclature       | Location    | Dimensions (Inches) |       |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |       | Heat Dissipation | Cooling Method | Mounting |
|                                                                                        |                    |             | H                   | W     | D    |                       |                 | AC             | DC    |                  |                |          |
| Indicator Digital Display                                                              | IP-1299/ALQ-99(V)  | Cockpit     | 13.37               | 10.7  | 48.3 | 2406                  | 47.0            | 0.703          | 0.025 | 264 W            |                |          |
| Converter Signal Data                                                                  | CP-1298/ALQ-99E(V) | Weapons Bay | 9.81                | 7.56  | 21.5 | 1595                  | 41.0            |                |       | 464 W            |                |          |
| Control                                                                                | C-9877A/A          | Cockpit     | 7.88                | 5.75  | 6.50 | 235                   | 6.0             |                |       | 35 W             |                |          |
| Jammer Control Panel                                                                   |                    | Cockpit     | 13.62               | 7.65  | 6.1  | 625                   | 11.3            | 0.03           |       |                  |                |          |
| Rev Control Panel                                                                      |                    | Cockpit     | 4.5                 | 7.85  | 4.0  | 141                   | 2.8             | 0.004          |       | 7 W              |                |          |
| Comparator Converter Signal                                                            | CM-476/ALQ-99      | Weapons Bay | 8.13                | 13.59 | 21.1 | 2331                  |                 |                |       |                  |                |          |
| Converter Synch Signal Data                                                            | CV-1451/ALQ-99E(V) | Weapons Bay | 13.0                | 21.0  | 21.1 | 5280                  |                 |                |       | 180 W            |                |          |
| Coupler Computer Data                                                                  | CV-1768/ATA-6      | Weapons Bay | 8.52                | 13.2  | 19.8 | 1721                  | 60.8            | 0.308          |       | 309 W            |                |          |
| Computer Digital Data                                                                  | CP-926/ATA-6       | Weapons Bay | 8.52                | 10.4  | 19.8 | 1721                  | 49.0            | 0.215          |       | 215 W            |                |          |

| Table 6-20. EF-111A AVIONICS CONFIGURATION DATA: (W DISPENSER SET, AM/ALE-28 USE: 5465-00-105-8947) |               |          |                     |      |      |                       |                 |                |       |                  |                |          |
|-----------------------------------------------------------------------------------------------------|---------------|----------|---------------------|------|------|-----------------------|-----------------|----------------|-------|------------------|----------------|----------|
| Name                                                                                                | Nomenclature  | Location | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |       | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                     |               |          | H                   | W    | D    |                       |                 | AC             | DC    |                  |                |          |
| Dispenser Set                                                                                       | C-6471/ALE-28 | Cockpit  | 4.12                | 5.75 | 6.25 | 148                   | 4.6             | 0.15           | 0.075 | 111 W            |                |          |
| Control                                                                                             | C-6472/ALE-28 |          | 2.25                | 7.00 | 5.31 | 81.6                  | 2.2             |                |       | 20 W             |                |          |
| Control, Sea-Eject                                                                                  | D-22/ALE-28   |          | 11.6                | 9.8  | 32.6 | 3483                  | 51              |                |       | 2 05 W           |                |          |
| Eject Force Dispenser                                                                               |               |          |                     |      |      |                       |                 |                |       |                  |                |          |
| Disposable Control Panel                                                                            |               | Cockpit  | 1.12                | 5.75 | 4.0  | 25.76                 | .4              | 0.005          | 0.007 | 12 W             |                |          |

| Table 6-21. EF-111A AVIONICS CONFIGURATION DATA: PC-11 AUTOMATIC FLIGHT CONTROL SYSTEM RSN: TWO |              |           |                          |     |      |                       |                 |                |    |                  |                |          |
|-------------------------------------------------------------------------------------------------|--------------|-----------|--------------------------|-----|------|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                            | Nomenclature | Location  | Diameter-inches (Inches) |     |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                 |              |           | W                        | M   | D    |                       |                 | AC             | DC |                  |                |          |
| Computer - av                                                                                   |              | Door 1101 | 7.0                      | 4.5 | 10.0 | 315                   | 21.0            |                |    | 40 W             |                |          |
| Computer - pitch                                                                                |              | Door 1101 | 7.0                      | 4.5 | 10.0 | 315                   | 21.0            |                |    | 40 W             |                |          |
| Computer - Roll                                                                                 |              | Door 1101 | 7.0                      | 4.5 | 10.0 | 315                   | 21.0            |                |    | 40 W             |                |          |
| Stick Force Sensor                                                                              |              |           | (4.5 diameter)           |     |      | 5.3                   | 5.0             |                |    |                  |                |          |
| Rate Sensor Assembly                                                                            |              | Cockpit   | 4.5                      | 2.5 | 5.0  | 54.25                 | 1.3             |                |    |                  |                |          |
| Lateral Accelerometer Assembly                                                                  |              |           | 1.0                      | 1.0 | 4.0  | 0.6                   | 1.0             |                |    |                  |                |          |
| Foot and Trim                                                                                   |              |           |                          |     |      |                       | 24.0            |                |    | 52 W             |                |          |

## 7. ANTENNA LOCATIONS

### 7.1 Existing Antennas

Figure 7-1 show the locations of existing EF-111A antennas.

### 7.2 Planned Antennas

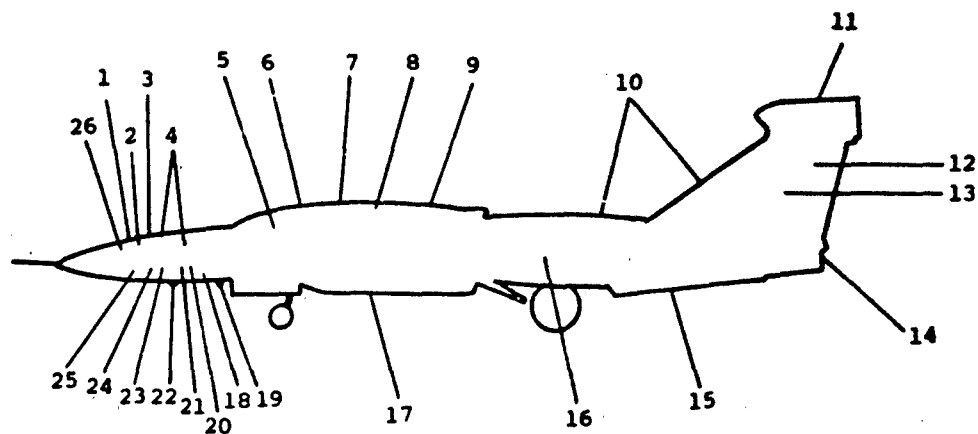
The proposed location for the GPS antenna is at the top of the forward equipment bays, approximately at fuselage station 160.

The EF-111A antenna nomenclature is as follows:

| <u>Location</u> | <u>Antenna</u>                 | <u>Nomenclature or<br/>Part Number</u> |
|-----------------|--------------------------------|----------------------------------------|
| 1               | Glide Slope                    |                                        |
| 2               | High Frequency Radar Homing    | TBD                                    |
| 3               | ADF                            | AS-909/ARA-48                          |
| 4               | Low and Medium Frequency Radar | TBD                                    |
| 5               | ALQ-137 Hi Band                | AS-3203/ALQ-137                        |
| 6               | IFF and UHF Data Link          | AS-1919                                |
| 7               | Radio Beacon Set               | TBD                                    |
| 8               | TTW and SPS                    | TBD                                    |
| 9               | UHF/TACAN Upper                | AS-1918/AR                             |
| 10              | HF                             | TBD                                    |
| 11              | ALQ-99 Band 8, Band 9          | AS-2911/ALQ-99, AS-3203/<br>ALQ-99     |
| 12              | ALQ-99 Band 1 (2)              | AS-3206/ALQ-99                         |
| 13              | ALQ-99 Band 2 (2)              | AS-3207/ALQ-99                         |
| 14              | ALQ-137 Hi Band                | AS-3203/ALQ-137                        |
| 15              | IFF Lower                      | AS-1919                                |
| 16              | ALQ-99 Blade (2)               | TBD                                    |
| 17              | ALQ-99 Band 4, 5/6, 7, 8, 9    | AS-3208/ALQ-99                         |
| 18              | Localizer (2)                  | TBD                                    |
| 19              | UHF/TACAN Lower                | AT-741B/A                              |
| 20              | ALQ-137 Low Band               | TBD                                    |
| 21              | ALQ-137 Mid Band               | TBD                                    |
| 22              | Marker Beacon                  | TBD                                    |
| 23              | Forward Radar Warning (2)      | TBD                                    |

| <u>Location</u> | <u>Antenna</u>                  | <u>Nomenclature or<br/>Part Number</u> |
|-----------------|---------------------------------|----------------------------------------|
| 24              | High Frequency Radar Homing (4) | TBD                                    |
| 25              | TFR (2)                         | TBD                                    |
| 26              | NAV Radar                       | TBD                                    |





1. Glide Slope
2. High Frequency Radar Homing
3. ADF
4. Low and Medium Frequency Radar
5. ALQ-137 Hi Band
6. IFF (Upper) and UHF Data Link
7. Radio Beacon Set
8. TTW & SPS
9. UHF #1 and TACAN Upper
10. HF
11. ALQ-99 Band 8, Band 9 Multiband, ALR-62, ALQ-137
12. ALQ-99 Band 1 (2)
13. ALQ-99 Band 2 (2)
14. ALQ-137 Hi Band
15. IFF Lower
16. ALQ-99 Blade Antenna (RH Band 1 - LH Band 2) (2)
17. ALQ-99 Band 4, Band 5/6, Band 7, Band 8, Band 9
18. Localizer (2)
19. UHF #2 and TACAN Lower
20. ALQ-137 Low Band
21. ALQ-137 Mid Band
22. Marker Beacon
23. Forward Radar Warning (2)
24. High Frequency Radar Homing (4)
25. TFR (2)
26. NAV Radar

Figure 7-1. ANTENNA LOCATIONS

8. INTERFACE DATA

Data were not available for this section.

#### 9. FUTURE MODIFICATIONS

This section is not applicable to the EF-111A at this time, since the production configuration has yet to be approved.

## 10. DATA SOURCES

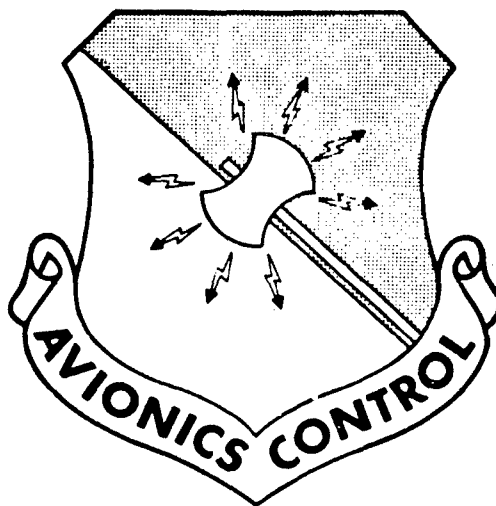
The following sources of data were used in preparing this summary:

- Aircraft and avionics configuration data assembled by ARINC Research, principally in the form of copies of applicable sections, tables, and figures, form the aircraft and equipment Technical Orders listed at the end of this section.
- JTIDS Configuration Data Summary, 5/31/78
- Requirements Analysis for a Multifunction, Multiband Airborne Radio System (MFBARS), AFAL TR-7899, July 1978
- Training Notes

### Inventory of Technical Orders

| <u>T.O. #</u>  | <u>Title</u>           | <u>Change<br/>Number</u> | <u>Date</u> |
|----------------|------------------------|--------------------------|-------------|
| IEF-111A-2-1   | General Information    | Basic                    | Manuscript  |
| IEF-111A-1     | Flight Manual          | Basic                    | 3/1/78      |
| IF-111A-1      | Flight Manual          | Basic                    | 1/28/78     |
| 12R2-2ARC164-2 | Radio Set              | Basic                    | 6/20/76     |
| 12R5-2ARN118-1 | TACAN Navigational Set | Basic                    | 10/15/76    |
| 12R5-2URT27-2  | Radio Beacon Set       | Basic                    | 6/1/77      |
| 12R5-2ARN58-2  | Radio Receiving        | Basic                    | 5/13/77     |

**AVIONICS INTERFACE DATA SUMMARY  
FOR  
F-4E**



**October 1979**

**Issued by  
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A Joint AFSC/AFLC Organization**

## FOREWORD

This document is one of a series of reports that describe Avionics interfaces for various USAF aircraft. It was prepared for the Deputy for Avionics Control, Aeronautical Systems Division (ASD/AX), Wright-Patterson AFB, Ohio by ARINC Research Corporation, Annapolis, Maryland under Contract F33657-79-C-0567.



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## 1. INTRODUCTION

This document contains configuration data relating to the integration of additional avionics into the F-4E aircraft. The data presented describe the F-4E aircraft avionics configuration in Block 48 and in subsequent blocks where the Digital Navigation (ARN-101) and the PAVE TACK systems have been installed.

This document will be revised periodically as additional modifications are planned and incorporated into the aircraft. Queries regarding information contained herein should be addressed to:

The Deputy for Avionics Control  
Code: ASD/AXP  
Wright-Patterson AFB, Ohio

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The applicable Technical Orders are included in the references listed in Section 10.

## 2. COCKPIT SPACE

Figures 2-1 through 2-8 show the current forward and aft cockpit layout.

The console and panel space available in the F-4E is very limited. There are two adjacent blank panels on the forward cockpit left console (Figure 2-3) that are about 6 inches high collectively. (The standard width is 5.75 inches.) There are two blank panels in the aft cockpit left console (Figure 2-7), only one of which is practically usable (1.5 inches high). Finally, there are two blank panels on the aft cockpit right console (Figure 2-8). One of these is 1 inch high; the other is not standard width and is about 3 inches square.

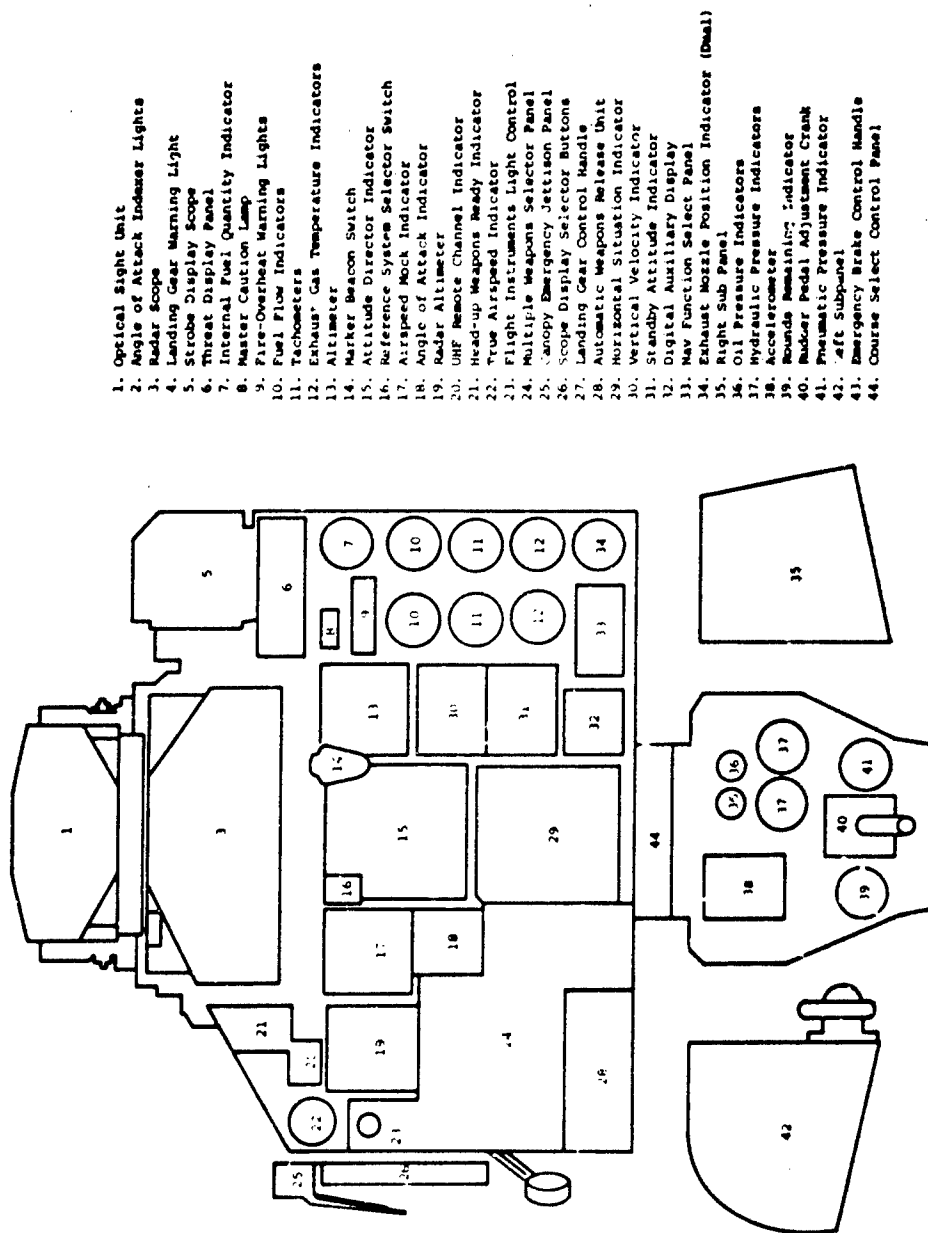


Figure 2-1. FORWARD COCKPIT, MAIN INSTRUMENT PANEL, F-4E

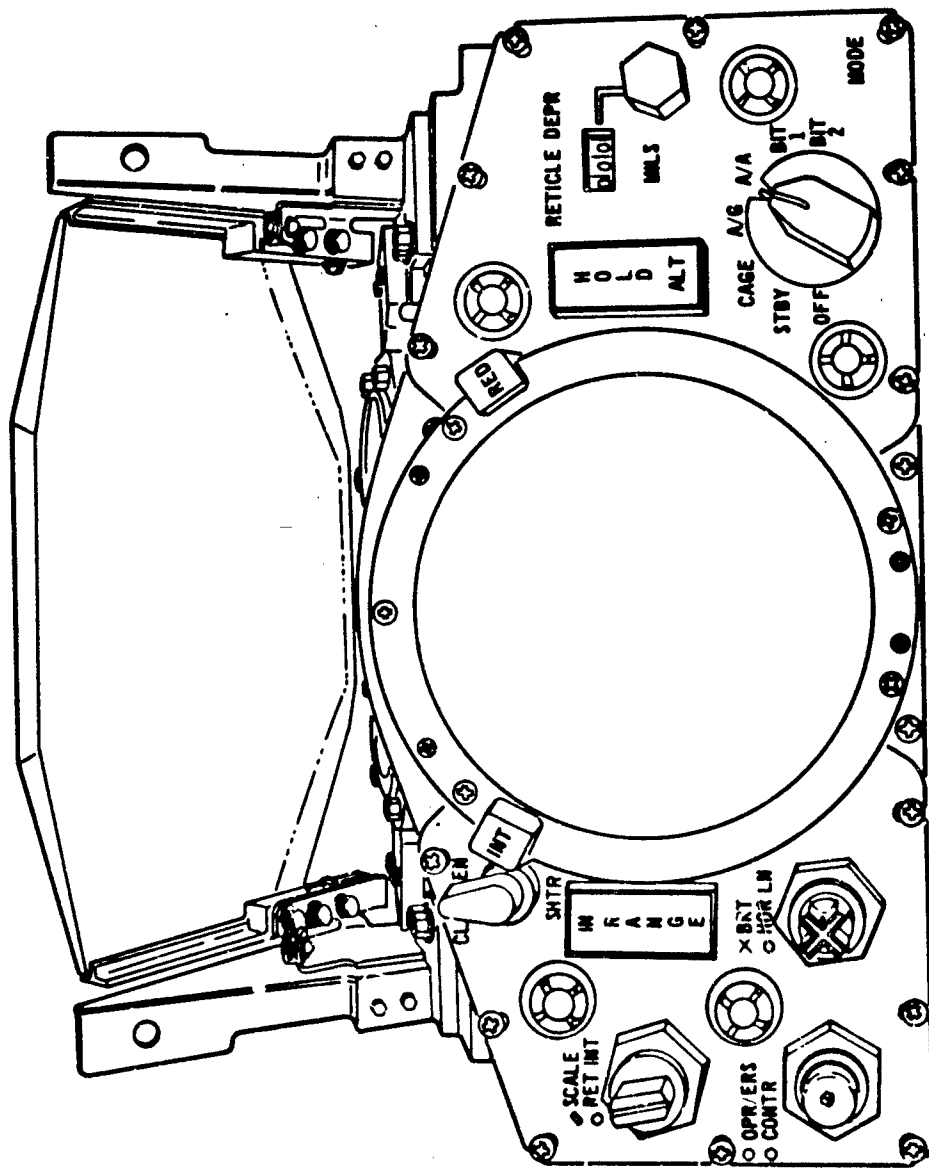


Figure 2-2. MULTIPLE SENSOR DISPLAY GROUP (MSDG) DISPLAY UNIT, FORWARD COCKPIT, F-4E

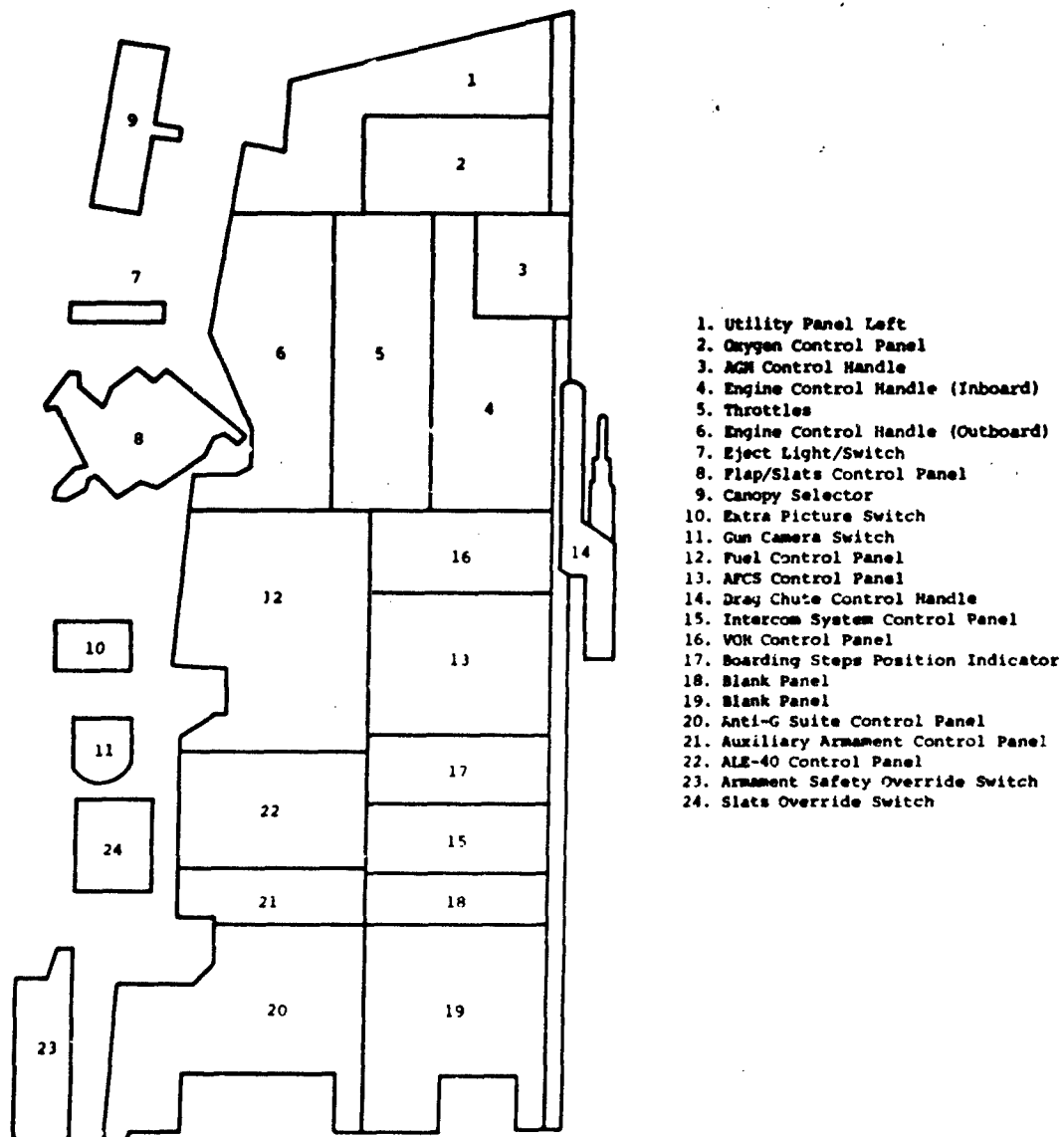


Figure 2-3. FORWARD COCKPIT, LEFT CONSOLE, F-4E

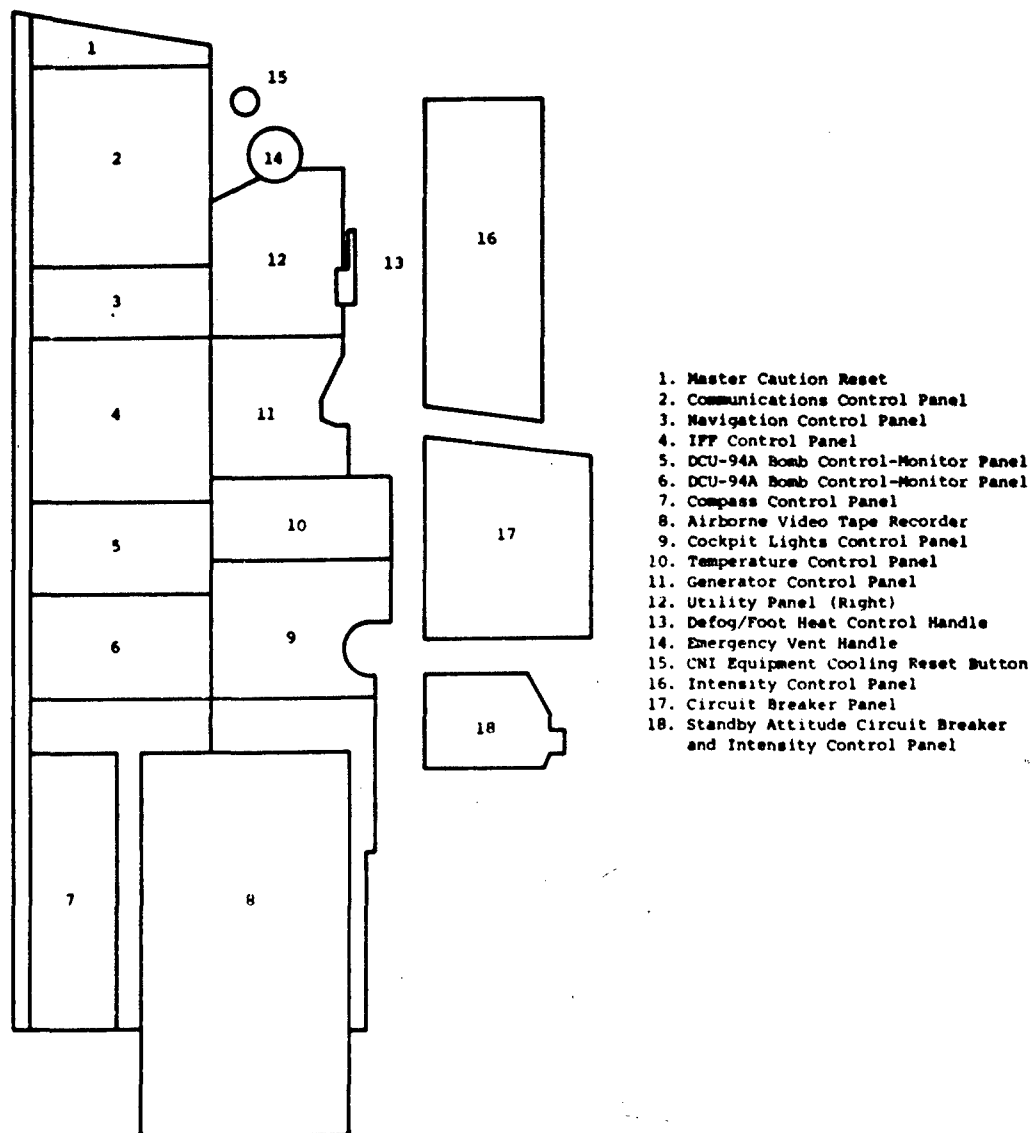
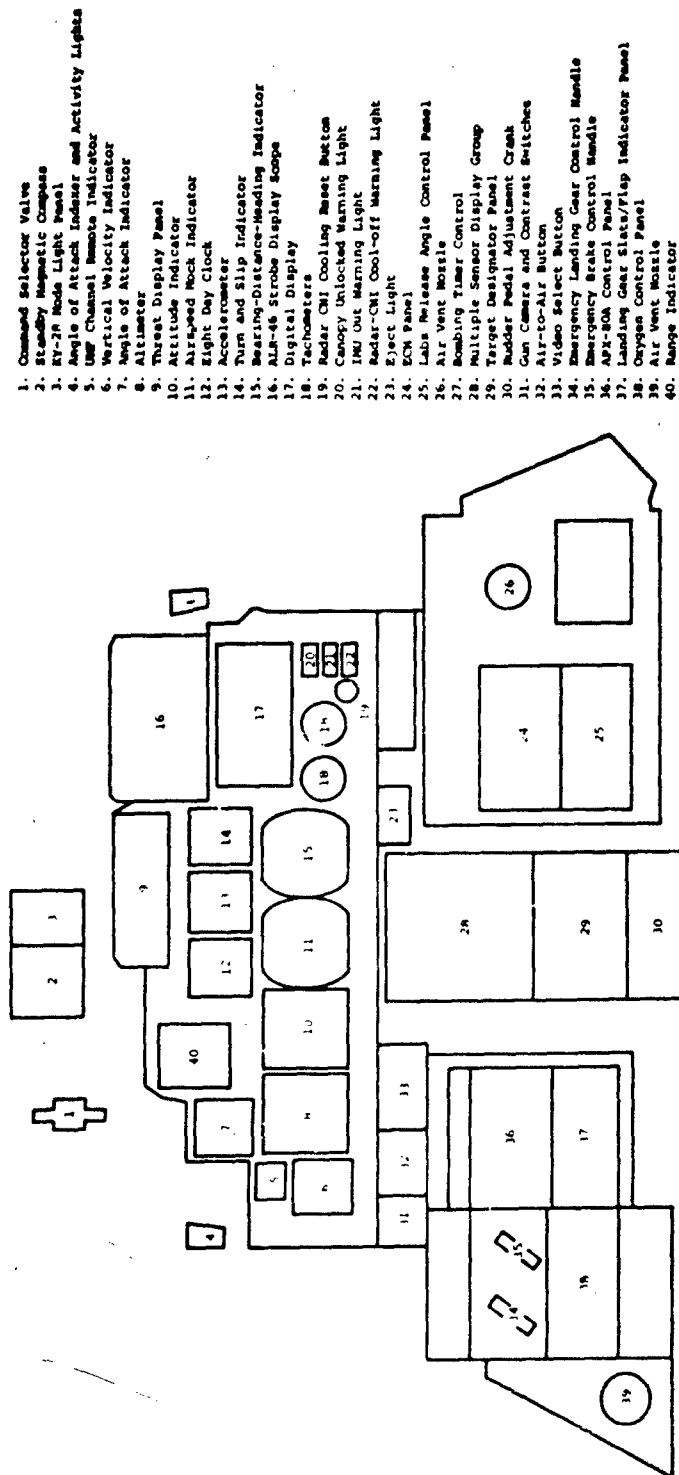


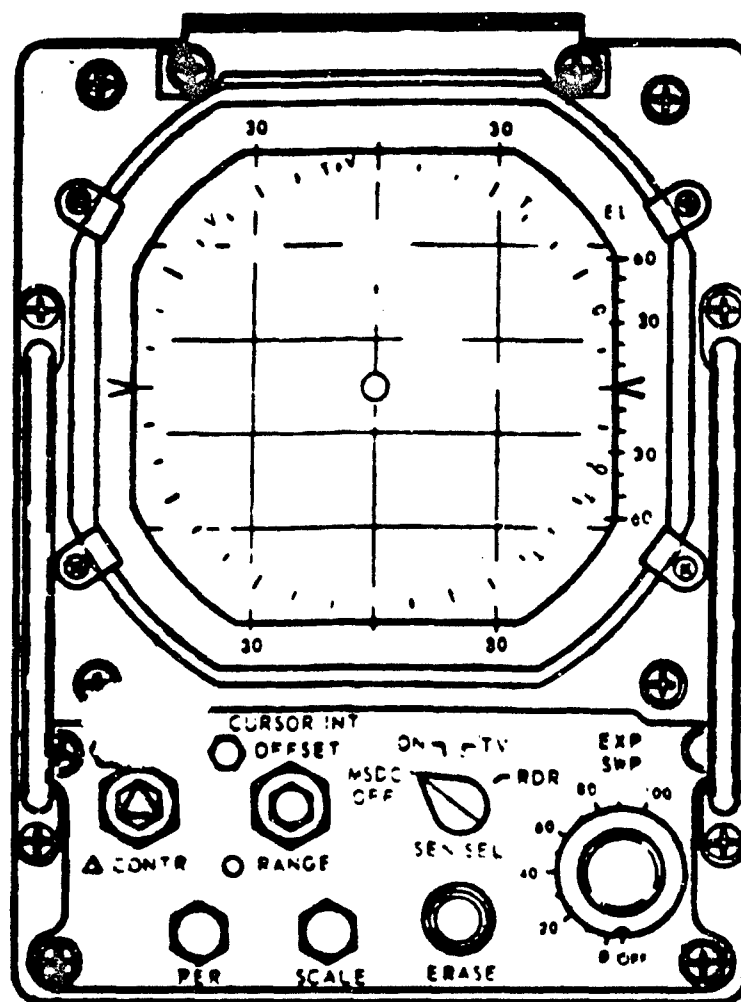
Figure 2-4. FORWARD COCKPIT, RIGHT CONSOLE, F-4E





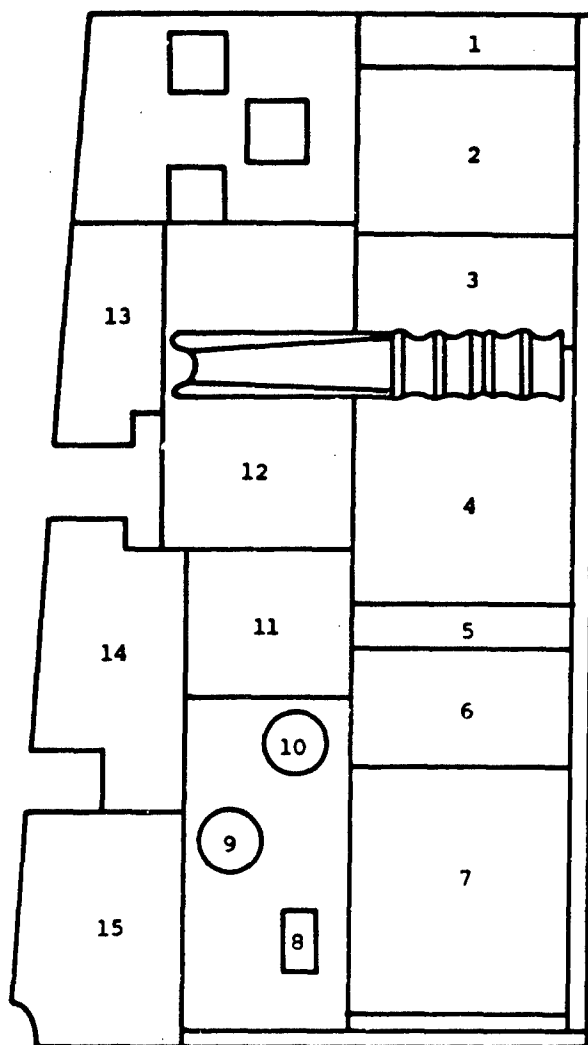
1. Command Selector Valve
2. Standby Magnetic Compass
3. RV-28 Mode Light Panel
4. Angle of Attack Indicator and Activity Light
5. UHF Channel Remote Indicator
6. Vertical Velocity Indicator
7. Angle of Attack Indicator
8. Altimeter
9. Threat Display Panel
10. Attitude Indicator
11. Airspeed Mach Indicator
12. Eight Day Clock
13. Accelerometer
14. Turn and Slip Indicator
15. Heading-Distance-Heading Indicator
16. ALM-48 Strobe Display Scope
17. Digital Display
18. Radiometers
19. Radar CMI Cooling Reset Button
20. Canopy Unlocked Warning Light
21. IMU Out Warning Light
22. Radar-CMI Cool-off Warning Light
23. Eject Light
24. ECM Panel
25. Labs Release Angle Control Panel
26. Air Vent Mottle
27. Bombing Timer Control
28. Multiple Sensor Display Group
29. Target Designator Panel
30. Rudder Pedal Adjustment Crank
31. Gun Camera and Contrast Switches
32. Air-to-Air Button
33. Video Select Button
34. Emergency Landing Gear Control Handle
35. Emergency Brake Control Handle
36. APN-80A Control Panel
37. Landing Gear Slats/Flap Indicator Panel
38. Oxygen Control Panel
39. Air Vent Mottle
40. Range Indicator

Figure 2-5. APT COCKPIT, MAIN INSTRUMENT PANEL, F-4E



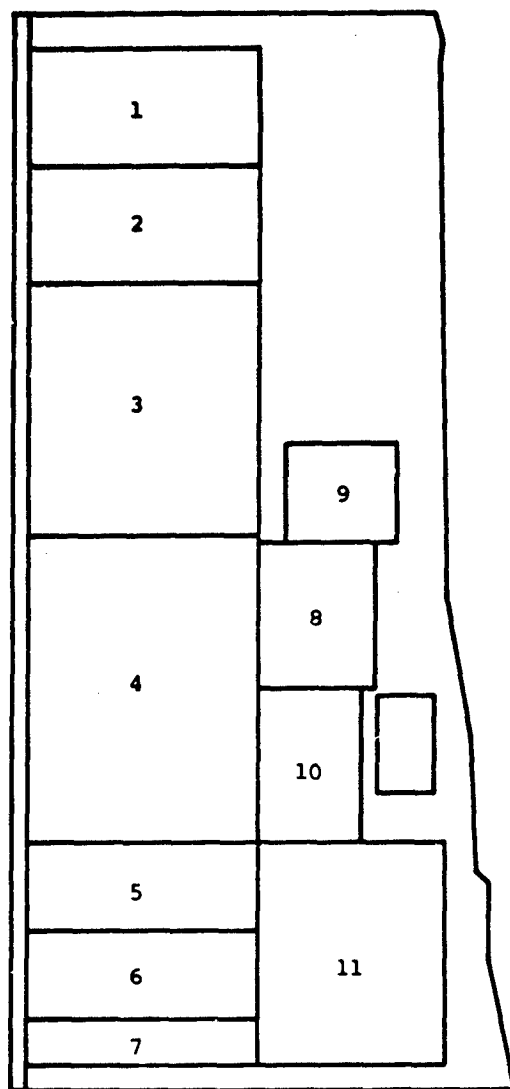
**IP-1093/APQ-120E**

Figure 2-6. MULTIPLE SENSOR DISPLAY GROUP (MSDG)  
DISPLAY UNIT, AFT COCKPIT



1. Blank Panel
2. Sensor Select Panel
3. AIC Control Panel
4. Radar Set Control Panel
5. Target Insert Panel
6. Nav Computer Set Control
7. UHF Radio Control
8. MKR BCN VOR/IUS Audio Control
9. Oxygen Quantity Gage
10. Cabin ALTIM Indicator
11. Remote Switching Panel
12. Throttles
13. Blank Panel
14. Pull up Tone Switch
15. Anti-G Suit Valve Control

Figure 2-7. AFT COCKPIT, LEFT CONSOLE, F-4E



1. Laser Code Control Panel
2. Pave Tack Control
3. Integrated Hand Control
4. KEYSER Control Panel
5. TACAN Control Panel
6. Intercom Control Panel
7. Blank Panel
8. Blank Panel
9. Stall Warning Tone Control Panel
10. Nuclear Store Consent Switch
11. Cockpit Lights Control Panel

Figure 2-8. AFT COCKPIT, RIGHT CONSOLE, F-4E

### 3. AVIONICS SPACE

Some of the alternatives for space provisions in the F-4E are compiled in the Form, Fit, and Environmental (F2E) Summary Table 3-1. Figure 3-1 shows the approximate locations of these spaces and is keyed to Table 3-1. The temperature-altitude-vibration environmental data relative to the identified locations are presented in Table 3-2.

The following basic points should be made with respect to the data contained in the tables:

- There is a large space apparently available in the tail area. However, there is a severe temperature environment to contend with, and cooling and power must be provided to the area. The attractiveness of this space depends on the amount of power and cooling required for candidate avionics.
- Small space may become available through equipment size reduction or relocation of other units. The latter might involve significant aircraft rewiring.
- The temperature data represent *uncontrolled* environmental conditions. Equipment installed in any area must be cooled to the extent necessary to meet Class 2 requirements.
- With the exception of the "Rat Bay" (Table 3-1, Space C) the condition I avionics areas have direct forced air conditioning. The condition II area in the tail is not cooled and has a severe temperature environment.
- The vibration data represent compartment conditions existing for any equipment mounted therein. The necessity for shock mounting can be determined from these data. The CNI bay has the most vibration in the 10 Hz to 15 Hz band, while the upper equipment bay has the largest vibration in the 20 Hz to 23 Hz band of the three regions examined.

Table 3-1. <sup>2</sup> SUMMARY - F-4E

| F/E Criteria                                                 | Potential Available Space               |                                        |                                                                                                                                                                                                                 |                                                                        |                                                                |                                                                    |
|--------------------------------------------------------------|-----------------------------------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------------------------|
| Location Reference and Description                           | A<br>CNI<br>Behind KY-28                | A<br>CNI Bay<br>Behind KIR-1A          | A<br>CNI Bay<br>Replacement of<br>Amp-Power<br>Supply-Aux Row<br>AM-2348/ASQ                                                                                                                                    | B<br>Upper Antennas<br>Bay<br>Door 19<br>Behind Lead<br>Computing Gyro | C<br>"Rat" Bay<br>Door 186L                                    | D<br>Tail Area<br>Behind Door<br>81L and Aft<br>of #7 Fuel<br>Cell |
| Rectangular Size*<br>(H, W, D)<br>Volume                     | 7'8" 5'0" 11'0"<br>0.25 ft <sup>3</sup> | 6'0" 6'7" 10'0"<br>0.2 ft <sup>3</sup> | 8'5" 5'4" 23'2"<br>0.7 ft <sup>3</sup><br>(Current Size)<br>Unit need only<br>provide power<br>for Intercom IFF<br>IFF transponder<br>and Aux Row<br>Power; Reduction<br>in volume by<br>perhaps 50<br>percent. | 8'5" 7'0" 8'0"<br>0.2 ft <sup>3</sup>                                  | 17'0" 25'0"†<br>0.6 - 1.2 ft <sup>3</sup> ††                   | 16" 18" 22"<br>16" 8" 22"<br>Total - 5.3 ft <sup>3</sup>           |
| Type Cooling Available                                       | Forced Air<br>Conditioning              | Forced Air<br>Conditioning             | Forced Air<br>Conditioning<br>(Cooling Air Flow<br>T8D) Tock CNI<br>Elec. Central System<br>Requires 3.2 Lb/Min.                                                                                                | Forced Air<br>Conditioning                                             | Cooling Air Blad<br>into Bay from<br>Upper Antennas<br>Bay     | Currently<br>Connection<br>Only                                    |
| McDonnell Report 8728**<br>Temperature-Altitude<br>Vibration | Condition I<br>Region IX                | Condition I<br>Region IX               | Condition I<br>Region IX                                                                                                                                                                                        | Condition I<br>Region X                                                | Condition I<br>Region I                                        | Condition II<br>Region I                                           |
| Possible Candidates<br>for the Space                         | VHF AM/FM<br>(ARC-186)<br>Compass Tie   | VHF AM/FM<br>(ARC-186)<br>Compass Tie  | Smaller Amp-Pwr<br>Supply-Row Unit<br>Requirement Reduced<br>with ARN-118 and<br>ARC-184 installed.<br>Only needed for<br>- Intercom<br>- IFF Xpndr<br>- Aux UHF Row<br>Perhaps Gain Half of<br>Vol.            | VHF AM/FM<br>(ARC-186)<br>Compass Tie<br>Existing                      | 2 AN/ALR-48(V)<br>LRUs to be<br>Installed Here<br>Very Shallow | None Known                                                         |
| Remarks                                                      | Adjacent                                |                                        |                                                                                                                                                                                                                 |                                                                        |                                                                |                                                                    |

\*Where LRU is currently installed, the dimensions given represent dimensions of LRU; when no LRU is installed, the dimensions given are those of the available space.

\*\*See Table 3.2.

†Depth Varies 2.5" - 5.1".

††Less Approximate 0.35 ft<sup>3</sup> for ALP-48 LRUs.

=No power currently available; no forced-air cooling currently available; severe ambient temperature environment.

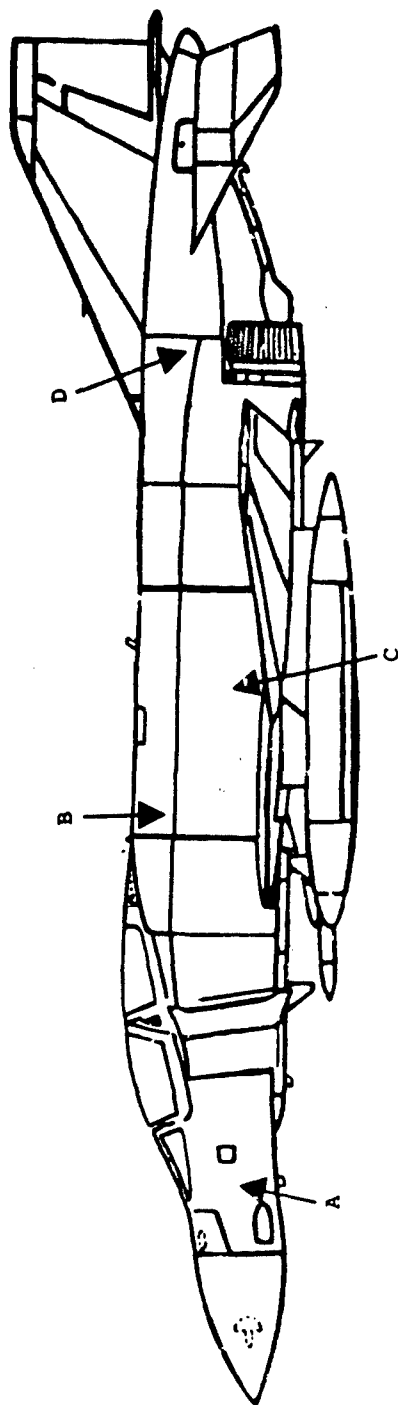


Figure 3-1. F-4E/RF-4C SPACE LOCATIONS

| Table 3-2. F-4E RAW ENVIRONMENTAL DATA SYNOPSIS |                                                          |                                                          |              |
|-------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------|--------------|
| Temperature Data                                |                                                          |                                                          |              |
| Temperature-Altitude Condition                  | Condition                                                |                                                          |              |
|                                                 | I                                                        | II                                                       |              |
| Continuous                                      | -54° C to +71° C, Sea level<br>-54° C to +24° C, 60,000' | -54° C to +71° C, Sea level<br>-54° C to +24° C, 60,000' |              |
| 30 Minutes                                      | to +95° C, Sea level<br>to +83° C, 60,000'               | to +95° C, Sea level<br>to +100° C, 60,000'              |              |
| 10 Minutes                                      | to +101° C, Sea level<br>to +143° C, 50,000'             | to +109° C, Sea level<br>to +170° C, 50,000'             |              |
| Vibration Data                                  |                                                          |                                                          |              |
| Equipment Performance                           | Region                                                   |                                                          |              |
|                                                 | I                                                        | IX                                                       | X            |
| 5-10 Hz                                         | 0.060 inches                                             | 0.060 inches                                             | 0.060 inches |
| 10-15 Hz                                        | 0.063 inches                                             | 0.078 inches                                             | 0.064 inches |
| 15-20 Hz                                        | 0.036 inches                                             | 0.036 inches                                             | 0.036 inches |
| 20-23 Hz                                        | 0.036 inches                                             | 0.060 inches                                             | 0.060 inches |
| 23-50 Hz                                        | 0.036 inches                                             | 0.036 inches                                             | 0.036 inches |
| > 50 Hz                                         | ±5g                                                      | ±5g                                                      | ±5g          |



#### 4. ELECTRICAL POWER SYSTEM

##### 4.1 Main Power System

The main electrical power system in the F-4E is composed of two 30 KVA, 115 volt, 400 Hz 3-phase power generators with a constant-speed drive (CSD) unit regulating the generator at 8,000 rpm. The load is evenly divided between the generators when they are operating in parallel. If a fault in either generator occurs, it is removed from the line. Two underfrequency protectors prevent underfrequency operation of the generators.

##### 4.2 Power Conversion and Distribution System

The power conversion and distribution system has three main functions: (1) distributes internal emergency and external ac power to the aircraft, (2) distributes dc power to the aircraft, and (3) converts 115 Vac to 28/14 Vac and 28 Vdc. Power from the left generator is supplied to the left main 115 Vac bus and instrument 200/115 Vac bus. The right generator delivers power to the 115 Vac right main bus and the essential 115 Vac bus. In normal operation the emergency generator delivers ac power to the essential and instrument buses.

Two 100 ampere transformer-rectifiers convert the received ac power from their generators to the 28 Vdc power.

##### 4.3 Battery Power

The battery power supply system contains a 24 volt nickel cadmium battery rated at 11 ampere-hours at a 2-hour discharge rate. The aircraft battery is used for normal ground and emergency air starts as well as to provide power to the four floodlights. If total ac-to-dc power conversion fails, the battery will supply power to the essential dc bus.

## 5. ENVIRONMENTAL CONTROL SYSTEM

### 5.1 General

The aircraft environmental control system air conditioning is divided into two major systems, one for cabin areas and one for electronic equipment cooling. Both systems utilize high-temperature, high-pressure, seventeenth stage engine compressor bleed air from either or both engines.

### 5.2 Cabin Air Conditioning

The cabin air conditioning system on the right side of the fuselage contains two air-to-air heat exchangers and other associated equipment that allow a selection of cabin air conditioning temperatures, vent air temperatures, defogging, rain removal, and ram air operations. This same cabin air is also used to purge the gun gases from the breech of the M61A1 nose gun.

### 5.3 Equipment Air Conditioning

The equipment air conditioning system on the left side of the fuselage supplies cooling air for the main radar package in the nose, the CNI package aft of the nosewheel well, and the electronic equipment shelf behind the rear cockpit bulkhead. Control of the air conditioning system is completely automatic. The temperature is controlled at approximately 84°F from seal level to 25,000 feet and 40°F from 25,000 feet up.

### 5.4 Equipment Auxiliary Air System

The equipment air conditioning system also supplies partially cooled air to the equipment auxiliary air system (EAAS). The EAAS automatically distributes partially cooled, low-pressure bleed air from the engine bleed air system to the following systems:

- Anti-G system
- Canopy seal system
- Air data computer
- Fuel pressurization system
- Pneumatic system air compressor
- Radio Receiver-transmitters
- Forward looking radar system

### 5.5 Cooling Power

The actual cooling power required (based on flight test results) is shown in Table 5-1 for two extreme flight conditions.

| Table 5-1. F-4E COOLING POWER REQUIRED FOR EXTREME FLIGHT CONDITIONS |                           |                 |                 |        |                         |                        |                 |        |  |
|----------------------------------------------------------------------|---------------------------|-----------------|-----------------|--------|-------------------------|------------------------|-----------------|--------|--|
| Compartment                                                          | Sea Level, Vmax (Hot Day) |                 |                 |        |                         | 48,000 Feet, Mach 0.81 |                 |        |  |
|                                                                      | Heat Dissipated (Watts)   | Air Flow Lb/Min | Air Temperature |        | Heat Dissipated (Watts) | Air Flow Lb/Min        | Air Temperature |        |  |
|                                                                      |                           |                 | °F in           | °F out |                         |                        | °F in           | °F out |  |
|                                                                      |                           |                 |                 |        |                         |                        |                 |        |  |
| Radar                                                                | 8,741                     | 29.9            | 100             | 169    | 3,052                   | 14.7                   | 40              | 89     |  |
| CNI                                                                  | 1,208                     | 5.0             | 100             | 157    | 418                     | 2.1                    | 40              | 87     |  |
| Upper Equipment Bay                                                  | 617                       | 2.8             | 100             | 152    | 234                     | 1.2                    | 40              | 86     |  |
| Cabin                                                                | 10,910                    | 28.3            | 41              | 132    | 2,101                   | 17.1                   | 41              | 70     |  |
| Totals                                                               | 21,476                    |                 |                 |        | 5,805                   |                        |                 |        |  |

## 6. CURRENT AVIONICS

Tables 6-1 through 6-20 contain LRU data relating to the F-4E avionics systems that make up the current or near-term configuration. Where no entries are shown, the data were not available for this report. Data pertaining to future avionics modifications are presented in Section 9.

| Name                                  | Nomenclature            | Location                                                              | Dimensions (Inches) |       |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power                   |               | Heat Dissipation | Cooling Method* | Mounting |
|---------------------------------------|-------------------------|-----------------------------------------------------------------------|---------------------|-------|------|-----------------------|-----------------|----------------------------------|---------------|------------------|-----------------|----------|
|                                       |                         |                                                                       | H                   | W     | D    |                       |                 | AC                               | DC            |                  |                 |          |
| <b>UIP Subsystem</b>                  |                         |                                                                       |                     |       |      |                       |                 |                                  |               |                  |                 |          |
| Antenna (2)                           | AS-1611A                | Upper in Fin Cap on Vert Fin (Door 68);**<br>Lower on Nose Wheel Door |                     |       |      | 166                   | 2.0             |                                  |               |                  |                 |          |
| Control Unit                          | C-6684/ASQ              | Pwd Cockpit Right Console                                             | 6.4                 | 5.75  | 5.0  | 184                   | 5.5             |                                  |               |                  |                 |          |
| Control Unit (TAGAN)                  | C-6685/ASQ              | Aft Cockpit Left Console                                              | 2.25                | 5.75  | 3.3  | 43                    | 1.1             |                                  |               |                  |                 |          |
| Freq Channel Indicator                | ID-1311/ASQ             | Pwd Cockpit Main Instr. Panel                                         | 1.3                 | 1.6   | 5.9  | 12                    | 3.0             | 5V Light                         | 25-29V/1A     |                  |                 |          |
| Receiver Transmitter                  | RT-791/ASQ              | Below Aft Cockpit Left Console                                        | 7.5                 | 11.85 | 16.3 | 1449                  | 35.9            | 115V 400 Hz 36 230VA (RXT) (MPT) | 27.5 +3W (RX) |                  |                 |          |
| Amplifier-Power Supply-Receiver (RUX) | AM-2349A/ASQ-19         | CNI Bay (Nose Wheelwell)                                              | 8.5                 | 6.4   | 23.2 | 1262                  | 36.0            | 6.3V 4.5A                        | 130V+ .27A    |                  | Forced Air      |          |
| <b>IIF Subsystem</b>                  |                         |                                                                       |                     |       |      |                       |                 |                                  |               |                  |                 |          |
| Antenna††                             | 2285-1                  | Above Door 19                                                         |                     |       |      | 86                    | 0.75            |                                  |               |                  |                 |          |
| Transponder Computer                  | KIT-1A/TSEC             | CNI Bay                                                               |                     |       |      | 244                   | 14.0            |                                  | 0             | 0                | Forced Air      |          |
| Transponder Control                   | C-6280(P)/APX           | Pwd cockpit Right Console                                             | 5.75                | 5.75  | 3.0  | 99                    |                 |                                  |               |                  | Convection      |          |
| Coder-Receiver Transmitter            | KY-532( )/ASQ-19CNI Bay |                                                                       | 8.6                 | 6.4   | 22.5 | 1238                  | 26.0            | 115V 400 Hz 70VA                 | 28V, 2A       |                  | Forced Air      |          |

\*The overall CNI requires cooling air at 3.2 lb/min.  
 \*\*Upper UHF Antenna will be relocated to top of fuselage forward of Vertical Fin with ANM-101 installation.  
 †Auxiliary Receiver power only. Power supply is the central source for entire Integrated Electronic Central System and its power requirement is TBD.  
 ††Not applicable with AN/APX-80A installation.  
 ‡Powered from KY-532( ).

\*The overall CNI requires cooling air at 3.2 lb/min.

\*\*Upper UIP Antenna will be relocated to top of fuselage forward of Vertical Fin with ABM-101 installed.

†Auxiliary Receiver power only. Power supply is the central source for entire Integrated Electronic Central System and its power requirement is TBD.

††Not applicable with AN/APX-80A installation.

‡Powered from KY-532( ).

(continued)

| Table 6-1. (continued)                                                                                              |                |                                   |                     |      |      |                       |                 |                              |                 |                  |                              |          |
|---------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------|---------------------|------|------|-----------------------|-----------------|------------------------------|-----------------|------------------|------------------------------|----------|
| Name                                                                                                                | Nomenclature   | Location                          | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power               |                 | Heat Dissipation | Cooling Method               | Mounting |
|                                                                                                                     |                |                                   | H                   | W    | D    |                       |                 | AC                           | DC              |                  |                              |          |
| <u>TACAM Subsystem</u>                                                                                              |                |                                   |                     |      |      |                       |                 |                              |                 |                  |                              |          |
| Radio Receiver Transmitter                                                                                          | RT-547-ASQ-19  | CNI Bay                           | 8.5                 | 7.5  | 22.6 | 1441                  | 40.0            | 400 Hz<br>115V               | 27.5V<br>27.4W  |                  | Convection w/Internal Blower |          |
| Pulse Decoder                                                                                                       | KY-312/ASQ-19  | Door 19                           | 7.5                 | 6.4  | 22.5 | 1080                  | 29.5            | 400 Hz<br>115V .5A<br>87.5VA | 27.5V<br>27.4W  |                  | Convection                   |          |
| Antennas (2)                                                                                                        | DM-MI-29       | Upper-Above Door 115              |                     |      |      | 36                    | 0.5             |                              |                 |                  |                              |          |
|                                                                                                                     | TRAM-CO 2282-1 | Lower-on Pod Nose Gear Door       |                     |      |      | 36                    | 0.5             |                              |                 |                  |                              |          |
| <u>Intercom Subsystem</u>                                                                                           |                |                                   |                     |      |      |                       |                 |                              |                 |                  |                              |          |
| Intercom Stations (2)                                                                                               | LS-460B/AIC    | Pod and Aft Cockpit Left Consoles | 2.25                | 5.75 | 6.4  | 83                    | 3.0             |                              | Each 28V<br>15W |                  | Convection                   | Console  |
| <u>ADP Subsystem</u>                                                                                                |                |                                   |                     |      |      |                       |                 |                              |                 |                  |                              |          |
| Antenna                                                                                                             | AS-901/ARA-48  | On Door 167                       | 12.4                | 11.4 | 3.5  | 495                   | 9.5             | 115V 26V<br>400 Hz           | 27.5V<br>.2W    |                  |                              |          |
| *Powered by Amplifier-Power Supply Unit.<br>**To operate Antenna Drive Motor, Rate Generator, and Position Synchro. |                |                                   |                     |      |      |                       |                 |                              |                 |                  |                              |          |

\*Powered by Amplifier-Power Supply Unit.

\*\*To operate Antenna Drive Motor, Rate Generator, and Position Synchro.

| Table 6-2. F-4E AVIONICS CONFIGURATION DATA: SECURE COMMUNICATIONS SET KY-28 |                                     |                                                                                                        |                     |      |     |                       |                 |                |     |                  |                |          |
|------------------------------------------------------------------------------|-------------------------------------|--------------------------------------------------------------------------------------------------------|---------------------|------|-----|-----------------------|-----------------|----------------|-----|------------------|----------------|----------|
| Name                                                                         | Nomenclature                        | Location                                                                                               | Dimensions (Inches) |      |     | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |     | Heat Dissipation | Cooling Method | Mounting |
|                                                                              |                                     |                                                                                                        | H                   | W    | D   |                       |                 | AC             | DC  |                  |                |          |
| Control Unit                                                                 | C-8057/ABC<br>MSN: 5821-00-087-1504 | Pwd Cockpit<br>Right Console                                                                           | 2.6                 | 5.75 | 2.3 | 34                    |                 |                | 28  |                  |                |          |
| Remote Unit                                                                  | TSBC/KY-28<br>MSN: TBD              | Lower Shelf<br>CWI Bay Aft of<br>Nose Wheelwell                                                        | 7.8                 | 5.0  | 9.1 | 355                   | 15.0            |                | 28V |                  |                |          |
| Indicator<br>Lights (2)                                                      |                                     | Pwd Cockpit<br>Main Instr.<br>Panel Lower<br>Right<br><br>Aft Cockpit on<br>Canopy Arch<br>Panel Assy. |                     |      |     |                       |                 |                |     |                  |                |          |

| Table 6-3. F-4E AVIONICS CONFIGURATION DATA: RADIO TRANSFORMER SST-181X, AM/UPM-25 MSW: 5895-00-137-0439 |                              |          |                     |     |     |                       |                 |                |                  |                  |
|----------------------------------------------------------------------------------------------------------|------------------------------|----------|---------------------|-----|-----|-----------------------|-----------------|----------------|------------------|------------------|
| Name                                                                                                     | Nomenclature                 | Location | Dimensions (Inches) |     |     | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |                  | Heat Dissipation |
|                                                                                                          |                              |          | H                   | W   | D   |                       |                 | AC             | DC               |                  |
| Radio Transmitter or Receiver<br>Transmitter*<br>Antenna                                                 | RT-846/UPN                   | Door 19  | 3.4                 | 2.9 | 4.0 | 39                    | 3.3             |                | 24-30V<br>16-27W | Convection       |
|                                                                                                          | RT-855/UPN-25<br>AS-2038/UPN | Door 19  | 1.0 (diam.)         |     | 5.0 | 3.9                   | 0.4             |                |                  | Convection       |
| *Either may be installed depending on requirements. Characteristics cited apply to both.                 |                              |          |                     |     |     |                       |                 |                |                  |                  |



| Table 6-4. F-4E AVIONICS CONFIGURATION DATA: FLIGHT DIRECTOR GROUP; NSN: TBD |              |                                |                     |   |   |                       |                 |                |    |                  |                |          |
|------------------------------------------------------------------------------|--------------|--------------------------------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                         | Nomenclature | Location                       | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                              |              |                                | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| Flight Director Computer                                                     | AF/A24C-1    | Aft Cockpit Right              |                     |   |   |                       |                 |                |    |                  |                |          |
| Mode Selector Control                                                        |              | Pod Cockpit Main Instr. Panel  |                     |   |   |                       |                 |                |    |                  |                |          |
| Horizontal Situation Indicator                                               |              | Pod Cockpit Main Instr. Panel  |                     |   |   |                       |                 |                |    |                  |                |          |
| HSI Amplifier                                                                |              | Pod Cockpit Above Left Console |                     |   |   |                       |                 |                |    |                  |                |          |
| Bearing Distance Heading Indicator                                           |              | Aft Cockpit Main Instr. Panel  |                     |   |   |                       |                 |                |    |                  |                |          |
| BDHI Mode Select Switch                                                      |              | Aft Cockpit Main Instr. Panel  |                     |   |   |                       |                 |                |    |                  |                |          |

| Table 6-5. F-4E AVIONICS CONFIGURATION DATA: FLIGHT CONTROL GROUP AM/ASA-32 |                                          |                             |                     |   |   |                       |                 |                |    |                  |                |          |
|-----------------------------------------------------------------------------|------------------------------------------|-----------------------------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                        | Nomenclature                             | Location                    | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                             |                                          |                             | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| Control Amplifier                                                           | C-6563/ASA-32B<br>MSN: TBD               | Aft Cockpit<br>Left Console |                     |   |   |                       |                 |                |    |                  |                |          |
| Auto-Pilot Engaging Controller                                              | C-6564/ASA-32H<br>MSN: 6615-00-907-0197  | Pod Cockpit<br>Left Console |                     |   |   |                       |                 |                |    |                  |                |          |
| Rate GYRCS                                                                  |                                          |                             |                     |   |   |                       |                 |                |    |                  |                |          |
| Pitch                                                                       | CN-506/ASA-32                            | Door 89L                    |                     |   |   |                       |                 |                |    |                  |                |          |
| Roll                                                                        | CN-558/ASA-32                            | Behind Aft Cockpit seat     |                     |   |   |                       |                 |                |    |                  |                |          |
| Yaw                                                                         | CN-559/ASA-32<br>MSN: TBD                | Door 89R                    |                     |   |   |                       |                 |                |    |                  |                |          |
| Accelerometers                                                              | MX-3423/ASA-320                          | Door 168                    |                     |   |   |                       |                 |                |    |                  |                |          |
| G-Limiting                                                                  | MSN: 6615-00-600-1007                    |                             |                     |   |   |                       |                 |                |    |                  |                |          |
| Lateral                                                                     | MX-3421/ASA-32D<br>MSN: 6615-00-600-0969 | Door 168                    |                     |   |   |                       |                 |                |    |                  |                |          |
| Motional Pick-Up Transducer                                                 | TR-175/ASA-32D<br>MSN: 6615-00-590-5172  | Pod Stick<br>Grip           |                     |   |   |                       |                 |                |    |                  |                |          |

| Table 6-6. F-42 AVIONICS CONFIGURATION DATA: RADAR ALTITUDE SYSTEM, AM/APN-155 SEN: 5841-00-411-1661 |              |           |                     |      |       |                       |                 |                              |               |                                       |
|------------------------------------------------------------------------------------------------------|--------------|-----------|---------------------|------|-------|-----------------------|-----------------|------------------------------|---------------|---------------------------------------|
| Name                                                                                                 | Nomenclature | Location  | Dimensions (Inches) |      |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power               |               | Cooling Method                        |
|                                                                                                      |              |           | H                   | W    | D     |                       |                 | AC                           | LC            |                                       |
| Receiver-Transmitter                                                                                 | RT-640       | Door 19** | 6.8                 | 3.75 | 15.75 | 402                   | 11.7            | 115V<br>400 Hz<br>1.0<br>34W | 27.5V<br>15W* | Forced Air<br>0.4 lb/m <sup>2</sup> . |
| Receive Antenna                                                                                      | AS-1386      | Door 27L  | 3.0                 | 9.6  | 14.2  | 409                   | 3.3             |                              |               |                                       |
| Transmitter Antenna                                                                                  | AS-1442      | Door 27R  | 3.0                 | 9.6  | 14.2  | 409                   | 3.3             |                              |               |                                       |
| *62W during warm-up.<br>**Located in OMI Bay on 8 aircraft.                                          |              |           |                     |      |       |                       |                 |                              |               |                                       |

| Table 6-7. F-4E AVIONICS CONFIGURATION DATA: AIR DATA COMPUTER SYSTEM |                                         |                                        |                     |     |     |                       |                 |                |    |                  |                |          |
|-----------------------------------------------------------------------|-----------------------------------------|----------------------------------------|---------------------|-----|-----|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                  | Nomenclature                            | Location                               | Dimensions (Inches) |     |     | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                       |                                         |                                        | H                   | W   | D   |                       |                 | AC             | DC |                  |                |          |
| Air Data Computer                                                     | CPK-92/A24G-34<br>NSN: TBD              | Aft Cockpit Left                       |                     |     |     |                       |                 |                |    |                  |                | Rack     |
| Angle of Attack XMTR                                                  | TRK-58/A24G-16<br>NSN: 6610-00-987-5611 | Door 3                                 |                     |     |     |                       |                 |                |    |                  |                | Hard     |
| Electrical Resistance Temperature Transmitter                         | TRK-64/A24G-19<br>NSN: TBD              | Door 2                                 | 5.0                 | 3.6 | 2.5 | 45                    |                 |                |    |                  |                | Hard     |
| Angle of Attack Indicators                                            | VRK-10A/A24G-8                          | Pwd and Aft Cockpit Main Instr. Panels |                     |     |     |                       |                 |                |    |                  |                | Panel    |
| Altitude Encoder Unit                                                 | CVK-99/A24G-34<br>NSN: TBD              | Door 19                                | 3.3                 | 6.4 | 5.5 | 116                   | 4.0             |                |    |                  |                |          |
| True Airspeed Indicators                                              | AVK-14/A24G-8<br>NSN: TBD               | Pwd and Aft Cockpit Main Instr. Panels | 2.0 (diam.)         |     | 6.9 | 22                    | 1.0             |                |    |                  |                | Panel    |
| Dual Servoed Altimeters                                               | ARU-19A<br>NSN: TBD                     | Pwd and Aft Cockpit Main Instr. Panels | 3.3 (diam.)         |     | 8.8 | 75                    | 4.5             |                |    |                  |                | Panel    |
| Stall Warning Aural Tone Generator                                    | O-1647/APN<br>NSN: TBD                  | Pwd Cockpit Center                     |                     |     |     |                       |                 |                |    |                  |                | Hard     |

**Table 6-8.**

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| Table 6-9. F-4E AVIONICS CONFIGURATION DATA: ILS/VOR SYSTEM, AN/ARN-127 RNA: TBD |              |                          |                     |     |      |                       |                 |                     |                    |                  |                |          |
|----------------------------------------------------------------------------------|--------------|--------------------------|---------------------|-----|------|-----------------------|-----------------|---------------------|--------------------|------------------|----------------|----------|
| Name                                                                             | Nomenclature | Location                 | Dimensions (Inches) |     |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power      |                    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                  |              |                          | H                   | W   | D    |                       |                 | AC                  | DC                 |                  |                |          |
| Control Panel                                                                    | C-10124      | Pod Cockpit Left Console | 5.75                | 2.6 | 4.5  | 68                    | 2.2             |                     | 27.5V              |                  | Convection     |          |
| Cockpit Indicator                                                                | ID-3518/ARN  | Aft Cockpit Canopy       |                     |     |      |                       |                 |                     |                    |                  |                |          |
| GS/VOR/ILS Antenna                                                               | D990-5       | Nose Radome Left Door 1  |                     |     |      |                       |                 |                     |                    |                  |                |          |
| Marker Beacon Antenna                                                            |              | Door 2SL                 |                     |     |      |                       |                 |                     |                    |                  |                |          |
| Receiver Mounting Base                                                           | R-2032       | Aft Cockpit Right        | 5.1                 | 7.2 | 12.6 | 463                   | 10.0            | 24V<br>400 Hz<br>1A | 27.5V<br>2A<br>Max |                  | Convection     |          |

| Name                                          | Nomenclature                   | Location                  | Dimensions (Inches) |       |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power**                 |     | Heat Dissipation | Cooling Method                                                                                    | Mounting        |
|-----------------------------------------------|--------------------------------|---------------------------|---------------------|-------|------|-----------------------|-----------------|----------------------------------|-----|------------------|---------------------------------------------------------------------------------------------------|-----------------|
|                                               |                                |                           | H                   | W     | D    |                       |                 | AC                               | DC  |                  |                                                                                                   |                 |
| Navigation Set Control<br>Navigation Computer | C-4779/ASN                     | Aft Cockpit Right Console | 2.2                 | 5.4   | 5.1  | 61                    | 1.5             | 400 Hz 115V                      | 28V |                  | Convection                                                                                        | Console-mounted |
|                                               | CP-733/ASN                     | Aft Cockpit Right Console | 8.0                 | 7.3   | 26.1 | 1524                  | 45.0            | 3 @ 750VA Per @ and 28V 1 @ 70VA |     |                  | Forced Air                                                                                        | Console-mounted |
| GYRO Scaled Platform                          | MX-4839/ASN<br>MX-7299/ASN-74* | Aft Cockpit Right         | 10.0                | 11.25 | 14.9 | 1676                  | 30.6            |                                  |     |                  | Internal Blower to circulate heated air with forced air intake to cool and stabilize temperature. | Hard            |
| Output Signal Distribution Unit               | MX-6728/ASN-63                 | Aft Cockpit Right         | 6.1                 | 7.1   | 14.7 | 637                   | 10.0            |                                  |     |                  |                                                                                                   | Hard            |

\*Either unit may be included in F-4E INS.  
\*\*System power value only.

| Table 6-11. P-4E AVIONICS CONFIGURATION DATA: IFF SYSTEM, AN/APX-80A NSN: TBD |                     |                                   |                     |      |      |                       |                 |                         |               |                  |                                                  |          |
|-------------------------------------------------------------------------------|---------------------|-----------------------------------|---------------------|------|------|-----------------------|-----------------|-------------------------|---------------|------------------|--------------------------------------------------|----------|
| Name                                                                          | Nomenclature        | Location                          | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power          |               | Heat Dissipation | Cooling Method                                   | Mounting |
|                                                                               |                     |                                   | H                   | W    | D    |                       |                 | AC                      | DC            |                  |                                                  |          |
| Receiver-Transmitter                                                          | RT-868A/APX-76      | Door 19                           | 7.6                 | 5.0  | 19.4 | 737                   | 19.0            | 115V, 2A<br>400 Hz      | 28V, 1A       |                  | Forced Air<br>0.27-0.50<br>lb/min.<br>Convection |          |
| Receiver-Transmitter                                                          | RT-961A/APX-81A     | Door 19                           | 7.5                 | 7.5  | 21.5 | 1209                  | 29.0            | 15V<br>125W<br>400 Hz   | 28V,<br>0.6A  |                  | Convection                                       |          |
| Interrogator Set Control                                                      | C-8518A/APX-80A     | Aft Cockpit<br>Left Vert<br>Panel | 3.0                 | 5.75 | 3.7  | 64                    | 2.0             | 0-, 28V<br>400 Hz       | 28V<br>0.075A |                  | Convection                                       |          |
| Electrical Synchronizer                                                       | SN-416( )/APX-76    | Door 19                           | 6.9                 | 5.1  | 7.5  | 230                   | 7.3             | 115V<br>0.24A<br>400 Hz | 28V, 1A       |                  | Convection                                       |          |
| Switch Amplifier                                                              | SA-1568A/APX-76     | Door 19                           | 6.0                 | 5.1  | 11.4 | 349                   | 10.0            | 115V<br>0.1A<br>400 Hz  | 28V,<br>0.2A  |                  | Convection                                       |          |
| Interrogator Computer                                                         | KIR-1A/TSEC         | CNI Bay                           | 6.0                 | 6.7  | 10.0 | 402                   | 15.0            |                         |               |                  | Convection                                       |          |
| Bandpass Filters                                                              | F-1346/APX          | Door 19                           | 7.0                 | 8.0  | 1.0  | 56                    | 4.0             |                         |               |                  | Convection                                       |          |
| Coupler                                                                       | CU-2099/APX         | Nose Radome                       | 2.5                 | 4.0  | 1.4  | 14                    | 0.4             |                         |               |                  | Convection                                       |          |
| Coupler                                                                       | CU-2100/APX         | Nose Radome                       | 2.5                 | 4.0  | 1.4  | 14                    | 0.4             |                         |               |                  | Convection                                       |          |
| Coaxial Switch                                                                | TRANSCO 13730       | Door 19                           | 2.5                 | 5.0  | 7.1  | 89                    | 2.0             |                         |               |                  | Convection                                       |          |
| Hybrid Coupler<br>Dipole Antennas (4)                                         | HAZELTINE<br>11789) | Nose Radome                       | 0.9                 | 4.0  | 0.9  | 3                     | 0.25            |                         |               |                  | Convection                                       |          |
| Dipole Antennas (4)                                                           |                     | Nose Radome                       |                     |      |      |                       |                 |                         |               |                  |                                                  |          |

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Table 6-12. F-4E AVIONICS CONFIGURATION DATA: FIRE CONTROL SYSTEM RADAR SET, AN/APQ-120 D/E/... V MSN: TBD

| Name                       | Nomenclature                            | Location                     | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds)      | Aircraft Power*         |             | Heat Dissipation | Cooling Method     | Mounting |
|----------------------------|-----------------------------------------|------------------------------|---------------------|---|---|-----------------------|----------------------|-------------------------|-------------|------------------|--------------------|----------|
|                            |                                         |                              | H                   | W | D |                       |                      | AC                      | DC          |                  |                    |          |
| Antenna                    | AS-2072 ( ) or<br>AS-2781 or<br>AS-2961 | Radome                       |                     |   |   |                       | 81.5                 | 115V<br>400 Hz          | 28V<br>525W |                  | Forced Air         | Rack     |
| Antenna Control            | C-7346 ( )                              | Aft Cockpit<br>Right Console |                     |   |   |                       | 3.3                  | 3 $\phi$<br>6600VA      |             |                  | Convection         | Console  |
| Radar Set<br>Control       | C-8908 ( )                              | Aft Cockpit<br>Left Console  |                     |   |   |                       | 5.1                  | 28V<br>1 $\phi$<br>50VA |             |                  | Convection         | Console  |
| Control-Monitor            | C-7345                                  | Aft Cockpit<br>Center        |                     |   |   |                       | 2.7                  |                         |             |                  | Convection         | Panel    |
| Control-<br>Indicator      | C-8909** or<br>C-9798† or<br>C-8671 ( ) | Aft Cockpit<br>Left Console  |                     |   |   |                       | 47.0<br>42.0<br>29.8 |                         |             |                  | Internal<br>Blower | Console  |
| IntraTarget<br>Indicators  |                                         |                              |                     |   |   |                       |                      |                         |             |                  |                    |          |
| Fwd                        | IP-1094** or<br>1204†                   | Cockpit<br>Center            |                     |   |   |                       | 37.8/38.1            |                         |             |                  | Internal<br>Blower |          |
| Aft                        | IP-1093** or<br>1205†                   |                              |                     |   |   |                       | 42.8/35.0            |                         |             |                  |                    |          |
| TGT                        |                                         |                              |                     |   |   |                       |                      |                         |             |                  |                    |          |
| Intercept<br>Computer      | CP-891B or<br>CP-891C                   | Radome                       |                     |   |   |                       | 43.7                 |                         |             |                  | Forced Air         | Rack     |
| Power Supply               | PP-4848 or<br>PP-6992                   | Radome                       |                     |   |   |                       | 43.1                 |                         |             |                  | Forced Air         | Rack     |
| Transmitter                | T-1050A or<br>T-1269 ( )                | Radome                       |                     |   |   |                       | 78.9                 |                         |             |                  | Forced Air         | Rack     |
| Electrical<br>Synchroniser | SW-464 or<br>SW-472 or<br>SW-483        | Radome                       |                     |   |   |                       | 12.5                 |                         |             |                  | Forced Air         | Rack     |
| Antenna Control<br>(Servo) | C-9047 or<br>C-9736 or<br>C-9737        | Radome                       |                     |   |   |                       | 27.9                 |                         |             |                  | Forced Air         | Rack     |
| Gyro Stable<br>Platform    | MX-8276                                 | Radome                       |                     |   |   |                       | 6.0                  |                         |             |                  | Forced Air         | Rack     |

\*Total system power.  
\*\*Comprise multiscanner display group in APQ-120E/F versions.  
†Comprise digital scan converter group in APQ-120V version.

| Category                                    | Value |
|---------------------------------------------|-------|
| 1. Total System Power                       | 1000  |
| 2. Power to the Main Processor              | 500   |
| 3. Power to the I/O Devices                 | 200   |
| 4. Power to the Memory                      | 100   |
| 5. Power to the Display                     | 50    |
| 6. Power to the Keyboard                    | 20    |
| 7. Power to the Mouse                       | 10    |
| 8. Power to the Printer                     | 10    |
| 9. Power to the Scanner                     | 10    |
| 10. Power to the Modem                      | 10    |
| 11. Power to the Network Interface          | 10    |
| 12. Power to the Sound Card                 | 10    |
| 13. Power to the Video Card                 | 10    |
| 14. Power to the Hard Drive                 | 10    |
| 15. Power to the Floppy Drive               | 10    |
| 16. Power to the CD-ROM Drive               | 10    |
| 17. Power to the DVD Drive                  | 10    |
| 18. Power to the Blu-ray Drive              | 10    |
| 19. Power to the External Storage           | 10    |
| 20. Power to the External Display           | 10    |
| 21. Power to the External Keyboard          | 10    |
| 22. Power to the External Mouse             | 10    |
| 23. Power to the External Printer           | 10    |
| 24. Power to the External Scanner           | 10    |
| 25. Power to the External Modem             | 10    |
| 26. Power to the External Network Interface | 10    |
| 27. Power to the External Sound Card        | 10    |
| 28. Power to the External Video Card        | 10    |
| 29. Power to the External Hard Drive        | 10    |
| 30. Power to the External Floppy Drive      | 10    |
| 31. Power to the External CD-ROM Drive      | 10    |
| 32. Power to the External DVD Drive         | 10    |
| 33. Power to the External Blu-ray Drive     | 10    |
| 34. Power to the External Storage           | 10    |
| 35. Power to the External Display           | 10    |
| 36. Power to the External Keyboard          | 10    |
| 37. Power to the External Mouse             | 10    |
| 38. Power to the External Printer           | 10    |
| 39. Power to the External Scanner           | 10    |
| 40. Power to the External Modem             | 10    |
| 41. Power to the External Network Interface | 10    |
| 42. Power to the External Sound Card        | 10    |
| 43. Power to the External Video Card        | 10    |
| 44. Power to the External Hard Drive        | 10    |
| 45. Power to the External Floppy Drive      | 10    |
| 46. Power to the External CD-ROM Drive      | 10    |
| 47. Power to the External DVD Drive         | 10    |
| 48. Power to the External Blu-ray Drive     | 10    |
| 49. Power to the External Storage           | 10    |
| 50. Power to the External Display           | 10    |
| 51. Power to the External Keyboard          | 10    |
| 52. Power to the External Mouse             | 10    |
| 53. Power to the External Printer           | 10    |
| 54. Power to the External Scanner           | 10    |
| 55. Power to the External Modem             | 10    |
| 56. Power to the External Network Interface | 10    |
| 57. Power to the External Sound Card        | 10    |
| 58. Power to the External Video Card        | 10    |
| 59. Power to the External Hard Drive        | 10    |
| 60. Power to the External Floppy Drive      | 10    |
| 61. Power to the External CD-ROM Drive      | 10    |
| 62. Power to the External DVD Drive         | 10    |
| 63. Power to the External Blu-ray Drive     | 10    |
| 64. Power to the External Storage           | 10    |
| 65. Power to the External Display           | 10    |
| 66. Power to the External Keyboard          | 10    |
| 67. Power to the External Mouse             | 10    |
| 68. Power to the External Printer           | 10    |
| 69. Power to the External Scanner           | 10    |
| 70. Power to the External Modem             | 10    |
| 71. Power to the External Network Interface | 10    |
| 72. Power to the External Sound Card        | 10    |
| 73. Power to the External Video Card        | 10    |
| 74. Power to the External Hard Drive        | 10    |
| 75. Power to the External Floppy Drive      | 10    |
| 76. Power to the External CD-ROM Drive      | 10    |
| 77. Power to the External DVD Drive         | 10    |
| 78. Power to the External Blu-ray Drive     | 10    |
| 79. Power to the External Storage           | 10    |
| 80. Power to the External Display           | 10    |
| 81. Power to the External Keyboard          | 10    |
| 82. Power to the External Mouse             | 10    |
| 83. Power to the External Printer           | 10    |
| 84. Power to the External Scanner           | 10    |
| 85. Power to the External Modem             | 10    |
| 86. Power to the External Network Interface | 10    |
| 87. Power to the External Sound Card        | 10    |
| 88. Power to the External Video Card        | 10    |
| 89. Power to the External Hard Drive        | 10    |
| 90. Power to the External Floppy Drive      | 10    |
| 91. Power to the External CD-ROM Drive      | 10    |
| 92. Power to the External DVD Drive         | 10    |
| 93. Power to the External Blu-ray Drive     | 10    |
| 94. Power to the External Storage           | 10    |
| 95. Power to the External Display           | 10    |
| 96. Power to the External Keyboard          | 10    |
| 97. Power to the External Mouse             | 10    |
| 98. Power to the External Printer           | 10    |
| 99. Power to the External Scanner           | 10    |
| 100. Power to the External Modem            | 10    |

\*Comprise multisensor display group in APQ-120Z/r versions.

<sup>†</sup>Comprise digital scan converter group in APO-120V version.

| Table 6-12. (continued)          |                                                     |                          |                     |   |   |                       |                 |                |    |                  |                |          |
|----------------------------------|-----------------------------------------------------|--------------------------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                             | Nomenclature                                        | Location                 | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                  |                                                     |                          | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| Blanking Pulse Amplifier/Divider | AM-6044                                             | Below Aft Left Console   |                     |   |   |                       | 1.1             |                |    |                  | Convection     | Console  |
| Elect Equipment Pack             | MT-3868 or MT-4612 or MT-4613 or MT-4439 or MT-4720 | Radome                   |                     |   |   |                       | 111.5           |                |    |                  | Forced Air     | Hard     |
| Cable Assembly                   | CX-10548                                            | Radome                   |                     |   |   |                       | 25.0            |                |    |                  | Forced Air     | Hard     |
| Control                          | C-7149 or C-9465                                    | Radome                   |                     |   |   |                       | 5.9             |                |    |                  | Forced Air     | Rack     |
| Waveguide Assembly               | CG-3365 or CG-3775                                  | Radome                   |                     |   |   |                       | 40.2            |                |    |                  | Forced Air     | Rack     |
| Power Supply (Pump Tube)         | PP-4847 or PP-6993                                  | Radome                   |                     |   |   |                       | 9.3             |                |    |                  | Forced Air     | Rack     |
| RF Oscillator                    | O-1430 ( )                                          | Radome                   |                     |   |   |                       | 9.4             |                |    |                  | Forced Air     | Rack     |
| Range Indicator                  | ID-1494                                             | Aft Cockpit Instr. Panel |                     |   |   |                       | 1.5             |                |    |                  | Convection     | Panel    |
| Modulator-Oscillator             | MO-715                                              | Radome                   |                     |   |   |                       | 11.8            |                |    |                  | Forced Air     | Rack     |
| RF Amplifier                     | AM-4827                                             | Radome                   |                     |   |   |                       | 40.8            |                |    |                  | Forced Air     | Rack     |
| AUX Armament Control Panel       |                                                     | Pod Cockpit Left         |                     |   |   |                       |                 |                |    |                  |                |          |
| Control Relay Panel              |                                                     | Aft Cockpit Left         |                     |   |   |                       |                 |                |    |                  |                |          |
| AIM-4D SEQ Relay                 |                                                     | Left Pod Missile Cavity  |                     |   |   |                       |                 |                |    |                  |                |          |

| Table 6-13. P-42 AVIONICS CONFIGURATION DATA: TARGET IDENTIFICATION SYSTEM ELECTROOPTICAL (TISEO). AN/ASX-1 NSN: 1270-00-216-3435 |             |                                     |                     |   |   |                       |                 |                                   |                            |                  |                        |          |
|-----------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------------------|---------------------|---|---|-----------------------|-----------------|-----------------------------------|----------------------------|------------------|------------------------|----------|
| Name                                                                                                                              | Part Number | Location                            | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power                    |                            | Heat Dissipation | Cooling Method         | Mounting |
|                                                                                                                                   |             |                                     | H                   | W | D |                       |                 | AC                                | DC                         |                  |                        |          |
| Converter Stabilizer Generator Group                                                                                              | CA-8585     | Left wing Inboard Door 141L         |                     |   |   |                       |                 | 115V<br>26-28V<br>400 Hz<br>3 1/2 | ±20V<br>±2V<br>±31V<br>±5V |                  | Forced 2.1-3.1 lbs/min |          |
| Power Supply                                                                                                                      | PP-6425     | Door 188 or 36L                     |                     |   |   |                       |                 | 115V<br>400 Hz<br>3 1/2           | .                          |                  |                        |          |
| Control                                                                                                                           | C-8591      | Aft Cockpit Left Console            |                     |   |   |                       |                 | 14V<br>28V<br>5V                  | ±12V<br>±20V<br>±28V       |                  | Convection             |          |
| Video Processor                                                                                                                   | SM-451      | Left wing Inboard Edge Door 141L    |                     |   |   |                       |                 |                                   | ±12V<br>±31V               |                  | Forced .35-.50 lbs/min |          |
| Radar Logic Unit                                                                                                                  | MR-9338/A   | CW 142 (wheelwell)                  |                     |   |   |                       |                 | 115V<br>400 Hz<br>5 A             | ±28V                       |                  | Convection             |          |
| Forward Scope Display Panel                                                                                                       |             | Full Cockpit Left Main Instr. Panel |                     |   |   |                       |                 |                                   |                            |                  |                        |          |
| *Supplies power to remaining TISEO elements.                                                                                      |             |                                     |                     |   |   |                       |                 |                                   |                            |                  |                        |          |

| Table 6-14. F-4E AVIONICS CONFIGURATION DATA: RIAM SET AM/ALR-46(V) NSM: 5865-00-091-8623 |                  |                                                         |                     |            |      |                       |                 |                                    |     |                  |                |          |
|-------------------------------------------------------------------------------------------|------------------|---------------------------------------------------------|---------------------|------------|------|-----------------------|-----------------|------------------------------------|-----|------------------|----------------|----------|
| Name                                                                                      | Nomenclature     | Location                                                | Dimensions (Inches) |            |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power                     |     | Heat Dissipation | Cooling Method | Mounting |
|                                                                                           |                  |                                                         | H                   | W          | D    |                       |                 | AC                                 | DC  |                  |                |          |
| Signal Processor                                                                          | CH-442( )        | Door 185                                                |                     |            |      |                       |                 | 115V<br>400 Hz<br>2.5A             |     |                  |                |          |
| Counter-Measures Receiver                                                                 | R-1854( )        | Door 185                                                | 4.0                 | 6.0        | 10.8 | 259                   | 8.0             | 1 $\phi$<br>115V<br>400 Hz<br>.25A |     |                  |                |          |
| Amplifier Detectors (4)                                                                   | AM-6639          | Door 65 (2)<br>Door 196R<br>Door 195L                   | 6.7                 | 1.7        | 7.6  | 87                    | 3.5             |                                    | 12V |                  | Convection     |          |
| Indicator Controls (2)                                                                    | ID-1902          | Pod and Aft Main Instr. Panels                          |                     |            |      |                       |                 |                                    |     |                  |                |          |
| Asimuth Indicators (2)                                                                    | ID-957/APR-39(1) | Pod and Aft Main Instr. Panels                          |                     |            |      |                       |                 |                                    |     |                  |                |          |
| Antennas (4)                                                                              |                  | Door 107<br>Door 107<br>Right Wing Tip<br>Left Wing Tip | 5.5                 | 2.6 (each) | 4.0  | 57 (each)             |                 |                                    |     |                  |                |          |

| Name           | Nomenclature       | Location                             | Dimensions (Inches) |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power* |    | Heat Dissipation | Cooling Method | Mounting               |
|----------------|--------------------|--------------------------------------|---------------------|-------|-----------------------|-----------------|-----------------|----|------------------|----------------|------------------------|
|                |                    |                                      | Diameter            | D     |                       |                 | AC              | DC |                  |                |                        |
| ECM Pod        | ALQ-71(V)-2        | Wing Pods                            | 10                  |       |                       | 242             |                 |    |                  |                | Pods use Mounting Lugs |
| ECM Pod        | ALQ-71(V)-3        | Wing Pods                            | 10                  | 114.6 | 9001                  | 350             |                 |    |                  |                |                        |
| ECM Pod        | ALQ-72             | Wing Pods                            | 10                  | 99.0  | 7775                  | 237             |                 |    |                  |                |                        |
| ECM Pod        | ALQ-87, A, (F)     | Wing Pods                            | 10                  |       |                       | 300             |                 |    |                  |                |                        |
| ECM Pod        | ALQ-101A           | Wing Pods                            | 10                  | 100   | 7854                  | 232             |                 |    |                  |                |                        |
| ECM Pod        | ALQ-101(V)-8       | Wing Pods                            | 10                  | 157   | 12331                 | 579             |                 |    |                  |                |                        |
| ECM Pod        | ALQ-119(V)-7, 8, 9 | Wing Pods                            | 10                  | 154   | 12095                 | 565             |                 |    |                  |                |                        |
|                |                    |                                      | 10                  | 104   | 8168                  | 307             |                 |    |                  |                |                        |
| ECM Pod        | AAQ-8              | Wing Pods                            |                     |       |                       | 264             |                 |    |                  |                |                        |
| ECM Pod**      | ALQ-131( )         | Wing Pods                            | 12 max.             | 172   | 19453                 | 831             |                 |    |                  |                |                        |
| Control Panel  | C-9501/AAQ-8       | Part of 6631 panel when used         |                     |       |                       |                 |                 |    |                  |                |                        |
| Control Panel† | C-6631/ALQ         | Aft Cockpit Lower Right Instr. Panel |                     |       |                       |                 |                 |    |                  |                |                        |
| Control Panel† | C-9492/ALQ         |                                      |                     |       |                       |                 |                 |    |                  |                |                        |

\*Pods use aircraft power.  
\*\*Expected to supersede ALQ-119 and become standard USAF tactical aircraft pod.  
†Only one control panel installed in aircraft.

\*Pods use aircraft power.  
 \*\*Expected to supersede ALQ-119 and become standard USAF tactical aircraft pod.  
 †Only one control panel installed in aircraft.

Table 6-16. F-4E AVIONICS CONFIGURATION DATA: CHAFF DISPENSING SYSTEM, AM/ALE-40 NSM: 5865-01-060-7327

| Name                 | Nomenclature | Location                 | Dimensions (Inches) |     |     | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|----------------------|--------------|--------------------------|---------------------|-----|-----|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
|                      |              |                          | H                   | W   | D   |                       |                 | AC             | DC |                  |                |          |
| Control Unit         |              | Aft Cockpit Left Console |                     |     |     |                       |                 |                |    |                  |                |          |
| Programmer           |              | Pod Cockpit Left Console |                     |     |     |                       |                 |                |    |                  |                |          |
| Chaff Payload Module |              | Inboard Armament Pylon   | 4.8                 | 9.5 | 8.2 | 374                   | 6.1             |                |    |                  |                |          |
| Flare Payload Module |              | Inboard Armament Pylon   | 5.7                 | 7.5 | 8.2 | 351                   | 7.2             |                |    |                  |                |          |

| Table 6-17. F-4E AVIONICS CONFIGURATION DATA: ATTITUDE REFERENCE BOMBING COMPUTER SYSTEM, AM/AJB-7 MSN: TBD |                                 |                                  |                     |     |      |                       |                 |                                            |    |                  |                |          |
|-------------------------------------------------------------------------------------------------------------|---------------------------------|----------------------------------|---------------------|-----|------|-----------------------|-----------------|--------------------------------------------|----|------------------|----------------|----------|
| Name                                                                                                        | Nomenclature                    | Location                         | Dimensions (Inches) |     |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power                             |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                             |                                 |                                  | H                   | W   | D    |                       |                 | AC                                         | DC |                  |                |          |
| Accelerometer*                                                                                              | MX-2911/AJB-3A<br>MX-6663/AJB-7 | Door 89L                         | 3.5                 | 4.1 | 3.5  | 50                    | 3.0             | 407VA @ 20W @<br>115Vac 28Vdc<br>(Total**) |    |                  |                |          |
| Amplifier-PWR Supply                                                                                        | ASK-12/P24-1A                   | Aft Cockpit Left                 | 3.0                 | 5.0 | 11.7 | 176                   | 9.25            |                                            |    |                  |                |          |
| Attitude Indicator*                                                                                         | ID-1144/AJB-7<br>ARU-11/A       | Pwd Cockpit Main Instr. Panel    | 5.25                | 5.0 | 8.0  | 210                   | 5.00            |                                            |    |                  |                |          |
| Bomb Release Angle Computer                                                                                 | CP-735/AJB-7                    | Aft Cockpit Right Vertical Panel | 2.6                 | 5.8 | 6.4  | 96                    | 3.0             |                                            |    |                  |                |          |
| Compass Adapter Compensator                                                                                 | ADK-182/A24G-1A                 | Aft Cockpit Right Behind Seat    | 4.1                 | 5.1 | 9.6  | 201                   | 8.5             |                                            |    |                  |                |          |
| Compass Controller                                                                                          | G-4781/AJB-7                    | Pwd Cockpit Right Console        | 2.6                 | 5.6 | 3.0  | 45                    | 3.0             |                                            |    |                  |                |          |
| Compass Transmitter                                                                                         | ML-1                            | Left Wing Door 197 or 646        | 3.8                 | 3.1 | 2.1  | 25                    | 1.2             |                                            |    |                  |                |          |
| Displacement GYRO Assembly                                                                                  | SBK-8/A24G-1A                   | Aft Cockpit Left                 | 7.7                 | 7.1 | 15.2 | 831                   | 26.1            |                                            |    |                  |                |          |
| Dual Timer                                                                                                  | ---                             | Aft Cockpit Right Vertical Panel | 2.4                 | 2.4 | 8.25 | 48                    | 2.7             |                                            |    |                  |                |          |
| Flight Director Bombing Computer                                                                            | CP-734/AJB-7                    | Aft Cockpit Left                 | 5.4                 | 4.7 | 10.4 | 264                   | 7.3             |                                            |    |                  |                |          |
| Rate GYRO<br>Yaw-mitter*                                                                                    | T-751/AJB-3A<br>T-970/AJB-7     | Aft Cockpit Left Console         | 2.8                 | 2.7 | 4.9  | 37                    | 3.1             |                                            |    |                  |                |          |
| Remote Attitude Indicator                                                                                   | ARU-13A                         | Aft Cockpit Main Instr. Panel    | 3.25                | 8.6 | 3.25 | 91                    | 3.8             |                                            |    |                  |                |          |
| Switching Rate GYRO                                                                                         | WC-1                            | Aft Cockpit BHD Seat Left        | 2.65                | 2.4 | 4.8  | 31                    | 0.6             |                                            |    |                  |                |          |
| *either type may be used in the system.<br>**total system power data.                                       |                                 |                                  |                     |     |      |                       |                 |                                            |    |                  |                |          |

| Table 6-18. F-4E AVIONICS CONFIGURATION DATA: WEAPON RELEASE COMPUTER SYSTEM, AN/ASQ-91 NSM: 1270-00-410-9123 |                         |                           |                     |      |      |                       |                 |                                                                     |            |                  |                |          |
|---------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------|---------------------|------|------|-----------------------|-----------------|---------------------------------------------------------------------|------------|------------------|----------------|----------|
| Name                                                                                                          | Nomenclature            | Location                  | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power*                                                     |            | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                               |                         |                           | H                   | W    | D    |                       |                 | AC                                                                  | DC         |                  |                |          |
| Ballistics Computer<br>Computer Control<br>Cursor Control<br>Weapons Delivery Panel                           | CP-805 ( )              | Door 19                   | 8.4                 | 7.2  | 19.6 | 1185                  | 36.6            | 400 Hz<br>115V<br>3 φ<br>120VA<br>-----<br>14/28V<br>25VA<br>400 Hz | 28V<br>30W |                  |                |          |
|                                                                                                               | C-6480A                 | Aft Cockpit Right Console | 6.0                 | 5.75 | 5.0  | 173                   | 3.6             |                                                                     |            |                  |                |          |
|                                                                                                               | C-6481A                 | Aft Right Console         | 3.0                 | 3.75 | 3.75 | 42                    | 1.4             |                                                                     |            |                  |                |          |
|                                                                                                               | WPG Part No. 53-81211-1 | Aft Cockpit Right Console |                     |      |      |                       |                 |                                                                     |            |                  |                |          |
| *Total system power data.                                                                                     |                         |                           |                     |      |      |                       |                 |                                                                     |            |                  |                |          |

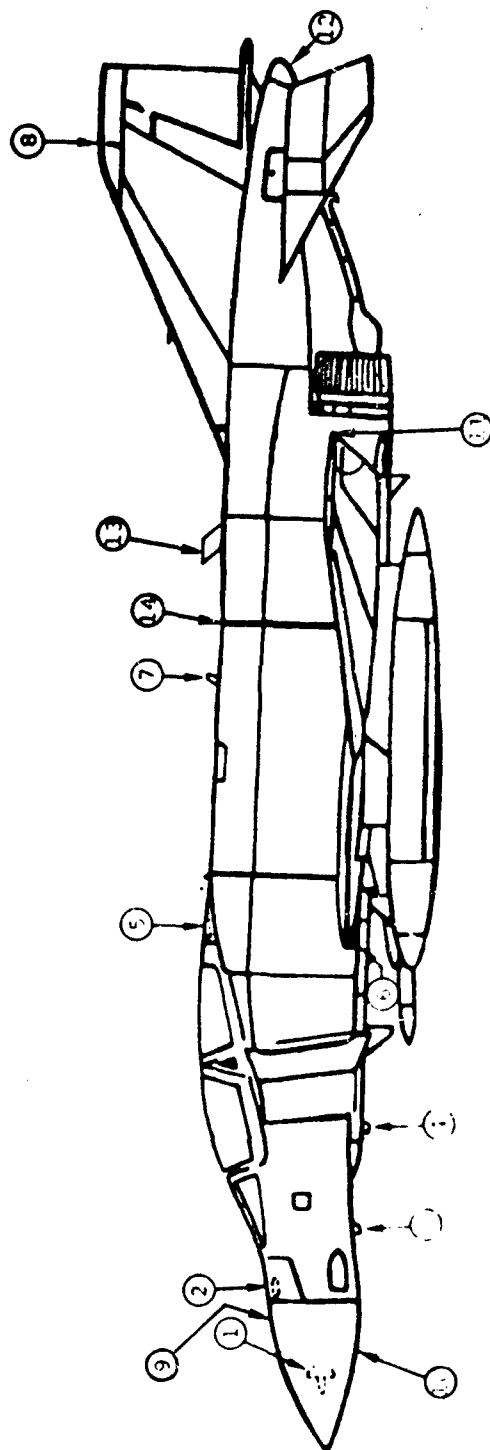


| Table 6-19. F-4E AVIONICS CONFIGURATION DATA: LEAD COMPUTING OPTICAL SIGHT SYSTEM (LCOSS), AM/ASG-26( ) NSM: 1270-00-105-9006 |              |                          |                     |      |      |                       |                 |                                      |               |                  |                |                                      |
|-------------------------------------------------------------------------------------------------------------------------------|--------------|--------------------------|---------------------|------|------|-----------------------|-----------------|--------------------------------------|---------------|------------------|----------------|--------------------------------------|
| Name                                                                                                                          | Nomenclature | Location                 | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power*                      |               | Heat Dissipation | Cooling Method | Mounting                             |
|                                                                                                                               |              |                          | H                   | W    | D    |                       |                 | AC                                   | DC            |                  |                |                                      |
| Optical Display Unit                                                                                                          | SU-40        | Pwr Cockpit Front Center | 10.6                | 12.0 | 12.5 | 1590                  | 25.0            |                                      |               |                  | Convection     | Attached to Pod Radar Indicator Unit |
| Computing Amplifier                                                                                                           | AM-6492      | Door 19                  | 8.5                 | 5.9  | 18.3 | 918                   | 16.4            |                                      |               |                  | Convection     | Hard                                 |
| Computing Gyroscope                                                                                                           | CN-1388      | Door 19                  | 8.9                 | 7.9  | 8.3  | 935                   | 11.2            |                                      |               |                  | Convection     | Shock                                |
| Gyro Mount                                                                                                                    | MT-1909      | Door 19                  | 2.25                | 10.5 | 10.4 | 246                   | 1.3             | 400 Hz<br>115 V<br>3 $\phi$<br>190VA | 24-29V<br>40W |                  | Convection     | Hard                                 |
| *Total system power data.                                                                                                     |              |                          |                     |      |      |                       |                 |                                      |               |                  |                |                                      |

## 7. ANTENNA LOCATIONS

Figure 7-1 shows the approximate location of the antennas on the F-4E. The F-4E antenna nomenclature is as follows from the most recently dated technical orders:

| <u>Antenna</u>                                        | <u>Nomenclature or<br/>Part Number</u> |
|-------------------------------------------------------|----------------------------------------|
| 1. Radar                                              | AS-3083/APQ-120(V)                     |
| 2. ADF                                                | AS-909A/ARA-48                         |
| 3. Lower                                              | 11C21400                               |
| 4. Lower UHF                                          | AS-1611/A                              |
| 5. IFF                                                | 2285-/A                                |
| 6. Radar Altimeter                                    | AS-1386/AS-1142                        |
| 7. Upper TACAN                                        | DMNI-29                                |
| 8. LORAN X-Axis                                       | TBD                                    |
| 9. VOR/ILS Glide Slope                                | DMN9-5                                 |
| 10. AN/APX-80A IFF Dipole                             | TBD                                    |
| 11. Left Wing Tip ALR-46 RHAW<br>(Same on right wing) | TBD                                    |
| 12. ALR-46 RHAW (2)                                   | 93346                                  |
| 13. Upper UHF                                         | AS-1611/A                              |
| 14. LORAN X-Y Axis Cross Loop                         | AS-4010/A                              |



- |                            |                                                         |
|----------------------------|---------------------------------------------------------|
| 1. Radar Antenna           | 8. LORAN X-Axis Antenna                                 |
| 2. ADF Antenna             | 9. VOR/ILS Glide Slope Antenna                          |
| 3. Lower TACAN Antenna     | 10. AN/APX-80A IFF Dipole                               |
| 4. Lower UHF Antenna       | 11. Left Wing Tip ALR-46 RHAW Antenna (Same Right Wing) |
| 5. IFF Antenna             | 12. ALR-46 RHAW Antennas (2)                            |
| 6. Radar Altimeter Antenna | 13. Upper UHF Comm Antenna                              |
| 7. Upper TACAN Antenna     | 14. LORAN X-Y Axis Cross Loop Antenna                   |

Figure 7-1. F-4E ANTENNA LOCATIONS

8. INTERFACE DATA

Data were not available for this section.

## 9. FUTURE MODIFICATIONS

Table 9-1 lists the known ongoing or near-term F-4E modifications (Block 48 and up) not previously discussed in Section 6. Table 9-2 presents some of the planned or tentative Class V modifications. Because the details of some modifications are classified, this section is limited in its content. Tables 9-3 through 9-5 list LRU data for the ARC-164, ARN-118, and ARN-101, respectively.

| Table 9-1. F-4E ONGOING MODIFICATIONS |                                                                                                                                             |
|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Terminology/Nomenclature              | Remarks                                                                                                                                     |
| AIM-7E Interface                      | Replaces analog fire control computer with digital air combat computer.                                                                     |
| PAVE TACK/AVQ-26                      | Provides ARN-101-equipped aircraft with the capability to acquire targets and employ terminally guided direct attack weapons.               |
| Maverick/AGM-65A                      | Maverick missile carriage and launch capability.                                                                                            |
| UHF Radio/ARC-164                     | Replaces appropriate UHF portion of ASQ-19( ). (Near Completion)                                                                            |
| TACAN/ARN-118                         | Replaces appropriate TACAN portion of ASQ-19( ).                                                                                            |
| Digital Avionics System/<br>ARN-101   | Replaces ASN-63, ASN-46A, and ASQ-91 systems.                                                                                               |
| GBU-15 Data Link/AXQ-14               | Provides ARN-101 aircraft with TV display signals and provides data link for GBU-15 weapon guidance.                                        |
| Digital Scan Converter Group          | Provides integrated and improved radar, optical, and TV display capability to the forward cockpit and radar/TV display to the rear cockpit. |
| Video Tape Recorder                   | Provides capability to tape information presented on the Digital Scan Converter displays.                                                   |

| Table 9-2. F-4E PLANNED/TENTATIVE MODIFICATIONS |                                                                                                                        |
|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| Terminology/Nomenclature                        | Remarks                                                                                                                |
| Compass Tie/ALR-69                              | Improved RHAW system and added ECM power management capability.                                                        |
| AIM-9L                                          | TBD                                                                                                                    |
| Global Positioning System                       | Space-based radio navigation system that provides worldwide precise three-dimensional location information.            |
| AN/ALQ-131( ) Jammer                            | Replacement for ALQ-119 Pod Jammer. The system will be modularized to provide mission-tailored ECM jamming capability. |
| VHF AM-FM Radio/ARC-196                         | Addition of VHF communication capability.                                                                              |
| Vinson/KY-58                                    | Secure-voice replacement for KY-28.                                                                                    |
| GBU-15                                          | Planar wing weapon.                                                                                                    |

| Table 9-1. F-4E AVIONICS CONFIGURATION DATA: UHF RADIO SET LENS, AM/ARC-164 (TWO COMPLETE SYSTEMS MAY BE INSTALLED)                                                                |                      |          |                     |      |      |                       |                 |                            |                               |                  |                |                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------|---------------------|------|------|-----------------------|-----------------|----------------------------|-------------------------------|------------------|----------------|------------------|
| Name                                                                                                                                                                               | Nomenclature         | Location | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power             |                               | Heat Dissipation | Cooling Method | Mounting         |
|                                                                                                                                                                                    |                      |          | H                   | W    | D    |                       |                 | AC                         | DC                            |                  |                |                  |
| Receiver-Transmitter (Remote)                                                                                                                                                      | RT-1145              | *        | 4.7                 | 5.0  | 8.25 | 194                   | 8.1             | 400 Ma 5Vac (Panel Lights) | 27.5V 10W TX Mode 30W RX Mode |                  | Forced Air     |                  |
| Main Receiver**                                                                                                                                                                    | R-1977               |          |                     |      |      |                       |                 |                            |                               |                  |                |                  |
| Guard Receiver**                                                                                                                                                                   | R-1976               |          |                     |      |      |                       |                 |                            |                               |                  |                |                  |
| Transmitter**                                                                                                                                                                      | T-1307               |          |                     |      |      |                       |                 |                            |                               |                  |                |                  |
| Signal Data Converter**                                                                                                                                                            | CV-3297              |          |                     |      |      |                       |                 |                            |                               |                  |                |                  |
| Radio Control Panel                                                                                                                                                                | C-6484               | TBD      | 4.9                 | 5.75 | 5.3  | 149                   | 4.3             |                            | 27.5V 10W                     |                  | Convection     | Console          |
| Freq/Channel Indicator                                                                                                                                                             | ID-1961† or ID-1994A | TBD      | 2.25                | 2.4  | 5.9  | 32                    |                 |                            |                               |                  | Convection     | Console of Panel |
| ADP Amplifier Relay Assembly                                                                                                                                                       | AM-3624/ARA-50       |          |                     |      |      |                       |                 |                            |                               |                  |                |                  |
| *Anticipate likely installation in spaces vacated by Integrated Electronic Central UHF Communications equipment.<br>**Included in RT-1145 data.<br>†Configuration not yet decided. |                      |          |                     |      |      |                       |                 |                            |                               |                  |                |                  |

| Table 9-4. F-4E AVIONICS CONFIGURATION DATA: TACAN LRUS, AM/AM-110                                                       |              |          |                     |      |      |                       |                 |                                        |    |                  |
|--------------------------------------------------------------------------------------------------------------------------|--------------|----------|---------------------|------|------|-----------------------|-----------------|----------------------------------------|----|------------------|
| Name                                                                                                                     | Nomenclature | Location | Dimensions (inches) |      |      | Volume (cubic inches) | Weight (pounds) | Aircraft Power                         |    | Heat Dissipation |
|                                                                                                                          |              |          | H                   | W    | D    |                       |                 | AC                                     | DC |                  |
| Transceiver                                                                                                              | RT-1159/A    | *        | 6.8                 | 7.5  | 14.6 | 745                   | 26.5            | 115V<br>400 Hz<br>1.0<br>250VA<br>max. |    |                  |
| Digital-to-Analog Adapter                                                                                                | MX-9577/A    | *        | 6.8                 | 1.77 | 13.1 | 131                   | 6.0             | 26V**<br>400 Hz                        |    |                  |
| Transceiver Mount                                                                                                        | MT-4926/A    | *        | 2.1                 | 11.7 | 20.5 | 504                   |                 | 28 Vdc<br>28VA                         |    |                  |
| Control Unit                                                                                                             | C-10062/A    | TBD      | 2.25                | 5.75 | 5.4  | 79                    | 2.0             |                                        |    |                  |
| Adapter Mount                                                                                                            | MT-4927/A    | *        |                     |      |      |                       |                 |                                        |    |                  |
| *Installation into space vacated by Integrated Electronic Central TACAN equipment is likely.<br>**For analog indicators. |              |          |                     |      |      |                       |                 |                                        |    |                  |



| Table 9-5. F-4E AVIONICS CONFIGURATION DATA: AM/AM-101 COMPONENTS                                                    |              |                              |                     |       |      |                       |                 |                              |                  |                |          |
|----------------------------------------------------------------------------------------------------------------------|--------------|------------------------------|---------------------|-------|------|-----------------------|-----------------|------------------------------|------------------|----------------|----------|
| Name                                                                                                                 | Nomenclature | Location                     | Dimensions (Inches) |       |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power (Total Watts) | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                                      |              |                              | H                   | W     | D    |                       |                 |                              |                  |                |          |
| Signal Data Converter, Unit 301                                                                                      | CV-3467/A    | Aft Cockpit RH Console       | 9.34                | 7.61  | 9.25 | 635                   | 16.9            | 138                          |                  |                |          |
| Computer, Navigation, Unit 302                                                                                       | CP-1314/A    | Aft Cockpit RH Console Area  | 11.88               | 11.02 | 7.60 | 946                   | 38.7            | 320                          |                  |                |          |
| Inertial Measurement Unit Buffer, Unit 304                                                                           | MX-9697/A    | Aft Cockpit RH Console       | 6.58                | 9.31  | 6.08 | 372                   | 12.0            | 83                           |                  |                |          |
| Power Supply, Unit 305                                                                                               | PP-7428/A    | Aft Cockpit LH Console Area  | 7.53                | 7.52  | 6.76 | 383                   | 17.2            | 110                          |                  |                |          |
| Keyer Control, Unit 306                                                                                              | C-9474/A     | Aft Cockpit RH Console       | 6.50                | 5.75  | 7.87 | 256                   | 7.9             | 77                           |                  |                |          |
| Control, Nav. Computer, Unit 307                                                                                     | C-9472/A     | Aft Cockpit LH Console       | 4.50                | 5.75  | 3.00 | 68                    | 2.2             | 16                           |                  |                |          |
| Indicator, Digital Display, Unit 308                                                                                 | ID-1742/A    | Aft Cockpit Instrument Panel | 5.75                | 5.75  | 3.00 | 86                    | 2.8             | 45                           |                  |                |          |
| Indicator, Aux. Digital Display, Unit 309                                                                            | ID-1943/A    | Pod Cockpit Instrument Panel | 6.00                | 2.38  | 2.38 | 34                    | 1.1             | 9                            |                  |                |          |
| Receiver, Loran, Unit 310                                                                                            | R-2086A      | Upper Equipment Bay Shelf    | 12.86               | 3.76  | 7.63 | 369                   | 12.2            | 105                          |                  |                |          |
| Antenna Coupler, Unit 311                                                                                            | CU-2150/A    | Upper Equipment Bay          | 7.52                | 2.91  | 2.53 | 55                    | 1.0             | 3                            |                  |                |          |
| Course Select Panel, Unit 312                                                                                        |              | Pod Cockpit Instrument Panel | 1.87                | 6.52  | 1.85 | 22.6                  | 2.0             | 4                            |                  |                |          |
| Relay Assembly, Unit 313**                                                                                           | RE-1118/A    | Upper Equipment Bay Door 19  | 8.25                | 4.72  | 4.37 | 155                   | 6               | 75                           |                  |                |          |
| *Replaces the ASQ-91, ASN-46A, and ASN-63 systems in the F-4E.<br>**Also herein referred to as Relay Box Unit (RBU). |              |                              |                     |       |      |                       |                 |                              |                  |                |          |

| Table 9-5. (continued)             |              |                                |                     |      |      |                       |                 |                              |                  |                |          |
|------------------------------------|--------------|--------------------------------|---------------------|------|------|-----------------------|-----------------|------------------------------|------------------|----------------|----------|
| Name                               | Nomenclature | Location                       | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power (Total Watts) | Heat Dissipation | Cooling Method | Mounting |
|                                    |              |                                | H                   | W    | D    |                       |                 |                              |                  |                |          |
| Antenna, Loran, X-Y Axis, Unit 314 | AS-4010/A    | Center Fuselage Door 48        | 1.93                | 9.02 | 1.90 | 220                   | 10.0            | N/A                          |                  |                |          |
| Antenna, Loran, Z Axis, Unit 315   | AS-4011/A    | Aft Fuselage Vertical Tail Fin | 6.19                | 1.75 | 9.19 | 71                    | 4.0             | N/A                          |                  |                |          |
| Target Insert Panel, Unit 316      |              | Aft Cockpit LH Console         | 2.90                | 5.75 | 1.12 | 18.7                  | 1.5             | 0                            |                  |                |          |

## 10. DATA SOURCES

The following sources of data were used in preparing this summary:

- Aircraft and avionics configuration data assembled by ARINC Research, principally in the form of copies of applicable sections, tables, and figures from the aircraft and equipment Technical Orders listed at the end of this section
- Avionics Planning Baseline Document - October 1978
- McDonnell Report 8738, Environmental Design Requirements and Test Procedures - Aircraft Electronic Equipment - 5 April 1962, Rev. 1 July 1964.
- Information supplied by Ogden ALC
- Technical Order T.O. 12P2-2APQ-120-2-1 for the MSDG and DSCG display information
- ARINC Research Informal Report: Technical Report, Preliminary JTIDS Configuration Data Analyses, May 1978

### Inventory of Technical Orders

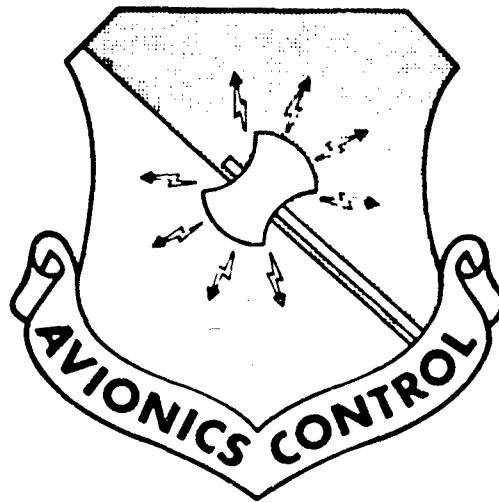
| <u>T.O. Number</u>         | <u>Subject</u>                                                    | <u>Change Number</u> | <u>Date</u> |
|----------------------------|-------------------------------------------------------------------|----------------------|-------------|
| 1F-4E-1                    | Flight Manual                                                     | 9                    | 9/15/78     |
| 1F-4E-2-1                  | Aircraft, General                                                 | 18                   | 4/15/78     |
| 1F-4E-2-4                  | Flight Control Systems                                            | 5                    | 12/15/77    |
| 1F-4E-2-9                  | Air Induction System                                              | 13                   | 6/1/77      |
| 1F-4E-2-10                 | Fuel Sys xms                                                      | 12                   | 11/15/77    |
| 1F-4E-2-11                 | Instrument System                                                 | 19                   | 12/15/77    |
| 1F-4E-2-12                 | Air Data Computer Set                                             | 8                    | 12/15/77    |
| 1F-4E-2-13                 | Electrical System                                                 | 2                    | 12/15/77    |
| 1F-4E-2-14                 | Integrated Electronic Central Radar Altimeter Radar Beacon System | Original             | 6/15/77     |
| 1F-4E-2-15                 | Navigation System                                                 | 17                   | 4/15/77     |
| 1F-4E-2-17                 | Avionics Navigation Instrument System                             | 8                    | 12/1/77     |
| 1F-4E-2-18<br>(Volume 1)   | Armament Systems (Sections 1&2)                                   | 15                   | 6/1/77      |
| 1F-4E-2-18<br>(Volume 2)   | Armament Systems (Sections 3,4,5,6,7)                             | 15                   | 6/1/77      |
| 1F-4E-2-19-1<br>(Volume 1) | Weapons Control System (P. 1-1; 6-430)                            | 16                   | 4/15/77     |

(continued)

Inventory of Technical Orders (continued)

| <u>T.O. Number</u>         | <u>Subject</u>                          | <u>Change<br/>Number</u> | <u>Date</u> |
|----------------------------|-----------------------------------------|--------------------------|-------------|
| 1F-4E-2-19-1<br>(Volume 2) | Weapons Control System (6-430,<br>end)  | 16                       | 4/15/77     |
| 1F-4E-2-22                 | Systems Integration                     | 16                       | 7/15/77     |
| 1F-4E-2-23<br>(Volume 1)   | Wiring Diagrams (Sections 1,2,3)        | Basic                    | 4/1/77      |
| 1F-4E-2-23<br>(Volume 2)   | Wiring Diagrams (Sections 4,5)          | Basic                    | 4/1/77      |
| 1F-4E-2-30                 | Electronic Intelligence System          | 3                        | 4/1/77      |
| 1F-4E-2-33                 | Weapons Release Computer                | 9                        | 4/1/77      |
| 1F-4E-2-38                 | Electronic Optical Target<br>Designator | Basic                    | 4/1/77      |
| 1F-4E-4-4                  | Instrument, Electric, Systems           | 24                       | 4/15/77     |
| 1F-4E-4-7                  | Index                                   | 2                        | 8/15/77     |
| 1F-4E-21                   | Equipment Inventory                     | 3                        | 11/4/76     |
| 1F-4E-34-1-1               | Weapons Delivery                        | 1                        | 7/15/77     |
| 12R2-2ARC164-2             | Radio Set                               | Basic                    | 6/20/76     |
| 12R5-2ARN118-1             | TACAN Navigational Set                  | Basic                    | 10/15/76    |
| 12P5-2APN-32               | Receiver-Transmitter and<br>Antennas    | 13                       | 12/1/76     |
| 12R5-2ARN127-2             | Radio Receiving                         | Basic                    | 1/15/77     |
| 12P3-2ALR46-42             | Signal Processor                        | 4                        | 12/31/77    |

**AVIONICS INTERFACE DATA SUMMARY  
FOR  
F-4G**



**October 1979**

**Issued by  
The Deputy for Avionics Control  
ASD/AX  
A Joint AFSC/AFLC Organization**

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## FOREWORD

This document is one of a series of reports that describe Avionics interfaces for various USAF aircraft. It was prepared for the Deputy for Avionics Control, Aeronautical Systems Division (ASD/AX), Wright-Patterson AFB, Ohio by ARINC Research Corporation, Annapolis, Maryland under Contract F33657-79-C-0567.



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## 1. INTRODUCTION

This document contains configuration data relating to the integration of additional avionics into the F-4G aircraft.

This document will be revised periodically as additional modifications are planned and incorporated into the aircraft. Queries regarding information contained herein should be addressed to:

The Deputy for Avionics Control  
Code: ASD/AXP  
Wright-Patterson AFB, Ohio

This document was compiled from Air Force source materials by ARINC Research Corporation under Contract F33657-79-C-0567.

The applicable Technical Orders are included in the references listed in Section 10.

## 2. COCKPIT SPACE

Figures 2-1 through 2-6 present the current forward and rear cockpit layout, respectively, for the F-4G aircraft. Space availability within each cockpit is extremely limited. The rear cockpit underwent an extensive change as a result of APR-38 ECM system installation.

It is expected that further significant cockpit modifications will occur in the near future with the addition of an airborne video tape recorder in the forward cockpit right console and a new navigation system (such as the ARN-101 or AJQ-25). It is noteworthy also that the layout shown does not reflect the ARC-164 UHF Radio or the ARN-118 TACAN installations that are nearing completion.

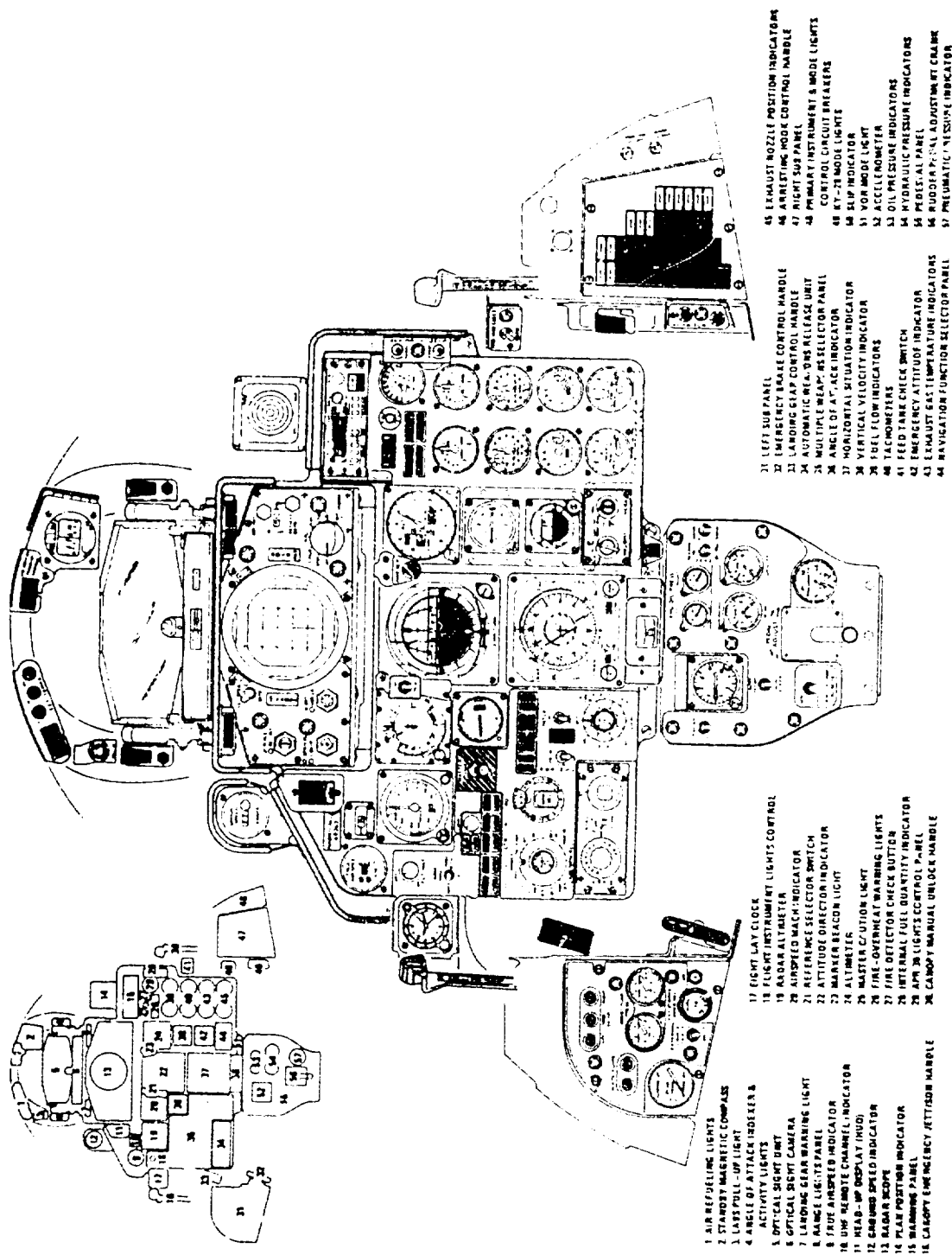


Figure 2-1. FRONT MAIN PANEL AREA

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1. UTILITY PANEL (LEFT)
2. OXYGEN CONTROL PANEL
3. ARM CONTROL HANDLE
4. ENGINE CONTROL PANEL (INBOARD)
5. DRAB CHUTE CONTROL HANDLE
6. VOR/ILS CONTROL PANEL
7. AUTOMATIC FLIGHT CONTROL SYSTEM CONTROL PANEL
8. BOARDING STEPS POSITION INDICATOR
9. ANTI-G SUIT HOSE
10. INTERCOM SYSTEM CONTROL PANEL
11. BLANK PANEL
12. BLANK PANEL
13. ANTI-G SUIT CONTROL VALVE
14. AURAL TONE & GYRO FAST ERECT PANEL
15. AN/ALZ-40 PROGRAMMER
16. FUEL CONTROL PANEL
17. ENGINE CONTROL PANEL (OUTBOARD)
18. THROTTLES
19. ELEVATION GAGE TOUCH BAR
20. EJECT LIGHT/SWITCH
21. SLATS FLAPS CONTROL PANEL
22. CANOPY SELECTOR
23. EXTRA PICTURE SWITCH
24. GUN CAMERA SWITCH
25. SLATS OVERRIDE SWITCH
26. ARMAMENT SAFETY OVERRIDE SWITCH

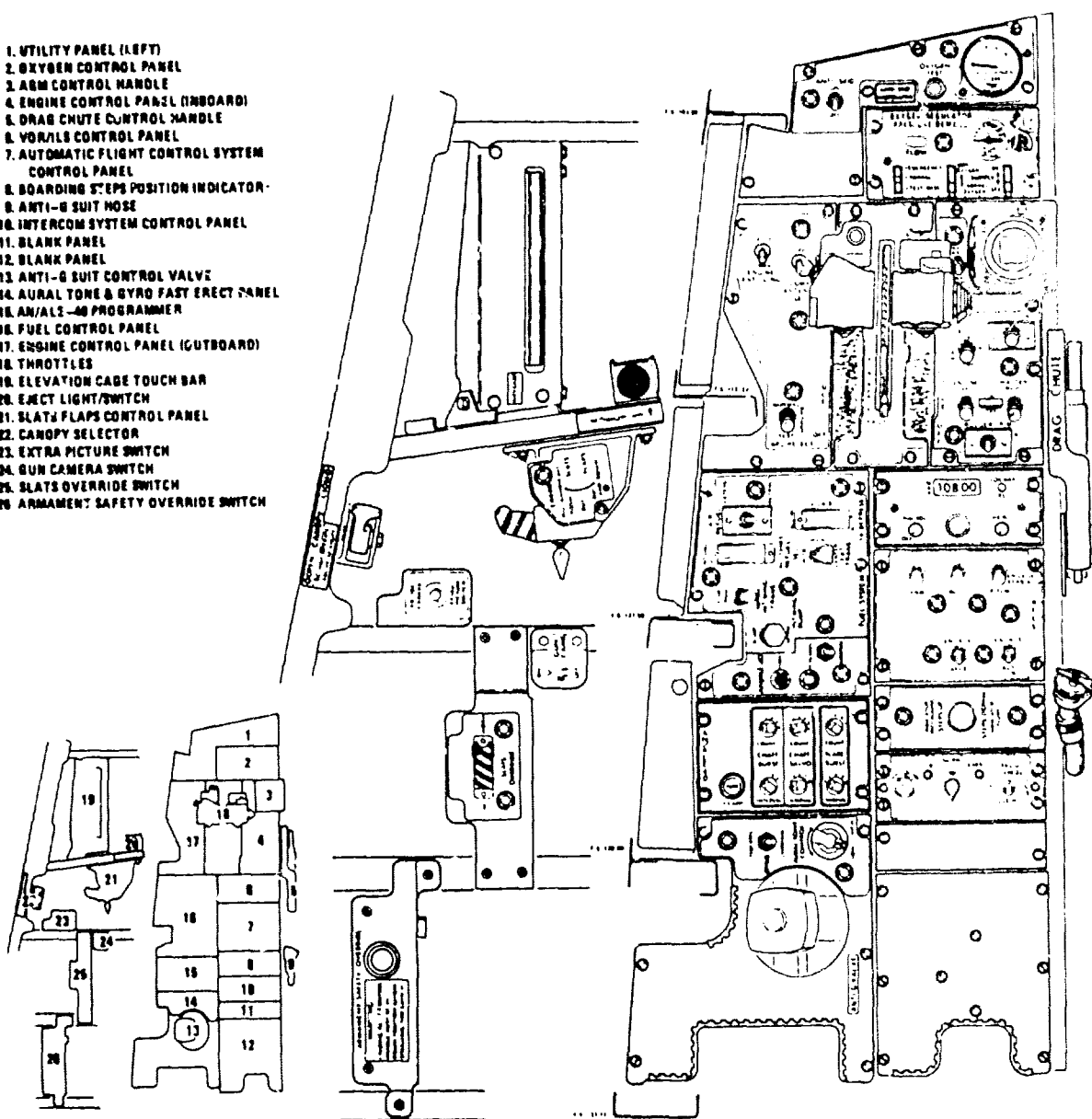


Figure 2-2. FRONT LEFT CONSOLE AREA

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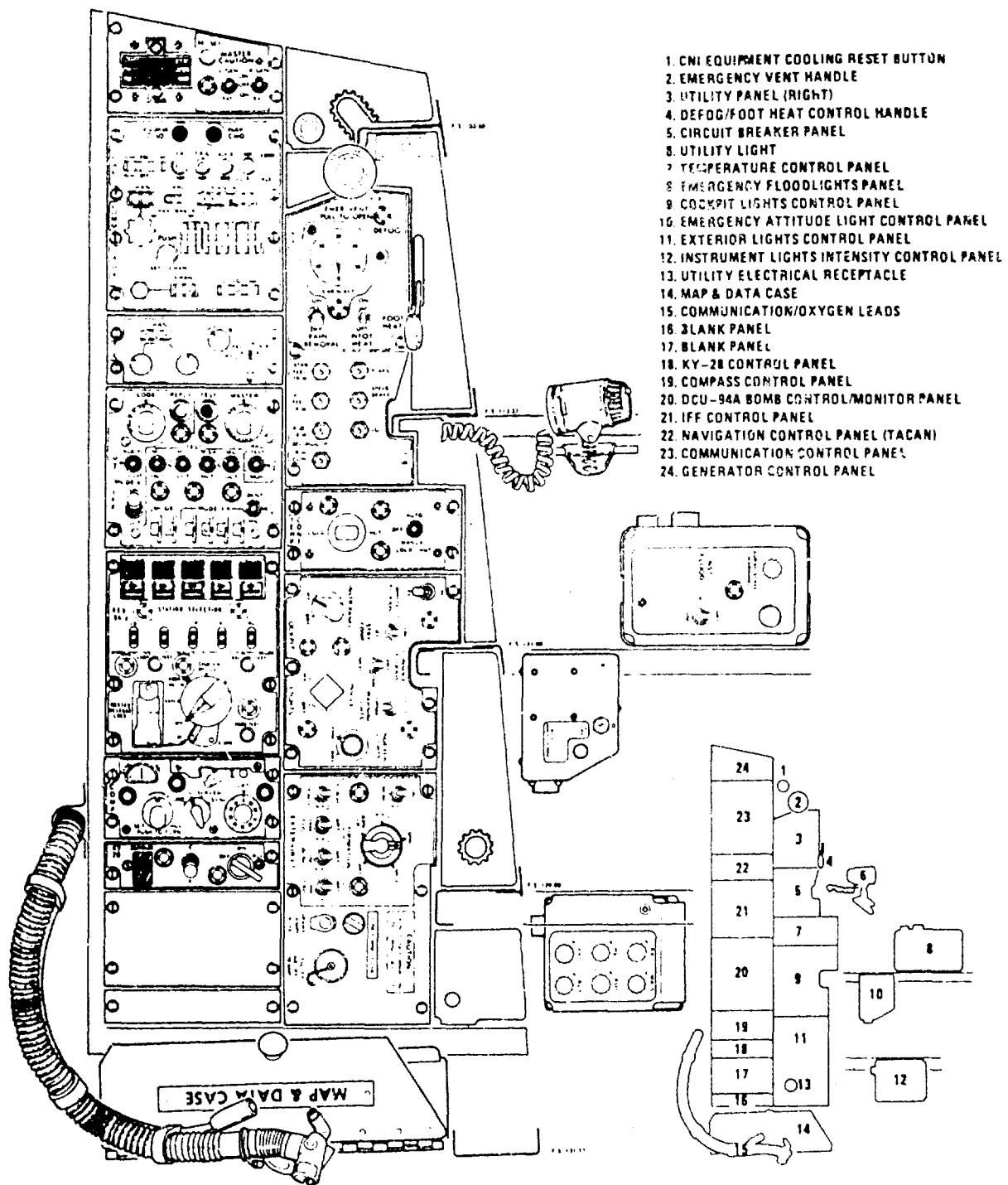


Figure 2-3. FRONT RIGHT CONSOLE AREA

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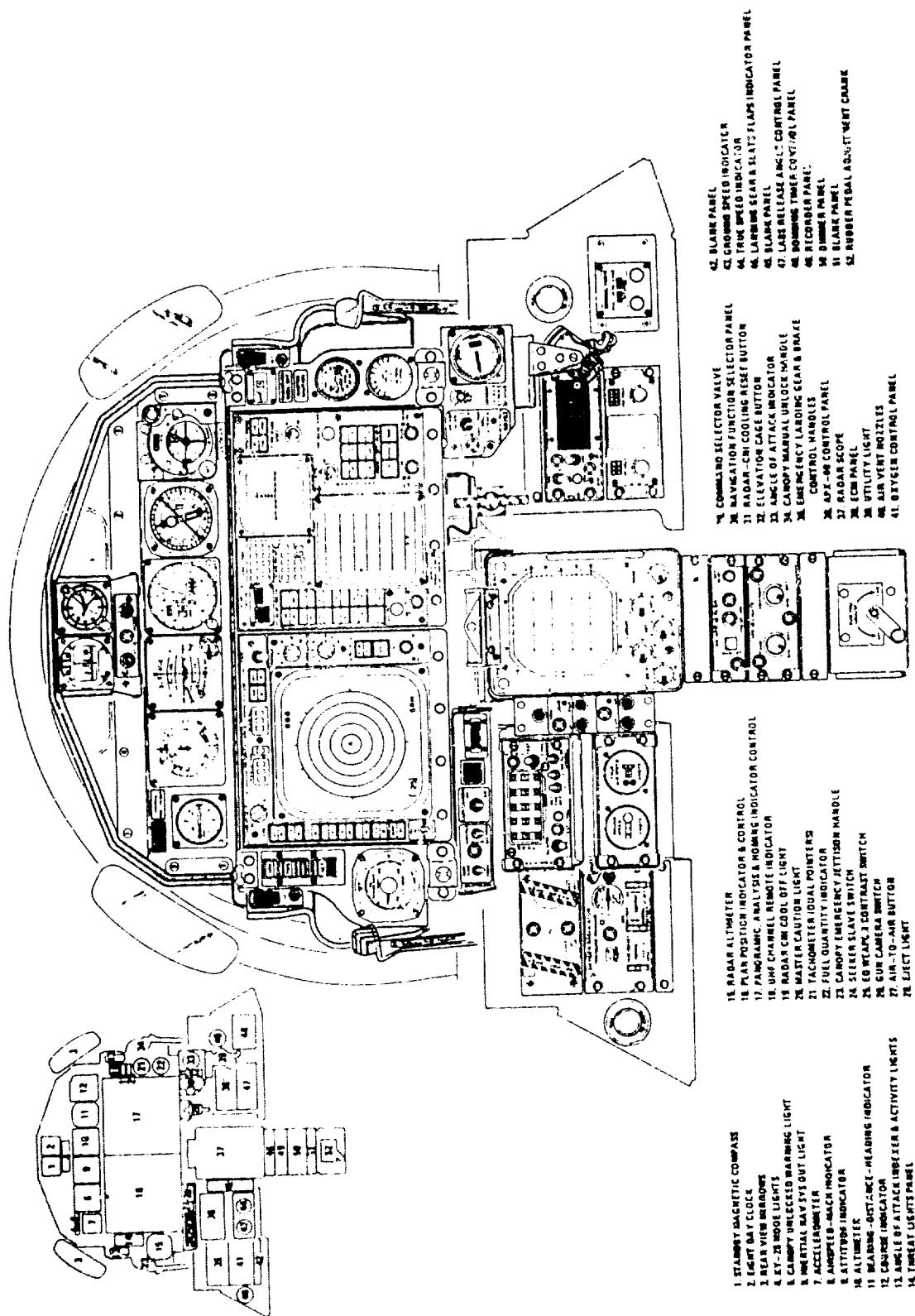


Figure 2-4. REAR MAIN PANEL AREA

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1. INTERCOM CONTROL PANEL
2. CONTROL-MONITOR PANEL
3. RADAR CONTROL PANEL
4. COMMUNICATION CONTROL PANEL
5. ANTI-G SUIT HOSE
6. NAVIGATION CONTROL PANEL
7. MARKER BEACON VOR/ILS AUDIO CONTROL
8. ANTI-G SUIT CONTROL VALVE
9. OXYGEN QUANTITY GAGE
10. CABIN ALTIMETER
11. UTILITY PANEL
12. AN/ALE-40 PROGRAMMER
13. THROTTLES
14. BLANK PANEL
15. EMERGENCY SLATS FLAPS
16. CANOPY CONTROL HANDLE

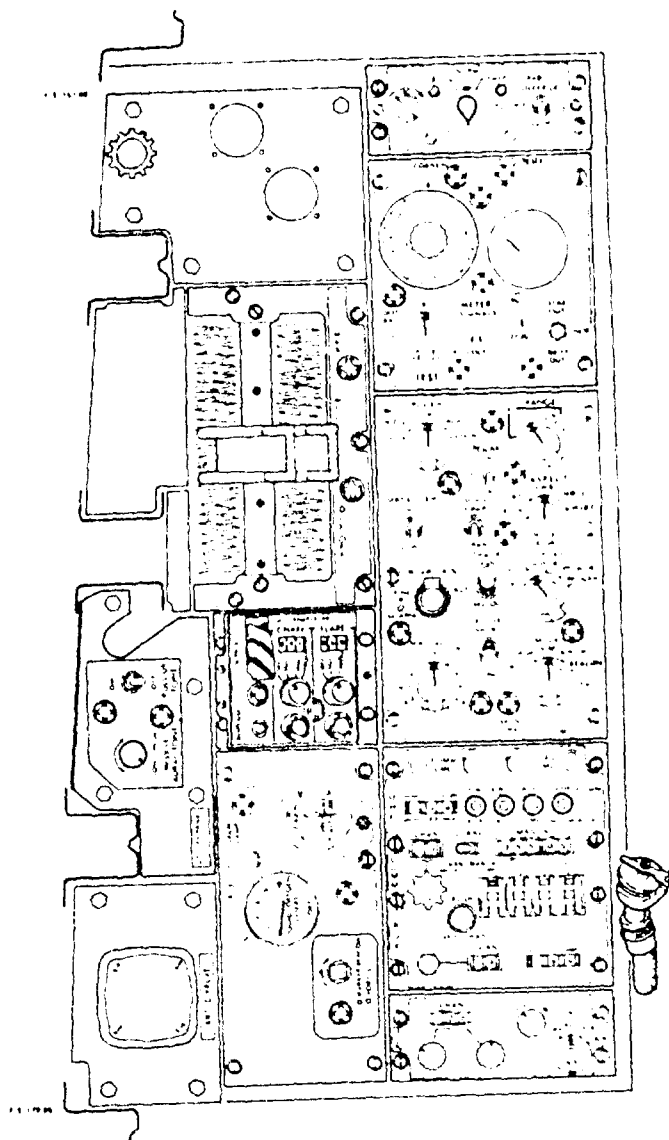
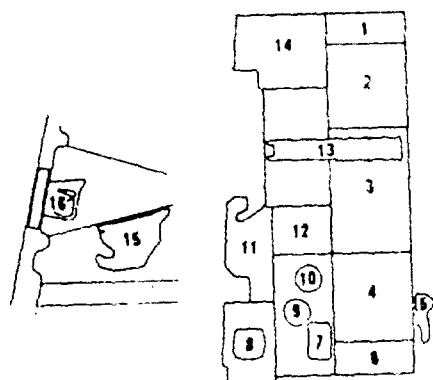
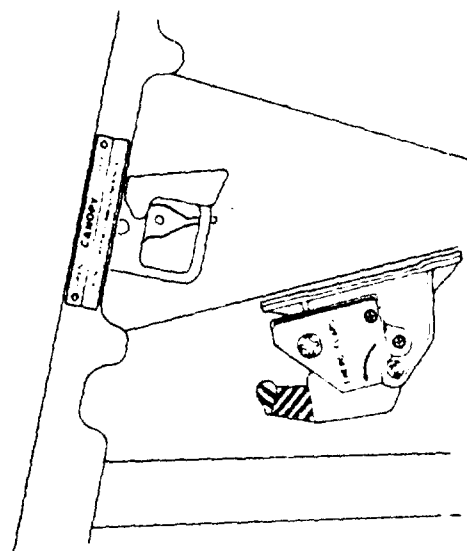


Figure 2-5. REAR LEFT CONSOLE AREA

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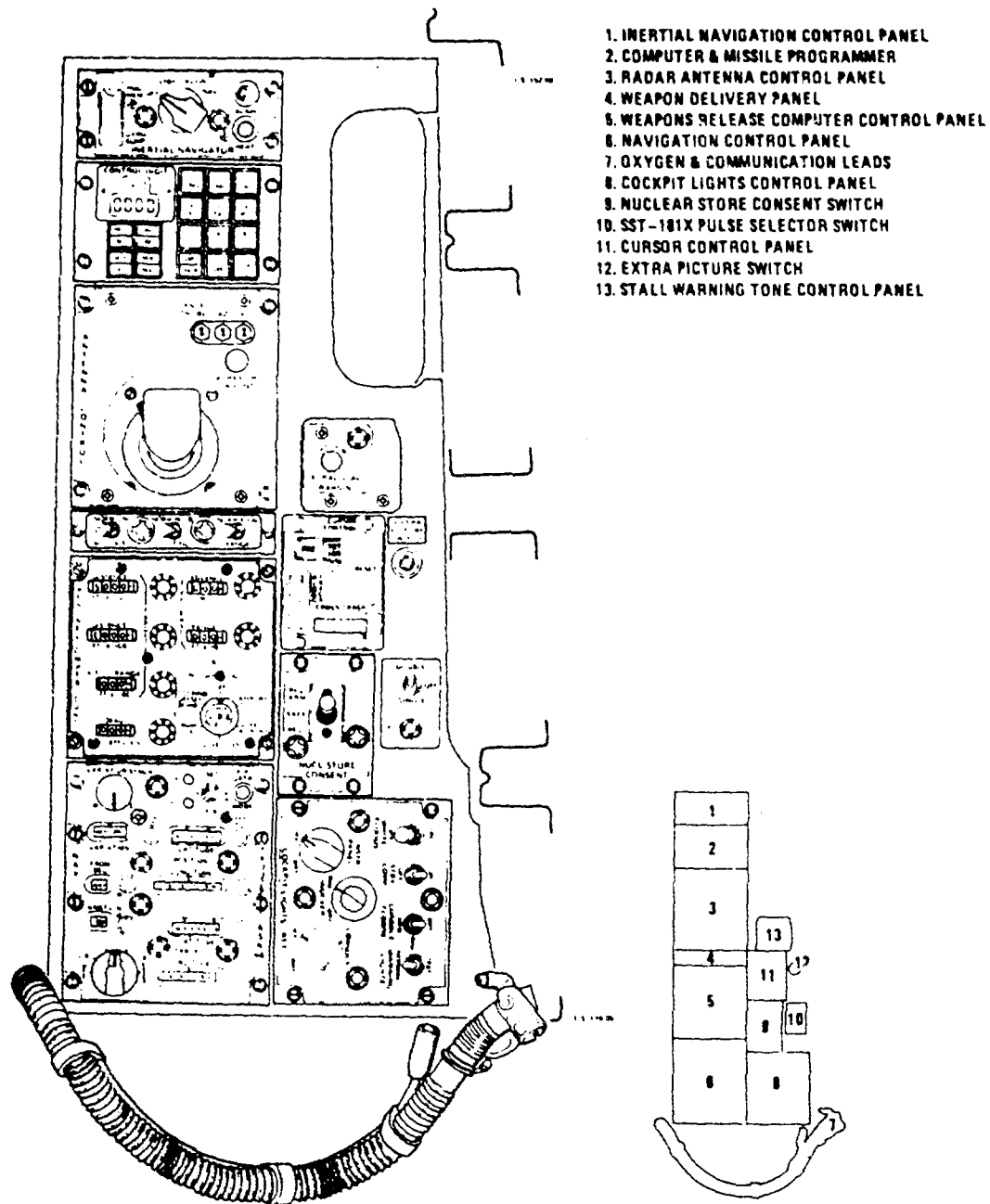


Figure 2-6. REAR RIGHT CONSOLE AREA

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### 3. AVIONICS SPACE AVAILABLE

On the basis of the examination of a production F-4G aircraft (Serial Number 69-7201) at Ogden ALC with the APR-38 system installed, available avionics space, as shown in Table 3-1, were identified. The location of these areas are listed in the table and are also keyed to Figure 3-1.

There exists a large space in the tail area, moderate space in the upper avionics bay and in the "Rat Bay", and smaller spaces in various other locations throughout the aircraft.

Table 3-2 details several possibilities for providing space in the 1984 time frame. These alternatives will require replacement or modification of certain systems. Locations are keyed to Figure 3-1.

The environmental data for the areas cited has been extracted from McDonnell Report 8738 and presented in Table 3-3. Although the addition of the "chin" pod and other structural changes made during the F-4E to F-4G conversion might produce some aerodynamic effects (e.g., added drag at low speeds and altitudes), the applicability of the environmental data contained in the report is considered valid currently and no known new/special temperature - altitude - vibration testing is now planned.

| Table 3-1. F <sup>2</sup> E SUMMARY - F-4G                                                                                                                                                |                                                                                                                                                                                                                  |                                          |                                           |                                          |                                       |                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-------------------------------------------|------------------------------------------|---------------------------------------|--------------------------------------------------------------------|
| F <sup>2</sup> E Criteria                                                                                                                                                                 | Potential Available Space                                                                                                                                                                                        |                                          |                                           |                                          |                                       |                                                                    |
|                                                                                                                                                                                           | A                                                                                                                                                                                                                | A                                        | A                                         | A                                        | A                                     | B                                                                  |
| Location Reference and Description                                                                                                                                                        | CNI Bay, Replacement of Amp-Power Supply. Aux Revr AM-2349/ASO                                                                                                                                                   | CNI Bay Nose Wheel-well behind KIT-1A    | CNI Bay Nose Wheel-well behind KIR-1A     | CNI Bay Nose Wheel-well behind KIR-1A    | CNI Bay Nose Wheel-well behind KIR-1A | Upper Avionics Bay - Door 19 Previous Lead Computing Gyro Location |
| Rectangular Size (H, W, D) Volume                                                                                                                                                         | 8.5", 6.4", 23.2"<br>0.7 ft <sup>3</sup>                                                                                                                                                                         | 8.0", 6.0", 10.0"<br>0.3 ft <sup>3</sup> | 7.8", 5.0", 11.0"<br>0.25 ft <sup>3</sup> | 6.7", 6.0", 10.0"<br>0.2 ft <sup>3</sup> | 14", 14", 16"<br>1.8 ft <sup>3</sup>  |                                                                    |
| Type Cooling Available                                                                                                                                                                    | Forced Air Conditioning                                                                                                                                                                                          | Forced Air Conditioning                  | Forced Air Conditioning                   | Forced Air Conditioning                  | Forced Air Conditioning               | Forced Air Conditioning                                            |
| Temperature - Altitude Condition*                                                                                                                                                         | Condition I                                                                                                                                                                                                      | Condition I                              | Condition I                               | Condition I                              | Condition I                           | Condition I                                                        |
| Vibration Region**                                                                                                                                                                        | Region IX                                                                                                                                                                                                        | Region IX                                | Region IX                                 | Region IX                                | Region IX                             | Region X                                                           |
| Possible Candidates for the Space                                                                                                                                                         | None Known                                                                                                                                                                                                       | None Known                               | VHF AM/FM ARC - 186                       | VHF AM/FM ARC - 186                      | VHF AM/FM ARC - 186                   | VHF AM/FM ARC - 186                                                |
| Remarks                                                                                                                                                                                   | The unit provides aux UHF receiver & intercom power functions. It is conceivable that at least half of the volume shown could be gained through replacement or repackaging methods without a loss of capability. |                                          |                                           |                                          |                                       |                                                                    |
| *Where LRU is currently installed, the dimensions given represent dimensions of LRU; when no LRU is installed, the dimensions given are those of the available space.<br>**See Table 3-2. |                                                                                                                                                                                                                  |                                          |                                           |                                          |                                       |                                                                    |

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Table 3-1. (CONTINUED)

| F <sup>1</sup> E Criteria          | Potential Available Space                          |                                                                                             |                                                              |                                                                                                     |                                                                                                                                                                                          |
|------------------------------------|----------------------------------------------------|---------------------------------------------------------------------------------------------|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                    | C                                                  | D                                                                                           | E                                                            | F                                                                                                   | G                                                                                                                                                                                        |
| Location Reference and Description | "Rat" Bay Door 185L                                | Tail Area of Fuselage Aft of #7 Fuel Cell Door 61L                                          | APR-38 Chin Pod Under Radome Door 71L Next to Analysis Rcvr. | Nose Radome Area                                                                                    | Door 183 Over Left Wing TISEO Power Supply Location on F-4E                                                                                                                              |
| Rectangular Size (H, W, D) Volume  | 17.0", 25.0", 5.1", (max)<br>1.3 ft <sup>3</sup>   | 27.0", 17.0", 15.0"<br>4.0 ft <sup>3</sup>                                                  | 7.0", 6.0", 19.0"<br>0.5 ft <sup>3</sup>                     | 4", 6", 10"<br>0.14 ft <sup>3</sup>                                                                 | 6.1", 6.2", 12.4"<br>0.3 ft <sup>3</sup>                                                                                                                                                 |
| Type Cooling Available             | Cooling Air Blind Into Bay From Upper Avionics Bay | Convection Only                                                                             | Forced Air Conditioning                                      | Forced Air Conditioning                                                                             | TBD. Forced Air Conditioning Available to TISEO on F-4E                                                                                                                                  |
| Temperature - Altitude Condition*  | Condition I                                        | Condition II                                                                                | Condition IV                                                 | Condition IV                                                                                        | Condition I                                                                                                                                                                              |
| Vibration Region**                 | Region I                                           | Region I                                                                                    | Region VII                                                   | Region VII                                                                                          | Region I                                                                                                                                                                                 |
| Possible Candidates for the Space  | None Known                                         | None Known                                                                                  | APR-38 Enhancement Program (Not Yet Approved)                | None Known                                                                                          | None Known                                                                                                                                                                               |
| Remarks                            | This is a very shallow compartment.                | No power or forced air cooling currently available. Severe ambient temperature environment. |                                                              | 4 spaces approximately this size currently exist on the radar shock mount. Spaces are not adjacent. | F-4G does not have TISEO (ASX-1) System installed. This space as well as space on left wing in-board used for TISEO or F-4E should be available. This space size has not been confirmed. |

\*\*Where LRU is currently installed, the dimensions given represent dimensions of LRU; when no LRU is installed, the dimensions given are those of the available space.

\*\*See Table 3-2.

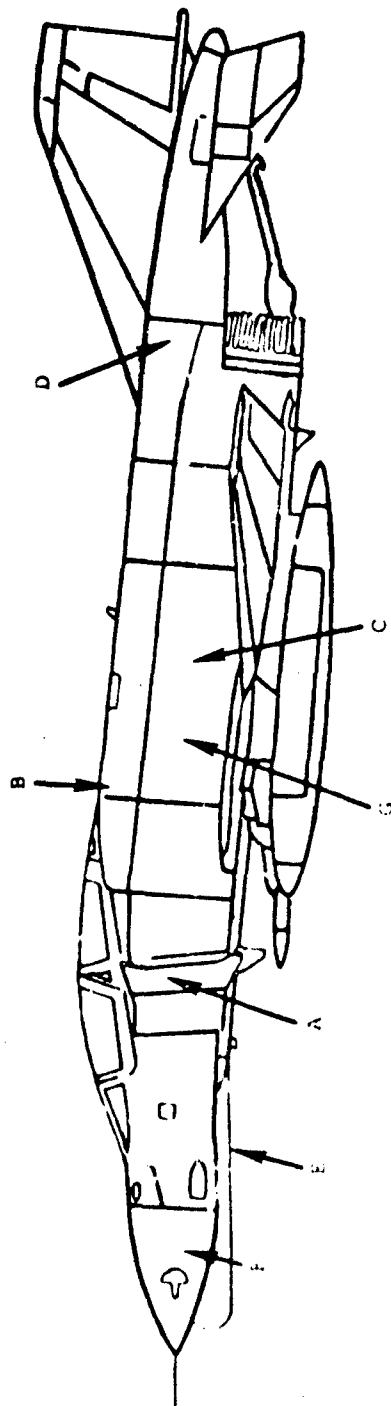


Figure 3-1. F-4G SPACE LOCATIONS

Table 3-2. F-4G RAW ENVIRONMENTAL DATA SYNOPSIS

| Table 3-2. F-4G RAW ENVIRONMENTAL DATA SYNOPSIS |                                                      |                                                      |                                            |                                            |
|-------------------------------------------------|------------------------------------------------------|------------------------------------------------------|--------------------------------------------|--------------------------------------------|
| Temperature Data                                |                                                      |                                                      |                                            |                                            |
| Temperature-Altitude Condition                  | Condition                                            |                                                      |                                            | Per MAC Detailed Performance Specification |
|                                                 | I                                                    | II                                                   | IV                                         |                                            |
| Continuous                                      | -54°C to +71°C, Sea level<br>-54°C to +24°C, 60,000' | -54°C to +71°C, Sea level<br>-54°C to +24°C, 60,000' | Per MAC Detailed Performance Specification |                                            |
| 30 Minutes                                      | to +95°C, Sea level<br>to +83°C, 60,000'             | to +95°C, Sea level<br>to +100°C, 60,000'            |                                            |                                            |
| 10 Minutes                                      | to +101°C, Sea level<br>to +143°C, 50,000'           | to +109°C, Sea level<br>to +170°C, 50,000'           |                                            |                                            |
| Vibration Data                                  |                                                      |                                                      |                                            |                                            |
| Equipment Performance (double amplitude)        | Region                                               |                                                      |                                            | X                                          |
|                                                 | I                                                    | VII                                                  | IX                                         |                                            |
| 5-10 Hz                                         | 0.060 inches                                         | 0.060 inches                                         | 0.060 inches                               | 0.060 inches                               |
| 10-15 Hz                                        | 0.063 inches                                         | 0.100 inches                                         | 0.078 inches                               | 0.064 inches                               |
| 15-20 Hz                                        | 0.036 inches                                         | 0.036 inches                                         | 0.036 inches                               | 0.036 inches                               |
| 20-23 Hz                                        | 0.036 inches                                         | 0.080 inches                                         | 0.050 inches                               | 0.060 inches                               |
| 23-50 Hz                                        | 0.036 inches                                         | 0.036 inches                                         | 0.036 inches                               | 0.036 inches                               |
| <50 Hz                                          | +5g                                                  | +5g                                                  | +5g                                        | +5g                                        |

#### 4. ELECTRICAL POWER SYSTEM

##### 4.1 Main Power System

The main electrical power system in the F-4G is composed of two 30 kVA, 115 volt, 400 Hz 3-phase power generators with a constant-speed drive (CSD) unit regulating the generator at 8,000 rpm. The load is evenly divided between the generators when they are operating in parallel. If a fault in either generator occurs, it is removed from the line. Two underfrequency protectors prevent underfrequency operation of the generators.

##### 4.2 Power Conversion and Distribution System

The power conversion and distribution system has three main functions: (1) distributes internal emergency and external ac power to the aircraft, (2) distributes dc power to the aircraft, and (3) converts 115 Vac to 28/14 Vac and 28 Vdc. Power from the left generator is supplied to the left main 115 Vac bus and instrument 200/115 Vac bus. The right generator delivers power to the 115 Vac right main bus and the essential 115 Vac bus. In normal operation the emergency generator delivers ac power to the essential and instrument buses.

Two 100 ampere transformer-rectifiers convert the received ac power from their generators to the 28 Vdc power.

##### 4.3 Battery Power

The battery power supply system contains a 24 volt nickel cadmium battery rated at 11 ampere-hours at a 2-hour discharge rate. The aircraft battery is used for normal ground and emergency air starts as well as to provide power to the four floodlights. If total ac-to-dc power conversion fails, the battery will supply power to the essential dc bus.

## 5. ENVIRONMENTAL CONTROL SYSTEM

### 5.1 General

The aircraft environmental control system air conditioning is divided into two major systems, one for cabin areas and one for electronic equipment cooling. Both systems use high temperature, high pressure, and seventeenth-stage engine compressor bleed air from either or both engines.

### 5.2 Cabin Air Conditioning

The cabin air conditioning system (CACS) on the right side of the fuselage consists of two air-to-air heat exchangers and other associated equipment. The CACS allows a selection of cabin conditioning temperatures, defogging, rain removal, and ram air operations.

### 5.3 Equipment Air Conditioning

The equipment air conditioning system, located on the left side of the forward fuselage, supplies cooling air for the radar compartment in the nose, the electronic equipment compartment aft of the nosewheel well, and the electronic equipment shelf behind the rear cockpit bulkhead. System control is entirely automatic with the temperature being controlled at approximately 84°F from sea level to 25,000 feet and 40°F from 25,000 feet up.

### 5.4 Equipment Auxiliary Air System

The equipment auxiliary air system (EAAS) uses partially cooled air from the equipment air conditioning system. The EAAS distributes the cooled air as follows:

- Anti-G System
- Canopy Seal System
- Air Data Computer
- Radar Wave Guide
- Rear Cockpit Radar Scope
- Radio Receiver(s) - Transmitter
- Fuel Pressurization System
- Pneumatic System Air Compressor



## 6. CURRENT AVIONICS

### 6.1 Summary of Current Avionics

Table 6-1 lists the current avionics systems in the F-4G. Those that are different from the F-4E configuration or unique to the F-4G are annotated.

Systems unique to the F-4G are described in this section. The reader is referred to the F-4E Configuration Data Summary for details of the common avionics systems. The unique systems are the AN-APR-38 ECM System and the AN/ASG-30 Computing Optical Sight.

Tables 6-2 and 6-3 list the available LRU data for the ECM System and the Computing Optical Sight System, respectively. A detailed description of the APR-38 system was not available for this report; however a mock diagram of the APR-38 ECM system is presented in Figure 6-1.

Refer to Section 9 of this document for avionics systems which can be expected to exist on the F-4G in the 1984 time frame (some pending approval) and replace many of those listed in Table 6-1.

**Table 6-1. PRINCIPAL AVIONICS SYSTEMS CURRENTLY  
INSTALLED ON THE F-4G AIRCRAFT**

|                                     |                                                         |
|-------------------------------------|---------------------------------------------------------|
| Flight Control                      | ASA-32( )                                               |
| Flight Director Computer            | TBD (Same as non-ARN-101<br>equipped F-4E aircraft)     |
| Air Data Computer                   | CPK-92/A24G-34                                          |
| Attitude Reference Bombing Computer | AJB-7                                                   |
| Fire Control                        | APQ-120(V) with Digital<br>Scan Converter Group Display |
| Flight Data Recording               | TBD (Same as F-4E)                                      |
| Inertial Navigation                 | ASN-63                                                  |
| Integrated Electronic Central       | ASQ-19A w/KIT-1A, KIR-1A                                |
| Intercommunications                 | IFF CRYPTO                                              |
| UHF Communications                  |                                                         |
| Automatic Direction Finding         |                                                         |
| TACAN                               |                                                         |
| IFF                                 |                                                         |
| Computing Optical Sight             | ASG-30*                                                 |
| Navigation Computer                 | ASN-46A                                                 |
| Radar Altimeter                     | APN-155                                                 |
| Radar Beacon                        | SST-181X or UPN-25                                      |
| IFF Interrogator                    | APX-80A                                                 |
| Speech Security                     | KY-28                                                   |
| Weapons Release Computer            | ASQ-91                                                  |
| Radar Receiving Set (RHAW)          | APR-38**                                                |
| ILS/VOR                             | ARN-127                                                 |
| Countermeasure Dispenser            | ALE-40                                                  |
| Data Recording Cameras              | KB-18A or KB-25A                                        |
| Electronic Countermeasures Pods     | ALQ-119(V)-12, -14                                      |
| Armament                            |                                                         |
| Missile Launching System            | For AIM-7, -9 and AGM-45, -65A                          |
| Multiple Weapons System             | For conventional stores                                 |
| Special Weapons Monitor             | Nuclear Stores Consent Switch<br>and DCU-94/A.          |
| Centerline Weapons Release          | AERO-27A, or BRU-5/A                                    |

\*Differs from F-4E.

\*\*Unique to F-4G.

| Table 6-2. AN/APR-38 ECM SYSTEM (WILD WEASEL) NSN: TBD  |                            |                                                                                      |                                    |   |   |                             |                    |                   |    |                     |                   |          |
|---------------------------------------------------------|----------------------------|--------------------------------------------------------------------------------------|------------------------------------|---|---|-----------------------------|--------------------|-------------------|----|---------------------|-------------------|----------|
| Name                                                    | Nomenclature               | Location                                                                             | Dimension <sup>a</sup><br>(Inches) |   |   | Volume<br>(Cubic<br>Inches) | Weight<br>(Pounds) | Aircraft<br>Power |    | Heat<br>Dissipation | Cooling<br>Method | Mounting |
|                                                         |                            |                                                                                      | H                                  | W | D |                             |                    | AC                | DC |                     |                   |          |
| Frequency Select Control/Converter                      | CV-3358<br>(Quantity of 2) | Chin Pod<br>Radome, Aft<br>Side                                                      |                                    |   |   |                             | 25 each            |                   |    |                     |                   |          |
| Forward Radio Receiver Array                            | R-2019                     | Gun Compart-<br>ment Radome<br>Access Door<br>B                                      |                                    |   |   |                             | 20                 |                   |    |                     |                   |          |
| Side Radio Receiver/Array                               | R-2018                     | Radome Access<br>Doors 52L/R                                                         |                                    |   |   |                             | 38                 |                   |    |                     |                   |          |
| Antenna Selector Low Band/<br>Special Warning<br>Switch | SA-2091                    | Access Door<br>171                                                                   |                                    |   |   |                             |                    |                   |    |                     |                   |          |
| Lighting Unit                                           | PP-7290                    | Bulkhead Aft<br>Cockpit Right<br>Side                                                |                                    |   |   |                             |                    |                   |    |                     |                   |          |
| Mid-Band Antenna                                        | AS-3120                    | Bottom of<br>Chin Pod                                                                |                                    |   |   |                             |                    |                   |    |                     |                   |          |
| High Band Antenna                                       | AS-3121                    | Bottom of<br>Chin Pod                                                                |                                    |   |   |                             |                    |                   |    |                     |                   |          |
| Omnit Antenna<br>(Blade)                                | AS-3122                    | Bottom of<br>Chin Pod                                                                |                                    |   |   |                             |                    |                   |    |                     |                   |          |
| Antenna                                                 | AS-3119<br>(Quantity of 9) | Left Side (3)<br>and Right<br>Side (3) of<br>Radome & 2 on<br>vertical<br>stabilizer |                                    |   |   |                             |                    |                   |    |                     |                   |          |
| Digital Computer                                        | CP-1255                    | Access<br>Door 171                                                                   |                                    |   |   |                             | 53                 |                   |    |                     |                   |          |
| Signal Data Converter (SPU)                             | CV-3355                    | Access<br>Door 77                                                                    |                                    |   |   |                             | 24                 |                   |    |                     |                   |          |
| Mounting Base                                           | MT-4826                    |                                                                                      |                                    |   |   |                             |                    |                   |    |                     |                   |          |
| Signal Data Converter/<br>Storer (NAV Coupler)          | CV-3356                    | Access<br>Door 171                                                                   |                                    |   |   |                             | 19                 |                   |    |                     |                   |          |
| *To be supplied when available.                         |                            |                                                                                      |                                    |   |   |                             |                    |                   |    |                     |                   |          |
| (continued)                                             |                            |                                                                                      |                                    |   |   |                             |                    |                   |    |                     |                   |          |

| Table 6-2. AM/APR-39 ECM System (Wild Weasel) NSM: TBD (continued) |                         |                                  |                     |   |   |                       |                                         |                |    |                  |                |          |
|--------------------------------------------------------------------|-------------------------|----------------------------------|---------------------|---|---|-----------------------|-----------------------------------------|----------------|----|------------------|----------------|----------|
| Name                                                               | Nomenclature            | Location                         | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds)                         | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                    |                         |                                  | H                   | W | D |                       |                                         | AC             | DC |                  |                |          |
| Electronic Frequency Synthesizer                                   | C-1722                  | Access Door 168                  |                     |   |   |                       | 33                                      |                |    |                  |                |          |
| Electronic Equipment Mounting Base                                 | MT-4828                 |                                  |                     |   |   |                       |                                         |                |    |                  |                |          |
| Analysis Receiver                                                  | R-2020                  | Access Door 71R                  |                     |   |   |                       | 14                                      |                |    |                  |                |          |
| Low Band Radio Receiver                                            | R-2021                  | Access Door 77                   |                     |   |   |                       | 29                                      |                |    |                  |                |          |
| Central Power Supply                                               | PP-7298                 | Access Door 171                  |                     |   |   |                       | 49                                      |                |    |                  |                |          |
| Mounting Base                                                      | MT-4827 (Quantity of 2) |                                  |                     |   |   |                       | Data for this equipment are Classified. |                |    |                  |                |          |
| Signal Data Converter (IP Processor)                               | CV-3357                 | Access Door 173                  |                     |   |   |                       | 19                                      |                |    |                  |                |          |
| Antenna Selector/Low Band Special Warning Switch                   | SA-2091                 | Access Door 171                  |                     |   |   |                       |                                         |                |    |                  |                |          |
| Signal Data Converter (DEU)                                        | CV-3352                 | Access Door 170                  |                     |   |   |                       | 30                                      |                |    |                  |                |          |
| Plan Position Indicator                                            | IP-1250                 | Forward Cockpit Instrument Panel |                     |   |   |                       | 5                                       |                |    |                  |                |          |
| Cdr Warning Control/Indicator                                      | ID-2066                 | Forward Cockpit Instrument Panel |                     |   |   |                       |                                         |                |    |                  |                |          |
| Panoramic Analysis and Homing Indicator                            | IP-1249                 | Aft Cockpit Instrument Panel     |                     |   |   |                       | 22                                      |                |    |                  |                |          |
| Plan Position Indicator and Control Unit                           | IP-1248                 | Aft Cockpit Instrument Panel     |                     |   |   |                       |                                         |                |    |                  |                |          |
| *To be supplied when available. (continued)                        |                         |                                  |                     |   |   |                       |                                         |                |    |                  |                |          |

| Table 6-2. AM/APR-38 ECM SYSTEM (WILD WEASEL) MSN: TBD (continued) |              |                                                  |                     |   |   |                       |                 |                |    |                  |                |          |
|--------------------------------------------------------------------|--------------|--------------------------------------------------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                               | Nomenclature | Location                                         | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                    |              |                                                  | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| Programming Indicator Control                                      | C-10023      | Aft Cockpit Right Console                        |                     |   |   |                       |                 |                |    |                  |                |          |
| Aft Receiver Array                                                 | R-2019       | Tail Pod Top of Vert Stabilizer Doors 97 and 177 |                     |   |   |                       | 20              |                |    |                  |                |          |
| Frequency Select Control                                           | CV-3358      | Tail Pod Top of Vert Stabilizer Door 85          |                     |   |   |                       |                 |                |    |                  |                |          |
| Data for this equipment are Classified.                            |              |                                                  |                     |   |   |                       |                 |                |    |                  |                |          |

| Table 6-3. COMPUTING OPTICAL SIGHT SYSTEM AN/ASG-30 RSN: TBD |              |                              |                     |      |      |                       |                 |                                 |                                     |                  |                |          |
|--------------------------------------------------------------|--------------|------------------------------|---------------------|------|------|-----------------------|-----------------|---------------------------------|-------------------------------------|------------------|----------------|----------|
| Name                                                         | Nomenclature | Location                     | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power                  |                                     | Heat Dissipation | Cooling Method | Mounting |
|                                                              |              |                              | H                   | W    | D    |                       |                 | AC                              | DC                                  |                  |                |          |
| Lead Computing Amplifier                                     | AM-6843      | Door 19 Upper Bay            | 8.5                 | 5.9  | 18.3 | 918                   | 18              |                                 |                                     |                  | Convection     |          |
|                                                              | SU-81        | Forward Cockpit Front Center | 10.6                | 12.0 | 12.5 | 1590                  | 25              | 115V<br>400 Hz<br>3 Ø<br>390 VA | 24-29V<br>40W<br>Total System Power |                  | Convection     |          |

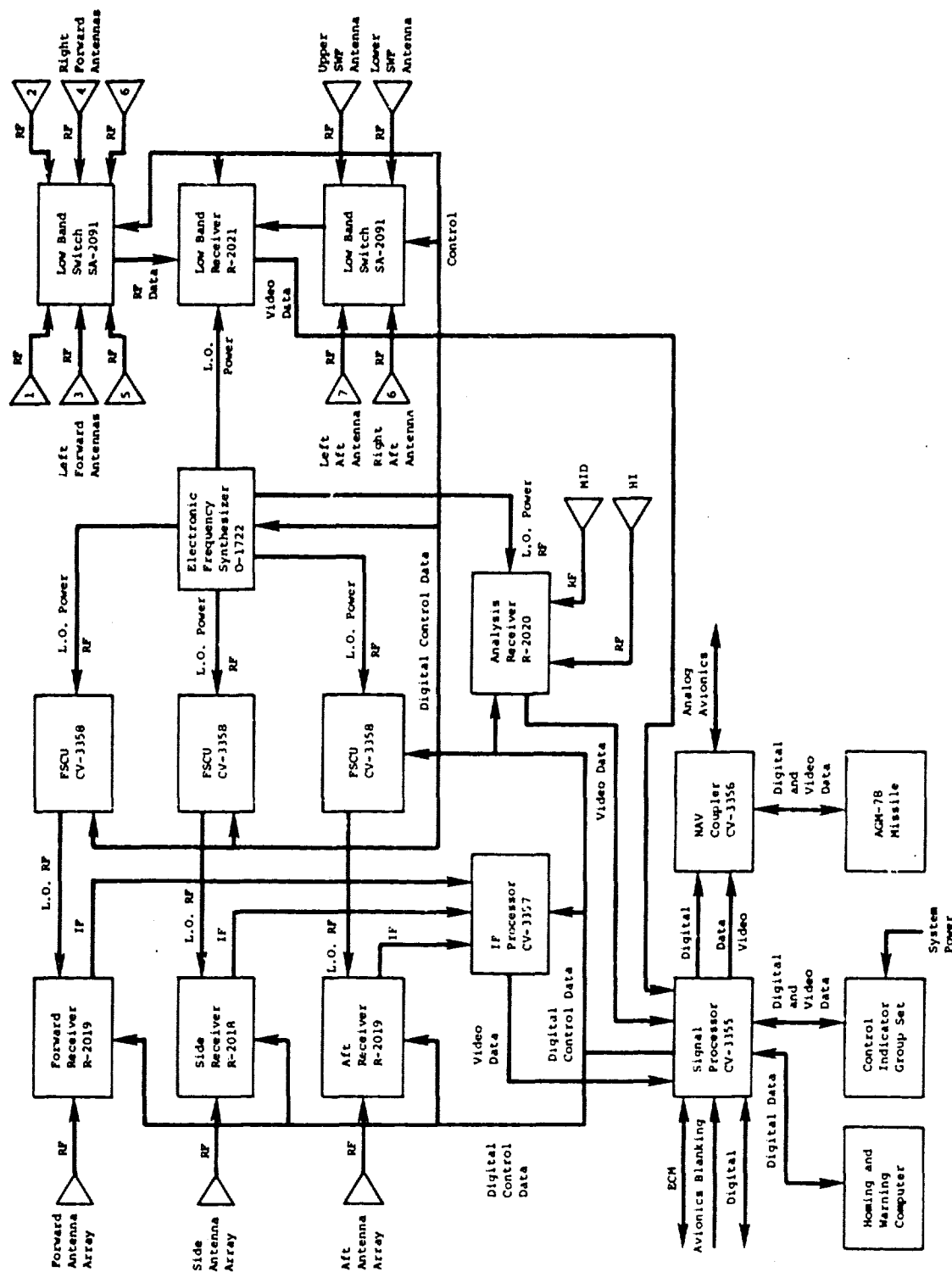


Figure 6-1. AN/APR-38 Simplified Block Diagram

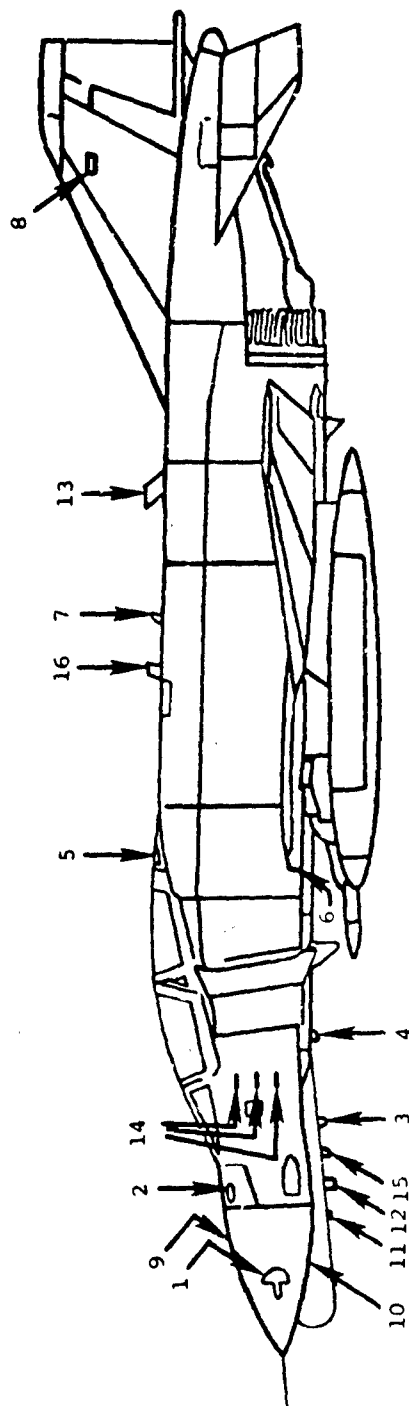
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## 7. ANTENNA LOCATIONS

Figure 7-1 shows the approximate location of the antennas on the F-4G. Antenna nomenclature from current technical orders is as follows:

| <u>Antenna</u>                     | <u>Nomenclature</u> |
|------------------------------------|---------------------|
| 1. Radar                           | AS-3083/APQ-120 (V) |
| 2. ADF                             | AS-909A/ARA-48      |
| 3. Lower TACAN                     | 11C21400            |
| 4. Lower UHF Comm.                 | AS-1611/A           |
| 5. IFF                             | 2285-1              |
| 6. Radar Altimeter                 | AS-1386/AS-1442     |
| 7. Upper TACAN                     | 11C21400            |
| 8. APR-38 Low Band                 | AS-3119/APR-38      |
| 9. VOR/ILS Glide Slope             | DMN9-5              |
| 10. AN/APX-SOA IFF                 | AS-2072/APQ-120     |
| 11. APR-38 High Band               | AS-3121/APR-38      |
| 12. APR-38 Special Warning (Lower) | AS-3122/APR-38      |
| 13. Upper UHF Comm.                | AS-1611/A           |
| 14. APR-38 Low Band                | AS-3119/APR-38      |
| 15. APR-38 Mid Band                | AS-3120/APR-38      |
| 16. APR-38 Special Warning (Upper) | AS-3122/APR-38      |





1. Radar Antenna
2. ADF Antenna
3. Lower TACAN Antenna
4. Lower UHF Antenna
5. IFF Antenna
6. Radar Altimeter Antenna
7. Upper TACAN Antenna

8. APR-38 Low Band Antenna
9. VOR/ILS Glide Slope Antenna
10. AN/APX-80A IFF Dipoles (4)
11. APR-38 High Band Antenna
12. APR-38 Special Warning Antenna (Lower)
13. Upper UHF Comm Antenna
14. APR-38 Low Band Antennas
15. APR-38 Mid Band Antenna
16. APR-38 Special Warning Antenna (Upper)

Figure 7-1. F-4G ANTENNA LOCATIONS

## 8. INTERFACE DATA

This section contains examples of interface signal characteristics. These data were extracted from applicable sections of the Interface Control Drawings (ICDs) for integration of GPS user equipment in the F-4G aircraft. Each sheet discusses a particular signal. The top line contains the signal name, type of signal (digital, analog, discrete, or synchronous), its signal source and load, and whether the signal is an input or output of the GPS user equipment. A functional description follows, as well as a description of the signal's characteristics.

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM | TO                          |
|-------------|---------|-----|------|-----------------------------|
| Bearing     | Synchro | O   | UE   | Pilot's HSI &<br>WSO's BDHI |

## Functional Description

Provides angular information to the bearing pointer\* to display relative bearing of the aircraft's present position to selected waypoint.

\*Note: No. 1 pointer on BDHI

## Signal Characteristics

RANGE: 0° to 360°  
 ACCURACY: ± 1°  
 INDEX REFERENCE: Aircraft Heading  
 POSITIVE DIRECTION SENSE: Increasing Bearing  
 SCALE FACTOR: 1° = 1°  
 RESOLUTION: ± 2.5° (HSI); ± 1.25° (BDHI)

## Electrical Characteristics (continued on next page)

LOAD: 1) Pilot's HSI (AF/A24J-1), 3-Wire Synchro, Bendix Type EP AY-500-5 or equal  
 2) WSO's BDHI (ID-663( )/U), 3-Wire Synchro, Type 26V-1114, or equal  
 SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Pair (X,Y)  
 Wire Size: No. 22 AWG  
 Note: "Z" tied to ground

A/C: F-4G  
 REF: MIL-I-22075  
 MIL-H-27269  
 1F-4E-2-14

|   |             |               |
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| A | FORM 10-1   | REVISION 10-2 |
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# ELECTRICAL CHARACTERISTICS

| LOAD 1                                                                          |             |         | LOAD 2                                               |             |        |
|---------------------------------------------------------------------------------|-------------|---------|------------------------------------------------------|-------------|--------|
| HSI (AF/A24J-1), Bearing Pointer, 3-Wire Synchro, Bendix Type AY-500-5 or equal |             |         | BDHI (ID-663( )/U), Synchro, Type 26V-11TX4 or equal |             |        |
| ROTOR                                                                           |             |         |                                                      |             |        |
| Input Voltage                                                                   | 26          | Volts   | Input Voltage                                        | 26          | Volts  |
| Frequency                                                                       | 400         | Cycles  | Input Current                                        | 242         | ma     |
| Input Current                                                                   | --          | ma      | Input Power                                          | .87         | Watts  |
| Input Power                                                                     | --          | Watts   | Transformation Ratio                                 | .454        |        |
| Resistance (DC)                                                                 | 530         | Ohms    | Sensitivity                                          | 206         | mv/deg |
| STATOR                                                                          |             |         | Phase Shift                                          | 4°          | lead   |
| Input Voltage                                                                   | 11.8        | Volts   | Impedance, Zro                                       | 14.9 + j106 | Ohms   |
| Input Current                                                                   | 20          | ma      | Impedance, Zso                                       | 760 + j4540 | Ohms   |
| Input Power                                                                     | 0.090       | Watts   |                                                      |             |        |
| Resistance (DC)                                                                 | 188         | Ohms    |                                                      |             |        |
| Rotor Output Voltage                                                            | 19          | Volts   |                                                      |             |        |
| Phase Shift (S to R)                                                            | 15          | Degrees |                                                      |             |        |
| Accuracy (Max)                                                                  | 15          | Minutes |                                                      |             |        |
| Null Voltage (Max)                                                              | 50          | mv      |                                                      |             |        |
| IMPEDANCE                                                                       |             |         |                                                      |             |        |
| Zso                                                                             | 222 + j470  | Ohms    |                                                      |             |        |
| Zro                                                                             | 940 + j2260 | Ohms    |                                                      |             |        |
| Zrss                                                                            | 1050 + j450 | Ohms    |                                                      |             |        |

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# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME     | TYPE    | I/O | FROM | TO                          |
|-----------------|---------|-----|------|-----------------------------|
| Distance, Units | Synchro | 0   | UE   | Pilot's HSI &<br>WSO's BDHI |

## Functional Description

Provides angular information to rotate the units digit in the range window. Displays aircraft present position distance to selected waypoint in 1nm increments (0.5nm indexed). Driven independently of other digits, but read in conjunction with them in order to provide the least significant digit.

## Signal Characteristics

RANGE: 0 to 9 ( $0^{\circ}$  to  $360^{\circ}$ )  
 ACCURACY:  $\pm 3.6^{\circ}$   
 INDEX REFERENCE: 0  
 POSITIVE DIRECTION SENSE: To decreasing values (distance to go)  
 SCALE FACTOR:  $36^{\circ} = 1$  numeral  
 RESOLUTION:  $\pm 9^{\circ}$

## Electrical Characteristics (continued on next page)

LOAD: 1) Pilot's HSI (AF/A24J-1), 3-Wire Synchro, Clifton Type CRC-8-A-1 or equal  
 2) WSO's BDHI ID-663( )/U, 3-Wire Synchro, Type 26V-11TX4 or equal  
 SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Pair (X,Y)  
 Wire Size: No. 22 AWG  
 Note: "Z" leg tied to ground

A/C: F-4G  
 REF: MIL-I-22075  
 MIL-H-27269  
 1F-4E-2-14

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# ELECTRICAL CHARACTERISTICS

| LOAD 1                                                                             |           |         | LOAD 2                                               |             |        |
|------------------------------------------------------------------------------------|-----------|---------|------------------------------------------------------|-------------|--------|
| HSI (AF/A24J-1), Distance Display, 3-Wire Synchro, Clifton Type CRC-8-A-1 or equal |           |         | BDHI (ID-663( )/U), Synchro, Type 26V-11TX4 or equal |             |        |
| Primary Winding                                                                    | Rotor     |         | Input Voltage                                        | 26          | Volts  |
| Primary Voltage (400 Hz)                                                           | 26        | Volts   | Input Current                                        | 242         | ma     |
| Secondary Voltage                                                                  | 11.8      | Volts   | Input Power                                          | .87         | Watts  |
| Input Current                                                                      | 100       | ma      | Transformation Ratio                                 | .454        |        |
| Input Power                                                                        | .54       | Watts   | Sensitivity                                          | 206         | mv/deg |
| Accuracy                                                                           | 30        | feet    | Phase Shift                                          | 4°          | lead   |
| Impedance, Zro                                                                     | 54 + j260 | Ohms    | Impedance, Zro                                       | 14.9 + j106 | Ohms   |
| Impedance, Zso                                                                     | 12 + j45  | Ohms    | Impedance, Zso                                       | 760 + j4540 | Ohms   |
| Rotor DC Resistance                                                                | 37        | Ohms    |                                                      |             |        |
| Stator DC Resistance                                                               | 12        | Ohms    |                                                      |             |        |
| Phase Shift                                                                        | 8.5       | Degrees |                                                      |             |        |

|             |      |      |            |    |      |
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| ICD-GPS-020 |      |      |            |    |      |
| ISSUE       | REV  | DATE | SHEET 10-5 |    |      |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME    | TYPE    | I/O | FROM | TO                          |
|----------------|---------|-----|------|-----------------------------|
| Distance, tens | Synchro | 0   | UE   | Pilot's HSI &<br>WSO's BDHI |

## Functional Description

Provides angular information to rotate the tens digit in the range window. Displays aircraft present position distance to selected waypoint in 10nm increments. Driven independently of other distance digits but read in conjunction with them.

## Signal Characteristics

RANGE: 0 to 9 (0° to 360°)  
 ACCURACY: + 3.6°  
 INDEX REFERENCE: 0  
 POSITIVE DIRECTION SENSE: To decreasing values (distance to go)  
 SCALE FACTOR: 36° = 1 numeral  
 RESOLUTION: +9°

## Electrical Characteristics (continued on page 10-5)

LOAD: 1) Pilot's HSI (AF/A24J-1), 3-Wire Synchro, Clifton Type CRC-8-A-1 or equal  
 2) WSO's BDHI (ID-663( )/U), 3-Wire Synchro, Type 26V-11TX4 or equal  
 SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Pair (X,Y)

Wire Size: No. 22 AWG

Note: "Z" leg tied to ground

A/C: F-4G  
 REF: MIL-I-22075  
 MIL-H-27269  
 1F-4E-2-14

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| DATE  | ISSUE NO. | REVISION NO. |
| A     |           | ICD-GPS-020  |
| SCALE | REV       | SHEET 10-6   |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME        | TYPE    | I/O | FROM | TO                       |
|--------------------|---------|-----|------|--------------------------|
| Distance, hundreds | Synchro | 0   | UE   | Pilot's HSI & WSO's BDHI |

## Functional Description

Provides angular information to rotate the hundreds digit in the range window. Displays aircraft present position distance to the selected waypoint in 100nm increments. Driven independently of the other distance digits, but read in conjunction with them in order to provide the most significant digit for the distance value.

## Signal Characteristics

RANGE: 0 to 9 (0° to 360°)  
 ACCURACY:  $\pm 3.6^\circ$   
 INDEX REFERENCE: 0  
 POSITIVE DIRECTION SENSE: To decreasing values (distance to go)  
 SCALE FACTOR:  $36^\circ = 1$  numeral  
 RESOLUTION:  $\pm 9^\circ$

## Electrical Characteristics (continued on page 10-5)

LOAD: 1) Pilot's HSI (AF/A24J-1), 3-Wire Synchro, Clifton Type CRC-8-A-1 or equal  
 2) WSO's BDHI (IN-663( )/U), 3-Wire Synchro, Type 26V-11TX4 or equal

SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Pair (X,Y)

Wire Size: No. 22 AWG

Note: "Z" leg tied to ground

A/C: F-4G  
 REF: MIL-I-22075  
 MIL-H-27269  
 1F-4E-2-14

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|          |          | 10-7        |



# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME   | TYPE     | I/O | FROM | TO                        |
|---------------|----------|-----|------|---------------------------|
| Distance Flag | Discrete | O   | UE   | Pilot's HSI<br>WSO's BDHI |

## Functional Description

Provides a discrete signal to operate the distance warning flag. The flag is normally out of view when the range indicator is operating and the range data is valid. The flag covers the range indicator when the distance information is not valid or the device supplying the distance data is not operating.

## Signal Characteristics

RANGE: 28 Vdc applied, Flag out-of-view  
28 Vdc not applied, Flag-in-view

## Electrical Characteristics

LOAD: 1) Pilot's HSI (AF/A24J-1), Distance shutter mechanism,  
28 Vdc, 150ma Max.  
2) WSO's BDHI (ID-663' )/U), Distance shutter mechanism,  
28 Vdc, 150ma Max.  
SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Two Single Conductors  
Wire Size: No. 22 AWG

A/C: F-4G  
REF: MIL-I-22075  
MIL-H-27269  
1F-4E-2-14

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| DATE  | DESIGN | REVISION | ICD-GPS-020 |
| A     |        |          |             |
| SCALE | REV    | SHEET    | 10-8        |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME    | TYPE     | I/O | FROM | TO                        |
|----------------|----------|-----|------|---------------------------|
| Thousand Digit | Discrete | O   | UE   | Pilot's HSI<br>WSO's BDHI |

## Functional Description

Provides a discrete output signal to operate the thousand digit shutter of the HSI when the distance to a selected waypoint is greater than 999 nautical miles.

## Signal Characteristics

RANGE: 28 Vdc applied, thousand digit in-view  
28 Vdc not applied, thousand digit out-of-view

## Electrical Characteristics

LOAD: 1) Pilot's HSI (AF/A24J-1), Distance 1000 digit shutter, 28 Vdc, 150 ma (Max)  
2) WSO's BDHI (ID-663( )/U), Distance 1000 digit shutter, 28 Vdc, 150 ma (Max)

SOURCE: TBD-1

## Interconnection Data

WIRE TYPE & NO.: Two Single Conductors  
WIRE SIZE: No. 22 AWG

A/C: F-4G  
REF: MIL-I-22075  
MIL-H-27269  
1F-4E-2-14

|       |          |             |
|-------|----------|-------------|
| DATE  | REVISION | DESCRIPTION |
| A     |          | ICD-GPS-020 |
| SCALE | REV      | DATE 10-9   |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE   | I/O | FROM | TO                 |
|-------------|--------|-----|------|--------------------|
| To-From     | Analog | O   | UE   | Pilot's HSI<br>FDC |

## Functional Description

Provides a d.c. analog signal to drive the To-From indicator. If the aircraft is flying toward the waypoint and has not intercepted a reference line perpendicular to the aircraft ground track and through the waypoint, the indication will be TO. Once past the waypoint reference line, the indication will be FROM, as long as the same waypoint is selected.

## Signal Characteristics

RANGE: TO = +225  $\mu$ a Max  
BLANK = no signal  
FROM = -225  $\mu$ a Max

## Electrical Characteristics

LOAD: 1) Pilot's HSI (AF/A24J-1), To-From Arrow Meter movement,  
150 - 250 Ohms

SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.:

Wire Size: No. 22 AWG

A/C: F-4G  
REF: MIL-H-27269  
1F-4E-2-14

|                  |                   |              |
|------------------|-------------------|--------------|
| DATE<br><b>A</b> | DESIGN OFFICE NO. | REVISION NO. |
| SCALE            | REV               | 10-10        |
| ICD-GPS-020      |                   |              |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME          | TYPE   | I/O | FROM | TO                 |
|----------------------|--------|-----|------|--------------------|
| Horizontal Deviation | Analog | O   | UE   | Pilot's HSI<br>FDC |

## Functional Description

Provides a variable d.c. signal that indicates the displacement of the aircraft to the left or right of a selected course. The displacement represented by the indicating device will be controlled by UE software and will be dependent upon aircraft flight phase. Deflection of the indicating device may represent angular displacement (e.g., 10° for a TACAN approach: 2.50° for ILS) or distance. For an area navigation system, the Area Navigation Subcommittee has recommended the following ranges for the flight modes indicated: a) Enroute: 2-6 miles full scale, b) Terminal: 1-2 miles full scale and c) Approach: 600-3000 feet full scale. Choice of presentation (distance/degrees) and scales are (TBD-1).

## Signal Characteristics

RANGE: 0 to + 150  $\mu$ a  
 RESOLUTION: 3  $\mu$ a  
 ACCURACY: + 12  $\mu$ a  
 INDEX REFERENCE: Selected Course  
 POSITIVE DIRECTION SENSE: Fly right (+)  
 SCALE FACTOR: 75  $\mu$ a/dot on the HSI  
 Distance/angular displacement scale factor (TBD-1)

## Electrical Characteristics

LOAD: 1) Pilot's HSI (AF/424J-1), course bar mechanism,  
 Input Impedance: 1000 Ohms + 3%  
 Input Current (Max): 500  $\mu$ a  
 2) Flight Director Computer (CPU-82/A)  
 Input Impedance: 1000 Ohms + 3%  
 Input Current (Max): 500  $\mu$ a  
 SOURCE: (TBD-1)

## Interconnection Data

WIRE TYPE & NO.: Two Single Conductors  
 WIRE SIZE: No. 22 AWG

A/C: F-46  
 REF: MIL-H-27269  
 1F-4E-2-14  
 ARINC Characteristic 582-5

|       |      |      |             |
|-------|------|------|-------------|
| APP   | DATE | REV  | ISSUED BY   |
| A     |      |      | ICD-GPS-020 |
| SCALE | REV  | DATE | 10-11       |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME               | TYPE     | I/O | FROM | TO  |
|---------------------------|----------|-----|------|-----|
| Horizontal Deviation Flag | Discrete | O   | UE   | FDC |

## Functional Description

Provides a discrete signal to operate the vertical director warning flag of the ADI when the deviation data is unreliable or a malfunction has occurred in the horizontal deviation circuitry.

## Signal Characteristics

RANGE: Flag in view, input current <245  $\mu$ a  
Flag out-of-view, input current >245  $\mu$ a

## Electrical Characteristics

LOAD: Flight Director Computer (CPU-82/A)  
Input Impedance: 1000 Ohms  $\pm$ 3%  
Input Current (Max): 380  $\mu$ a

SOURCE: (TBD-1)

## Interconnection Data

WIRE TYPE & NO.: Two Single Conductors  
WIRE SIZE: No. 22 AWG

A/C: F-4G  
REF: MIL-I-27619  
1F-4E-2-17

|       |           |              |
|-------|-----------|--------------|
| DATE  | ISSUE NO. | REVISION NO. |
| A     |           | ICD-GPS-020  |
| SCALE | REV       | SHEET 10-12  |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME        | TYPE   | I/O | FROM | TO  |
|--------------------|--------|-----|------|-----|
| Vertical Deviation | Analog | O   | UE   | FDC |

## Functional Description

Provides a variable d.c. signal that indicates the displacement of the aircraft above or below a desired flight path. The displacement represented by the indicating device will be controlled by UE software and will be dependent upon aircraft flight phase. Deflection of the indicating device may represent angular displacement (e.g., 0.5° for ILS) or distance. For an area navigation system, the Area Navigation Subcommittee of the Air Transport Association's Air Traffic Control Committee has recommended the following ranges for the flight modes indicated: a) Enroute: 200 to 2000 feet full scale, b) Terminal: 60-200 feet full scale and c) Approach: 40-100 feet full scale. Choice of presentation (distance/degrees) and scales are (TBD-1).

## Signal Characteristics

RANGE: 0 to + 10 ma  
 RESOLUTION:  $\pm$  0.1 ma  
 ACCURACY: + 7.5%  
 INDEX REFERENCE: Desired flight path  
 POSITIVE DIRECTION SENSE: Fly down (+)  
 SCALE FACTOR: 2.51 ma/inch deflection on the indicator  
 Distance/angular displacement scale factor (TBD-1)

## Electrical Characteristics

LOAD: Flight Director Computer (CPU-82/A)  
 Input Impedance: 1000 Ohms  $\pm$  3%  
 Input Current (Max): 13.5 ma

## Interconnection Data

WIRE TYPE & NO.: Two Single Conductors  
 WIRE SIZE: No. 22 AWG

A/C: F-4G  
 REF: MIL-I-27619  
 1F-4E-2-17  
 ARINC Characteristics 582-5

| DATE  | CODE | REVISION | DESCRIPTION |
|-------|------|----------|-------------|
| A     |      |          | ICD-GPS-020 |
| SCALE | REV  | SHEET    | 10-13       |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME             | TYPE     | I/O | FROM | TO  |
|-------------------------|----------|-----|------|-----|
| Vertical Deviation Flag | Discrete | O   | UE   | FDC |

## Functional Description

Provides a discrete signal to the FDC to advise when the UE vertical deviation signal is not reliable.

## Signal Characteristics

RANGE: Flag in view, input current <245  $\mu$ a  
Flag out-of-view, input current >245  $\mu$ a

## Electrical Characteristics

LOAD: Flight Director Computer (CPU-82/A)  
Input Impedance: 1000 Ohms  $\pm$ 3%  
Input Current (Max): 380  $\mu$ a

SOURCE:

## Interconnection Data

Wire Type & No.: Two Single Conductors  
Wire Size: No. 22 AWG

A/C: F-4G  
REF: MIL-I-27619  
1F-4E-2-17

|             |      |       |       |      |    |
|-------------|------|-------|-------|------|----|
| REV         | DATE | BY    | CHKD  | DATE | BY |
| A           |      |       |       |      |    |
| ICD-GPS-020 |      |       |       |      |    |
| SCALE       | REV  | SHEET | 10-14 |      |    |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME         | TYPE    | I/O | FROM | TO                         |
|---------------------|---------|-----|------|----------------------------|
| Digital Output Data | Digital | O   | UE   | AN/ARN-101<br>(Future Mod) |

## Functional Description

Provides the following digital data to update the INS and to aid in navigation/bombing solutions:

- |                            |                 |
|----------------------------|-----------------|
| 1) Latitude                | 5) Covariances  |
| 2) Longitude               | 6) Time         |
| 3) Altitude                | 7) Display Data |
| 4) Velocities (Vx, Vy, Vz) |                 |

## Signal Characteristics

(TBD-3)

## Electrical Characteristics

(TBD-3)

## Interconnection Data

(TBD-3)

A/C: F-4G  
REF:

|       |              |              |
|-------|--------------|--------------|
| DATE  | REVISION NO. | REVISION NO. |
| A     |              | 1CD-GPS-020  |
| SCALE | REV          | SHEET 10-15  |



# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME      | TYPE    | I/O | FROM  | TO |
|------------------|---------|-----|-------|----|
| Magnetic Heading | Synchro | I   | ARBCS | UE |

## Functional Description

Provides angular reference signal of aircraft heading relative to magnetic north.

## Signal Characteristics

RANGE: 0° to 360°  
 ACCURACY: + 0.5°  
 INDEX REFERENCE: Magnetic North  
 POSITIVE DIRECTION SENSE: Nose Right  
 SCALE FACTOR: 10 = 1  
 RESOLUTION: (TBD-1)

## Electrical Characteristics (continued on next page)

SOURCE: 1) ARBCS, Compass Adapter Compensator (ADK-182/A246-1A); Synchro, Bendix Type EP AY-500-5 or equal

LOAD: (TBD-1)

## Interconnection Data

Wire Type & No.: Two Conductors (X,Y)

Wire Size: No. 22 AWG

Note: "Z" leg tied to ground

A/C: F-4G  
 REF: 1F-4E-2-17  
 MIL-C-26485

|   |            |             |
|---|------------|-------------|
| A | FORM 10-15 | ICD-GPS-020 |
|   | REV        | SHEET 10-15 |

# ELECTRICAL CHARACTERISTICS

| SOURCE                                    |             |         |
|-------------------------------------------|-------------|---------|
| Synchro, Bendix Type EP AY-500-5 or equal |             |         |
| Rotor                                     |             |         |
| Input Voltage                             | 26          | Volts   |
| Frequency                                 | 400         | Cycles  |
| Input Current                             | --          | ma      |
| Input Power                               | --          | Watts   |
| Resistance (DC)                           | 530         | Ohms    |
| Stator                                    |             |         |
| Input Voltage                             | 11.8        | Volts   |
| Input Current                             | 20          | ma      |
| Input Power                               | 0.090       | Watts   |
| Resistance (DC)                           | 188         | Ohms    |
| Rotor Output Voltage                      | 19          | Volts   |
| Phase Shift (S to R)                      | 15          | Degrees |
| Accuracy (Max)                            | 15          | Minutes |
| Null Voltage (Max)                        | 50          | mv      |
| Impedance                                 |             |         |
| Zso                                       | 222 + j470  | Ohms    |
| Zro                                       | 940 + j2260 | Ohms    |
| Zrss                                      | 1050 + j450 | Ohms    |

|       |             |              |
|-------|-------------|--------------|
| DATE  | DESIGNED BY | DESIGNED NO. |
| A     |             | 1CD-GPS-020  |
| ISSUE | REV         | SHEET 10-17  |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM  | TO |
|-------------|---------|-----|-------|----|
| Pitch       | Synchro | I   | ARBCS | UE |

## Functional Description

Provides a synchro signal representing aircraft pitch attitude to the UE.

## Signal Characteristics

RANGE: 0 to 360°  
 ACCURACY: ± 0.5°  
 INDEX REFERENCE: 0° Pitch  
 POSITIVE DIRECTION SENSE: Nose up  
 SCALE FACTOR: 1° = 1°  
 RESOLUTION: (TBD-1)

## Electrical Characteristics

SOURCE: ARBCS, Displacement Gyroscope Assembly (SBK-8/A24G-1A), Synchro Bendix Type AY-300-5 or equal (see page 10-17 for synchro characteristics)  
 LOAD: (TBD-1)

## Interconnection Data

WIRE TYPE & NO.: Twisted Triad  
 WIRE SIZE: No. 22 AWG

A/C: F-4G  
 REF: MIL-C-26485  
 1F-4E-2-17

|       |      |     |      |             |    |
|-------|------|-----|------|-------------|----|
| REV   | DATE | BY  | CHKD | DATE        | BY |
| A     |      |     |      |             |    |
| TITLE |      |     |      | 1CD-GPS-020 |    |
| SCALE |      | REV |      | SHEET 10-18 |    |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM  | TO |
|-------------|---------|-----|-------|----|
| Roll        | Synchro | I   | ARBCS | UE |

## Functional Description

Provides a synchro signal representing aircraft roll attitude to the UE.

## Signal Characteristics

RANGE: 0 to 360°  
 ACCURACY: + 0.5°  
 INDEX REFERENCE: 0° Roll  
 POSITIVE DIRECTION SENSE: Right Wing Down  
 SCALE FACTOR: 1° = 1°  
 RESOLUTION: (TBD-1)

## Electrical Characteristics

SOURCE: ARBCS, Displacement Gyroscope Assembly (SBK-8/A24G-1A),  
 Synchro, Bendix Type AY-500-5, or equal (see page 10-17 for  
 synchro characteristics)

LOAD: (TBD-1)

## Interconnection Data

WIRE TYPE & NO.: Twisted Traid  
 WIRE SIZE: No. 22 AWG

A/C: F-4G  
 REF: MIL-C-26485  
 1F-4E-2-17

|   |          |             |
|---|----------|-------------|
| A | FORM NO. | 1CD-GPS-020 |
|   | REV      | 10-19       |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME   | TYPE    | I/O | FROM              | TO |
|---------------|---------|-----|-------------------|----|
| True Airspeed | Synchro | I   | Air Data Computer | UE |

## Functional Description

Provides an input of true air speed in synchro format.

## Signal Characteristics

RANGE: 150 - 1500 knots  
 ACCURACY: (TBD-2)  
 INDEX REFERENCE: (TBD-2)  
 POSITIVE DIRECTION SENSE: Increasing air speed  
 SCALE FACTOR: (TBD-2)

## Electrical Characteristics

SOURCE: Air Data Computer (CPK-92/A24G-34), Synchro. Type (TBD-2)

LOAD: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Triad

Wire Size: No. 22 AWG

A/C: F-4G  
 REF: T.O. 1F-4E-2-12

|     |             |       |
|-----|-------------|-------|
| REV | ICD-GPS-020 |       |
|     | REV         | 10-20 |

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# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME         | TYPE    | I/O | FROM                  | TO |
|---------------------|---------|-----|-----------------------|----|
| Barometric Altitude | Synchro | I   | Altitude Encoder Unit | UE |

## Functional Description

Provides an input of pressure altitude in synchro format for use by the system when operating with less than full navigation capability.

## Signal Characteristics

RANGE: -1000 to 80,000 feet  
 ACCURACY: + 0.05 inch Hg and + 0.2% indication  
 INDEX REFERENCE: 0 Feet (29.92 inches of mercury)  
 SCALE FACTOR: 360/1000 feet  
 POSITIVE DIRECTION SENSE: Up-perpendicular to horizontal earth plane  
 RESOLUTION: 0.01 inch Hg

## Electrical Characteristics

SOURCE: Altitude Encoder Unit (CVK-99/A24G)  
 LOAD: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Triad  
 Wire Size: No. 22 AWG

A/C: F-4G  
 REF: 1F-4E-2-12

|       |       |          |             |
|-------|-------|----------|-------------|
| DATE  | ISSUE | REVISION | REVISION    |
| A     |       |          | ICD-6PS-020 |
| ISSUE | REV   | CHG      | 10-21       |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM        | TO |
|-------------|---------|-----|-------------|----|
| Course Set  | Synchro | I   | Pilot's HSI | UE |

## Functional Description

Provides an electrical reference signal for the course manually selected by the course set control on the HSI. This signal will be used by the UE as a reference for positioning the course deviation and To-From indicators on the HSI.

## Signal Characteristics

RANGE: 0° to 360°  
 ACCURACY: + 0.5°  
 RESOLUTION: + 1.0°  
 INDEX REFERENCE: Magnetic North  
 POSITIVE DIRECTION SENSE: Right Hand Increments  
 SCALE FACTOR: 1° = 1°

## Electrical Characteristics (continued on next page)

SOURCE: HSI (AF/A24J-1), Course Resolver, Bendix Type EP AY221-5-B, or equal  
 LOAD: (TBD-1)

## Interconnection Data

WIRE TYPE & NO.: Seven conductors; one twisted, shielded pair and five single conductors  
 WIRE SIZE: No. 22 AWG

A/C: F-46  
 REF: MIL-H-27269  
 1F-4E-2-14

|       |      |            |             |
|-------|------|------------|-------------|
| A     | DATE | REVISION   | DESCRIPTION |
|       |      |            | ICD-GPS-020 |
| SCALE | DEV  | PAGE 10-22 |             |

# ELECTRICAL CHARACTERISTICS

| SOURCE                                                                   |                      |
|--------------------------------------------------------------------------|----------------------|
| HS1 (AF/A24J-1), Course Resolver, Bendix<br>Type EP AY-221-5-B, or equal |                      |
| Input Winding                                                            | Rotor                |
| Input Voltage                                                            | 26 Vac, 400 Hz       |
| Input Current                                                            | 12 ma                |
| Input Power                                                              | 100 mw               |
| Impedance, Zso                                                           | 700 + j2100 Ohms     |
| Rotor Resistance (DC)                                                    | 400 Ohms             |
| Output Voltage                                                           | 17.2 Volts           |
| Accuracy                                                                 | 20 Minutes<br>(max.) |
| Phase Shift                                                              | 10 Degrees           |

|       |               |             |
|-------|---------------|-------------|
| DATE  | FORM IDENT NO | REVISION NO |
| A     |               | ICD-GPS-020 |
| SCALE | REV           | SHEET 10-23 |



# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME        | TYPE    | I/O | FROM                       | TO |
|--------------------|---------|-----|----------------------------|----|
| Digital Input Data | Digital | I   | AN/ARN-101<br>(Future Mod) | UE |

## Functional Description

Provides the UE with the following digital data to aid in acquiring satellites and improving AJ capabilities:

- 1) Latitude
- 2) Longitude
- 3) Velocities (Vx, Vy, Vz)
- 4) Covariances
- 5) Others (TBD-3)

## Signal Characteristics

(TBD-3)

## Electrical Characteristics

(TBD-3)

## Interconnection Data

(TBD-3)

A/C: F-4G  
wLF:

|      |           |             |
|------|-----------|-------------|
| DATE | ISSUED BY | REVISION    |
| A    |           | ICD-GPS-020 |
| DATE | REV       | DATE 10-24  |

| SIGNAL NAME     | TYPE  | I/O | FROM | TO |
|-----------------|-------|-----|------|----|
| Blanking Pulses | Pulse | I   | IFF  | UE |

Provides blanking pulses (suppression) to blank the GPS UE receiver when the IFF is transmitting.

(TBD-2)

SOURCE: IFF, Coder-Receiver Transmitter (KY-532A/ASQ)  
LOAD: (TBD-1)

WIRE TYPE & NO.: Coaxial Cable, Type (TBD-2)

|       |               |                |
|-------|---------------|----------------|
| DATE  | DATE RECEIVED | CLASSIFICATION |
| A     |               | ICD-GPS-020    |
| CLASS | REV           | DATE 10-25     |

## 9. FUTURE MODIFICATIONS

### 9.1 On-Going and Near-Term Modifications

Table 9-1 lists some of the known on-going or near-term F-4G modifications not previously addressed herein. Some of the modifications (e.g., the installation of the ARC-164 UHF Radio and the ARN-118 TACAN Set) may be incorporated shortly into the actual F-4E to F-4G conversion/production modification process. If so, then only a limited number of F-4G production aircraft completed previously would need a retrofit for these systems, that could be accomplished at the operational squadron or wing location.

### 9.2 Future Planned Modifications

Table 9-2 lists some of the planned or tentative Class IV and V modifications that could impact an available spares if approved.

| Table 9-1. ON-GOING/NEAR-TERM MODIFICATIONS |                                                                                                                                                                                                                                                                                      |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Terminology/Nomenclature                    | Remarks                                                                                                                                                                                                                                                                              |
| UHF Radio/ARC-164                           | Replaces appropriate UHF radio portion of the ASQ-19 Integrated Electronic Central. The RT-1145 transceiver unit with associated mounting adapter (Magna-vox #706521-801) replaces the RT-793A unit. See the RF-4C and F-4E configuration summaries, Section 11 for ARC-164 details. |
| TACAN Set/ARN-118                           | Replaces appropriate TACAN portion of the ASQ-19 system including the RT-547 transceiver and the KY-312 pulse decoder. See the F-4E and RF-4C data summaries for details.                                                                                                            |
| ECM Mission Recorder                        | Mounting provisions are provided as part of the APR-38 installation. The unit is not yet in production.                                                                                                                                                                              |
| Navigation System                           | An improved navigation system will most likely be installed in the F-4G. However, the candidate has yet to be selected from among several contenders, including the ARN-101 and the AJQ-25 systems. Details of the ARN-101 are contained in the F-4E Data Summary, Section 11.5.     |

(continued)

| Table 9-1. (continued)       |                                                                                                                                                                                                                                                  |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Terminology/Nomenclature     | Remarks                                                                                                                                                                                                                                          |
| Airborne Video Tape Recorder | This forward cockpit console mounted unit will provide capability to video tape information presented on radar and E/O displays.                                                                                                                 |
| AGM-65A Maverick Capability  | Already part of the F-4G production modification cycle, this mod provides AGM-65A missile carriage and launch capability and the Digial Scan Converter to the F-4G. An improved TV display for the APQ-120 Fire Control Radar System is included |

| Table 9-2. PLANNED MODIFICATIONS |                                                                                                                        |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------|
| Terminology/Nomenclature         | Remarks                                                                                                                |
| VHF AM/FM Radio/ARC-186          | Provides VHF AM and FM voice or data communications capability.                                                        |
| Intercommunications Set/AIC-18   | Possible replacement of ASQ-19 intercom with separate system.                                                          |
| Global Positioning System        | Highly accurate, three-dimensional, space located, world-wide, position-fixing system.                                 |
| Vinson/KY-58                     | Replacement for Parkhill/KY-28 Secure System.                                                                          |
| APR-38 Enhancement Program       | Expansion of current ECM Receiving System (Wild Weasel) Capability. This is not completely formulated/approved as yet. |
| JTIDS                            | Time Division Multiple Access to the Communicating System                                                              |

## 10. DATA SOURCES

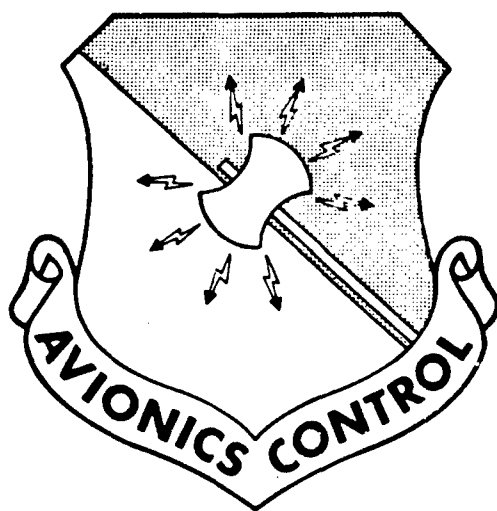
The following sources of data were used in preparing this summary:

- Aircraft and avionics configuration data assembled by ARINC Research, principally in the form of copies of applicable sections, tables, and figures from the aircraft and equipment Technical Orders listed at the end of this section
- Avionics Planning Baseline Document - October 1978
- McDonnell Report 8738: Environmental Design Requirements and Test Procedures - Aircraft Electronic Equipment, 5 April 1962, Rev. 1 July 1964.
- Information supplied by Ogden ALC
- ARINC Research Informal Report: Technical Report, Preliminary JTIDS Configuration Data Analyses, May 1978

### Inventory of Technical Orders

| <u>T.O. Number</u> | <u>Subject</u>                                                          | <u>Change<br/>Number</u> | <u>Date</u>         |
|--------------------|-------------------------------------------------------------------------|--------------------------|---------------------|
| 1F-4G-1            | Flight Manual                                                           |                          | 9/15/78             |
| 1F-4G-2-1          | Aircraft General                                                        |                          | 12/15/77            |
| 1F-4G-2-22         | System Integration                                                      |                          | 1/15/78             |
| 1F-4G-501          | Group B Installation for APR-38                                         | 1                        | 1/20/77             |
| 1F-4G-600          | F-4E to F-46 Conversion<br>Including Group A Installation<br>for APR-38 |                          | Final Draft<br>Copy |

**AVIONICS INTERFACE DATA SUMMARY  
FOR  
F-15A**



**October 1979**

**Issued by  
The Deputy for Avionics Control  
ASD/AX  
A Joint AFSC/AFLC Organization**

## FOREWORD

This document is one of a series of reports that describe Avionics interfaces for various USAF aircraft. It was prepared for the Deputy for Avionics Control, Aeronautical Systems Division (ASD/AX), Wright-Patterson AFB, Ohio by ARINC Research Corporation, Annapolis, Maryland under Contract F33657-79-C-0567.





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## 1. INTRODUCTION

This document contains configuration data relevant to the integration of additional avionics into the F-15A aircraft.

This document will be periodically revised as additional modifications are planned and incorporated into the aircraft. Queries regarding information contained herein should be addressed to:

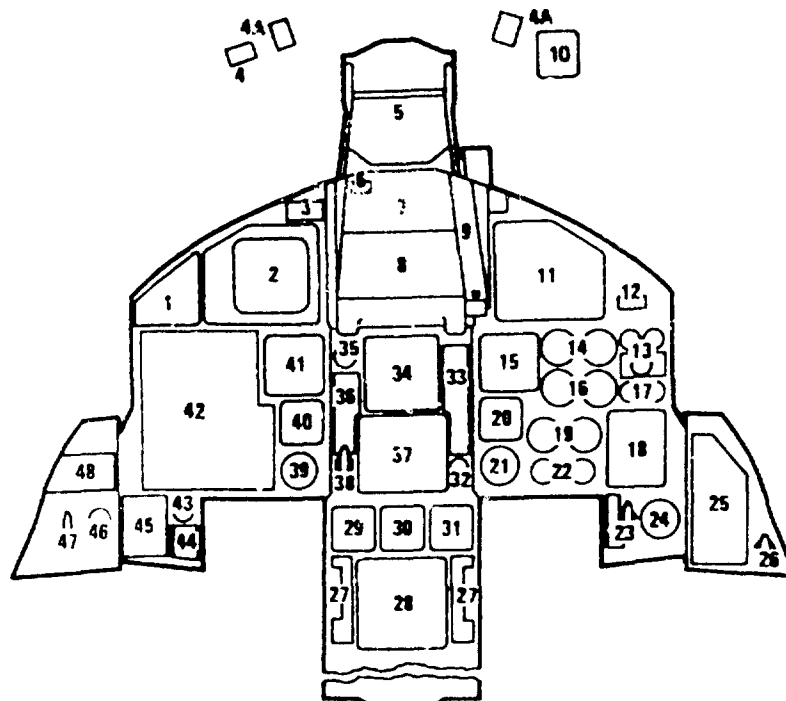
The Deputy for Avionics Control  
Code: ASD/AXP  
Wright-Patterson AFB, Ohio

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The applicable technical orders are included in the references listed in Section 10.

## 2. COCKPIT SPACE

There is space available for controls within the F-15A cockpit (Figures 2-1, 2-2, and 2-3). On the right console there is a single blank panel approximately 1.91" x 5.75". On the left console there are five blank panels. The total amount of space available is 12.1" x 5.75"; with proper alterations, most of this space can be utilized.



## MAIN PANEL AREA

- |                                               |                                               |
|-----------------------------------------------|-----------------------------------------------|
| 1. FIRE WARNING/EXTINGUISHING PANEL           | 24. CABIN PRESSURE ALTIMETER                  |
| 2. VERTICAL SITUATION DISPLAY (VSD)           | 25. CAUTION LIGHTS PANEL                      |
| 3. RADIO CALL PANEL                           | 26. EMERGENCY VENT CONTROL HANDLE             |
| 4. AIR REFUELING READY LIGHT                  | 27. CIRCUIT BREAKER PANELS                    |
| 4A. LOCK/SHOOT LIGHTS (SOME AIRCRAFT)         | 28. COCKPIT COOLING AND PRESSURIZATION OUTLET |
| 5. HEAD UP DISPLAY COMBINING GLASS            | 29. STANDBY AIRSPEED INDICATOR                |
| 6. MASTER CAUTION LIGHT                       | 30. STANDBY ATTITUDE INDICATOR                |
| 7. MAIN COMMUNICATIONS CONTROL PANEL          | 31. STANDBY ALTIMETER                         |
| 8. HEAD UP DISPLAY CONTROL PANEL              | 32. RUDDER PEDAL ADJUST RELEASE KNOB          |
| 9. GUN SIGHT CAMERA CONTROL PANEL             | 33. MASTER MODE CONTROLS/MARKER BEACON PANEL  |
| 10. STANDBY MAGNETIC COMPASS                  | 34. ATTITUDE DIRECTOR INDICATOR               |
| 11. TEWS DISPLAY UNIT                         | 35. EMERGENCY JETTISON SWITCH                 |
| 12. CANOPY UNLOCKED WARNING LIGHT             | 36. STEERING MODE PANEL                       |
| 13. HYDRAULIC PRESSURE INDICATORS             | 37. HORIZONTAL SITUATION INDICATOR            |
| 14. ENGINE TACHOMETERS                        | 38. EMERGENCY BRAKE/STEERING CONTROL HANDLE   |
| 15. ALTIMETER                                 | 39. ACCELEROMETER                             |
| 16. FAN TURBINE INLET TEMPERATURE INDICATORS  | 40. ANGLE OF ATTACK INDICATOR                 |
| 17. ENGINE OIL PRESSURE INDICATORS            | 41. AIRSPEED/MACH INDICATOR                   |
| 18. FUEL QUANTITY INDICATOR                   | 42. ARMAMENT CONTROL PANEL                    |
| 19. ENGINE FUEL FLOW INDICATORS               | 43. PITCH RATIO INDICATOR                     |
| 20. VERTICAL VELOCITY INDICATOR               | 44. PITCH RATIO SELECT SWITCH                 |
| 21. EIGHT DAY CLOCK                           | 45. LANDING GEAR CONTROL HANDLE               |
| 22. ENGINE EXHAUST NOZZLE POSITION INDICATORS | 46. FLAP POSITION INDICATOR                   |
| 23. JET FUEL STARTER CONTROL HANDLE           | 47. EMERGENCY LANDING GEAR HANDLE             |
|                                               | 48. ARRESTING HOOK CONTROL SWITCH             |

Figure 2-1. COCKPIT, MAIN INSTRUMENT PANEL, F-15A

## RIGHT CONSOLE AREA

1. OXYGEN REGULATOR
2. ECS PANEL
3. TEMPERATURE PANEL
4. CANOPY CONTROL HANDLE
5. INTERIOR LIGHTS CONTROL PANEL
6. TEWS POD CONTROL PANEL
7. OXYGEN HOSE STOWAGE FITTING
8. BLANK
9. ENGINE START FUEL SWITCHES
10. UTILITY LIGHT
11. STOWAGE COMPARTMENT
12. OXYGEN/COMMUNICATION  
OUTLET PANEL
13. COMPASS CONTROL PANEL
14. TEWS POWER CONTROL PANEL
15. NAVIGATION CONTROL PANEL
16. ENGINE CONTROL PANEL

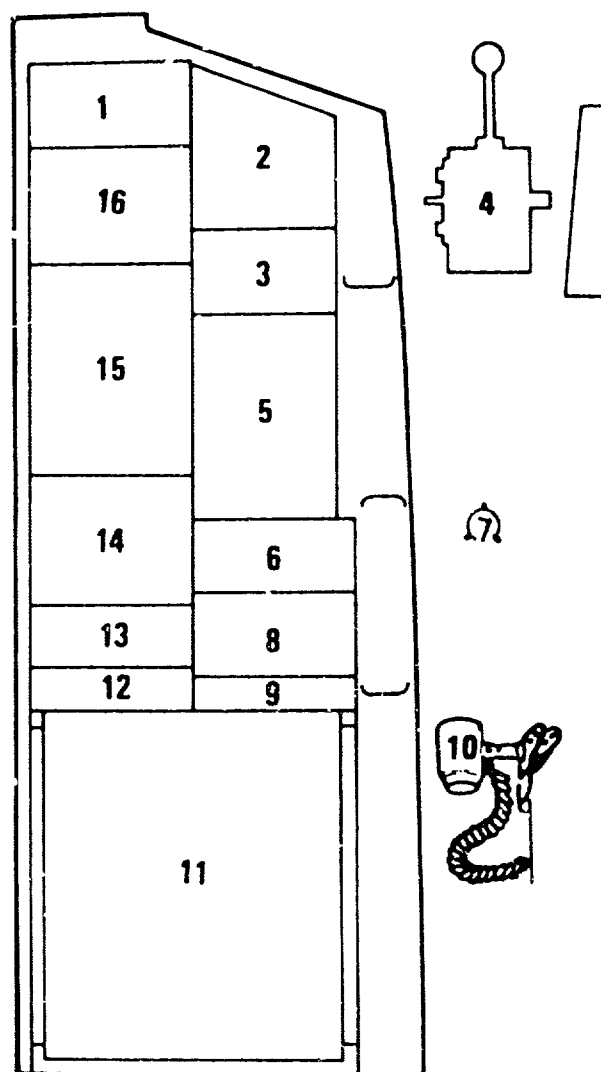


Figure 2-2. COCKPIT, RIGHT CONSOLE AREA, F-15A

## LEFT CONSOLE AREA

1. ILS/TACAN CONTROL PANEL
2. CONTROL AUGMENTATION SYSTEM CONTROL PANEL
3. BLANK
4. THROTTLE QUADRANT
5. EXTERIOR LIGHTS CONTROL PANEL
6. INTEGRATED COMMUNICATIONS CONTROL PANEL
7. BLANK, (F); TAKE COMMAND/CS CONTROL PANEL, (TF)
8. BLANK
9. ANTI-G PANEL
10. BOARDING STEPS POSITION INDICATOR
11. BLANK
12. ARMAMENT SAFETY OVERRIDE SWITCH
13. GROUND POWER PANEL
14. BLANK
15. EMERGENCY AIR REFUELING HANDLE
16. HY PANEL
17. INTERROGATOR CONTROL PANEL
18. IFF CONTROL PANEL
19. IFF ANTENNA SELECT SWITCH
20. TEWS PANEL
21. SEAT ADJUST SWITCH
22. RADAR CONTROL PANEL
23. VMAX SWITCH
24. BLANK
25. FUEL CONTROL PANEL
26. MISCELLANEOUS CONTROL PANEL
27. CANOPY JETTISON HANDLE

### NOTE

- ① (F) 77-0061 AND UP;  
(TF) 77-0154 AND UP.

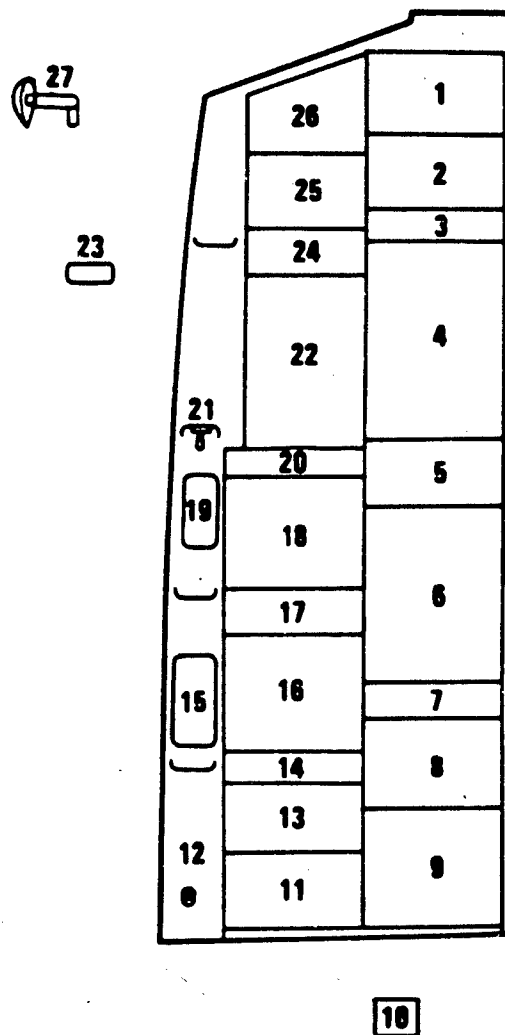


Figure 2-3. COCKPIT, LEFT CONSOLE AREA, F-15A



### 3. AVIONICS SPACE

Currently there are 20.8 cubic feet of equipment space in the F-15A located in six different areas (Figure 3-1 and Table 3-1). Table 3-1 lists possible spaces where new equipment may be installed. Some candidate avionics for these spaces are listed also. With the tail area there are two large areas that will require coding. The irregular interior of the space in Section B may complicate equipment installation.

Additional new avionics or ECPs (listed in Tables 5-1 and 9-1) that are not already shown as candidates for the spaces shown in this section are not expected to have any impact on these spaces. A possible exception may be SEEK TALK which is still in preliminary planning. The engine diagnostics system listed in Table 5-1 is currently planned for aircraft F-105 through F-110 only.

Table 3-1. F<sup>2</sup>E SUMMARY - F-15A

| F <sup>2</sup> E Criteria                                                                                                                                             | Potential Available Space                                                        |                                                                                              |                                                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| Location Reference and Description                                                                                                                                    | A<br>Aft Cockpit Bay 5                                                           | A<br>Bay 5 Next to Rear Wall                                                                 | B<br>Canopy Shelf Above Bay 5                                                                |
| Rectangular Size*<br>(H, W, D)<br>Volume                                                                                                                              | 24" 21-1/2" 32"<br>9.6 ft <sup>3</sup>                                           | 15" 10" 10"<br>0.9 ft <sup>3</sup>                                                           | 8.5" 16.5" 34"<br>2.8 ft <sup>3</sup>                                                        |
| Type Cooling Available                                                                                                                                                | Convection and Forced Air                                                        | Normal Cockpit Cooling                                                                       | Convection                                                                                   |
| Temperature-Altitude                                                                                                                                                  | Cont. Op. -540° to 71° C at 70k Ft, 30 min.<br>+95° C at 50k Ft.<br>±2 g Maximum | Class 2, MIL-E-2400                                                                          | Class 2, MIL-E-2400                                                                          |
| Vibration                                                                                                                                                             | Endurance 9.5 gs 50 to 2,000 Hz                                                  | 50 to 1,000 Hz<br>0.019 g <sup>2</sup> /Hz Performance<br>0.067 g <sup>2</sup> /Hz Endurance | 50 to 1,000 Hz<br>0.019 g <sup>2</sup> /Hz Performance<br>0.067 g <sup>2</sup> /Hz Endurance |
| Possible Candidates for the Space                                                                                                                                     | TEWS Threat Update                                                               | None Known                                                                                   | Video Tapes Recorders                                                                        |
| Remarks                                                                                                                                                               |                                                                                  |                                                                                              | None Known                                                                                   |
| *Where LRU is currently installed, the dimensions given represent dimensions of LRU; when no LRU is installed, the dimensions given are those of the available space. |                                                                                  |                                                                                              |                                                                                              |

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Table 3-1. (continued)

| F <sup>2</sup> E Criteria                 | Potential Available Space                                                                                           |                                                                                                                     |                                                                                                                     |                                                                                                                     |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
|                                           | D<br>Access<br>Door 6R                                                                                              | D<br>Access<br>Door 6R                                                                                              | D<br>Access<br>Door 6R                                                                                              | E<br>Access<br>Door 47R                                                                                             |
| Rectangular Size *<br>(H, W, D)<br>Volume | 4.5" 4" 5"<br>0.05 ft <sup>3</sup>                                                                                  | 2.25" 6.5" 7"<br>0.06 ft <sup>3</sup>                                                                               | 7" 6.5" 21"<br>0.9 ft <sup>3</sup>                                                                                  | 7" 10.25" 21"<br>0.9 ft <sup>3</sup>                                                                                |
| Type Cooling<br>Available                 | Forced Air<br>Available                                                                                             | Forced Air<br>Available                                                                                             | Convection                                                                                                          | Convection                                                                                                          |
| Temperature-Altitude<br>Vibration         | Class 2, MIL-E-2400<br>50 to 1,000 Hz<br>0.019 g <sup>2</sup> /Hz Performance<br>0.067 g <sup>2</sup> /Hz Endurance | Class 2, MIL-E-2400<br>50 to 1,000 Hz<br>0.019 g <sup>2</sup> /Hz Performance<br>0.067 g <sup>2</sup> /Hz Endurance | Class 2, MIL-E-2400<br>50 to 1,000 Hz<br>0.019 g <sup>2</sup> /Hz Performance<br>0.067 g <sup>2</sup> /Hz Endurance | Class 2, MIL-E-2400<br>50 to 1,000 Hz<br>0.019 g <sup>2</sup> /Hz Performance<br>0.037 g <sup>2</sup> /Hz Endurance |
| Possible Candidates<br>for the Space      | None Known                                                                                                          | None Known                                                                                                          | None Known                                                                                                          | Tail Warning Set                                                                                                    |
| Remarks                                   | Small                                                                                                               | Small                                                                                                               | Space contains<br>dead-ended cabling                                                                                | Existing                                                                                                            |

Table 3-1. (continued)

| F <sup>2</sup> E Criteria                 | Potential Available Space                                                                                              |                                                                                                                        |                                                                                                                        |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
|                                           | E<br>Access<br>Door 48R                                                                                                | F<br>Bay 155L                                                                                                          | F<br>Bay 155R                                                                                                          |
| Rectangular Size *<br>(H, W, D)<br>Volume | 10.5" 14" 10.25"<br>0.9 ft <sup>3</sup>                                                                                | 6.5" 12.25" 16."<br>0.8 ft <sup>3</sup>                                                                                | 7" 12" 20.5"<br>1.0 ft <sup>3</sup>                                                                                    |
| Type Cooling<br>Available                 | Convection                                                                                                             | Convection                                                                                                             | Convection                                                                                                             |
| Temperature-Altitude                      | Cont. Op. -54° to<br>71° C at 70k Ft.<br>30 min, 95° C of<br>50k Ft.<br>± 2 g Maximum<br>Endurance 9.5 gs<br>50 - 2kHz | Cont. Op. -54° to<br>71° C at 70k Ft.<br>30 min, 95° C of<br>50k Ft.<br>± 2 g Maximum<br>Endurance 9.5 gs<br>50 - 2kHz | Cont. Op. -54° to<br>71° C at 70k Ft.<br>30 min, 95° C of<br>50k Ft.<br>± 2 g Maximum<br>Endurance 9.5 gs<br>50 - 2kHz |
| Vibration                                 |                                                                                                                        |                                                                                                                        |                                                                                                                        |
| Possible Candidates<br>for the Space      | ALE-4C<br>Chaff Disp. Set                                                                                              | None Known                                                                                                             | Tail Warning Set                                                                                                       |
| Remarks                                   | Rounded, Not<br>Rectangular                                                                                            | Existing                                                                                                               | Existing                                                                                                               |

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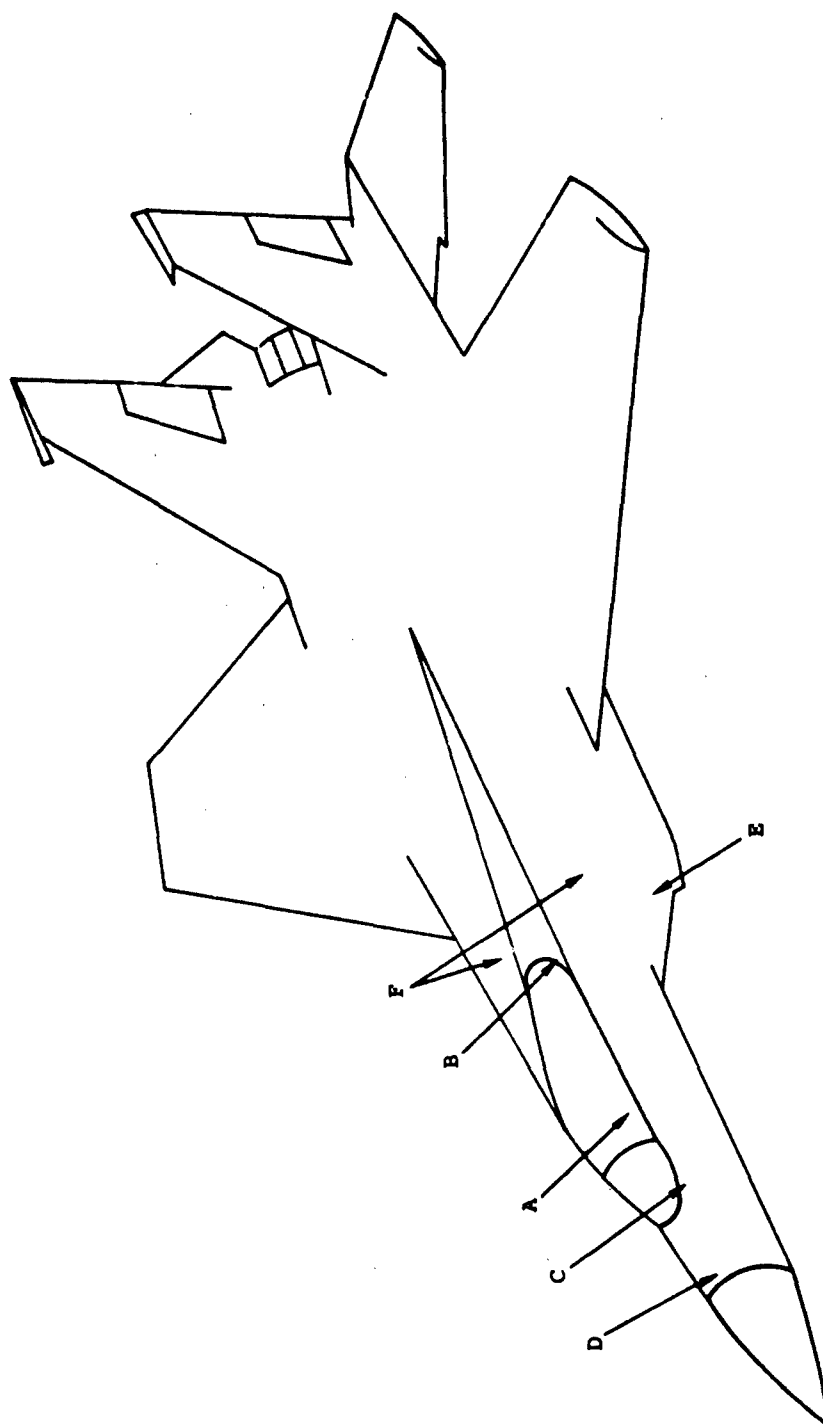


Figure 3-1. F-15A GROWTH VOLUME

#### 4. ELECTRICAL POWER

##### 4.1 Main Power System

The main electrical power system is made up principally of two 40/50 kVA, 115 Vac, 3-phase, 400 Hz, constant-speed drive generators. These two generators are connected in split-bus nonsynchronous operation to supply the essential and emergency/essential buses. This generating system consists of the following:

- Integrated Drive Generator
- Generator Control Unit
- Current Transformer Assembly
- Bus Tie Fuses
- Line Contactor
- GEN OUT Caution Light

##### 4.2 Emergency Power Supply System

If the main power system breaks down, the emergency power system will provide ac and dc power to the essential loads of the aircraft. This system will supply power to fuel control valves during engine start or shutdown.

The following components make up this system:

- Emergency generator
- Emergency generator-hydraulic motor
- Emergency generator/stabilator selector valve
- Emergency generator control unit
- Engine control bus relay
- Emergency/essential relay
- Emergency/essential bus lock-in relay
- Essential power control relay
- Ac present relay
- Essential ac contactor
- Essential dc contactor
- EMERG GEN switch
- EMER GEN ON light

##### 4.3 Power Conversion and Distribution System

This system supplies and distributes power to various aircraft systems, converts 115 Vac 3-phase to 28 Vdc, and converts 115 Vac to 26 Vac. To

perform these operations, there is a need for a left, right, and essential 115 Vac, 400 Hz, 3-phase bus system, and a low-voltage ac and dc bus system. Normally the left and right buses are operated in a split-bus condition, and the essential 115 Vac, 3-phase bus is powered from the left bus via the deenergized contacts of the essential ac contactor.

## 5. ENVIRONMENTAL CONTROL SYSTEM

### 5.1 General

The F-15A Environmental Control System (ECS) employs a conventional bootstrap air cycle that is augmented by a regenerative heat exchanger to provide cooling air to the avionics and electrical equipment, as well as to the cabin. A liquid cooling system is used to cool the radar transmitter.

### 5.2 Cabin Cooling

The Air-Cycle Air Conditioning System (ACACS) provides conditioned air to both the cabin and the avionics; the cabin airflow requirements have priority over the conditioned air required for avionics cooling. If cabin cooling requirements cause a decrease in the avionics airflow, the entire ACACS is automatically adjusted until the airflow requirements of both the cabin and avionics can be satisfied the nominal airflow rate into the cabin is 13 lb./min. with a maximum capability of 25 lb./min.

### 5.3 Avionics Cooling

The ECS is designed to provide sufficient cooling airflow to limit the equipment bays' total mixed-air discharge temperature to a maximum of 160°F with the Internal Countermeasures Set (ICS) "ON" or 140°F with the ICS "OFF". The cooling airflow is provided to the various equipments by the ECS via ducting. The desired airflow rates and temperature levels are controlled by the avionics air circuit controller (AACC) which can manipulate hot and cold air modulating valves to control airflow temperature.

The AACC is set to maintain the airflow temperature at 82.5°F ( $\pm 2.5^\circ$ ) at altitudes less than 34,500 feet and at 53°F ( $\pm 3^\circ$ ) at altitudes greater than 34,500 feet. The two different airflow temperatures are used to avoid moisture condensation in the avionics compartments at low altitudes and to minimize bleed air requirements at high altitudes.

The total cooling airflow required is established by the AACC. The actual airflow is controlled by a ground-selected schedule to provide the flow rate necessary to maintain the equipment bay's total mixed-air discharge temperature requirements of 160°F or 140°F. There are five such flow-rate schedules. The specific schedule selected operates within tolerance band rather than to a set curve. The flow-rate tolerance bands vary within the five schedules from 63 to 90 lb./min. at 85°F for Schedule 1 to 83 to 109 lb./min. at 85°F for Schedule 5. The AACC will maintain the airflow nominal altitude-dependent temperatures of 82.5°F or 53°F as long as the ECS has the capability to deliver air temperatures as low as the control temperatures.

A liquid cooling system is used to cool the radar transmitter. The present liquid cooling load is approximately 6,350 watts.



#### 5.4 Avionics Forced-Air Cooling Power

The avionics cooling air allocations are illustrated in Table 5-1. Table 5-1 may be summarized as follows:

|                                                                                                                        |                |
|------------------------------------------------------------------------------------------------------------------------|----------------|
| Installed Avionics Required Cooling Power -                                                                            | 19,828.4 watts |
| Approved ECPs Required Cooling Power -                                                                                 | 4,999.0 watts  |
| Pending ECPs Required Cooling Power -                                                                                  | 496.0 watts    |
| Equipment Provisions Required Cooling Power -                                                                          | 1,650.0 watts  |
| Total Required Cooling Power                                                                                           | 26,973.4 watts |
| Present F-15A Total Available Forced-Air -<br>Cooling Power (Not including Aerodynamic<br>heating growth of 464 watts) | 25,394.4 watts |
| Deficit Cooling Power                                                                                                  | 1,579 watts    |

The present F-15A ECS capacity cannot meet the cooling requirements of the planned equipment installations throughout the airplane operating envelope. Approximately 1,050 watts of cooling power presently held in reserve may be added to the available cooling power, which will reduce the deficit to 529 watts. Additionally, an investigation is underway into changing the airflow temperature and flow schedules. These changes have the possibility of adding up to 7,000 watts of additional cooling power to the airplane.

| Table 5-1. AVIONICS COOLING-AIR ALLOCATIONS FOR F-15A                                                                                                                                                                                                                                                                                                                                                            |                          |                               |           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-------------------------------|-----------|
| Compartment                                                                                                                                                                                                                                                                                                                                                                                                      | Cooling Power<br>(Watts) | Airflow at 85°F<br>(Lb./Min.) |           |
|                                                                                                                                                                                                                                                                                                                                                                                                                  |                          | ICS On*                       | ICS Off** |
| Installed Avionics                                                                                                                                                                                                                                                                                                                                                                                               |                          |                               |           |
| Bay 1 Left                                                                                                                                                                                                                                                                                                                                                                                                       | 4,891.5                  | 15.462                        | 21.085    |
| Bay 1 Right                                                                                                                                                                                                                                                                                                                                                                                                      | 2,281.1                  | 7.211                         | 9.833     |
| Bay 2 Left                                                                                                                                                                                                                                                                                                                                                                                                       | 1,224.0                  | 3.871                         | 5.278     |
| Bay 2 Right                                                                                                                                                                                                                                                                                                                                                                                                      | 573.5                    | 1.813                         | 2.473     |
| Bay 3 Left                                                                                                                                                                                                                                                                                                                                                                                                       | 878.4                    | 2.778                         | 3.788     |
| Bay 3 Right                                                                                                                                                                                                                                                                                                                                                                                                      | 1,322.2                  | 4.184                         | 5.705     |
| ICS Bay (Aft cockpit - Bay 5)                                                                                                                                                                                                                                                                                                                                                                                    | 7,849.0†<br>1,046.5††    | 24.810†<br>-                  | 4.491#    |
| Aft Bays                                                                                                                                                                                                                                                                                                                                                                                                         | 460.2                    | 1.475                         | 1.987     |
| Right Rear Cockpit                                                                                                                                                                                                                                                                                                                                                                                               | 348.5                    | 1.100                         | 1.500     |
| Subtotal                                                                                                                                                                                                                                                                                                                                                                                                         | 19,828.4                 | 62.704                        | 56.140    |
| Approved Engineering Change Proposals                                                                                                                                                                                                                                                                                                                                                                            |                          |                               |           |
| TEKS Threat Update<br>CCP-120-ICS/WR Bands<br>(ICS Bay)                                                                                                                                                                                                                                                                                                                                                          | 4,954                    | 15.654                        | 1.566#,## |
| Video Tape Recorder<br>ECP 1045 VTR<br>(Aft Bay)                                                                                                                                                                                                                                                                                                                                                                 | 45                       | 0.142                         | 0.194     |
| Subtotal                                                                                                                                                                                                                                                                                                                                                                                                         | 4,999                    | 15.796                        | 1.760     |
| Pending Engineering Change Proposals                                                                                                                                                                                                                                                                                                                                                                             |                          |                               |           |
| ECP TWS                                                                                                                                                                                                                                                                                                                                                                                                          | 396                      | 1.251                         | 1.706     |
| Engine Diagnostics System                                                                                                                                                                                                                                                                                                                                                                                        | 100                      | 0.316                         | 0.431     |
| Subtotal                                                                                                                                                                                                                                                                                                                                                                                                         | 496                      | 1.567                         | 2.137     |
| Anticipated Additional Avionics                                                                                                                                                                                                                                                                                                                                                                                  |                          |                               |           |
| TISEO                                                                                                                                                                                                                                                                                                                                                                                                            | 950                      | 3.002                         | 4.094     |
| IR Tail Warning                                                                                                                                                                                                                                                                                                                                                                                                  | 600                      | 1.896                         | 2.586     |
| ALE-40(V) Chaff Dispenser                                                                                                                                                                                                                                                                                                                                                                                        | 100                      | 0.316                         | 0.431     |
| Subtotal                                                                                                                                                                                                                                                                                                                                                                                                         | 1,650                    | 5.214                         | 7.111     |
| Total                                                                                                                                                                                                                                                                                                                                                                                                            | 26,973.4                 | 85.281                        | 67.148    |
| *Airflow required to limit average total mixed air discharge temperature to a maximum of 160°F.<br>**Airflow required to limit average total mixed air discharge temperature to a maximum of 140°F.<br>†Cooling power for ICS on.<br>††Cooling power for ICS in standby. Total cooling power based on ICS on.<br>#Based on cooling power for ICS in standby. Included in ICS off totals.<br>##Approximate value. |                          |                               |           |

## 6. CURRENT AVIONICS

Tables 6-1 through 6-22 contain LRU data relating to the F-15A avionics systems that make up the current or near-term configuration. Where no entries are shown, the data were not available for this report. Data pertaining to future avionics modifications are presented in Section 9.

| Table 6-1. F-15A AVIONICS CONFIGURATION DATA: AM/ANC-164 UHF RADIO NSM:* (REPLACES AM-ANC-109) |                 |          |                     |      |      |                       |                 |                |       |                             |                |          |
|------------------------------------------------------------------------------------------------|-----------------|----------|---------------------|------|------|-----------------------|-----------------|----------------|-------|-----------------------------|----------------|----------|
| Name                                                                                           | Nomenclature    | Location | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |       | Heat Dissipation            | Cooling Method | Mounting |
|                                                                                                |                 |          | H                   | W    | D    |                       |                 | AC             | DC    |                             |                |          |
| Main R/T                                                                                       | RT-1168/NC-164  | Door 3R  | 4.87                | 5.75 | 8.62 | 242                   | 9.25            | 400Hz 5V       | 27.5V | 110W TX Mode<br>35W RX Mode | Convection     | Console  |
| Guard R/T                                                                                      | RT-1145/AMC-164 | Door 3R  | 4.73                | 4.98 | 8.25 | 194                   | 8.10            | 27.5V          | 27.5V |                             | Convection     | Console  |
| Control                                                                                        | C-9533/ANC-164  | Cockpit  | 4.87                | 5.75 | 5.34 | 150                   | 4.32            |                |       |                             | Convection     | Console  |
| Indicator                                                                                      | ID-1961/ANC-164 | Cockpit  | 2.25                | 2.38 | 5.90 | 31.6                  | 0.9             |                |       |                             | Convection     | Panel    |
| Antenna Selector                                                                               | C-4808/ANC-164  | Cockpit  |                     |      |      |                       |                 |                |       |                             | Convection     | Console  |
| *ANC-164/V13; 5821-01-008-4600; V14: -4601; V15: -4599; V24: -4603; V3: -4604; V4: -4598.      |                 |          |                     |      |      |                       |                 |                |       |                             |                |          |

| Table 6-2. F-15A AVIONICS CONFIGURATION DATA: AM/ARC-109 UHF RADIO MSN: 5821-00-496-9236 (BEING REPLACED BY AM/ARC-164) |                 |          |                     |      |      |                       |                 |                |    |                      |                |            |
|-------------------------------------------------------------------------------------------------------------------------|-----------------|----------|---------------------|------|------|-----------------------|-----------------|----------------|----|----------------------|----------------|------------|
| Name                                                                                                                    | Nomenclature    | Location | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation     | Cooling Method | Mounting   |
|                                                                                                                         |                 |          | H                   | W    | D    |                       |                 | AC             | DC |                      |                |            |
| UHF Antenna (Low)                                                                                                       | AS-2817/ARC-109 | Door 1L  |                     |      |      |                       |                 |                |    |                      |                | Hard       |
| Auxiliary UHF Receiver                                                                                                  | R-1789/ARC-109  | Door 3R  | 5.59                | 6.40 | 11.9 |                       | 63.3            | 0.136          |    | 0.25 lb/min at 40° C | Forced Air     |            |
| UHF Radio                                                                                                               | RT-967/ARC-109  | Door 3R  | 6.78                | 8.84 | 14.8 |                       | 28.7            |                |    |                      | Forced Air     | Shock Tray |
| UHF Antenna Selector                                                                                                    | C-9634/ARC-109  | Door 3R  |                     |      |      |                       |                 |                |    |                      |                |            |
| UHF Antenna (Low)                                                                                                       | AS-2817/ARC-109 | Door 6R  |                     |      |      |                       |                 |                |    |                      |                |            |
| Control                                                                                                                 | C-9015/ARA      | Cockpit  |                     |      |      |                       |                 |                |    |                      |                |            |

| Table 6-3. F-15A AVIONICS CONFIGURATION DATA. KY-28 COMMUNICATIONS SPEECH SECURITY SET |                         |          |                     |      |     |                       |                 |                |               |                  |                |          |
|----------------------------------------------------------------------------------------|-------------------------|----------|---------------------|------|-----|-----------------------|-----------------|----------------|---------------|------------------|----------------|----------|
| Name                                                                                   | Nomenclature            | Location | Dimensions (Inches) |      |     | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |               | Heat Dissipation | Cooling Method | Mounting |
|                                                                                        |                         |          | H                   | W    | D   |                       |                 | AC             | DC            |                  |                |          |
| Crypto Control                                                                         | TSEL/KY-28<br>NSN: TBD  | Door JR  | 7.8                 | 5.0  | 9.1 | 155                   | 25.0            |                | 28V<br>0.04kW | 100 BTU/hr       | Convection     | Panel    |
|                                                                                        | C-90011/ARA<br>NSN: TBD | Cockpit  |                     | 5.75 |     |                       |                 |                | 28V           |                  | Convection     |          |

| Table 6-4. F-15A AVIONICS CONFIGURATION DATA: OA-8639/ARD UNF-ADF |                                          |             |                     |     |     |                       |                 |                |    |                  |                |          |
|-------------------------------------------------------------------|------------------------------------------|-------------|---------------------|-----|-----|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                              | Nomenclature                             | Location    | Dimensions (Inches) |     |     | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                   |                                          |             | H                   | W   | D   |                       |                 | AC             | DC |                  |                |          |
| Control Amplifier                                                 | AM-0440/APD                              | Door JR     | 4.5                 | 5.5 | 7.0 |                       | 5.6             |                |    |                  |                |          |
| Control Unit                                                      |                                          | Cockpit     |                     |     |     |                       |                 |                |    |                  |                |          |
| Antenna                                                           | AS-2701/ARD<br>NSN: 5826-<br>00-262-5022 | Nose Radome |                     |     |     |                       |                 |                |    |                  |                |          |

| Table 6-5. F-15A AVIONICS CONFIGURATION DATA: AN/AJN-18 FLIGHT DIRECTOR SYSTEM NSN: TRD |                |          |                     |   |   |                       |                 |                |    |                  |                |          |
|-----------------------------------------------------------------------------------------|----------------|----------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                    | Nomenclature   | Location | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                         |                |          | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| Flight Director Adapter                                                                 | MX-9114/AJN-18 | Door 3R  |                     |   |   |                       |                 |                |    |                  |                |          |



| Table 6-6. F-15A AVIONICS CONFIGURATION DATA: AM/ASK-6 CADC MSN: 6610-00-295-2454* |              |          |                     |   |   |                       |                 |                |    |                  |                |          |
|------------------------------------------------------------------------------------|--------------|----------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                               | Nomenclature | Location | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                    |              |          | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| Air Data Computer                                                                  | AM/ASK-6     | Door 3R  |                     |   |   |                       |                 |                |    |                  |                |          |
| Airspeed Mach Indicator                                                            | AVU-25/A     | Cockpit  |                     |   |   |                       |                 |                |    |                  |                |          |
| Altitude Indicator                                                                 | ID-1818/ASN  | Cockpit  |                     |   |   |                       |                 |                |    |                  |                |          |
| Left AOA Transponder                                                               | T-1217/AR    | Door 5L  |                     |   |   |                       |                 |                |    |                  |                |          |
| Right AOA Transponder                                                              | T-1217/AR    | Door 5R  |                     |   |   |                       |                 |                |    |                  |                |          |
| Vertical Speed Indicator                                                           | AAU-29/A     | Cockpit  |                     |   |   |                       |                 |                |    |                  |                |          |
| *Also 6610-00-505-1798.                                                            |              |          |                     |   |   |                       |                 |                |    |                  |                |          |

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| Table 6-7. F-15A AVIONICS CONFIGURATION DATA: AN/ASN-109 INERTIAL NAVIGATION SYSTEM |                                          |          |                     |   |   |                       |                 |                |    |                  |                |          |
|-------------------------------------------------------------------------------------|------------------------------------------|----------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                | Nomenclature                             | Location | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                     |                                          |          | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| Inertial Measurement Unit                                                           | CN-1376/ASN-109<br>ASN: 6605-00-179-1817 | Door 3R  |                     |   |   |                       |                 |                |    |                  |                |          |
| Navigation Control Indicator Panel                                                  | C-8849/ASN-109<br>ASN: 6605-00-304-2454  | Cockpit  |                     |   |   |                       |                 |                |    |                  |                |          |

| Table 6-8. F-5A AVIONICS CONFIGURATION DATA: AM/ASN-108 ATTITUDE-HEADING REFERENCE SYSTEM NSN: TBD |                 |          |                     |      |      |                       |                 |                |    |                  |                |          |
|----------------------------------------------------------------------------------------------------|-----------------|----------|---------------------|------|------|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                               | Nomenclature    | Location | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                    |                 |          | H                   | W    | D    |                       |                 | AC             | DC |                  |                |          |
| Gyro                                                                                               | CN-137S/ASN-108 | Door 6R  | 7.05                | 7.0  | 8.6  |                       | 13.9            |                |    |                  |                |          |
| Gyro Amplifier                                                                                     | AM-6435/ASN-108 | Door 6R  | 6.10                | 7.75 | 9.75 |                       | 13.9            |                |    |                  |                |          |

| Table 6-9. P-15A AVIONICS CONFIGURATION DATA AN/ARN-112 INSTRUMENT LANDING SYSTEM |                                         |          |                     |      |      |                       |                 |                |      |                  |                |          |
|-----------------------------------------------------------------------------------|-----------------------------------------|----------|---------------------|------|------|-----------------------|-----------------|----------------|------|------------------|----------------|----------|
| Name                                                                              | Nomenclature                            | Location | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |      | Heat Dissipation | Cooling Method | Mounting |
|                                                                                   |                                         |          | H                   | W    | D    |                       |                 | AC             | DC   |                  |                |          |
| ILS Receiver                                                                      | R-1755/ARN-112<br>NSN: 5826-00-279-6114 | Door 3R  | 5.0                 | 3.75 | 10.0 |                       | 6.6             |                | 0.02 |                  |                |          |
| Integrated Navigation Air Control Panel                                           | C-9014/ARN-112<br>NSN: 1110-00-367-6298 | Cockpit  |                     |      |      |                       |                 |                |      |                  |                |          |
| Glide slope/Localizer Antenna                                                     | A5-2704/ARN-112<br>NSN: TBD             | Door 1   |                     |      |      |                       |                 |                |      |                  |                |          |
| Marker Beacon Antenna                                                             | A5-28961/ARN-112<br>NSN: THD            |          |                     |      |      |                       |                 |                |      |                  |                |          |

| Table 6-10. F-15A AVIONICS CONFIGURATION DATA: AH/ARN-118 TACAN NSM: 5826-01-015-0434 (REPLACES AH/ARC-111) |                 |          |                     |      |      |                       |                 |                                |     |                  |                |          |
|-------------------------------------------------------------------------------------------------------------|-----------------|----------|---------------------|------|------|-----------------------|-----------------|--------------------------------|-----|------------------|----------------|----------|
| Name                                                                                                        | Nomenclature    | Location | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power                 |     | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                             |                 |          | H                   | W    | D    |                       |                 | AC                             | DC  |                  |                |          |
| Receiver Transmitter                                                                                        | RT-1159/ARN-118 | Door 3R  | 6.8                 | 7.5  | 14.6 | 745                   | 26.5            | 400Hz<br>115V<br>0.250kw<br>1φ | 28V | 100W             | Convection     | Shock    |
| Receiver Transmitter Adapter                                                                                | MX-9577/ARN-118 |          | 6.78                | 1.73 | 13.1 | 154                   | 5.0             | 26V<br>400Hz                   |     | 10W              | Convection     | Shock    |
| Control                                                                                                     | C-9014/ARN-118  | Cockpit  | 2.3                 | 5.8  | 5.5  | 73.4                  | 2.0             |                                |     | 35W              | Convection     | Console  |

| Table 6-11. F-15A AVIONICS CONFIGURATION DATA: AR/ARN-111 TACAN SYSTEM NSN: TBD (BEING REPLACED BY AR/ARN-118) |                 |          |                     |      |      |                       |                 |                |    |                  |                |          |
|----------------------------------------------------------------------------------------------------------------|-----------------|----------|---------------------|------|------|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                                           | Nomenclature    | Location | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                                |                 |          | H                   | W    | D    |                       |                 | AC             | DC |                  |                |          |
| Receiver                                                                                                       | RT-1045/ARN-111 | Door JR  | 6.86                | 6.85 | 16.7 |                       |                 |                |    |                  |                |          |

| Table 6-12. F-15A AVIONICS CONFIGURATION DATA: CENTRAL COMPUTER |                                        |          |                     |   |   |                       |                 |                |    |                  |                |          |
|-----------------------------------------------------------------|----------------------------------------|----------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                            | Nomenclature                           | Location | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                 |                                        |          | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| Computer                                                        | CP-1075/AYK<br>MSN: 4730-00-142-1418   | 6L       |                     |   |   |                       |                 |                |    |                  |                |          |
| Data Processor                                                  | CP-111/AVQ-20<br>MSN: 5910-00-070-2834 | 6L       |                     |   |   |                       |                 |                |    |                  |                |          |
| Data Processor                                                  | CP-1088P<br>MSN: TBD                   | 6L       |                     |   |   |                       |                 |                |    |                  |                |          |

| Table 6-11. F-15A AVIONICS CONFIGURATION DATA: INTERFERENCE BLANKER REF. TWO |              |          |                     |   |   |                       |                 |                |    |                  |                |          |
|------------------------------------------------------------------------------|--------------|----------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                         | Nomenclature | Location | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                              |              |          | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| Interference                                                                 | MO-9287/A    | Door 3R  |                     |   |   |                       |                 |                |    |                  |                |          |



| Table 6-14. F-15A AVIONICS CONFIGURATION DATA: AM/APX-101 IPT TRANSFORMER RESN: 5895-01-016-6739 |                 |          |                     |      |       |                       |                 |                |             |                  |                |                 |
|--------------------------------------------------------------------------------------------------|-----------------|----------|---------------------|------|-------|-----------------------|-----------------|----------------|-------------|------------------|----------------|-----------------|
| Name                                                                                             | Nomenclature    | Location | Dimensions (Inches) |      |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |             | Heat Dissipation | Cooling Method | Mounting        |
|                                                                                                  |                 |          | H                   | W    | D     |                       |                 | AC             | DC          |                  |                |                 |
| R/T Unit<br>Control Panel                                                                        | RT-1063/APX-101 | Door JR  | 5.8                 | 6.0  | 10.82 | 377                   | 14.3            |                | 0.0635      | 55W              | Convection     | Special Console |
|                                                                                                  | C-628CA/APX     | cockpit  | 5.25                | 5.75 | 3.1   | 94                    | 3.0             | 6V<br>1A       | 28V<br>0.2A | 30W              |                |                 |

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| Table 6-15. F-15A AVIONICS CONFIGURATION DATA: A/A/APX-76 177 INTERCOMPUTER MSN: 5895-00-115-7813* |                 |          |                     |       |       |                       |                  |                       |             |                  |                |          |
|----------------------------------------------------------------------------------------------------|-----------------|----------|---------------------|-------|-------|-----------------------|------------------|-----------------------|-------------|------------------|----------------|----------|
| Name                                                                                               | Nomenclature    | Location | Dimensions (Inches) |       |       | Volume (Cubic Inches) | Weight* (Pounds) | Aircraft Power        |             | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                    |                 |          | H                   | W     | D     |                       |                  | AC                    | DC          |                  |                |          |
| R/T Unit<br>Control Unit                                                                           | RT-868A/APX-76  | Door IR  | 7.63                | 5.0   | 19.37 | 737.2                 | 19.0             | 0.230                 | 0.074       |                  | Forced Air     | MT-4024  |
|                                                                                                    | C-7959/APX-76   | Cockpit  | 2.87                | 5.75  | 2.25  |                       |                  |                       |             |                  | Convection     | Panel    |
| Evaluator                                                                                          | MX-9147/APX-76  | Door IR  |                     |       |       |                       |                  |                       |             |                  |                |          |
| Computer Interrogator                                                                              | KIR-1A/APX-76   | Door IR  | 6.0                 | 6.7   | 10.0  | 402.0                 | 11.0             | 0.03                  |             | 30W              | Convection     |          |
| Switch Amplifier                                                                                   | SA-1568A/APX-76 | TBO      | 6.0                 | 5.125 | 11.5  | 349.0                 | 10.0             | 115V<br>0.1A<br>400Hz | 28V<br>0.2A |                  | Convection     | MT-3829  |
| Electronic Synchronizer                                                                            | SN-416A/B       | TBO      | 6.0                 | 5.125 | 9.00  |                       | 7.25             | 0.24A                 | 1A          |                  | Convection     | MT-3923  |

\*All MSN 5895-00-702-4040.

| Table 6-16. F-15A AVIONICS CONFIGURATION DATA: AM/APG-63 FIRE CONTROL/ACQUISITION RADAR NSN: 5941-01-060-0616 |                |             |                     |      |       |                       |                 |                |    |                  |                |          |
|---------------------------------------------------------------------------------------------------------------|----------------|-------------|---------------------|------|-------|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                                          | Nomenclature   | Location    | Dimensions (Inches) |      |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                               |                |             | M                   | L    | D     |                       |                 | AC             | DC |                  |                |          |
| Radar S/T Antenna                                                                                             | AS-2712/APG-63 | Nose Radome | 36.0                | 36.0 | 23.23 |                       | 110             |                |    |                  |                |          |
| Integrating Gyro                                                                                              |                | Nose Radome |                     |      |       |                       |                 |                |    |                  |                |          |
| Radar Horn Antenna                                                                                            | AS-2711/APG-63 | Nose Radome |                     |      |       |                       |                 |                |    |                  |                |          |
| Radar Target Data Processor                                                                                   | MX-9100/APG    | Door 3L     |                     |      |       |                       |                 |                |    |                  |                |          |
| Radar Power Supply                                                                                            | PP-6682/APG    | Door 3L     |                     |      |       |                       |                 |                |    |                  |                |          |
| Radar Data Processor                                                                                          | MX-9099/APG    | Door 3L     |                     |      |       |                       |                 |                |    |                  |                |          |
| Radar Transmitter                                                                                             | T-1208/APG-63  | Door 3L     |                     |      |       |                       |                 |                |    |                  |                |          |
| R F Oscillator                                                                                                | O-1620/APG-63  | Door 3L     |                     |      |       |                       |                 |                |    |                  |                |          |
| Radar Receiver                                                                                                | R-1765/APG     | Door 3L     |                     |      |       |                       |                 |                |    |                  |                |          |

| Table 6-17. P-15A AVIONICS CONFIGURATION DATA: AN/ALQ-128 RADAR WARNING SYSTEM NSN: 5865-00-209-3961 |                 |             |                     |   |   |                       |                 |                |    |                  |                |          |
|------------------------------------------------------------------------------------------------------|-----------------|-------------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                                 | Nomenclature    | Location    | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                      |                 |             | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| ICS Radar                                                                                            | AN/ALQ-128      |             |                     |   |   |                       |                 |                |    |                  |                |          |
| Sum and Difference Diplexer                                                                          | LO-2101/ALQ-128 | Door JR     |                     |   |   |                       |                 |                |    |                  |                |          |
| Switch                                                                                               | SA-1985/ALQ-128 | Nose Radome |                     |   |   |                       |                 |                |    |                  |                |          |
| Antenna                                                                                              | AS-2958/ALQ-128 | Nose Radome |                     |   |   |                       |                 |                |    |                  |                |          |
| Radar Warning                                                                                        | OR-1132/ALQ-128 | Door JR     |                     |   |   |                       |                 |                |    |                  |                |          |

| Table 6-18. 1-15A AVIONICS CONFIGURATION DATA: AN/ALR-56 RADAR WARNING SET MSN: 5865-00-209-3955 |                |                        |                     |   |   |                       |                 |                |    |                  |                |          |
|--------------------------------------------------------------------------------------------------|----------------|------------------------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                             | Nomenclature   | Location               | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                  |                |                        | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| Receiver                                                                                         | R-1866/ALR-56  | Door 6R                |                     |   |   |                       |                 |                |    |                  |                |          |
| Power Supply                                                                                     | PP-6968/ALR-56 | Door 6R                |                     |   |   |                       |                 |                |    |                  |                |          |
| TEWS Antenna                                                                                     | AS-2934/ALR-56 | Nose Landing Gear Door |                     |   |   |                       |                 |                |    |                  |                |          |

| Table 6-19. F-15A AVIONICS CONFIGURATION DATA: AN/ALQ-135 ELECTRONIC COUNTERMEASURES MSN: 5855-00-209-3962* |                      |           |                     |   |   |                       |                 |                |    |                |
|-------------------------------------------------------------------------------------------------------------|----------------------|-----------|---------------------|---|---|-----------------------|-----------------|----------------|----|----------------|
| Name                                                                                                        | Nomenclature         | Location  | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Cooling Method |
|                                                                                                             |                      |           | H                   | W | D |                       |                 | AC             | DC |                |
| ICS Antenna                                                                                                 | AS-2903/ALQ-135      | Door 3L   |                     |   |   |                       |                 |                |    |                |
| ICS Antenna                                                                                                 | AS-2903/ALQ(v)       | Door 6R   |                     |   |   |                       |                 |                |    |                |
| Summing Network                                                                                             | CU-2081/ALQ-135      | #5 Bay L. |                     |   |   |                       |                 |                |    |                |
| R F Amplifier                                                                                               | AM-6597/ALQ-135      | #5 Bay L. |                     |   |   |                       |                 |                |    |                |
| Oscillator Control                                                                                          | C-9341(p)/ALQ-135(v) | #5 Bay L. |                     |   |   |                       |                 |                |    |                |
| Oscillator Control                                                                                          | C-9362(p)/ALQ-135    | #5 Bay L. |                     |   |   |                       |                 |                |    |                |
| R F Amplifier                                                                                               | AM-6598/ALQ-135      | #5 Bay L. |                     |   |   |                       |                 |                |    |                |
| *MSN given for AN/ALQ-135(v).                                                                               |                      |           |                     |   |   |                       |                 |                |    |                |

| Table 6-20. F-15A AVIONICS CONFIGURATION DATA: ARMAMENT CONTROL SRT NSN: TBD |                |          |                     |   |   |                       |                 |                |    |                  |                |          |
|------------------------------------------------------------------------------|----------------|----------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                         | Nomenclature   | Location | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                              |                |          | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| AUG-20                                                                       | CV-1080/AMG-20 | 6L       |                     |   |   |                       |                 |                |    |                  |                |          |
| Programmer                                                                   | NSN: TBD       |          |                     |   |   |                       |                 |                |    |                  |                |          |
| Control                                                                      | C-9358/AMG-20  | Cockpit  |                     |   |   |                       |                 |                |    |                  |                |          |

| Table 6-21. F-15A AVIONICS CONFIGURATION DATA: KIT-A IFF CRYPTO NSN: TBD |              |          |                     |      |      |                       |                 |                |    |                  |                |          |
|--------------------------------------------------------------------------|--------------|----------|---------------------|------|------|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                     | Nomenclature | Location | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                          |              |          | H                   | W    | D    |                       |                 | AC             | DC |                  |                |          |
| Crypto Unit<br>Control                                                   | TSEL/KIT-1A  | TBD      | 6.5                 | 5.0  | 8.2  |                       |                 | 1ø<br>0.03     |    | 30W              |                |          |
|                                                                          | TBD          | Cockpit  | 3.375               | 5.75 | ≈4.0 |                       | ≈2.0            |                |    |                  | Convection     | Shock    |



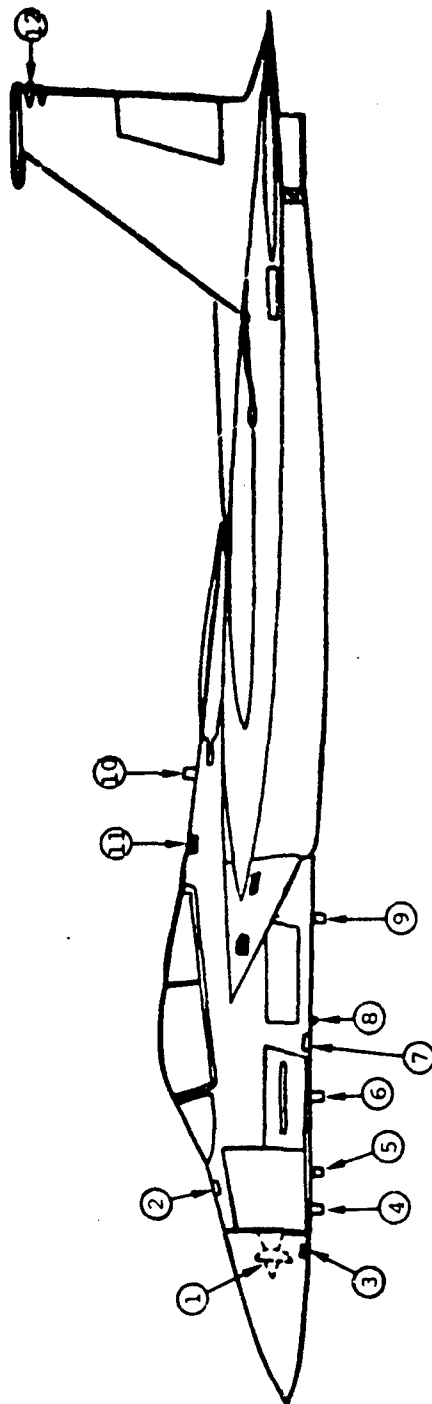
| Table 6-22. F-15A AVIONICS CONFIGURATION DATA: MISCELLANEOUS |                                      |          |                     |   |   |                       |                 |                |    |                  |                |          |
|--------------------------------------------------------------|--------------------------------------|----------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                         | Nomenclature                         | Location | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                              |                                      |          | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| Interference Blanker                                         | MC-9287/A                            | Door 3R  |                     |   |   |                       |                 |                |    |                  |                |          |
| Electronic Counter                                           | ABJ-K7/AJ7J-8<br>NSN: TBD            | Door 6R  |                     |   |   |                       |                 |                |    |                  |                |          |
| Lead Computing Gyro                                          | CN-1377/AMG<br>NSN: 1270-00-516-9039 | Door 10R |                     |   |   |                       |                 |                |    |                  |                |          |
| Signal Data Receiver                                         | AN/ASH-28<br>NSN: TBD                |          |                     |   |   |                       |                 |                |    |                  |                |          |
| Visual Site Display                                          | OD-60A<br>NSN: TBD                   |          |                     |   |   |                       |                 |                |    |                  |                |          |

## 7. ANTENNA LOCATIONS

Figure 7-1 shows the approximate location of the antennas on the F-15A.

The nomenclature for the antennas, as shown on the figure, is as follows:

| <u>Location</u> | <u>Antenna</u>        | <u>Nomenclature or<br/>Part Number</u> |
|-----------------|-----------------------|----------------------------------------|
| 1               | Radar/IFF             | AS-2712/APG                            |
| 2               | ADF Antenna           | AS-2701/ARD                            |
| 3               | Glide Slope/Localizer | AS-2740/ARN                            |
| 4               | TACAN/UHF             | AS-2817/ARC                            |
| 5               | ILS Transmit          | AS-2903/ALQ-135                        |
| 6               | UHF/IFF               | AS-2817/ARC                            |
| 7               | Marker Beacon         | AS-2796/ARN                            |
| 8               | Radar Warning         | AS-2903/ALQ-135                        |
| 9               | ICS Transmit          | AS-2903/ALQ-135                        |
| 10              | Upper TACAN           | AS-2799/ARN                            |
| 11              | UHF/IFF               | AS-2817/ARC                            |
| 12              | Radar Warning         | AS-2959/ALQ-128                        |



- |                                 |                                        |
|---------------------------------|----------------------------------------|
| 1. Radar/IFF Antenna            | 7. Marker Beacon Antenna               |
| 2. ADF Antenna                  | 8. Radar Warning Antenna               |
| 3. Glideslope/Localizer Antenna | 9. ICS Transmit Antenna                |
| 4. TACAN/UHF Antenna            | 10. TACAN Antenna                      |
| 5. ILS Transmit Antenna         | 11. UHF/IFF Antenna                    |
| 6. UHF/IFF Antenna              | 12. Radar Warning Antenna (both sides) |
| 7. Marker Beacon Antenna        |                                        |

Figure 7-1. F-15A ANTENNA LOCATIONS

## 8. INTERFACE DATA

This section contains examples of interface signal characteristics and a description of the F-15A Multiplex bus requirements. These data were extracted from applicable sections of the Interface Control Document (ICD) for integration of GPS User Equipment in the F-15 aircraft.

Each signal characteristic sheet discusses a particular signal. The top line contains the signal name, type of signal (digital, analog, discrete, or synchronous), signal source and load, and whether the signal is an input or output of the GPS user equipment. A functional description follows, together with a description of the signal's characteristics.

The general requirements of the F-15A data bus, were originally extracted from a report (H009) dated 12 March 1969 entitled *F-15 Multiplex Data Bus*. A copy of the preliminary draft of that report is included in this section, beginning on page 8-2.

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM | TO                      |
|-------------|---------|-----|------|-------------------------|
| Bearing     | Digital | 0   | UE   | Flight Director Adapter |

## Functional Description

Provides angular information, in digital format, of the relative bearing of the aircraft's present position to a selected waypoint. The relative bearing is the difference, in degrees, between the lubber line and the bearing pointer as read from the compass card.

## Signal Characteristics

WORD/FRAME STRUCTURE: See Appendix III, Paragraph 2.2  
 INFORMATION IDENTIFIER: See Appendix III, Paragraph 2.2.1  
 TIMING TOLERANCES: See Appendix III, Paragraph 3.2.1  
 DATA STANDARD: See Table 1A, Item 1 and Appendix III, Paragraph 2.2.2

## Electrical Characteristics

See Appendix III, Paragraphs 3.2.2, 4.2.1, 4.2.2

## Interconnection Data

See Appendix III, Paragraph 4.0

A/C: F-15A  
 REF: T.O. 1F-15A-2-18  
 Report H009

|      |             |              |
|------|-------------|--------------|
| A    | FORM 100-10 | REVISION NO. |
|      | ICD-GPS-011 |              |
| DATE | REV         | SHEET 10-2   |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM | TO                      |
|-------------|---------|-----|------|-------------------------|
| Distance    | Digital | O   | UE   | Flight Director Adapter |

## Functional Description

Provides the distance from the aircraft's present position to the next selected waypoint.

## Signal Characteristics

WORD/FRAME STRUCTURE: See Appendix III, Paragraph 2.2  
 INFORMATION IDENTIFIER: See Appendix III, Paragraph 2.2.1  
 TIMING TOLERANCES: See Appendix III, Paragraph 3.2.1  
 DATA STANDARD: See Table IA, Item 2 and Appendix III, Paragraph 2.2.2

## Electrical Characteristics

See Appendix III, Paragraphs 3.2.2, 4.2.1, 4.2.2

## Interconnection Data

See Appendix III, Paragraph 4.0

A/C: F-15A  
 REF: IF-15A-2-18  
 Report H009

|        |             |        |
|--------|-------------|--------|
| A      | FORM 100-10 | 100-10 |
|        | 100-10      | 100-10 |
| 100-10 | 100-10      | 100-10 |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM                    | TO |
|-------------|---------|-----|-------------------------|----|
| Course Set  | Digital | O   | Flight Director Adapter | UE |

## Functional Description

Provides an electrical reference signal of the course manually selected by the Course Set Control or the HSI. This signal will be used by the UE as a reference for positioning the course deviation and To-From indicators on the HSI.

## Signal Characteristics

WORD/FRAME STRUCTURE: See Appendix III, Paragraph 2.2  
 INFORMATION IDENTIFIER: See Appendix III, Paragraph 2.2.1  
 TIMING TOLERANCES: See Appendix III, Paragraph 3.2.1  
 DATA STANDARDS: See Table IA, Item 3 and Appendix III, Paragraph 2.2.2.

## Electrical Characteristics

See Appendix III, Paragraphs 3.2.2, 4.2.1, 4.2.2

## Interconnection Data

See Appendix III, Paragraph 4.0

A/C: F-15A  
 REF: T.O. 1F-15A-2-18  
 Report H009

|   |             |      |
|---|-------------|------|
| A | ICD-GPS-011 |      |
|   | REV         | 10-4 |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME          | TYPE    | I/O | FROM | TO                      |
|----------------------|---------|-----|------|-------------------------|
| Horizontal Deviation | Digital | O   | UE   | Flight Director Adapter |

## Functional Description

Provides a variable signal that indicates the displacement of the aircraft to the left or right of a selected course. The displacement represented by the indicating device will be controlled by UE software and will be dependent upon aircraft flight phase. The indicating device may display angular displacement (e.g., 10° for a TACAN approach; 2.5° for ILS) or distance. For an area navigation system, the Area Navigation Subcommittee of the Air Transport Association's Air Traffic Control Committee has recommended the following ranges for the flight modes indicated: (a) Enroute: 2-6 miles full scale, (b) Terminal: 1-2 miles full scale and (c) Approach: 600-3000 feet full scale. Choice of presentation (distance/degrees) and scales are TBD-3.

## Signal Characteristics

WORD/FRAME STRUCTURE: See Appendix III, Paragraph 2.2  
 INFORMATION IDENTIFIER: See Appendix III, Paragraph 2.2.1  
 TIMING TOLERANCES: See Appendix III, Paragraph 3.2.1  
 DATA STANDARD: See Table IA, Item 4 and Appendix III, Paragraph 2.2.2

## Electrical Characteristics

See Appendix III, Paragraphs 3.2.2, 4.2.1, 4.2.2

## Interconnection Data

See Appendix III, Paragraph 4.0

A/C: F-15A  
 REF: T.O. 1F-15A-2-18  
 Report H009

|       |                 |             |
|-------|-----------------|-------------|
| DATE  | ISSUE IDENT AND | ISSUANCE NO |
| A     |                 | ICD-GPS-011 |
| SCALE | REV             | SHEET 10-5  |



# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME        | TYPE    | I/O | FROM | TO                      |
|--------------------|---------|-----|------|-------------------------|
| Vertical Deviation | Digital | O   | UE   | Flight Director Adapter |

## Functional Description

Provides a variable signal that indicates the displacement of the aircraft above or below a desired flight path. The displacement represented by the indicating device will be controlled by UE software and will be dependent upon aircraft flight phase. The indicating device may display angular displacement (e.g., 0.5° for ILS) or distance. For an area navigation system, the Area Navigation Subcommittee of the Air Transport Association's Air Traffic Control Committee has recommended the following ranges for the flight modes indicated: (a) Enroute: 200 to 2000 feet full scale, (b) Terminal: 60-200 feet full scale and (c) Approach: 40-100 feet full scale. Choice of presentation (distance/degrees) and scales are TBD-3.

## Signal Characteristics

WORD/FRAME STRUCTURE: See Appendix III, Paragraph 2.2  
 INFORMATION IDENTIFIER: See Appendix III, Paragraph 2.2.1  
 TIMING TOLERANCES: See Appendix III, Paragraph 3.2.1  
 DATA STANDARD: See Table IA, Item 5 and Appendix III, Paragraph 2.2.2

## Electrical Characteristics

See Appendix III, Paragraphs 3.2.2, 4.2.1, 4.2.2

## Interconnection Data

See Appendix III, Paragraph 4.0

A/C: F-15A  
 REF: T.O. 1F-15A-2-18  
 Report M009

|   |      |             |
|---|------|-------------|
| A | NAME | ICD-GPS-011 |
|   | REV  | 10-6        |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM | TO                      |
|-------------|---------|-----|------|-------------------------|
| To-From     | Digital | 0   | UE   | Flight Director Adapter |

## Functional Description

Provides a digital signal which indicates direction aircraft is flying in relation to the selected waypoint. If the aircraft is flying toward the waypoint and has not intercepted a reference line perpendicular to the aircraft ground track and through the waypoint, the indication will be To. Once past the waypoint reference line, the indication will be From, as long as the same waypoint is selected.

## Signal Characteristics

WORD/FRAME STRUCTURE: See Appendix III, Paragraph 2.2  
 INFORMATION IDENTIFIER: See Appendix III, Paragraph 2.2.1  
 TIMING TOLERANCES: See Appendix III, Paragraph 3.2.1  
 DATA STANDARD: Logic 1 = From  
 Logic 0 = To

## Electrical Characteristics

See Appendix III, Paragraphs 3.2.2, 4.2.1, 4.2.2

## Interconnection Data

See Appendix III, Paragraph 4.0

A/C: F-15A  
 REF: T.O. 1F-15A-2-18  
 Report H009

|       |                  |              |
|-------|------------------|--------------|
| A     | ISSUE REPORT NO. | ISSUING ORG. |
|       | ICD-GPS-011      |              |
| TABLE | REV              | DATE 10-7    |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME   | TYPE             | I/O | FROM | TO                      |
|---------------|------------------|-----|------|-------------------------|
| Distance Flag | Digital Discrete | 0   | UE   | Flight Director Adapter |

## Functional Description

Provides a digital discrete signal to the Flight Director Adapter to operate the HSI distance warning flag. The flag is normally out of view when the range indicator is operating and the range data is valid. The flag covers the range indicator when the distance information is not valid or the device supplying the distance data is not operating.

## Signal Characteristics

WORD/FRAME STRUCTURE: See Appendix III, Paragraph 2.2  
 INFORMATION IDENTIFIER: See Appendix III, Paragraph 2.2.1  
 TIMING TOLERANCES: See Appendix III, Paragraph 3.2.1  
 DATA STANDARD: Logic 1 = Valid  
 Logic 0 = Invalid

## Electrical Characteristics

See Appendix III, Paragraphs 3.2.2, 4.2.1, 4.2.2

## Interconnection Data

See Appendix III, Paragraph 4.0

A/C: F-15A  
 REF: T.O. 1F-15A-2-18  
 Report H009

|             |            |               |
|-------------|------------|---------------|
| DOC: A      | ISSUE: 001 | REVISION: 001 |
| 1CD-GPS-011 |            |               |
| DATE: 10-8  | REV: 001   | ISSUE: 001    |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME               | TYPE             | I/O | FROM | TO                      |
|---------------------------|------------------|-----|------|-------------------------|
| Horizontal Deviation Flag | Digital Discrete | 0   | UE   | Flight Director Adapter |

## Functional Description

Provides a digital discrete signal to the Flight Director Adapter to operate the HSI and ADI deviation warning flags or circuits when the deviation data is unreliable or a malfunction has occurred in the course deviation circuitry.

## Signal Characteristics

WORD/FRAME STRUCTURE: See Appendix III, Paragraph 2.2  
 INFORMATION IDENTIFIER: See Appendix III, Paragraph 2.2.1  
 TIMING TOLERANCES: See Appendix III, Paragraph 3.2.1  
 DATA STANDARD: Logic 1 = Valid  
 Logic 0 = Invalid

## Electrical Characteristics

See Appendix III, Paragraphs 3.2.2, 4.2.1, 4.2.2

## Interconnection Data

See Appendix III, Paragraph 4.0

A/C: F-15A  
 REF: T.O. 1F-15A-2-18  
 Report H009

|      |             |              |
|------|-------------|--------------|
| A    | FORM 100-10 | REVISION NO. |
|      |             | ICD-GPS-011  |
| FORM | REV         | DATE 10-8    |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME             | TYPE             | I/O | FROM | TO                      |
|-------------------------|------------------|-----|------|-------------------------|
| Vertical Deviation Flag | Digital Discrete | O   | UE   | Flight Director Adapter |

## Functional Description

Provides a digital discrete signal to the Flight Director to advise the ADI when the UE vertical deviation signal is not reliable.

## Signal Characteristics

WORD/FRAME STRUCTURE: See Appendix III, Paragraph 2.2  
 INFORMATION IDENTIFIER: See Appendix III, Paragraph 2.2.1  
 TIMING TOLERANCES: See Appendix III, Paragraph 3.2.1  
 DATA STANDARD: Logic 1 = Valid  
 Logic 0 = Invalid

## Electrical Characteristics

See Appendix III, Paragraphs 3.2.2, 4.2.1, 4.2.2

## Interconnection Data

See Appendix III, Paragraph 4.0

A/C: F-15A  
 REF: T.O. 1F-15A-2-18  
 Report H009

|          |          |          |             |
|----------|----------|----------|-------------|
| DATE     | REVISION | REVISION | REVISION    |
| A        |          |          | ICD-GPS-011 |
| REVISION | REV      | SHEET    | 10-10       |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM | TO                      |
|-------------|---------|-----|------|-------------------------|
| Latitude    | Digital | O   | UE   | Flight Director Adapter |

## Functional Description

Provides present position latitude in digital format to Flight Director Adapter for transfer to the Central Computer.

## Signal Characteristics

WORD/FRAME STRUCTURE: See Appendix III, Paragraph 2.2  
 INFORMATION IDENTIFIER: See Appendix III, Paragraph 2.2.1  
 TIMING TOLERANCES: See Appendix III, Paragraph 3.2.1  
 DATA STANDARD: See Table 1A, Item 6 and Appendix III, Paragraph 2.2.2

## Electrical Characteristics

See Appendix III, Paragraphs 3.2.2, 4.2.1, 4.2.2

## Interconnection Data

See Appendix III, Paragraph 4.0

A/C: F-15A  
 REF: T.O. 1F-15A-2-18  
 Report H009

|             |      |             |           |
|-------------|------|-------------|-----------|
| A           | DATE | REV         | ISSUED BY |
|             | DATE | REV         | ISSUED BY |
| ICD-GPS-011 |      | Sheet 10-11 |           |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM | TO                      |
|-------------|---------|-----|------|-------------------------|
| Longitude   | Digital | O   | UE   | Flight Director Adapter |

## Functional Description

Provides present position longitude in digital format to the Flight Director Adapter for transfer to the Central Computer.

## Signal Characteristics

WORD/FRAME STRUCTURE: See Appendix III, Paragraph 2.2  
 INFORMATION IDENTIFIER: See Appendix III, Paragraph 2.2.1  
 TIMING TOLERANCES: See Appendix III, Paragraph 3.2.1  
 DATA STANDARD: See Table IA, Item 7 and Appendix III, Paragraph 2.2.2

## Electrical Characteristics

See Appendix III, Paragraphs 3.2.2, 4.2.1, 4.2.2

## Interconnection Data

See Appendix III, Paragraph 4.0

A/C: F-15A  
 REF: T.O. 1F-15A-2-18  
 Report H009

|   |          |             |
|---|----------|-------------|
| A | FORM NO. | 1CD-GPS-011 |
|   | REV      | 10-12       |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME          | TYPE    | I/O | FROM | TO                      |
|----------------------|---------|-----|------|-------------------------|
| North-South Velocity | Digital | O   | UE   | Flight Director Adapter |

## Functional Description

Provides north-south velocity in digital format to the Flight Director Adapter for transfer to the Central Computer.

## Signal Characteristics

WORD/FRAME STRUCTURE: See Appendix III, Paragraph 2.2  
 INFORMATION IDENTIFIER: See Appendix III, Paragraph 2.2.1  
 TIMING TOLERANCES: See Appendix III, Paragraph 3.2.1  
 DATA STANDARD: See Table 1A, Item 8 and Appendix III, Paragraph 2.2.2

## Electrical Characteristics

See Appendix III, Paragraphs 3.2.2, 4.2.1, 4.2.2

## Interconnection Data

See Appendix III, Paragraph 4.0

A/C: F-15A  
 REF: T.O. 1F-15A-2-18  
 Report H009

|             |      |            |     |
|-------------|------|------------|-----|
| FIG         | NAME | DATE       | REV |
| A           |      |            |     |
| ICD-GPS-011 |      |            |     |
| TOTAL       | REV  | PAGE 10-13 |     |



# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME        | TYPE    | I/O | FROM | TO                      |
|--------------------|---------|-----|------|-------------------------|
| East-West Velocity | Digital | O   | UE   | Flight Director Adapter |

## Functional Description

Provides east-west velocity in digital format to the Flight Director Adapter for transfer to the Central Computer.

## Signal Characteristics

WORD/FRAME STRUCTURE: See Appendix III, Paragraph 2.2  
 INFORMATION IDENTIFIER: See Appendix III, Paragraph 2.2.1  
 TIMING TOLERANCES: See Appendix III, Paragraph 3.2.1  
 DATA STANDARD: See Table IA, Item 9 and Appendix III, Paragraph 2.2.2

## Electrical Characteristics

See Appendix III, Paragraphs 3.2.2, 4.2.1, 4.2.2

## Interconnection Data

See Appendix III, Paragraph 4.0

A/C: F-15A  
 REF: T.O. 1F-15A-2-18  
 Report H009

|             |      |       |     |     |       |
|-------------|------|-------|-----|-----|-------|
| A           | DATE | ISSUE | REV | REV | REV   |
|             |      |       |     |     |       |
| ICD-GPS-011 |      |       |     |     |       |
| DATE        | REV  | REV   | REV | REV | REV   |
|             |      |       |     |     | 10-14 |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME       | TYPE    | I/O | FROM | TO                      |
|-------------------|---------|-----|------|-------------------------|
| Vertical Velocity | Digital | O   | UE   | Flight Director Adapter |

## Functional Description

Provides vertical velocity in digital format to the Flight Director Adapter for transfer to the Central Computer.

## Signal Characteristics

WORD/FRAME STRUCTURE: See Appendix III, Paragraph 2.2  
 INFORMATION IDENTIFIER: See Appendix III, Paragraph 2.2.1  
 TIMING TOLERANCES: See Appendix III, Paragraph 3.2.1  
 DATA STANDARD: See Table IA, Item 10 and Appendix III, Paragraph 2.2.2

## Electrical Characteristics

See Appendix III, Paragraphs 3.2.2, 4.2.1, 4.2.2

## Interconnection Data

See Appendix III, Paragraph 4.0

A/C: F-15A  
 REF: T.O. 1F-15A-2-18  
 Report H009

|      |      |          |             |
|------|------|----------|-------------|
| A    | DATE | REVISION | DESCRIPTION |
|      |      |          | ICD-GPS-011 |
| DATE | REV  | SHEET    | 10-15       |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME     | TYPE     | I/O | FROM | TO                |
|-----------------|----------|-----|------|-------------------|
| BIT Acknowledge | Discrete | O   | UE   | BIT Control Panel |

## Functional Description

Discrete is sent to BIT Control Panel during the time the UE is in a BIT routine as a result of receiving a BIT Initiate discrete (see page 10-32), from the BIT Control Panel.

## Signal Characteristics

TBD-2

## Electrical Characteristics

TBD-2

## Interconnection Data

TBD-2

A/C: F-15A  
REF: T.O. 1F-15A-2-17  
T.O. 1F-15A-2-18

|   |          |             |
|---|----------|-------------|
| A | REVISION | 1CD-GPS-011 |
|   | DATE     | 10-16       |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME  | TYPE     | I/O | FROM | TO                    |
|--------------|----------|-----|------|-----------------------|
| Antenna Fail | Discrete | 0   | UE   | Avionics Status Panel |

## Functional Description

An Antenna Fail discrete is sent to the Avionics Status Panel when a UE antenna failure is detected by UE BITE circuits after a BIT Initiate discrete is received from the BIT Control Panel (see page 10-32).

## Signal Characteristics

TBD-2

## Electrical Characteristics

TBD-2

## Interconnection Data

TBD-2

A/C: F-15A  
REF: T.O. 1F-15A-2-17  
T.O. 1F-15A-2-18

|                 |      |            |             |
|-----------------|------|------------|-------------|
| REV<br><b>A</b> | CODE | DEFINITION | REVISION    |
|                 |      |            | ICD-6PS-011 |
| SCALE           | REV  | SHEET      | 10-17       |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME       | TYPE     | I/O | FROM | TO                    |
|-------------------|----------|-----|------|-----------------------|
| Preamplifier Fail | Discrete | 0   | UE   | Avionics Status Panel |

## Functional Description

A Preamplifier Fail discrete is sent to the Avionics Status Panel when a UE preamplifier failure is detected by UE BITE circuits after a BIT Initiate discrete is received from the BIT Control Panel (see page 10-32).

## Signal Characteristics

TBD-2

## Electrical Characteristics

TBD-2

## Interconnection Data

TBD-2

A/C: F-15A  
REF: T.O. 1F-15A-2-17  
T.O. 1F-15A-2-18

|      |      |      |             |
|------|------|------|-------------|
| A    | DATE | REV  | ISSUED BY   |
|      |      |      | ICD-GPS-011 |
| FORM | REV  | DATE | 10-18       |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME  | TYPE     | I/O | FROM | TO                    |
|--------------|----------|-----|------|-----------------------|
| Receiver 111 | Discrete | O   | UE   | Avionics Status Panel |

## Functional Description

A Receiver Fail discrete\* is sent to the Avionics Status Panel when a UE receiver failure is detected by UE BITE circuits after a BIT Initiate discrete is received from the BIT Control Panel (see page 10-32).

\*A separate discrete will be provided for each receiver LRU.

## Signal Characteristics

TBD-2

## Electrical Characteristics

TBD-2

## Interconnection Data

TBD-2

A/C: F-15A  
REF: T.O. 1F-15A-2-17  
T.O. 1F-15A-2-18

|   |             |
|---|-------------|
| A | ICD-GPS-011 |
|   | 10-19       |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME  | TYPE     | I/O | FROM | TO                    |
|--------------|----------|-----|------|-----------------------|
| CDU/NCI Fail | Discrete | O   | UE   | Avionics Status Panel |

## Functional Description

A CDU/NCI Fail discrete is sent to the Avionics Status Panel when a CDU/NCI failure is detected by UE BITE circuits after a BIT Initiate discrete is received from the BIT Control Panel (see page 10-32).

## Signal Characteristics

TBD-2

## Electrical Characteristics

TBD-2

## Interconnection Data

TBD-2

A/C: F-15A  
REF: T.O. 1F-15A-2-17  
T.O. 1F-15A-2-18

|   |          |             |
|---|----------|-------------|
| A | FORM NO. | ICD-GPS-011 |
|   | REV      | 10-20       |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE     | I/O | FROM | TO                |
|-------------|----------|-----|------|-------------------|
| GPS No-Go   | Discrete | O   | UE   | BIT Control Panel |

## Functional Description

A GPS No-Go discrete is sent to the BIT Control Panel when a GPS UE failure is detected by UE BITE circuitry after receipt of a BIT Initiate discrete from the BIT Control Panel (see page 10-32).

## Signal Characteristics

TBD-2

## Electrical Characteristics

TBD-2

## Interconnection Data

TBD-2

A/C: F-15A  
REF: T.O. 1F-15A-2-17  
T.O. 1F-15A-2-18

|             |      |    |      |      |    |      |      |       |      |
|-------------|------|----|------|------|----|------|------|-------|------|
| REV         | DATE | BY | CHKD | DATE | BY | CHKD | DATE | BY    | CHKD |
| A           |      |    |      |      |    |      |      |       |      |
| ICD-GPS-011 |      |    |      |      |    |      |      |       |      |
| REV         |      |    |      | DATE |    |      |      | 10-21 |      |



# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME      | TYPE    | I/O | FROM                    | TO |
|------------------|---------|-----|-------------------------|----|
| Magnetic Heading | Digital | I   | Flight Director Adapter | UE |

## Functional Description

Provides magnetic heading in digital format to the GPS UE.

## Signal Characteristics

WORD/FRAME STRUCTURE: See Appendix III, Paragraph 2.2  
 INFORMATION IDENTIFIER: See Appendix III, Paragraph 2.2.1  
 TIMING TOLERANCES: See Appendix III, Paragraph 3.2.1  
 DATA STANDARD: See Table IA, Item 11 and Appendix III, Paragraph 2.2.2

## Electrical Characteristics

See Appendix III, Paragraphs 3.2.2, 4.2.1, 4.2.2

## Interconnection Data

See Appendix III, Paragraph 4.0

A/C: F-15A  
 REF: T.O. 1F-15A-2-18  
 Report H009

|       |          |             |
|-------|----------|-------------|
| DATE  | REVISION | DESCRIPTION |
| A     |          | 1CD-6PS-011 |
| SCALE | REV      | SHEET 10-22 |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME    | TYPE    | I/O | FROM                    | TO |
|----------------|---------|-----|-------------------------|----|
| True Air Speed | Digital | I   | Flight Director Adapter | UE |

## Functional Description

Provides true air speed in digital format to the GPS UE.

## Signal Characteristics

WORD/FRAME STRUCTURE: See Appendix III, Paragraph 2.2  
 INFORMATION IDENTIFIER: See Appendix III, Paragraph 2.2.1  
 TIMING TOLERANCES: See Appendix III, Paragraph 3.2.1  
 DATA STANDARD: See Table 1A, Item 12 and Appendix III, Paragraph 2.2.2

## Electrical Characteristics

See Appendix III, Paragraphs 3.2.2, 4.2.1, 4.2.2

## Interconnection Data

See Appendix III, Paragraph 4.0

A/C: A-15A  
 REF: T.O. 1F-15A-2-18  
 Report H009

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| REV  | ISSUE | DATE | DESCRIPTION |
| A    |       |      | ICD-GPS-011 |
| DATE | REV   | DATE | 10-23       |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME    | TYPE  | I/O | FROM    | TO |
|----------------|-------|-----|---------|----|
| Blanking Pulse | Pulse | I   | Blanker | UE |

## Functional Description

The blanking pulse blocks the input to the UE preamplifier when other selected equipments, such as IFF, are transmitting.

## Signal Characteristics

SIGNAL TYPE: Positive Pulse  
 AMPLITUDE: 0 to +40 volts  
 FREQUENCY RANGE: 20,000 PPS (max.)  
 DUTY CYCLE: 15% (max.)  
 LOGIC ONE LEVEL (SUPPRESSION): +20 to +40 volts  
 LOGIC ZERO (NON-SUPPRESSION): 0  $\pm$  0.5 volts  
 START TIME: See next page  
 STOP TIME: See next page

## Electrical Characteristics

SOURCE: IFF (AN/APX-101), Receiver-Transmitter  
 RT-1063B/APX-101(V), R = 100 Ohms  $\pm$  10%  
 LOAD: 300 to 2,200 Ohms shunted by 1850 Pf

## Interconnection Data

WIRE TYPE: RG-58C/U Coaxial Cable

A/C: F-15A  
 REF:

|   |       |      |
|---|-------|------|
| A | REV   | DATE |
|   | 10-24 |      |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME                   | TYPE  | I/O | FROM                    | TO |
|-------------------------------|-------|-----|-------------------------|----|
| Blanking Pulse<br>(continued) | Pulse | I   | Interference<br>Blanker | UE |

## Signal Characteristics (continued)

**START TIME:** The suppression pulse shall rise to 7.5 volts minimum at least 0.5 usec but not more than 3.0 usec before the RF output pulse has reached 10% of its amplitude. For auxiliary trigger and Modu 4 replies, the pulse shall rise to 7.5 volts minimum less than 0.5 usec before the RF output pulse has reached 10% of its amplitude. Maximum rise time (10-90%) shall be 0.5 usec.

**STOP TIME:** The suppression pulse shall be less than 1.0 volt, 3.0 usec after the 10% amplitude point of the trailing edge of the last RF framing pulse of the reply pulse train or after the 10% amplitude point of the trailing edge of each RF output pulse resulting from the auxiliary trigger input.

A/C: F-15A  
REF:

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| A | DATE  | DESIGN | REV   | ISSUED | ICD-GPS-011 |
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# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME         | TYPE    | I/O | FROM                    | TO |
|---------------------|---------|-----|-------------------------|----|
| Barometric Altitude | Digital | I   | Flight Director Adapter | UE |

## Functional Description

Provides barometric altitude in digital format to the GPS UE.

## Signal Characteristics

WORD/FRAME STRUCTURE: See Appendix III, Paragraph 4.2  
 INFORMATION IDENTIFIER: See Appendix III, Paragraph 2.2.1  
 TIMING TOLERANCES: See Appendix III, Paragraph 3.2.1  
 DATA STANDARD: See Table 1A, Item 13 and Appendix III, Paragraph 2.2.2

## Electrical Characteristics

See Appendix III, Paragraphs 3.2.2, 4.2.1, 4.2.2

## Interconnection Data

See Appendix III, Paragraph 4.0

A/C: F-15A  
 REF: T.O. 1F-15A-2-18  
 Report H009

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| A     | FORM 100-100 | 100-100     |
|       | ICD-GPS-011  |             |
| SCALE | REV          | SHEET 10-26 |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM                    | TO |
|-------------|---------|-----|-------------------------|----|
| Pitch       | Digital | I   | Flight Director Adapter | UE |

## Functional Description

Provides pitch in digital format to the GPS UE.

## Signal Characteristics

WORD/FRAME STRUCTURE: See Appendix III, Paragraph 2.2  
 INFORMATION IDENTIFIER: See Appendix III, Paragraph 2.2.1  
 TIMING TOLERANCES: See Appendix III, Paragraph 3.2.1  
 DATA STANDARD: See Table IA, Item 14 and Appendix III, Paragraph 2.2.2

## Electrical Characteristics

See Appendix III, Paragraphs 3.2.2, 4.2.1, 4.2.2

## Interconnection Data

See Appendix III, Paragraph 4.0

A/C: F-15A  
 REF: T.O. 1F-15A-2-18  
 Report H009

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| A    | DATE | REVISION | DESCRIPTION |
|      |      |          | ICD-GPS-011 |
| DATE | BY   | CHKD     | 10-27       |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM                    | TO |
|-------------|---------|-----|-------------------------|----|
| Roll        | Digital | I   | Flight Director Adapter | UE |

## Functional Description

Provides roll in digital format to the GPS UE.

## Signal Characteristics

WORD/FRAME STRUCTURE: See Appendix III, Paragraph 2.2  
 INFORMATION IDENTIFIER: See Appendix III, Paragraph 2.2.1  
 TIMING TOLERANCES: See Appendix III, Paragraph 3.2.1  
 DATA STANDARD: See Table IA, Item 15 and Appendix III, Paragraph 2.2.2

## Electrical Characteristics

See Appendix III, Paragraphs 3.2.2, 4.2.1, 4.2.2

## Interconnection Data

See Appendix III, Paragraph 4.0

A/C: F-15A  
 REF: T.O. 1F-15A-2-18  
 Report H009

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|-------------|-----------|-------------|
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|             | DATE      | DATE        |
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# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME  | TYPE    | I/O | FROM                    | TO |
|--------------|---------|-----|-------------------------|----|
| True Heading | Digital | I   | Flight Director Adapter | UE |

## Functional Description

Provides true heading in digital format to the GPS UE.

## Signal Characteristics

WORD/FRAME STRUCTURE: See Appendix III, Paragraph 2.2  
 INFORMATION IDENTIFIER: See Appendix III, Paragraph 2.2.1  
 TIMING TOLERANCES: See Appendix III, Paragraph 3.2.1  
 DATA STANDARD: See Table 1A, Item 16 and Appendix III, Paragraph 2.2.2

## Electrical Characteristics

See Appendix III, Paragraphs 3.2.2, 4.2.1, 4.2.2

## Interconnection Data

See Appendix III, Paragraph 4.0

A/C: F-15A  
 REF: T.O. 1F-15A-2-18  
 Report H009

|   |            |             |
|---|------------|-------------|
| A | FORM 10-29 | ICD-GPS-011 |
|   | REV        | 10-29       |



ABSTRACT

This report contains specifications defining the standard interface between the control computer complex and associated peripheral equipment via multiplex buses to be used in the F-15 Avionics System.

Attachment A of Appendix III  
ICD-GPS-011  
Reproduced from H009,  
12 March 1969, F-15  
Multiplex Data Bus

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#### 1.0 SCOPE

This report defines the operating characteristics and standard format for multiplexed digital data transmission between the Central Computer Complex (P.S. 68-870060) and associated peripheral units in the F-15 avionics system. Included are detail performance requirements of standard interface units required to transmit, receive and process the multiplexed digital data. Detail contents of the standard digital words will be as defined by the input/output digital data table contained in individual procurement specifications for specific sub-system components affected.

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## 2.0 OPERATING CHARACTERISTICS

2.1 General - Digital data transmission between peripheral avionic system components and the Central Computer Complex (CCC) shall be in a word serial, bit serial time division multiplex (TDM) format over standard buses. The transmission of standard messages shall be accomplished using half duplex (two way transmission, but not simultaneous) operation controlled by the CCC. A continuous system timing reference (clock) signal, originating in the CCC, shall be distributed to all multiplex terminals in the peripherals to allow bit synchronous data transmission. Two identical transmission lines (one data line and one clock line) shall constitute a multiplex bus. Two multiplex buses, providing system selectable standby redundancy, will be routed to each peripheral. Interfacing units will be connected to the buses in parallel (party line) fashion; therefore, all units connected to a bus will see all data on the bus.

2.2 Standard Message and Word Format - All data transmitted over multiplex buses interfacing with the CCC shall be transmitted as standard messages. A standard message shall be composed of a "Select" word originating in the CCC and one or more (15 maximum) "Data" words transmitted to or from a single peripheral. All select words and data words shall be composed of 17 bits: 16 bits of information (bits 0 through 15) plus a 17th (bit 16) bit providing odd "ones" parity. See Figure 1.

The content and detail format of all messages, select words, and data words will be specified in the input/output digital data table for the related peripheral.

2.2.1 Select Words - Select words shall be used to initiate all data exchanges (messages) and shall originate only in the CCC. A select word shall provide one of three functions; request data transmission from a peripheral, command a peripheral to take some action other than to transmit data, or identify data to be transmitted from the CCC to a peripheral. A select word shall be composed of three separate fields; a four bit equipment address field (bits 0 through 3), 30-8

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a single bit command indicator (bit 4), a six bit control field (bits 5 through 10), a single bit T/R indicator (bit 11), and a four bit word count field (bits 12 through 15). The 17th bit (bit 16) provides odd "ones" parity. The equipment address field shall contain a unique code identifying the unit on the bus to which the communications are being directed. The command indicator identifies whether it is a command or data message. The control field shall identify the data to be transmitted by the CCC or by a peripheral following the select word, or for a command message, the command which causes the peripheral to take some action other than transmit data. The command indicator (bit 4 in the select word) shall be a logical "one" if the select word is a command which requires no specific data from a peripheral except to acknowledge receipt of the command. Bit 11 in the select word shall be a transmit/receive (T/R) indicator with a logical "one" indicating the peripheral will transmit the data word(s), or a logical "zero" indicating the computer will transmit the data word(s). The word count field shall specify the number of data words to follow the select word by a four bit binary number (LSB = bit 15) in bits 12 through 15. If the select word is a command the T/R bit shall be a logical "one" and the word count shall equal one.

Select words shall always be preceded by a no-data period (no signals on the data transmission line) equal to or greater than 8 periods of the reference clock signal. This no-data period shall identify the word following as a select word and the start of a message (see Figure 1). Bit 0 shall be transmitted first and parity (bit 16) transmitted last.

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2.2.2 Data Words - Data words shall originate either in the CCC or a peripheral unit and contain the data identified by the control field of the select word. If the control field of the select word identifies a block of data, individual words within the block shall be identified by their relative position in the message, i.e., word number one follows the select word in the serial bit stream, and word number two follows word number one, etc. All data words regardless of content shall be composed of a 16 bit data field (bits 0 through 15) plus a 17th bit (bit 16) providing odd "ones" parity. The content and format of all data words shall be approved by WDC. The general rules for data word formatting follow.

If the select word indicates a command message, the peripheral shall acknowledge receipt of the command by transmitting one data word which is identical to the select word received.

If the select word indicates a data message, the peripheral shall transmit or receive the data words. In general, each data word shall contain only one numerical parameter. The numerical value of the parameter shall be represented using a true binary/two's complement notation. The most significant bit (MSB) (bit 0) shall be transmitted first with the remaining less significant bits (bits 1 through 15) following in descending order of their value. The number of bits used to define the numeric shall be consistent with the resolution or accuracy required. If more than 16 bits are necessary to achieve the required resolution or accuracy, the less significant bits which cannot be included in the 16 bit word shall be transmitted as a part of the next data word in the message, starting at the beginning of the word with the remaining less significant bits following in descending order of their

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value. If less than 16 bits are required, the unused bit positions shall be transmitted as logical "0" bits unless discrete bits are to be included in the word according to the ground rules established in a later paragraph of this section.

*minus the LCB*  
The binary value of a numerical data word shall be capable of ranging from (-) MAX to (+) MAX. Each bit in the word transmitted as a logical "1" shall have a sign and value associated with it. The MSB (bit 0) shall have the sign of (-) and the value of (MAX) and each bit following shall have the sign of (+) and the value of  $MAX/2^n$ , where n is the bit number; thus, bit 1 has the value (+)  $MAX/2^1$ , bit 2 has the value (+)  $MAX/2^2$ , etc. For nonangular quantities, MAX shall be an exact power of two (i.e.,  $MAX=2^i$ , where i is an integer) in the units of the parameter. For angular quantities which require the full 360° angular range, such as bearing, MAX shall have the value 180° (i.e., the angular range shall be -180° to +180°). For angular ranges less than ± 180°, MAX shall have the value  $180°/2^i$ , where i is an integer chosen such that the binary data word is capable of representing the entire range of the parameter. In all cases, the MSB has the sign and value of (-MAX) with each subsequent bit having the sign and value of (+MAX/2^n), where n is the bit number.

Discrete functions, i.e., data functions which can assume only one or two states (such as an ON-OFF) shall be transmitted as single discrete bits within a data word, or as combinations of single discrete bits which represent a uniquely recognizable code or straight binary number. Discrete functions directly related to an individual numeric parameter such as special "validity bits", or mode definition functions for the parameter shall be included in the word with the numerical value of the parameter if unused bit positions are available. Other unrelated discretizes shall be formatted into a special "discrete function" data word unless the total quantity of these discretizes in the message is such that they all can be

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included in the unused portion of one data word. If the quantity of unrelated discretes in the message is greater than 16 or some multiple of 16, and the remaining bits can all be combined in the unused portion of one data word they may be "packed" into that word. In summary only one data word carrying a numerical parameter in any message can include unrelated discretes.

Multi-position switch functions, i.e., data representing one out of  $n$  switch positions, shall, in general, be binary encoded such that the number of bits used to represent the switch position shall be the smallest value of  $2^i$ , where  $i$  is an integer.

In summary, the above formatting rules for data words are general guidelines. Detailed formats for specific subsystem input/output signals will be contained in the individual procurement specifications for the subsystems and are all subject to final MCAIR approval.

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FIGURE

2.3 Bus Control - The CCC will select which of the data buses will be used for data transmission and will initiate a data exchange by transmitting the appropriate select word over the selected bus. No peripheral shall be required to receive or transmit over more than one bus at a time. Data words transmitted by the CCC shall be transmitted on the same bus as the initiating select word. Peripheral units shall transmit or accept the data defined by the select word over the same bus which carried the select word and the clock signal. When a bus is shut down, either because it has failed or because it is a back up bus, the data line and clock line are disabled by the CCC. All terminals operating from a bus that is shutdown during operation shall resynchronize their terminal data processing functions regardless of their operating mode, either transmitting or receiving.

2.3.1 Data Transmission From Peripherals - A peripheral shall transmit only after the receipt of a valid select word requiring data transmission and only when it is operating normally and is capable of initiating the data word exactly 5 clock periods after receipt of the last bit of the select word, or after transmitting the last bit of the previous data word. A valid select word requiring data transmission from a peripheral shall meet the following criteria:

- a) A no-data period equal to or greater than 8 clock periods shall have been detected on the data transmission line prior to receipt of the first bit of the select word.
- b) The code represented by the address field (bits 0 through 3) shall compare to the address code preset in the peripheral unit.
- c) The code represented by the control field (bits 5 through 10) shall be recognized as one of the data word or command word codes assigned to the peripheral.

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- d) The T/R bit (bit 11) shall be a logic "one".
- e) The parity bit (bit 16) shall produce an odd "ones" count.
- f) No data dropouts shall have occurred during the 17 clock periods immediately following the start of the select word.

2.3.2 Data Acceptance By a Peripheral - A peripheral shall accept data only after the receipt of a valid select word indicating data to be transmitted by the CCC to the peripheral. The validating criteria for a select word directing a peripheral to accept data shall be the same as that directing transmission, except that the T/R bit shall be a logical "zero".

If a parity error or dropout is detected by the peripheral during reception of a data word, that word shall be invalidated.

2.3.3 Data Acceptance By The CCC - If no data word is detected by the CCC from a peripheral 5 clock periods after transmission of a select word requiring a response (i.e., a request for data or a command) the CCC will internally flag a no response condition. This no-response condition indicates that one of the following conditions exists:

- a) The peripheral failed to recognize the select word as valid due to a signal dropout, a transmission error, or a momentary malfunction producing a parity error.
- b) The peripheral was not operating normally and was unable to reply within the required 5 clock periods.
- c) The communications link between the CCC and the peripheral has failed.
- d) The peripheral has failed.

When a no-response condition is recognized by the CCC after 5 clock periods, the CCC may, at the option of the program, reinterrogate the peripheral by retransmitting the same select word after the required 8 clock periods of "no data". The computer may also, at the program option, switch

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to the standby bus and repeat the interrogation process, or ignore the no response condition and go on.

If a parity error or dropout is detected by the CCC during the reception of a data word, the CCC may request a repeat transmission over the same bus or over the back-up bus by retransmitting the select word after the required 8 clock periods of "no data".

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### 3.0 SIGNAL AND TRANSMISSION LINE CHARACTERISTICS

3.1 Multiplex Bus - A multiplex bus shall be composed of two transmission lines. One line carries the 1 MHz clock reference signal from a master multiplex system clock in the CCC to all terminals on the bus and the other line carries digital data signals at a 1 Megabit rate to and from the CCC-I/O and the peripheral unit terminals. All terminal units on a single bus will be connected to the transmission lines comprising that bus in parallel, such that the physical removal of the unit from the line will not interrupt the continuity of the lines. Transmission lines shall be driven and terminated in a balanced to ground configuration to minimize the effects of ground plane noise. Transmission line shields will be grounded at each terminal.

Two redundant multiplex buses (4 transmission lines total) will interface with each peripheral unit.

3.1.1 Transmission Line Characteristics - The transmission line used for data and reference clock signal transmission shall be of shielded twisted pair construction having a characteristic impedance of approximately 68 ohms. The shielded twisted pair shall have a line to line capacitance of less than 30 pf per foot and a line to ground capacitance of less than 50 pf per foot.

### 3.2 Signal Characteristics

3.2.1 Reference Clock Signal - The clock signal shall be a bipolar differential sinusoidal signal at a nominal frequency of 1 MHz  $\pm 0.1\%$ . Long term variations shall not exceed  $\pm 0.1\%$  of the nominal frequency. The positive going zero crossing shall define the start of a clock period. Short term variations, i.e. cycle to cycle variations in the clock period, shall not exceed 5 nanoseconds.

The reference clock signal shall be generated and transmitted by the CCC I/O to all multiplex terminal on the buses. All terminals shall receive the clock signal via the clock receiver in the terminal unit. The clock signal transmitter shall

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have the same characteristics as those specified for the transmit mode of the receiver/transmitter except the mode switching capability (see paragraph 4.2). The clock transmitter shall be transmitting the reference clock signal whenever a particular multiplex bus has been enabled by the CCL.

**3.2.2 Data Signal** - The data signals shall be bipolar differential signals which are "bi-phase level: coded and smoothed. The harmonic content shall be limited such that frequency components at 2.5 MHz and above are at least - 24 Db (referenced to the peak amplitude of the signal) and components in the frequency band 0.5 to 1.5 MHz are essentially unaffected. A logical "one" (data bit one) shall be transmitted as a coded bipolar 1,0 signal, i.e. a positive going pulse followed by a negative going pulse resulting in a signal which is in phase with the reference clock signal. A logical "zero" (data bit zero) shall be transmitted as a coded bipolar 0,1 signal, i.e. a negative going pulse followed by a positive going pulse resulting in a signal which is 180° out of phase with the reference clock signal (see Figure 2). No signals shall be generated on the data line during the intervals between words (no-data periods).

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#### 4.0 MULTIPLEX TERMINAL

The standard multiplex terminal shall be incorporated as an integral part of each equipment item serviced and shall provide an interface between the standard multiplex bus and the digital circuitry of the component serviced.

The functions performed by the multiplex terminal in the receive mode shall be to accept standard format data and clock signals from the multiplex bus, to detect and decode the incoming data using the incoming system clock signal as a reference, to convert the data to signals which are compatible with the subsystem component logic, and to generate the control signals necessary to supply the incoming data to the peripheral serviced with proper identification.

The functions performed by the multiplex terminal in the transmit mode shall be to accept signals from the subsystem component logic, to convert these signals to the standard transmission format using the incoming clock signal as a reference, and to transmit these signals at the proper time.

The multiplex terminals shall include a data receiver/transmitter, a clock receiver, data presence detection circuitry, and the necessary logic to provide control signals to interpret select words and regulate the operation of the terminal unit. The terminal units shall be designed such that no single component failure in a terminal, except the coupling transformer, degrades the transmission line or results in unwanted data transmissions. Redundant portions of the terminal shall be sufficiently isolated so that a failure of one transmission line does not degrade the performance of the other bus coupled to the unit.

4.1 Clock Receiver - The clock receiver shall be coupled to the clock signal transmission line through a transformer with grounded center taps. The coupling transformer shall have a narrow pass band which rejects noise at frequencies above and below the clock signal frequency, but passes the clock signal with

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minimum attenuation and phase distortion. The impedance reflected onto the transmission line through the coupling transformer shall be 10,000 ohms or greater line to line, shall be essentially resistive, and shall be balanced to ground to within 1%. These impedance requirements shall apply even when terminal power is off. The clock receiver shall produce signals suitable for use in the terminal and for transferring data to the digital equipment in the interfacing unit. The clock receiver shall operate with input signal amplitudes in the range of  $\pm 1$  volt to  $\pm 7$  volts peak line-to-ground ( $\pm 2$  volts to  $\pm 14$  volts peak line-to-line) and shall be capable of withstanding over voltage inputs without permanent damage to the receiver. Over voltage protection shall be consistent with that provided for other input signal lines in the equipment item serviced.

4.2 Data Receiver/Transmitter - The data receiver/transmitter shall be coupled to the data signal transmission line through a transformer with grounded center taps. The coupling transformer shall have a narrow pass band which passes the data signal with a minimum of attenuation and phase distortion. The impedance reflected onto the transmission line through the transformer shall be essentially resistive and balanced to ground to within 1% in both modes of operation, even when terminal power is off. When power is off, the magnitude of the reflected impedance shall be 10,000 ohms or greater line-to-line.

4.2.1 Receiving Mode - When operating in the receiving mode the magnitude of the impedance reflected onto the data transmission line shall be 10,000 ohms or greater, including any effects of the transmitter in the terminal. The receiver shall be capable of operating with input signal amplitudes in the range of  $\pm 1$  volt to  $\pm 7$  volts line to ground, and shall be capable of withstanding over voltage inputs without permanent damage to the unit. The receiver shall be capable of detecting and indicating the presence of bi-phase coded data, and of

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decoding the bi-phase data (i.e. identifying a logical "one" or logical "zero" code) by comparison with the reference clock signal, even though the incoming data lags the clock by as much as 200 nanoseconds. The receiver shall also have the capability of recognizing improperly coded signals, or a data dropout, occurring during reception of a word, and of producing an error signal indicating that an invalid word has been received.

**4.2.2 Transmitter Mode** - When operating in the transmitting mode, the magnitude of the impedance reflected onto the data transmission line shall be  $68\text{ ohms} \pm 10\%$ . The transmitter shall be capable of driving a load equivalent to  $175\text{ ohms line-to-line pure resistance to a peak amplitude of } 5\text{ volts} \pm 1\text{ volt line to ground (} 10\text{ volts} \pm 2\text{ volts line to line)}$ . The output wave form will be similar to that shown in Figure 2 with its spectral content limited as defined in paragraph 3.2.3. The mid-period zero crossing of the data signal, with the transmitter operating with a  $175\text{ ohm resistive load}$ , shall lag the mid-period zero crossing (negative going zero crossing) of the signal on the clock line by no more than 35 nanoseconds. The terminal shall be capable of driving a transmission line producing cap: which are equivalent to  $19\text{ ohms in series with } 1050\text{ pfd}$  without ampl. variations from the levels achieved with the  $175\text{ ohm resistive load}$ . (Note: Line load cannot be simulated by a capacitance alone.)

**4.2.3 Mode Switching** - Switching of the receiver/transmitter unit between the receive mode and transmit mode shall be controlled by the terminal control logic based on the contents of the select word and system operating characteristics defined in Section 2. When a receiver/transmitter is operating in the transmit mode ( $68\text{ ohm reflected impedance}$ ), it shall maintain the transmit mode impedance characteristic for a minimum of 3 clock periods (3 usec) after transmitting the last bit required and shall switch to a stabilized receive mode ( $10K\text{ ohm reflected impedance}$ ) within the next 2 clock periods (2 usec.) When the receiver/

30-20

transmitter is in the receive mode it shall switch to a stabilized transmit mode (68 ohms reflected impedance) within 2 clock periods (2 usec) after receiving the last bit required when transmission is indicated. Mode switching shall be accomplished without generating significant transients on the transmission line.

4.3 Terminal Control Functions - The terminal unit shall include control circuitry which regulates the operating mode of the Data Receiver/Transmitter (R/T) unit, identifies and selects the bus to be used for receiving or transmitting data, and identifies, decodes, and processes incoming and outgoing messages.

4.3.1 Receive/Transmit Mode Selection - Receiver/Transmitter units in the CCC-I/O terminals shall operate in the transmit mode at all times except when required to receive data from a peripheral as indicated by the presence of a logical "1" as bit 11 of the transmitted select word. The unit shall remain in the receive mode until all words contained in the message (the number indicated by the count field of the select word) have been received or a "no-data response" condition is recognized, i.e. no data word is received after the five "no-data" clock periods. When either of these two conditions occur, the receiver/transmitter shall resynchronize and switch to the transmit mode in preparation for transmitting the next select word.

Receiver/transmitter units in peripheral equipment terminals shall operate in the receive mode at all times except when requested to transmit data as indicated by the presence of a logical "1" as bit 11 of a valid select word. The unit shall remain in the transmit mode until all data words requested (the number indicated by the word count field of the select word) have been transmitted or the clock signal on the operating bus is shut down causing the terminal to resynchronize. After the last bit of the last word of the message has been transmitted, or the terminal is resynchronized, the receiver/transmitter unit shall switch to the receive mode.

30-21

104-100

4.3.2 Word and Message Identification and Synchronization - The terminal shall provide facilities for identifying incoming words as "Select" or "Data" words based on the length of the no-data period following the preceding word. It shall provide a capability for counting both incoming and outgoing bits to define the end of a word. It shall check or generate the parity bit. It shall provide a capability for counting incoming or outgoing words to define the end of a message based on the value of the word count field of the select word. If a no-data period greater than 5 clock periods is detected after a word and before the end of a message, or the bus is shut down (i.e. the clock signal is interrupted) before the word counter has counted down to zero, the system shall resynchronize and prepare to receive the next select word. This condition results when the message being transmitted is not completed because of a failure, or the inability of the transmitting unit to supply the data to complete the message, or the bus is shut down by the CCC. It should be noted that a select word is always followed by at least one data word transmitted either by the CCC or a peripheral.

4.3.3 Select Word Decoding - When an incoming word is recognized as a select word and a valid parity check has been made, the terminal shall inspect the address field to determine if the address code compares to the address code which has been pre-set into the terminal. Provision shall be provided to set the terminal address code by physical connections (e.g. jumpers, patches, plugs etc.) which are made on the bench in a shop; flight line address code programming is not required or desired. The CCC-I/C is not required to recognize address codes.

When an address code is recognized, the terminal shall determine if the peripheral is required to supply data words, or accept data words, by inspection of the T/R bit (bit 11 in the select word). If the terminal is required to transmit data, the receiver/transmitter shall be switched to the transmit mode.

30-22

The terminal shall store the contents of the control field (bits 4 through 10) and the contents of the word count field (bits 12 through 15) of the select word, which in combination identify the data word(s) to be accepted or supplied by the peripheral.

4.3.4 Outputting Data Words - When a peripheral receives an indication that a data word must be supplied to the terminal for transmission, it shall select the data word (identified by the control field code and the word count) from its data storage and transfer that word to the terminal unit for transmission. After the data word is transferred to the terminal, and the required 5 clock periods have elapsed, the terminal shall transmit the data word, with the correct parity bit at the end of the word. After the data word and parity bit have been transmitted, the word counter shall be decremented one count. If the word count is not zero, the terminal shall again indicate to the peripheral that a data word is to be supplied for transmission. This process shall be repeated until all the data words required for the message have been transmitted, as indicated by a zero count of the word counter.

4.3.5 Inputting Data Words - When a peripheral receives an indication that a data word directed to it has been received by the terminal with correct parity, it shall transfer that data word into the storage or buffer location identified by the control field code and word count indicated. After the required 5 clock periods have elapsed the terminal shall inhibit transfer of data from the terminal to the using unit, and decrement the word counter one count. If the word count is not zero the terminal shall accept the next data word on the data transmission line. This process shall be repeated until all data words in the message have been received as indicated by a zero count of the word counter.

5.0 RELIABILITY

5.1 Reliability Data - Reliability data for the terminal equipment shall be combined with reliability data for the peripheral, such that the reliability of the peripheral shall include terminal reliability considerations exclusive of transmission line reliability.

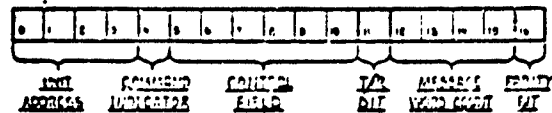
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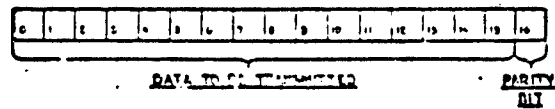
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FIGURE 1  
STANDARD MESSAGE AND WORD FORMAT

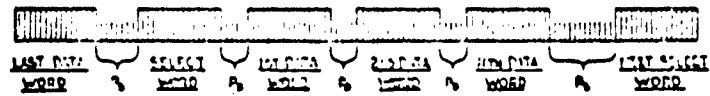
SELECT WORD FORMAT



DATA WORD FORMAT

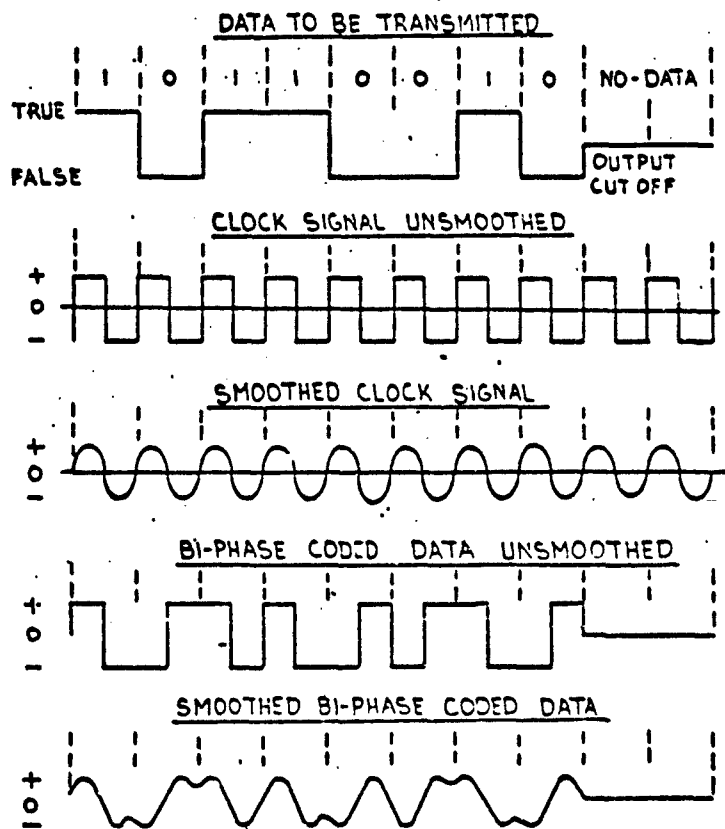


TYPICAL MESSAGE FORMAT



P IS MID-DATA ON-LINE PERIOD  
P<sub>1</sub> = 0 CLOCK PERIODS  
P<sub>2</sub> = 5 CLOCK PERIODS

FIGURE 2  
DATA AND CLOCK SIGNAL WAVE SHAPES



30-26



## 9. FUTURE MODIFICATIONS

Table 9-1 lists future modifications planned for the F-15A.

| Table 9-1. FUTURE MODIFICATIONS    |                                                                                                                                                                                                           |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Terminology/Nomenclature           | Remarks                                                                                                                                                                                                   |
| HAVE QUICK                         | Interim AJ voice capability; now being developed; preliminary planning for F-15A.                                                                                                                         |
| SEEK TALK                          | AJ voice capability; under development by ESD; preliminary planning for F-15A.                                                                                                                            |
| Video Tape Recorder (ECP 1045 VTR) | Preliminary planning for F-15. Would use TEAC recorder. Awaiting ASD/AE development of new CCD camera to replace existing camera.                                                                         |
| Programmable Signal Processor      | Modification to F-15A radar to enhance capability. Item under development; preliminary planning for F-15 C/D aircraft.                                                                                    |
| ALE-40(V) Dispenser Set            | Development contract expected shortly. Planned to retrofit all F-15As.                                                                                                                                    |
| TEWS Threat Update (CCP 120-ICS)   | R&D ECP now under way. Modification to ALR-56 to enhance capability. Add Band 3 to ICS system; modify Band 2 capability of ICS.                                                                           |
| Tail Warning System (ECP TWS)      | Two competing systems: ALQ-153 (Westinghouse) and ALQ-154 (AIL). Prototype contracts to be awarded mid-1978. McAIR to start Group A kit development October 1978. Installations starting in 1981 to 1982. |
| AN/ARC-186 VHF/AM Radio            | Preliminary planning for F-15. VHF/UHF requirements being defined by TAC. Installation of dual ARC-164 UHF could be superseded by installation of single ARC-164 and single ARC-186.                      |
| UHF - Dual ARC-164                 | Replaces AN/ARC-109.                                                                                                                                                                                      |
| TACAN - AN/ARN-118                 | Replaces AN/ARN-111.                                                                                                                                                                                      |
| ECPs 899 and 900                   | Modifications to APG-63 radar software; AIMVAL and ACEVAL; 1100 words of computer memory.                                                                                                                 |
| GPS                                | Global Positioning System.                                                                                                                                                                                |

## 10. DATA SOURCES

The following sources of data were used in preparing this summary:

- Aircraft and avionics configuration data assembled by ARINC Research, principally in the form of copies of applicable sections, tables, and figures, from the aircraft and equipment Technical Orders listed at the end of this section.
- Avionics Planning Baseline Document - October 1978
- Requirements Analysis for a Multifunction, Multiband Airborne Radio System (MFBARS), March 1978, ARINC Research Corporation Publication 1935-11-01-1769

### Inventory of Technical Orders

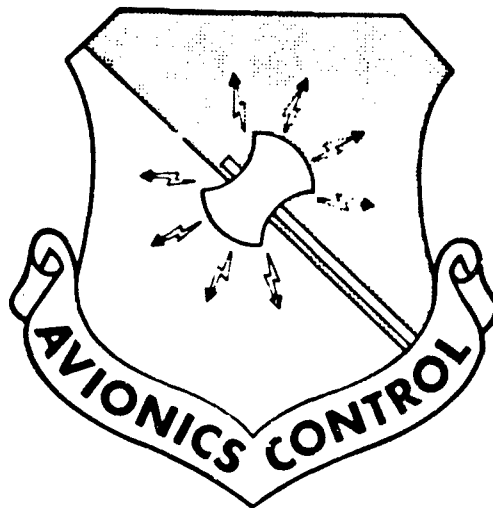
| <u>T.O. Number</u> | <u>Subject</u>                                 | <u>Change<br/>Number</u> | <u>Date</u> |
|--------------------|------------------------------------------------|--------------------------|-------------|
| IF-15A-01          | List of Publications                           | Basic                    | 4/15/77     |
| IF-15A-1           | Flight Manual                                  | 3                        | 5/1/79      |
| IF-15A-2-13        | Weapons Control and Delivery<br>System         | 9                        | 8/1/77      |
| IF-15A-2-16-1      | Central Computer System                        | 6                        | 8/15/77     |
| IF-15A-2-17        | Air Data and Instrument System                 | 11                       | 7/15/77     |
| IF-15A-2-18        | Inertial Navigation,<br>Site Indicator System  | 9                        | 7/1/77      |
| IF-15A-2-19        | TACAN and Instrument Landing<br>System         | 6                        | 5/1/77      |
| IF-15A-2-20        | Auto Flight Control System                     | 7                        | 6/1/77      |
| IF-15A-2-21        | Auto Direction Finder                          | 1                        | 5/1/77      |
| IF-15A-2-22        | Identification and Recognition<br>System       | 3                        | 6/1/77      |
| IF-15A-2-24        | Head Up Display System                         | 8                        | 5/1/77      |
| IF-15A-2-25        | Radar System                                   | 1                        | 9/15/77     |
| IF-15A-2-26        | Lighting System                                | 6                        | 8/15/77     |
| IF-15A-2-27        | Electrical Power Supply                        | 8                        | 9/1/77      |
| IF-15A-2-28-1      | Wiring Diagrams                                | 6                        | 9/1/77      |
| IF-15A-2-28-2      | Wiring Diagrams                                | 5                        | 9/15/77     |
| IF-15A-4-4         | Instrument and Electric,<br>Electronic Systems | 1                        | 6/15/77     |

(continued)

Inventory of Technical Orders (continued)

| <u>T.O. Number</u> | <u>Subject</u>                        | <u>Change<br/>Number</u> | <u>Date</u> |
|--------------------|---------------------------------------|--------------------------|-------------|
| IF-15A-4-7         | Parts Index                           | 1                        | 5/15/77     |
| IF-15A-21          | Equipment Inventory                   | Basic                    | 6/15/77     |
| IF-15A-34-1-1      | Non Nuclear Weapon Delivery<br>Manual | Basic                    | 9/1/77      |
| 12P4-2APX101-2     | Radio                                 | Basic                    | 9/1/75      |
| 12P4-2APX76-2      | Interrogator Set                      | Changed                  | 1/15/77     |
| 12P2-2APG63-2      | Antenna                               | 1                        | 12/15/76    |
| 12R2-2ARC109-4     | Radio Set                             | 9                        | 6/15/76     |
| 12R5-2ARN118-1     | TACAN Navigational Set                | Basic                    | 10/15/76    |
| 12R2-2ARC164-2     | Radio Set                             | Basic                    | 6/20/76     |

**AVIONICS INTERFACE DATA SUMMARY  
FOR  
F-16A**



**October 1979**

**Issued by  
The Deputy for Avionics Control  
ASD/AX  
A Joint AFSC/AFLC Organization**

## FOREWORD

This document is one of a series of reports that describe Avionics interfaces for various USAF aircraft. It was prepared for the Deputy for Avionics Control, Aeronautical Systems Division (ASD/AX), Wright-Patterson AFB, Ohio by ARINC Research Corporation, Annapolis, Maryland under Contract F33657-79-C-0567.

| Record of Changes |         |              |          |
|-------------------|---------|--------------|----------|
| Change            | Subject | Date Entered | Initials |
|                   |         |              |          |

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## 1. INTRODUCTION

This document contains configuration data relevant to the integration of additional avionics into the F-16A aircraft.

This document will be revised periodically as additional modifications are planned and incorporated into the aircraft. Queries regarding information contained herein should be addressed to:

The Deputy for Avionics Control  
Code: ASD/AXP  
Wright-Patterson AFB, Ohio

This document was compiled from Air Force source materials by ARINC Research Corporation under Contract F33657-79-C-0567.

The applicable technical orders are included in the references listed in Section 10.

## 2. COCKPIT SPACE

Table 2-1 summarizes the available cockpit space in the F-16A and provides references, as appropriate, to Figures 2-1, 2-2, and 2-3.

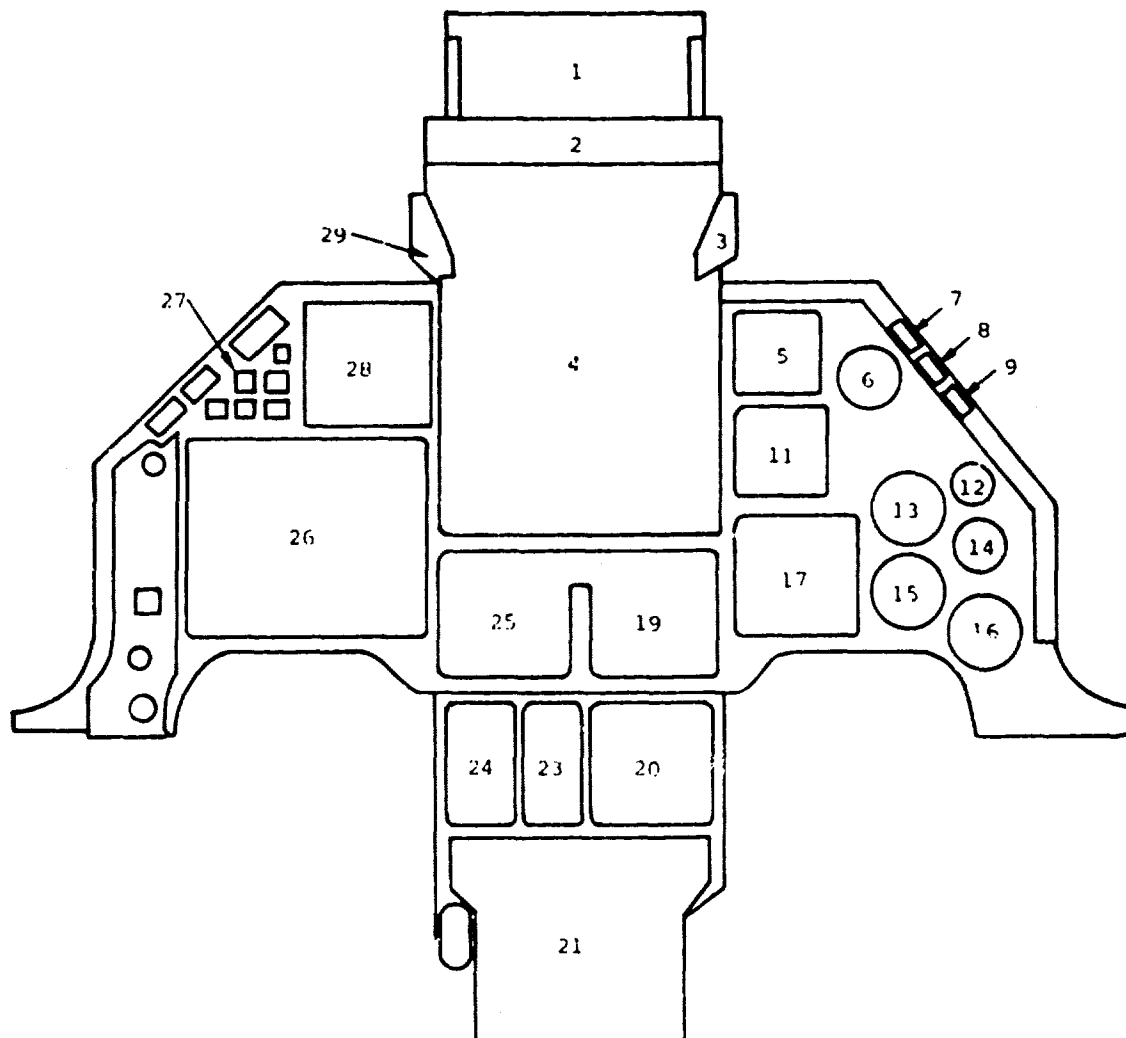
The F-16 program office is currently planning to relocate the cockpit Fire Control/Navigation Panel (FCNP) from the right console to the left console (ECP0076). No detailed information is currently available on this cockpit rearrangement except as shown in Figure 2-4 and in the ECP0076 overview that follows:

### ECP0076 (Relocate FCNP) Modifications for FOT&E

- Modification will be made in accordance with formal retrofit engineering for FOT&E aircraft
- All modifications of approved ECP0076 configuration will be made:
  - Relocate FCNP (which necessitates moving other panels)
  - Relocate 3 Autopilot Switches
  - Delete Alternate Release Switch in F-16B Front Station
  - Relocate Selective Jettison Switch to the SM Panel
  - Reverse Gain and Symbology Controls on Radar/E-O Display
  - Increase Rotation of Manual Range Control
  - Rearrange Volume Control Knobs on COMM Panel
  - Change Intensity Control of AUX Console Gauges to the Instrument Control Knob
  - Reduce Intensity of AOA and NWS/AR Lights
  - Reverse the Switch Activation for Designate/Return-to-Search
  - Spring Load Speed Brake Switch in F-16B Rear Station
  - Additional Cockpit Utility Lights
  - Add the Roll, Pitch, Yaw, and Standby Gain Caution Lights to the Press-to-Self-Test Switch in the Crew Station

Table 2-1. F-16A AVAILABLE COCKPIT SPACE

| Unit                                | Figure Number | Item      | Size (W, H, D)       | Notes                                               |
|-------------------------------------|---------------|-----------|----------------------|-----------------------------------------------------|
| INS Control (FCNP)                  | 2-3           | 6         | 5-3/4" x 6" x 7"     | To be relocated - ECP0076                           |
| Communications Panel                | 2-2           | 1         |                      | To be relocated - ECP0076                           |
| Anti-Ice/Antenna Select Panel       | 2-3           | 1 and 2   | 5-3/4" x 1-3/8"      | To be relocated - ECP0076                           |
| Blank (reserved for video recorder) | 2-2           | 25        | 5-3/4" x 2-1/4" x 7" | Growth space                                        |
| Blank (reserved for video recorder) | 2-3           | 16        | 5-3/4" x 2-5/8" x 7" | Growth space                                        |
| Blank                               | 2-2           | 11 and 18 | 5-3/4" x 9" x 2-1/4" | Growth space (extended to be inaccessible to pilot) |
| Blank                               | 2-3           | 19        | 6" x 5" x 9-1/4"     | Growth space                                        |
| Stores Control Panel                | 2-1           | 26        | 6" x 5" x 9-1/4"     |                                                     |
| Threat Warning Azimuth Indicator    | 2-1           | 28        | 3-1/4" x 3"          |                                                     |
| Radar/EO Display                    | 2-1           | 21        |                      | CRT size is 4" x 4"                                 |
| ILS Control                         | 2-2           | 17        | 5-3/4" x 1-1/2" x 8" | To be relocated - ECP0076                           |
| VHF Control/Radio                   | 2-2           | 4         | 5-3/4" x 4-7/8" x 8" | To be relocated - ECP0076                           |
| UHF Control/Radio                   | 2-2           | 3         | 5-3/4" x 4-7/8" x 8" | To be relocated - ECP0076                           |
| Radar Control                       | 2-2           | 2         |                      | To be relocated - ECP0076                           |
| Interior Lights Panel               | 2-3           | 4         | 5-3/4" x 4-3/8"      | To be relocated - ECP0076                           |



- |                                     |                                           |
|-------------------------------------|-------------------------------------------|
| 1. HUD Combiner Glass               | 15. FTIT Indicator                        |
| 2. Gun Camera                       | 16. Fuel Quantity Indicator               |
| 3. Air Refuel Status/NWS Indicator  | 17. Altimeter                             |
| 4. HUD Control Panel                | 18. Deleted                               |
| 5. Standby Attitude Indicator       | 19. Attitude Director Indicator (ADI)     |
| 6. FUEL FLOW Indicator              | 20. Horizontal Situation Indicator (HSI)  |
| 7. DUAL FC FAIL Warning Lamp (Red)  | 21. Radar/EO Display                      |
| 8. HYD/OIL PRESS Warning Lamp (Red) | 22. Deleted                               |
| 9. CANOPY Warning Lamp (Red)        | 23. Angle of Attack (AOA) Indicator       |
| 10. Deleted                         | 24. Instrument Mode Select Panel          |
| 11. Vertical Velocity Indicator     | 25. Air Speed/Mach Indicator              |
| 12. Engine Oil Pressure Indicator   | 26. Stores Control Panel                  |
| 13. Tachometer                      | 27. Threat Warning Indicator Control Unit |
| 14. Nozzle Position Indicator       | 28. Threat Warning Azimuth Indicator      |
|                                     | 29. Angle of Attack (AOA) Indexer         |

Figure 2-1. INSTRUMENT PANEL

1. Communications Control Panel
2. Radar Control Panel
3. UHF Radio Control Panel AN/ARC-164
4. VHF Radio Control Panel AN/ARC-115
5. TACAN Control Panel AN/ARN-118
6. Flight Control Manual Trim Panel
7. ECM Pod Control Panel C-7854/ALQ
8. Anti-G Suit Hose Connection
9. Deleted
10. Oxygen Control Panel
11. Oxygen Hose Connection
12. Test Switch Panel
13. Windshield Defog Control Lever
14. Flight Control System Control Panel
15. Fuel System Control Panel
16. Canopy Jettison Control
17. ILS Control Panel AN/ARN-108
18. EPU Control Panel
19. Electrical System Control Panel
20. Throttle Lever Friction Control
21. Engine and Jet Fuel Starter Control Panel
22. Throttle Grip
23. Chaff/Flare Dispenser Button (on left vertical panel)
24. Reduced Idle Thrust
25. Reserved-Video Recorder

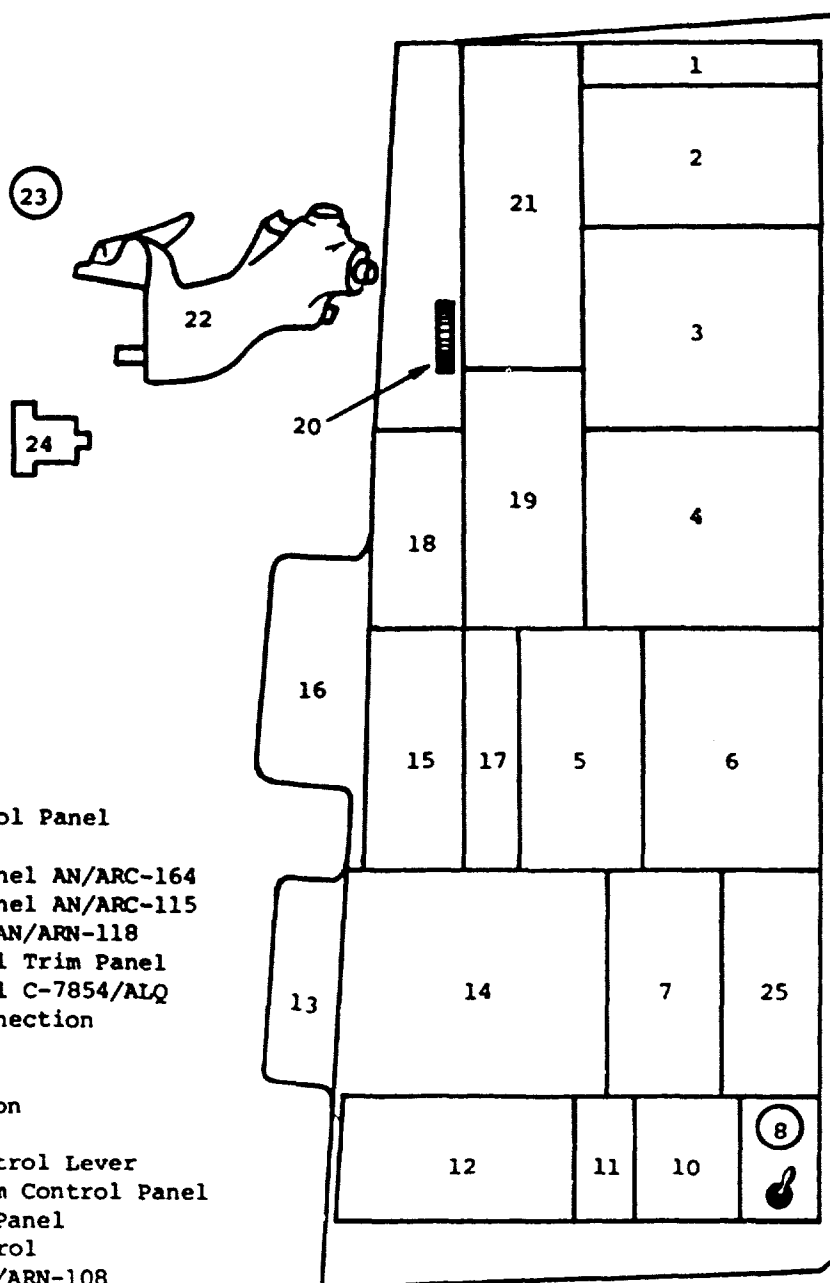


Figure 2-2. LEFT CONSOLE

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1. Engine Anti-Ice Switch
2. Antenna Select Panel
3. Nuclear Consent Switch (Guarded)
4. Interior Lighting Control Panel
5. Pressure Suit Vent Switch
6. Fire Control/Navigation Control Panel (INS)
7. Deleted
8. Deleted
9. Air Conditioning Control Panel
10. Secure Speech Control Panel KY-28/TSEC
11. Growth Space
12. Chaff/Flare Dispenser Control Panel
13. Map and Data Stowage Bin
14. External Lighting Control Panel
15. Side Stick
16. Reserved for JTIDS
17. Oxygen Regulator Control Panel
18. Growth Space
19. Growth Space

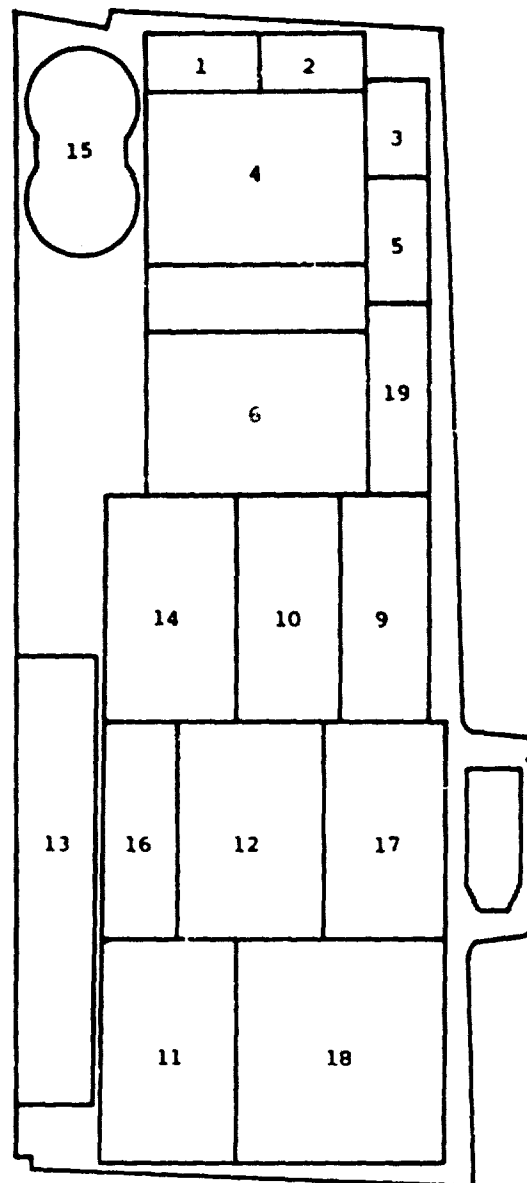


Figure 2-3. RIGHT CONSOLE

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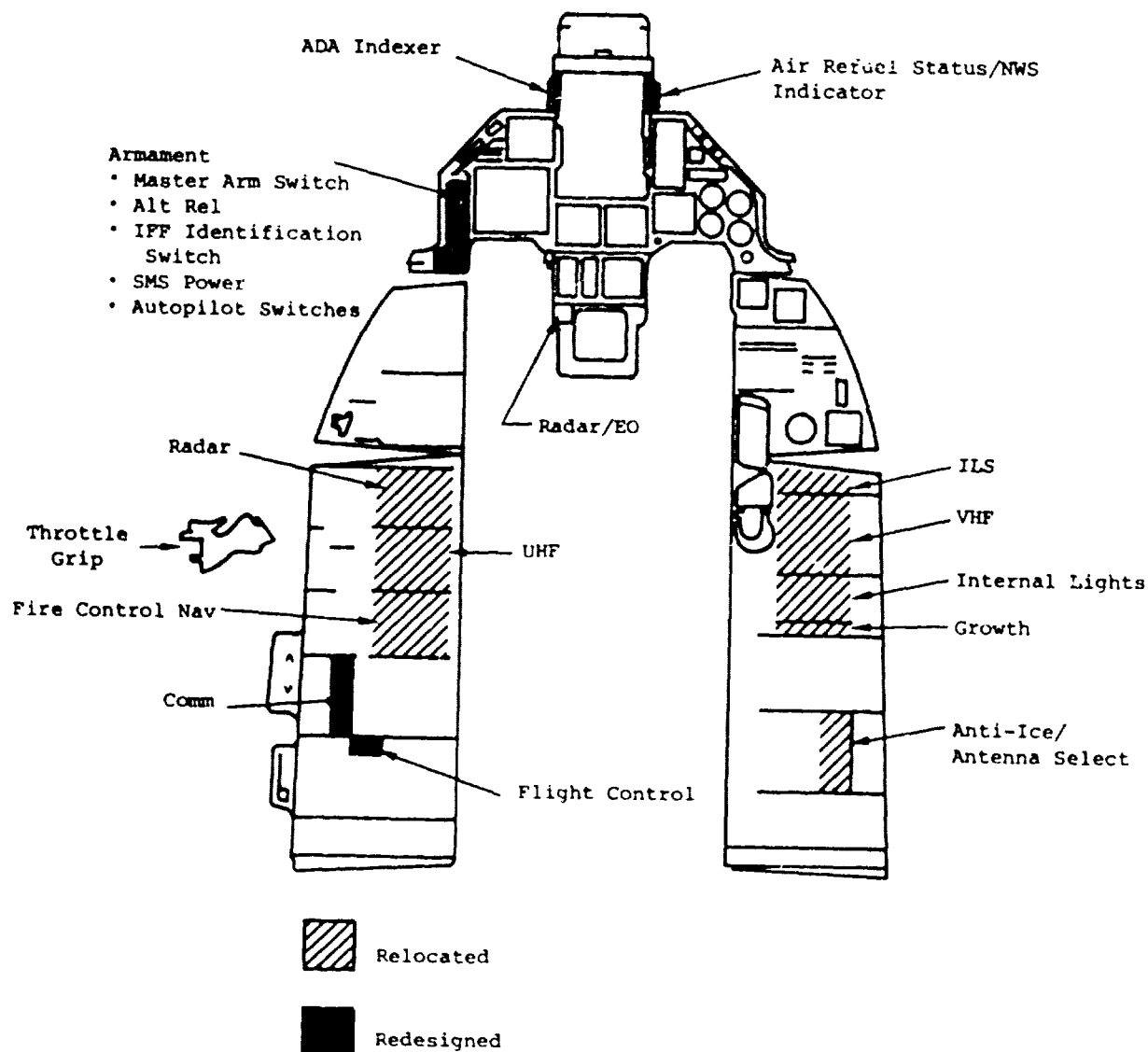


Figure 2-4. ECP0076 F-16A CREW STATION MODIFICATIONS

### 3. AVIONICS SPACE

There are several areas that could become locations for additional avionics equipment (see Figure 3-1 and Table 3-1). Behind the seat there is an avionics growth space. This space is irregularly shaped. The nominal size is 12 inches H  $\times$  24 inches W  $\times$  24 inches D. If JTIDS took over TACAN, that space would also be available. There are also two spaces available that have either limited or no access. There is also a radar growth space available. Space A (Figure 3-1) has not been dedicated to any avionics equipment.



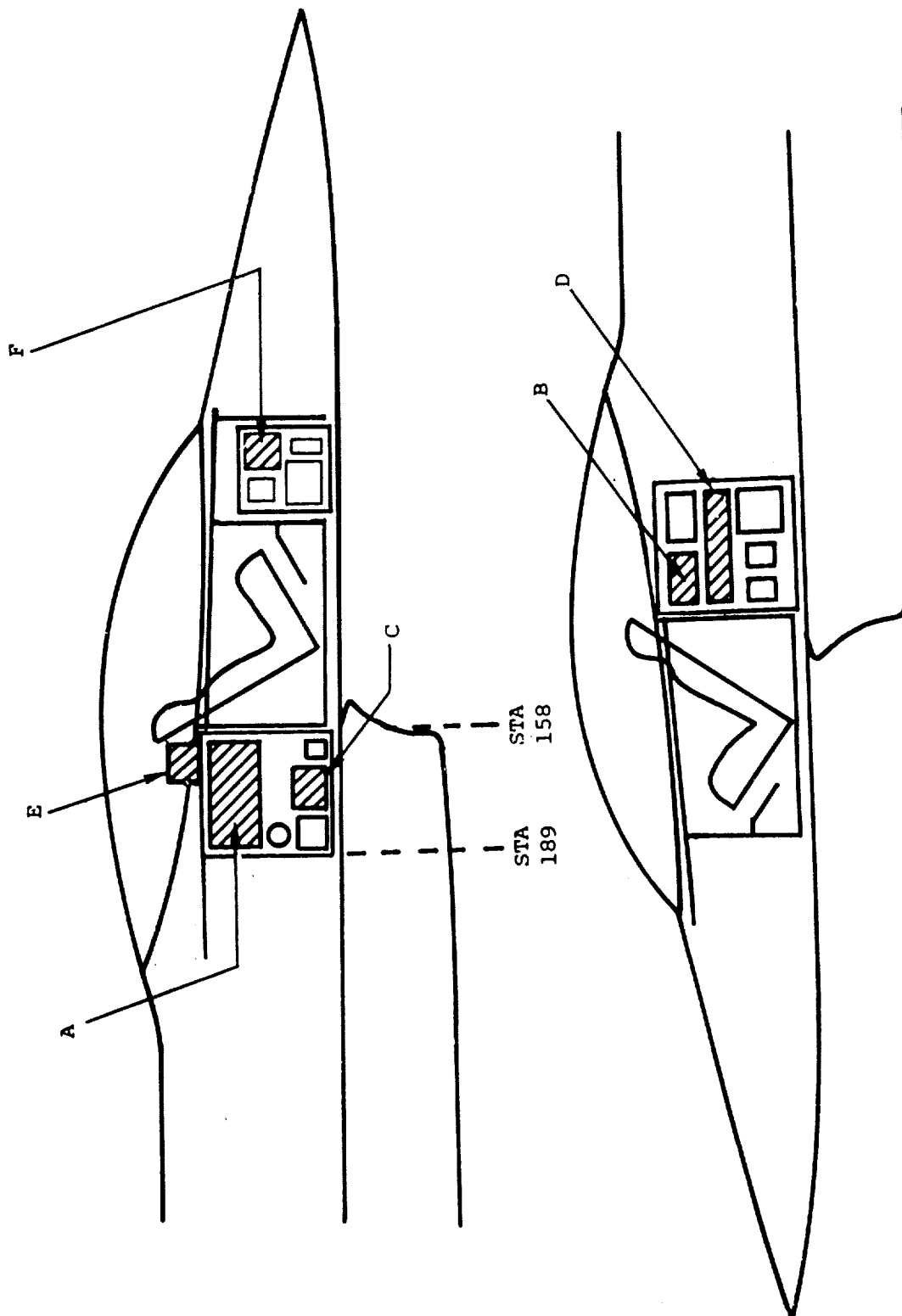


Figure 3-1. F-16A AVAILABLE AVIONICS SPACE

Table 3-1. F<sup>2</sup>E SUMMARY - F-16A

| F <sup>2</sup> E Criteria                                                                                                                                                | Potential Available Space         |                                                     |                                             |                                   |                                                   |                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------------------------------------------|---------------------------------------------|-----------------------------------|---------------------------------------------------|-----------------------------------------|
|                                                                                                                                                                          | A<br>2404 Bay,<br>RH<br>Door 2404 | C<br>2202 Bay,<br>RH, ARN-118<br>TACAN<br>Door 2202 | B<br>2404 Bay,<br>LH<br>No Direct<br>Access | D<br>2404 Bay,<br>LH<br>Door 2101 | E<br>Shelf Above<br>and Behind<br>Seat<br>Cockpit | F<br>RH Fwd<br>Bay (Radar)<br>TBD       |
| Rectangular Size<br>(H, W, D - inches)<br>Volume (Ft <sup>3</sup> )                                                                                                      | 12 x 24 x 24<br>4 Ft <sup>3</sup> | 8.9 x 11.7 x<br>20.5<br>1.2 Ft <sup>3</sup>         | 10 x 11.2<br>x 5<br>0.3 Ft <sup>3</sup>     | 4 x 15 x 9<br>0.3 Ft <sup>3</sup> | 6 x 5 x 17<br>0.3 Ft <sup>3</sup>                 | 6 x 9 x 8.2<br>0.3 Ft <sup>3</sup>      |
| Type of Cooling<br>Available                                                                                                                                             | Forced<br>Air<br>Available        | Forced<br>Air<br>Available                          | Forced<br>Air<br>Available                  | Forced<br>Air<br>Available        | Normal<br>Cockpit<br>Cooling                      | Forced<br>Air<br>Available              |
| Temperature-Altitude<br>Vibration                                                                                                                                        | Class 2, MIL-E-<br>5400<br>8-15G  | Class 2, MIL-E-<br>5400<br>8-15G                    | Class 2, MIL-E-<br>5400<br>15-30G           | Class 2, MIL-E-<br>5400<br>15-30G | Class 1, MIL-E-<br>5400<br>8-15G                  | Class 2, MIL-E-<br>5400<br>8-15G        |
| Possible Candidates<br>for this Space                                                                                                                                    | Not Known                         | GPS                                                 | Not Known                                   | Not Known                         | Not Known                                         | Radar<br>(Dedicated<br>Growth<br>Space) |
| Remarks                                                                                                                                                                  |                                   | IF JTIDS<br>Performs<br>TACAN                       | No Direct<br>Access                         | Awkward<br>Access                 | Awkward<br>Form Factor                            |                                         |
| *Where LRU is currently installed, the dimensions given represent dimensions of LRU;<br>when no LRU is installed, the dimensions given are those of the available space. |                                   |                                                     |                                             |                                   |                                                   |                                         |

#### 4. ELECTRICAL POWER SYSTEM

The electrical power system in the F-16A consists of a primary ac power generating system, an emergency ac power generating system, a dc power system, a flight control power supply system, and a power distribution and control system.

Normally, electrical power is supplied by a 40 kVA generator system, supplying 115/200 V 400 Hz to the two ac power panel essential and non-essential buses. The emergency back-up system supplies 5 kVA 115/200 V 400 Hz electrical power. This generator is driven by the emergency power unit accessory gear box. If this system fails, the permanent magnet generator section of the emergency generator will supply dc power to the four flight control power supplies.

A 24 V battery system and two ac-to-dc, 100-amp converters supply 28 Vdc power. The converters take the power from either the main generator or emergency generator and convert it to dc power.

Reported electrical power growth reserve in the F-16A aircraft is as follows:

- 50 kVA ac capability
  - 33.7 kVA load
  - 16.3 kVA growth
- 200 amp 28 Vdc capability
  - 120 amp load
  - 80 amp reserve (nonessential bus limited)

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## 5. ENVIRONMENTAL CONTROL SYSTEM

### 5.1 General

The F-16A Environmental Control System (ECS) uses a regenerative, bootstrap open-air refrigeration system to provide cooling air to the cabin and to the various avionics and electrical equipments. The ECS uses bleed air from the seventh- and/or thirteenth-stage compressor bleed ports (depending on the available bleed pressures). The bleed air is cooled by the heat exchangers, passed through a water separator, then routed into two lines for cabin and avionics cooling.

### 5.2 Cabin Cooling

The ECS is designed to maintain a shirt-sleeve cockpit environment while cooling heat loads up to 7,834 BTU/hr or 2.296 kW. The cabin cooling air is discharged through the cabin pressure regulator into the forward equipment bay to aid in equipment cooling. In the forward equipment bay, the cabin air mixes with the discharge air from the forced air cooled equipment. The air mixture then flows aft through the under-floor and aft equipment bays, through the right-hand strake equipment bay, and is discharged overboard.

### 5.3 Avionics Cooling

The cooling air supplied by the ECS for force-cooled equipment is controlled at a nominal lower limit of 35°F, except during supersonic transients at high altitude when the cooling air temperature may be as low as 0°F. The ECS cooling air is maintained below 80°F at all times. The design cooling airflow is designed to vary with temperature. Minimum airflows of 1.69, 2.25, and 3.95 pounds per minute are required for temperatures of 0°F, 35°F, and 80°F respectively per kilowatt of electrical heat dissipated to the cooling air.

Those equipments which are not designed for forced-air cooling are cooled by convection to the surrounding air.

Table 5-1 illustrates the present ECS loads and anticipated load growth. Table 5-2 illustrates the ECS loads by compartments.

### 5.4 Cooling System Growth

Forced-air cooling system growth reserve is reported to be available to handle additional heat dissipation beyond current loads. Rated figures are as follows:

Capacity: 6.90 kW

Load: 5.43 kW

Reserve: 1.47 kW (this is forced-air cooling to avionics)

Identified Growth: 1.81 kW (see Tables 5-1 and 5-2)

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| Table 5-1. F-16A ECS LOADS (WATTS) AVIONICS<br>AND ELECTRICAL EQUIPMENT*                                                                                                                                                                                                                          |                      |                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------|
| Equipment                                                                                                                                                                                                                                                                                         | Cooling Load         |                           |
|                                                                                                                                                                                                                                                                                                   | Forced-Air<br>Cooled | Self-Cooled<br>to Ambient |
| Production Equipment                                                                                                                                                                                                                                                                              |                      |                           |
| Fire Control                                                                                                                                                                                                                                                                                      | 3,892                | 332                       |
| Navigation                                                                                                                                                                                                                                                                                        | 292                  | 244                       |
| Penetration Aids                                                                                                                                                                                                                                                                                  | 372**                | 428                       |
| Commun-Ident                                                                                                                                                                                                                                                                                      | 145**                | 197                       |
| Flight Control                                                                                                                                                                                                                                                                                    | 225**                | 43                        |
| SLM and CTG Accel                                                                                                                                                                                                                                                                                 | --                   | 139                       |
| Electrical                                                                                                                                                                                                                                                                                        | 501                  | 848                       |
| Other                                                                                                                                                                                                                                                                                             | 7**                  | 269                       |
| Total                                                                                                                                                                                                                                                                                             | 5,434                | 2,500                     |
| Identified Growth                                                                                                                                                                                                                                                                                 |                      |                           |
| CW Illuminator                                                                                                                                                                                                                                                                                    | 1,390                | --                        |
| Data Link                                                                                                                                                                                                                                                                                         | 425                  | --                        |
| Video Recorder                                                                                                                                                                                                                                                                                    | --                   | 32                        |
| Total                                                                                                                                                                                                                                                                                             | 1,805                | 32                        |
| Total Load                                                                                                                                                                                                                                                                                        | 7,239                | 2,532                     |
| *Data taken from General Dynamics Report 16<br>PR226A, 15 November 1976: F-16A/B Environ-<br>mental Control System Analysis, with Table<br>3.1.2 revision dated 13 January 1978.<br>**Equipment is self-cooled. Forced-cooled<br>listing results from equipment bay area<br>cooling requirements. |                      |                           |

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| Table 5-2. F-16A AVIONICS AND ELECTRICAL ECS LOADS (WATTS) BY COMPARTMENT |                   |                        |                   |                        |                        |                        |
|---------------------------------------------------------------------------|-------------------|------------------------|-------------------|------------------------|------------------------|------------------------|
| Compartment                                                               | Present Loads     |                        | Identified Growth |                        | Total Heat Dissipation |                        |
|                                                                           | Forced-Air Cooled | Self-Cooled to Ambient | Forced-Air Cooled | Self-Cooled to Ambient | Forced-Air Cooled      | Self-Cooled to Ambient |
| Cabin                                                                     | --                | 670                    | --                | 2                      | --                     | 672                    |
| Padome                                                                    | --                | 137                    | --                | --                     | --                     | 137                    |
| Forward Equipment Bay                                                     | 3,157             | 16                     | --                | --                     | 3,157                  | 16                     |
| Under Floor Bay                                                           | 1,026             | 200                    | --                | --                     | 1,026                  | 200                    |
| Aft Equipment Bay                                                         | 436               | 1,009                  | 1,805             | 30                     | 2,241                  | 1,039                  |
| Right-Hand Strake                                                         | 240               | 375                    | --                | --                     | 240                    | 375                    |
| Lower Equipment Bay                                                       | 575*              | 93                     | --                | --                     | 575                    | 93                     |
| Totals                                                                    | 5,434             | 2,500                  | 1,805             | 32                     | 7,239**                | 2,532                  |

\*Equipment is self-cooled. Forced-cooled listing results from equipment area cooling requirements.

\*\*System forced-air cooling capacity is 6,900 units.

## 6. CURRENT AVIONICS

Tables 6-1 through 6-13 contain LRU data relating to the F-16 avionics systems that make up the current or near-term configuration. Where no entries are shown, the data were not available for this report. Data pertaining to future avionics modifications are presented in Section 9.

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Table 6-2. F-16A AVIONICS CONFIGURATION DATA: VHF RADIO SET LAUS AN/ARC-115 NSN: 5821-00-411-9824

| Name                                    | Nomenclature             | Location                       | Dimensions (Inches) |      |     | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |       | Heat Dissipation | Cooling Method | Mounting |
|-----------------------------------------|--------------------------|--------------------------------|---------------------|------|-----|-----------------------|-----------------|----------------|-------|------------------|----------------|----------|
|                                         |                          |                                | H                   | W    | D   |                       |                 | AC             | DC    |                  |                |          |
| Radio Set                               | AN/ARC-115               | Cockpit Left Console           | 4.9                 | 5.25 | 8.0 | 205.8                 | 6.5             |                | 27.5V | 85W TX Mode      |                | Console  |
| Comm. System Control                    | C-6513/ARC or C-9513/ARC | Cockpit Left Console           |                     |      |     |                       |                 |                |       |                  |                | Console  |
| Channel/Frequency Indicator (Identical) |                          | Cockpit Right Instrument Panel |                     |      |     |                       |                 |                |       |                  |                | Console  |

\*Serial numbers 1-400; 5821-00-160-1710; serial numbers 401 and up: 5821-00-935-5072.

\*\*Or equivalent needed for radio set. F-16A may have integrated communications control incorporating this requirement.

†F-16 documentation alludes to separate frequency indicator to be shared by UHF and VHF sets.

| Table 6-1. F-16 AVIONICS CONFIGURATION DATA: INTERCOMMUNICATIONS SET AN/AIC-18* NSN: 5831-00-116-6503 |               |                                                             |                     |     |     |                       |                 |                |    |                  |                |          |
|-------------------------------------------------------------------------------------------------------|---------------|-------------------------------------------------------------|---------------------|-----|-----|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                                  | Nomenclature  | Location                                                    | Dimensions (Inches) |     |     | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                       |               |                                                             | H                   | W   | D   |                       |                 | AC             | DC |                  |                |          |
| Amplifier                                                                                             | AN-1963/AIC   | Behind Pilot Seat                                           | 3.0                 | 5.7 | 4.7 | 80.4                  | 2.6             |                |    |                  | Convection     |          |
| Station Amplifier                                                                                     | C-6624/AIC-25 | Ground Surface Compartment<br>Lower Right of Engine Nacelle |                     |     |     |                       |                 |                |    |                  | Convection     |          |
| Warning Tone Generator                                                                                |               | Right Console<br>Below Exterior Lights Panel                |                     |     |     |                       |                 |                |    |                  |                |          |
| Intercommunica-<br>tion Relay<br>Matrix Assembly                                                      |               | Behind Pilot Seat                                           |                     |     |     |                       |                 |                |    |                  |                |          |
| Control Panel                                                                                         |               | Left Forward Console                                        |                     |     |     |                       |                 |                |    |                  |                |          |

•5831-00-116-6503 also

| Table 6-4. F-16 AVIONICS CONFIGURATION DATA: FLIGHT INSTRUMENTS |                               |                                             |                     |       |       |                       |                 |                               |                    |                  |                |          |
|-----------------------------------------------------------------|-------------------------------|---------------------------------------------|---------------------|-------|-------|-----------------------|-----------------|-------------------------------|--------------------|------------------|----------------|----------|
| NSN: VARIOUS                                                    |                               |                                             |                     |       |       |                       |                 |                               |                    |                  |                |          |
| Name                                                            | Part Number                   | Location                                    | Dimensions (Inches) |       |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power                |                    | Heat Dissipation | Cooling Method | Mounting |
|                                                                 |                               |                                             | H                   | W     | D     |                       |                 | AC                            | DC                 |                  |                |          |
| Attitude Direction Indicator                                    | AD-13A<br>NSN 6610-00-180 T8D | Cockpit Forward Instrument Panel            | 3.25                | 3.25  | 8.0   | 84.5                  | 5.0             | 115V<br>10VA<br>5VA<br>5Vac   |                    |                  | Convection     | Console  |
| Horizontal Situation Indicator                                  | AD-13A<br>NSN 6610-00-180 T8D | Cockpit Center Pedestal                     | 3.25                | 3.25  | 9.0   | 95.1                  | 6.0             | 115V<br>15VA<br>5Vac<br>26Vac | 26Vdc              |                  | Convection     | Console  |
| Magnetic Compass                                                | AD-13A<br>NSN 6610-00-180 T8D | Cockpit Right Auxiliary Console             | 2.5                 | 2.375 | 2.375 | 14.1                  | 0.875           | 5Vac                          |                    |                  |                |          |
| Self-Contained Attitude Indicator                               | AD-13A<br>NSN 6610-00-180 T8D | Cockpit Right Side Forward Instrument Panel | 2.4                 | 2.4   | 7.61  | 43.8                  |                 | 5Vac                          | 28Vdc<br>25W<br>9W |                  | Convection     | Console  |
| Angle of Attack Indicator                                       | AD-13A<br>NSN 6610-00-180 T8D | Cockpit Center Pedestal                     | 1.438               | 3.25  | 5.375 | 25.1                  | 1.1             | 115V<br>5VA<br>5V<br>2VA      |                    |                  | Convection     | Console  |
| Rate Gyro Transmitter                                           | AD-13A<br>NSN 6610-00-180 T8D | Forward Avionics Bay                        | 2.8                 | 2.875 | 4.75  | 38.2                  | 2.5             |                               | 28Vdc<br>15W<br>9W |                  | Convection     | Console  |
| Clock                                                           | AD-13A<br>NSN 6610-00-180 T8D | Cockpit Right Console                       | 2.375               | 2.375 | 1.89  | 10.7                  | 1.0             | 5Vac                          |                    |                  | Convection     | Console  |

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| Table 6-5. F-16 AVIONICS CONFIGURATION DATA: CADC AND OTHERS |                                   |                                                 |                     |       |       |                       |                 |                                          |    |                  |                |          |
|--------------------------------------------------------------|-----------------------------------|-------------------------------------------------|---------------------|-------|-------|-----------------------|-----------------|------------------------------------------|----|------------------|----------------|----------|
| Name                                                         | Nomenclature                      | Location                                        | Dimensions (Inches) |       |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power                           |    | Heat Dissipation | Cooling Method | Mounting |
|                                                              |                                   |                                                 | H                   | W     | D     |                       |                 | AC                                       | DC |                  |                |          |
| Air Data Computer                                            | Spec: 4025111-902                 | Forward Avionics Bay                            | 6.94                | 6.2   | 12.5  | 537.9                 | 17.5            | 115V<br>65W                              |    |                  | Forced Air     | Back     |
| Total Temperature Probe                                      | MS271R-2<br>NSN: 61RS-00-80J-7/LS | Lower Left On Fuselage                          | N/A                 | N/A   | N/A   |                       |                 | 115V<br>350W                             |    |                  | N/A            | Hard     |
| Pitot Static Probe                                           | Rosemount: 855EG                  | Nose                                            |                     |       |       |                       | 2.5             | 115V<br>1700W                            |    |                  | N/A            | Hard     |
| Angle of Attack Probe                                        | Teledyne<br>SL2965                | One On Each Side Of Nose                        | N/A                 | N/A   | N/A   |                       | 2.7             | 26Vac<br>800Hz<br>115V<br>125VA+<br>30VA |    |                  | N/A            | Hard     |
| CADC Fail Lamp                                               |                                   | Avionics Caution Panel<br>Cockpit Right Console |                     |       |       |                       |                 |                                          |    |                  | Convection     | Panel    |
| Airspeed Indicator                                           | AVU-8C/A<br>NSN: TBD              | Center Instrument Panel                         | 3.25                | 3.25  | 6.62  | 69.9                  | 2.5             | 5Vac                                     |    |                  | Convection     | Console  |
| Altimeter                                                    | AAU-14/A<br>NSN: TBD              | Center Instrument Panel                         | 3.25                | 3.25  | 7.0   | 73.9                  | 4.5             | 115V<br>25VA<br>5Vac<br>28V<br>2.5VA     |    |                  | Convection     | Console  |
| Vertical Velocity Indicator                                  | AAU-18/A<br>NSN: 6610-00-078-5694 | Right Instrument Panel                          | 5.25                | 2.375 | 2.375 | 29.6                  | 1.75            | 5Vac                                     |    |                  | Convection     | Console  |

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| Table 6-6. F-16A AVIONICS CONFIGURATION DATA: TACAM LINES AM/ANM-118 |              |                            |                     |      |      |                       |                 |                               |    |                  |                 |                                               |
|----------------------------------------------------------------------|--------------|----------------------------|---------------------|------|------|-----------------------|-----------------|-------------------------------|----|------------------|-----------------|-----------------------------------------------|
| NSN: 5826-01-015-0819                                                |              |                            |                     |      |      |                       |                 |                               |    |                  |                 |                                               |
| Name                                                                 | Nomenclature | Location                   | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power                |    | Heat Dissipation | Cooling Method  | Mounting                                      |
|                                                                      |              |                            | H                   | W    | D    |                       |                 | AC                            | DC |                  |                 |                                               |
| Transceiver Unit                                                     | RT-1159/A    | Right Strake Equipment Bay | 6.8                 | 7.5  | 14.5 | 745.5                 | 26.5            | 115V<br>150W                  |    | 100W             | Internal Blower | Secured to mount with two captive nut latches |
| Digital-to-Analog Adapter                                            | MX-9577/A    | Right Strake Equipment Bay | 6.8                 | 1.7  | 13.0 | 159.1                 | 5.0             | 26V**<br>40W                  |    | 10W              | Convection      | Secured to mount with one captive nut latch   |
| Mount                                                                | MT-4682/A    | Right Strake Equipment Bay | 2.1                 | 11.7 | 20.5 | 503.7                 | 7               | 28V<br>28VA                   |    |                  | Convection      | Shock                                         |
| Control Unit                                                         | C-9603/A     | Left After Cockpit Console | 2.3                 | 5.8  | 5.5  | 73.4                  | 2               | 250VA**<br>115V<br>16<br>400W |    | 35W              | Convection      | Console                                       |
| *For analog indicators.<br>**Total system power required.            |              |                            |                     |      |      |                       |                 |                               |    |                  |                 |                                               |

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| Table 6-7. F-16A AVIONICS CONFIGURATION DATA: INERTIAL NAVIGATION SYSTEM LINES |                                         |                       |                     |     |      |                       |                 |                                      |              |                  |                | NSN: TBD                          |
|--------------------------------------------------------------------------------|-----------------------------------------|-----------------------|---------------------|-----|------|-----------------------|-----------------|--------------------------------------|--------------|------------------|----------------|-----------------------------------|
| Name                                                                           | Nomenclature                            | Location              | Dimensions (Inches) |     |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power                       |              | Heat Dissipation | Cooling Method | Mounting                          |
|                                                                                |                                         |                       | H                   | W   | D    |                       |                 | AC                                   | DC           |                  |                |                                   |
| Inertial Navigation Unit                                                       | Singer-Kearfott<br>Part No.<br>K160A030 | Forward Avionics Bay  | 7.6                 | 7.5 | 15.2 | 866.4                 | 14.0            | 300VA*<br>1 $\phi$<br>115Vac<br>400M |              | ..               | Forced Air     | Quick Removal From INU/Batt Mount |
|                                                                                |                                         |                       |                     |     |      |                       |                 | 40VA<br>1 $\phi$<br>26Vac<br>400M    |              |                  |                |                                   |
| Fire Control/Navigation Panel                                                  | Singer-Kearfott<br>Part No.<br>K330A034 | Cockpit Right Console | 6.0                 |     | 7.3  | 249.7                 | 8.5             | 15VA<br>0-5Vac                       | 28Vdc<br>50W |                  | Convection     | Console Mounted                   |
|                                                                                |                                         |                       |                     |     |      |                       |                 |                                      |              |                  |                |                                   |
| INU Battery                                                                    | Gulton Ind., Inc.<br>Part No.<br>16342  | Forward Avionics Bay  | 5.0                 | 9.1 | 15.6 | 709.8                 | 5.1             |                                      |              |                  | Convection     | Quick Removal From INU/Batt Mount |

\*1020 VA start-up, 3  $\phi$  400 M. 1480 VA of this divides between 2 phases for heaters. Value shown is running prime power.  
 \*\*Refer to cooling airflow requirements curve.

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| Table 6-8. F-16 AVIONICS CONFIGURATION DATA: ILS SYSTEM LINES AM/ARM-108 |                  |                                      |                     |     |      |                       |                 |                |    |                  |                |          | MSM: TBD |  |
|--------------------------------------------------------------------------|------------------|--------------------------------------|---------------------|-----|------|-----------------------|-----------------|----------------|----|------------------|----------------|----------|----------|--|
| Name                                                                     | Nomenclature     | Location                             | Dimensions (Inches) |     |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |          |  |
|                                                                          |                  |                                      | H                   | W   | D    |                       |                 | AC             | DC |                  |                |          |          |  |
| Receiver                                                                 | R-1871/ARM-108   | Forward Avionics Bay                 | 5.1                 | 3.9 | 10.1 | 200.9                 | 7               |                |    |                  | Convection     |          |          |  |
| Control Panel                                                            | C-9445/ARM-108   | Cockpit Left Console                 | 1.5                 | 5.4 | 4.7  | 38.1                  |                 |                |    |                  | Convection     | Console  |          |  |
| Diplexer                                                                 |                  | Forward Avionics Bay                 |                     |     |      |                       |                 |                |    |                  | Convection     |          |          |  |
| Glide Slope/Localizer Antenna                                            |                  | Bottom of Nose Radome                |                     |     |      |                       |                 |                |    |                  |                | Hard     |          |  |
| Marker Beacon Antenna                                                    |                  | Fuselage forward end of Engine Inlet |                     |     |      |                       |                 |                |    |                  |                |          |          |  |
| Marker Beacon Lamp                                                       |                  | Cockpit Forward Instrument Panel     |                     |     |      |                       |                 |                |    |                  | Convection     |          |          |  |
| NOT PART OF JLS                                                          |                  |                                      |                     |     |      |                       |                 |                |    |                  |                |          |          |  |
| Angle of Attack Indexer                                                  | Grimes 65-0922-1 | Cockpit Forward Instrument Panel     | 1.9                 | 0.8 | 2.5  |                       | 0.4             |                |    |                  | 28Vdc<br>140MS | Console  |          |  |
|                                                                          |                  |                                      |                     |     |      |                       |                 |                |    |                  |                |          |          |  |
| *Includes power for one beacon lamp. 23W maximum for receiver alone.     |                  |                                      |                     |     |      |                       |                 |                |    |                  |                |          |          |  |

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| Table 6-10. F-16A AVIONICS CONFIGURATION DATA: RADAR SYSTEM (WESTINGHOUSE 6 646M483C01) |                                                   |                                  |                        |      |      |                             |                    |                    |      |                       |                       |          |
|-----------------------------------------------------------------------------------------|---------------------------------------------------|----------------------------------|------------------------|------|------|-----------------------------|--------------------|--------------------|------|-----------------------|-----------------------|----------|
| MSM: TBD                                                                                |                                                   |                                  |                        |      |      |                             |                    |                    |      |                       |                       |          |
| Name                                                                                    | Nomenclature<br>(Westinghouse<br>Drawing Numbers) | Location                         | Dimensions<br>(Inches) |      |      | Volume<br>(Cubic<br>Inches) | Weight<br>(Pounds) | Aircraft<br>Power* |      | Heat<br>Dissipation** | Cooling<br>Method     | Mounting |
|                                                                                         |                                                   |                                  | H                      | W    | D    |                             |                    | AC                 | DC   |                       |                       |          |
| Antenna                                                                                 | 16VE009001                                        | Nose Radome                      |                        |      |      |                             | 61.1               | 681VA              |      | 0.8                   | Forced Air<br>at 27°C | Hard     |
| Transmitter                                                                             | 16VE009002                                        | Forward Equip-<br>ment Bay Left  | 11.8                   | 18.5 | 10.5 | 2292.2                      | 69.2               | 1424VA             | 29W  | 3.6                   | Forced Air<br>at 27°C | Rack     |
| Low Power RF                                                                            | 16VE009003                                        | Forward Equip-<br>ment Bay Right | 11.3                   | 7.0  | 22.4 | 1771.8                      | 52.7               | 603VA              | 207W | 2.5                   | Forced Air<br>at 27°C | Rack     |
| Digital Signal<br>Processor                                                             | 16VE009006                                        | Forward Equip-<br>ment Bay Right | 11.3                   | 7.1  | 23.4 | 1877.4                      | 63.4               | 1059VA             |      | 4.4                   | Forced Air<br>at 27°C | Rack     |
| Computer                                                                                | 16VE009004                                        | Forward Equip-<br>ment Bay Right | 11.3                   | 4.0  | 24.5 | 1107.4                      | 30.5               | 348VA              |      | 1.2                   | Forced Air<br>at 27°C | Rack     |
| Radar Control<br>Panel                                                                  | 16VE009005                                        | Left Cockpit<br>Console          | 3.8                    | 5.8  | 6.5  | 143.3                       | 3.8                | 5VA                | 12W  |                       | Convection            | Console  |
| Rack                                                                                    | 16VE009007                                        |                                  |                        |      |      |                             |                    |                    |      |                       |                       |          |

\*All ac power is 115 v, 3 0, 400 Hrs, all dc power is 28 vdc.  
\*\*Heat dissipation is given in terms of pounds/minute of forced air.

\*All ac power is 115 V, 3 0, 400 Hz; all dc power is 28 vdc.

\*\*Heat dissipation is given in terms of pounds/minute of forced air.

| Table 6-11. F-16A AVIONICS CONFIGURATION DATA: CRYPTOGRAPHIC EQUIPMENT |              |          |                     |     |     |                       |                 |                |             |                  |                          |          | MSN: TBD |  |
|------------------------------------------------------------------------|--------------|----------|---------------------|-----|-----|-----------------------|-----------------|----------------|-------------|------------------|--------------------------|----------|----------|--|
| Name                                                                   | Nomenclature | Location | Dimensions (Inches) |     |     | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |             | Heat Dissipation | Cooling Method           | Mounting |          |  |
|                                                                        |              |          | H                   | W   | D   |                       |                 | AC             | DC          |                  |                          |          |          |  |
| Secure Voice Device<br>Control Unit                                    | TSEC/KV-58   |          | 4.88                | 5.0 | 4.2 |                       | 4.25            | 5V             | 28V<br>7.5W | 100 BTU 1 Hr     | Convection<br>Convection |          |          |  |
|                                                                        | C-7990/ARC   |          | 2.6                 | 5.8 | 2.3 |                       |                 |                | 28V         |                  |                          |          |          |  |

| Table 6-12. F-16A AVIONICS CONFIGURATION DATA: STORES MANAGEMENT SYSTEM LINE |                                |                                   |                     |      |       |                       |                 |                |    |                  |                |          | NSN: 780 |  |
|------------------------------------------------------------------------------|--------------------------------|-----------------------------------|---------------------|------|-------|-----------------------|-----------------|----------------|----|------------------|----------------|----------|----------|--|
| Name                                                                         | Nomenclature                   | Location                          | Dimensions (Inches) |      |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |          |  |
|                                                                              |                                |                                   | H                   | W    | D     |                       |                 | AC             | DC |                  |                |          |          |  |
| Armament Panel                                                               |                                | Left Instrument Panel             |                     |      |       |                       |                 |                |    |                  |                |          |          |  |
| Stores Control Panel                                                         |                                | Left Instrument Panel             | 5.0                 | 6.0  | 9.3   | 279                   | 6.5             | 20W            |    |                  |                |          |          |  |
| Central Interface Unit                                                       | G-D Part No. 81755-1681235-827 | Left Forward Avionics Bay         | 9.0                 | 13.5 | 12.0  | 1458                  | 17.9            | 230W           |    |                  | Forced Air     |          |          |  |
| Nuclear Consent Switch                                                       |                                | Right Cockpit Console             | 1.5                 | 5.8  |       |                       |                 |                |    |                  |                |          |          |  |
| Jettison and Release Remote Interface Units                                  |                                | Under Wings Between Pylons        | 2.0                 | 3.2  | 13.25 |                       | 2.3<br>4.5      | 7W             |    |                  | N/A            | Hard     |          |  |
| Conventional Weapons Interface Units                                         |                                | Under Wings On Appropriate Pylons | 2.0                 | 3.2  | 13.25 |                       | 2.3<br>4.5      | 7W             |    |                  | N/A            | Hard     |          |  |
| Missile Remote Interface Units                                               |                                | Under Wings On Appropriate Pylons | 2.0                 | 3.2  | 13.25 |                       | 2.3<br>4.5      | 7W             |    |                  | N/A            | Hard     |          |  |
| Emergency Stores Jettison Switch Panel                                       |                                | Left Forward Cockpit Console      |                     |      |       |                       |                 |                |    |                  |                |          |          |  |

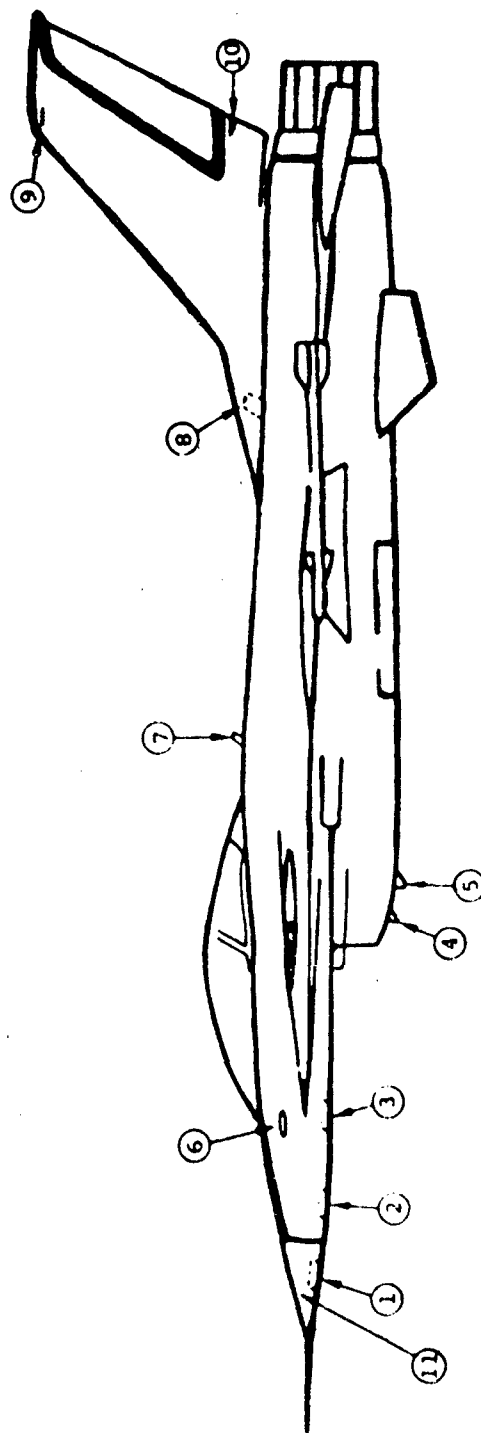
| Table 6-13. F-16A AVIONICS CONFIGURATION DATA: WEAPONS CONTROL SYSTEM LENS EXCLUDING REAR AND INS SYSTEMS |                    |                                |                     |     |      |                       |                 |                |     |                  |                |          | REF: TWO |
|-----------------------------------------------------------------------------------------------------------|--------------------|--------------------------------|---------------------|-----|------|-----------------------|-----------------|----------------|-----|------------------|----------------|----------|----------|
| Name                                                                                                      | Nomenclature       | Location                       | Dimensions (Inches) |     |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |     | Heat Dissipation | Cooling Method | Mounting |          |
|                                                                                                           |                    |                                | H                   | W   | D    |                       |                 | AC             | DC  |                  |                |          |          |
| Fire Control Computer Head-Up Display                                                                     | Delco Magic 362P-2 | Right After Equipment Bay      | 7.8                 | 5.0 | 20.0 | 780                   | 24              | 192W           |     |                  | Forced Air     |          |          |
|                                                                                                           |                    | Top Center Instrument Panel    |                     |     |      |                       | 35              | 37W            | 60W |                  | Convection     |          |          |
|                                                                                                           |                    | Bottom Center Instrument Panel |                     |     |      |                       | 10              | 40W            |     |                  | Convection     |          |          |
| Radio Electronics Unit                                                                                    | Kaiser PN 29500-30 | Left Forward Avionics Bay      | 8.0                 | 7.0 | 15.0 | 840                   | 18              | 125W           |     |                  | Forced Air     |          |          |
| Head-Up Display Electronics Unit                                                                          |                    | Left Forward Avionics Bay      | 7.5                 | 7.5 | 13.0 | 731.3                 | 23              | 176W           |     |                  | Forced Air     |          |          |
| Rate Sensor Unit                                                                                          |                    |                                |                     |     |      |                       | 7.5             | 35W            |     |                  | Convection     |          |          |

## 7. ANTENNAS

Figure 7-1 shows the antenna locations for the antennas of the F-16A aircraft.

The antenna functions and nomenclature are as follows:

- |                  |                                 |
|------------------|---------------------------------|
| 1. Glideslope    | Collins No. 608-6929-001        |
| Localizer        | Collins No. 608-6930-001        |
| 2. TACAN (flush) | Transco No. 2282-2              |
| 3. Marker Beacon | Transco No. 16F0-1500-1         |
| 4. TWS           | TBD                             |
| 5. UHF/IFF       | Dorne and Margolin No. CN18-7   |
| 6. TWS           | TBD                             |
| 7. TACAN         | Sensor Systems No. 565-5366-16L |
| 8. UHF/IFF       | Dorne and Margolin No. CN18-7   |
| 9. VHF           | GD 16E130-3                     |
| 10. TWS          | TBD                             |
| 11. Radar        | Westinghouse, #646R483G01       |



- |                                 |                            |
|---------------------------------|----------------------------|
| 1. Glideslope/Localizer Antenna | 7. TACAN Antenna           |
| 2. TACAN Antenna                | 8. UHF/IFF Antenna         |
| 3. Marker Beacon Antenna        | 9. VHF Antenna             |
| 4. Threat Warning Antenna       | 10. Threat Warning Antenna |
| 5. UHF/IFF Antenna              | 11. Radar Antenna          |
| 6. Threat Warning Antenna       |                            |

Figure 7-1. F-16A ANTENNA LOCATIONS

## 8. INTERFACE DATA

This section contains examples of interface signal characteristics and a description of the F-16A-MIL STD 1553 Multiplex bus requirements. These data were extracted from applicable sections of the Interface Control Document (ICD) for integration of GPS User Equipment in the F-16 aircraft.

Each signal characteristic sheet discusses a particular signal. The top line contains the signal name, type of signal (digital, analog, discrete, or synchronous), signal source and load, and whether the signal is an input or output of the GPS user equipment. A functional description follows, together with a description of the signal's characteristics.

The general requirements of the MIL STD 1553 data bus, as applied in the F-16A, are included in this section beginning on Page 8-9. These requirements are extracted from the Interface Control Document for the F-16 Avionics System, 16PP188(C) dated 27 July 1976.

# INTERFACE SIGNAL CHARACTERISTIC SHEET

| SIGNAL NAME          | TYPE         | I/O | FROM | TO   |
|----------------------|--------------|-----|------|------|
| Horizontal Deviation | Analog, d.c. | C   | UE   | IMSC |

## Functional Description

This signal provides a variable d.c. signal that indicates the displacement of the aircraft to the left or right of an approach course. The displacement represented by the indicating device will be controlled by UE software.

## Signal Characteristics

Range: Typically  $\pm 2.5^\circ$  full scale angular deflection for localizer. For area navigation systems, the Area Navigation Subcommittee of the Air Transport Association's Air Traffic Control Committee has recommended a range of 600 to 3000 feet full scale\* deflection for approach flight modes.

Index Reference: Desired approach course  
Positive Direction Sense: Fly right (+ right)

## Electrical Characteristics

Load: d.c. meter movement (two in parallel)  
Impedance:  $1000 \pm 30$  ohms (one instrument)  
Current: 2.5 ma for full scale deflection  
Scale Factor: 2.2 ma for 0.875 inch deflection  
Resolution: 106  $\mu$ A (one bar width)  
Accuracy:  $\pm 7.5$  percent

## Interconnection Data

Wire Type: Two conductor, twisted  
Wire Size: No. 22 AWG

Figure 1-1b. F-16A Horizontal Deviation Interface Signal Characteristics

\*Reference APINC Characteristic 5B2-2

|   |     |             |
|---|-----|-------------|
| A |     | ICD-GPS-012 |
|   | REV | 35          |



# INTERFACE SIGNAL CHARACTERISTIC SHEET

| SIGNAL NAME               | TYPE     | I/O | FROM | TO   |
|---------------------------|----------|-----|------|------|
| Horizontal Deviation Flag | Discrete | 0   | UE   | IMSC |

## Functional Description

Provides a discrete signal to operate the horizontal deviation warning flag or circuit when the deviation data is unreliable or a malfunction has occurred in the course deviation circuitry.

## Signal Characteristics

Deviation signal valid or invalid

## Electrical Characteristics

Load: d.c. meter movement (two in parallel)  
 Impedance: 1000  $\pm$  30 ohms (one instrument)  
 Input Voltage: 245 to 500 mv = signal valid  
 <180 mv = signal invalid

## Interconnection Data

Wire Type: Two conductor, twisted  
 Wire Size: No. 26 AWG

Figure 1-1c. F-16A Horizontal Deviation Flag Interface Signal Characteristics

|   |           |             |
|---|-----------|-------------|
| A | FORM 1-1c | ICD-GPS-012 |
|   | DATE      | REV         |
|   |           | 36          |

# INTERFACE SIGNAL CHARACTERISTIC SHEET

| SIGNAL NAME        | TYPE         | I/O | FROM | TO   |
|--------------------|--------------|-----|------|------|
| Vertical Deviation | Analog, d.c. | 0   | UE   | IMSC |

## Functional Description

Provides a variable d.c. signal that indicates the displacement of the aircraft above or below a desired flight path. The displacement represented by the indicating device will be controlled by UE software. Deflection of the indicating device may represent angular displacement or distance.

## Signal Characteristics

Range: Typically  $\pm 0.5^\circ$  full scale angular deflection for glideslope operation. For an area navigation system, the Area Navigation Subcommittee of the Air Transport Association's Air Traffic Control Committee has recommended a range of 40 to 100 feet full scale for approach flight modes.\*

## Electrical Characteristics

Load: d.c. meter movement (two in parallel)  
 Impedance:  $1000 \pm 30$  ohms (one instrument)  
 Current: 2.5 ma for full scale deflection  
 Scale Factor: 2.2 ma for 0.875 inch deflection  
 Resolution: 106  $\mu$ a (one bar width)  
 Accuracy:  $\pm 7.5$  percent

## Interconnection Data

Wire Type: Two conductor, twisted  
 Wire Size: No. 26 AWG

Figure I-1d. F-16A Vertical Deviation Interface Signal Characteristics

\*Reference ARINC Characteristic 582-2

|      |      |      |      |      |             |
|------|------|------|------|------|-------------|
| REV  | DATE | BY   | CHKD | CD   | ICD-GPS-012 |
| A    |      |      |      |      |             |
| DATE | REV  | DATE | REV  | DATE | 37          |

# INTERFACE SIGNAL CHARACTERISTIC SHEET

| SIGNAL NAME             | TYPE     | I/O | FROM | TO   |
|-------------------------|----------|-----|------|------|
| Vertical Deviation Flag | Discrete | 0   | UE   | IMSC |

## Functional Description

Provides a discrete signal to operate the vertical deviation warning flag or circuit when the deviation data is unreliable or a malfunction has occurred in the vertical deviation circuitry.

## Signal Characteristics

Deviation signal valid or invalid

## Electrical Characteristics

Load: d. c. meter movement (two in parallel)  
 Impedance: 1000 + 30 ohms  
 Input Voltage: 245 to 500 mv = signal valid  
 <180 mv = signal invalid

## Interconnection Data

Wire Type: Two conductor, twisted  
 Wire Size: No. 26 AWG

Figure I-1e. F-16A Vertical Deviation Flag Interface Signal Characteristics

|   |              |             |
|---|--------------|-------------|
| A | REVISION NO. | 1CD-GPS-012 |
|   | DATE         | 38          |

### 3. REQUIREMENTS

3.1 General Requirements. The detailed interface requirements for the F-16 Avionic System shall be as specified in this document.

#### 3.2 Electrical Interface

3.2.1 General. The signal interface for each subsystem is documented in the subsection covering tie-ins for the individual subsystem. Electrical signal specifications are included for signals routed "to", "from", and/or "within" the subsystem. The electrical signal specification number is assigned by using the convention outlined in Figure 1. This specification number is used as the "tie-in" sheet number.

Schematic diagrams, signal flow diagrams, and sketches of physical hook-ups are provided as supplementary sheets where required for clarification of interface requirements.

#### 3.2.2 Signal Interface Definition

3.2.2.1 Signal Types. This paragraph contains a definition of the basic types of electrical signal interfaces and terms which describe signal characteristics. Signal types include:

1. Power Excitation and Reference - All 115 vac, 400 hertz, and 28 vdc power excitation and reference signals.

2. Analog - Synchro, AC, and DC analog signals.

3. Discrete - All two-state signals which are transmitted or received over one wire and a return. The return may be common to several discrettes. It is also used for complementary two-state which are transmitted or received over two wires and a common return.

4. Serial Digital - All signals transmitted or received on the multiplex data bus in standard binary digital format; it includes status and control signals.

5. Video - All video and high frequency signals when coaxial or waveguide transmission lines are employed.

ELECTRICAL SIGNAL SPECIFICATION  
IDENTIFICATION NUMBER

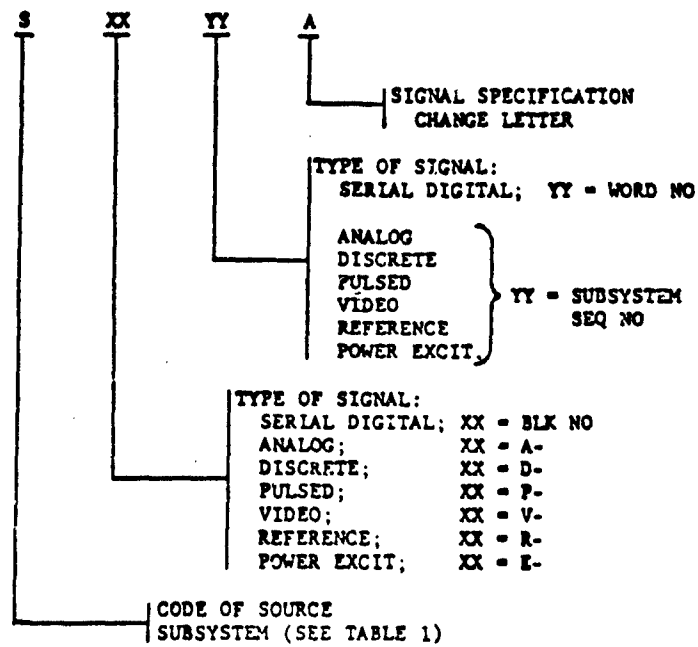


Figure 1 BREAKDOWN OF SIGNAL SPECIFICATION NUMBER

3.2.2.2 Signal Interface Specification Description Format.  
The format to be used for each of the above signal types and a definition of interface terms are presented in this paragraph.

3.2.2.2.1 Definition of Interface Terms. The interface terms are defined as follows.

**ACCURACY - (ANALOG)** - Unless otherwise specified, the accuracy shall be defined as the overall RMS error, in units of physical data, in the tie-in signals at the input of the receiving element. This accuracy does not include the error contributed by the receiving element, but it does include the loading effect of the receiver. Accuracy values are included under remarks section for reference only.

**ACCURACY - (SERIAL DIGITAL)** - Number of significant bits required to represent the value of the quantity, i.e., minimum number of bits needed to prevent degradation.

**BANDWIDTH** - The electrical bandwidth of the signal.

**BINARY STATES** - The True (T) state, logical "1" with voltage tolerances and the False (F) state, logical "0" with voltage tolerances.

**BIT NUMBERS** - Definition of the parameters of the data bits of a specified serial digital address.

**BIT RATE** - The rate at which bits are generated at the source (bits/second).

**BLANKING INTERVAL - (VIDEO)** - The interval during which blanking occurs.

**CABLE TYPE** - Type of interconnecting cable (i.e., wire size, twisted pair, twisted shielded triplet, coaxial, etc.)

**COMPUTATION RATE (SERIAL DIGITAL)** - The rate at which data is updated at the source.

**DATE** - Date of the last signal revision in the format: day, month, year.

**DC REFERENCE LEVEL - (VIDEO)** - Reference level of the video signal, at output of transmitting LRU.

**DESTINATION** - Set or interim distribution point which receives the tie-in signal.

**DISTRIBUTION** - Listings of all destinations receiving the tie-in signal.

**ELECTRICAL SIGNAL SPECIFICATION** - The specification number for a particular signal shall be of the form SXYYA as shown in Figure 1. Each signal, from origin to destination, will have a distinct specification number.

**ISOLATION** - Type of isolation required at the destination load.

**LSB VALUE** - The value assigned to the least significant bit of the parameter data.

**MAXIMUM LOAD CURRENT** - The maximum signal current allowed in a receiver load.

**MAXIMUM NOISE LEVEL** - The maximum electrical noise level that can be tolerated on the circuit without degradation.

**MAXIMUM POWER** - The maximum source signal power available from the transmitting element.

**MAXIMUM PRF** - The maximum pulse repetition frequency of the element from which the RF energy is originally transmitted.

**MAXIMUM SOURCE CURRENT** - The maximum current the source must be capable of providing.

**MAXIMUM VOLTAGE** - The maximum signal voltage encountered on a particular conductor (maximum steady-state voltage allowed by MIL-STD-704A at -65°).

**MAXIMUM VSWR** - The maximum ratio occurring between the standing wave maximum voltage and the standing wave minimum voltage measured along a particular RF conductor.

**MINIMUM VOLTAGE** - The minimum steady-state source signal voltage encountered on a particular conductor.

**MSB VALUE** - The value assigned to the most significant bit of the parameter data.

**NO. OF BITS** - Number of bits utilized for a particular parameter or the number of complementary bits required to transfer the specified data the tie-in represents.

**NOMINAL VOLTAGE - (POWER EXCITATION AND REFERENCE)** - Value of voltage with tolerances. This value is specified at the output of the transmitting equipment.

**OFFSET VALUE** - Value of a constant that is added to actual engineering data to represent the data.

**PHASE - (POWER AND REFERENCE)** - This term is used to identify phase for AC signals.

**PHASE SHIFT - (ANALOG)** - The nominal phase angle between the reference voltage and the voltage in question. Phase shift is referenced to the A/C bus Phase A. If the tie-in voltage leads the referenced voltage, the phase shift is defined as positive.

**PHASING - (ANALOG)** - Phase relationship between the analog signal and the physical data (i.e.,  $\pm 40^\circ$  for east values, CCW rotation for increasing north latitudes, etc.). The red wire (R<sub>1</sub>) on all synchro control transmitters will be excited by A/C bus Phase A. Synchros shall be zeroed and installed in accordance with ARINC unless otherwise noted.

**PIN NUMBER** - The identifying character(s) for the termination contact.

**RATE - (DISCRETE)(PULSES)** - The maximum number of pulses occurring in one second.

**(STEADY-STATE)** - Maximum rate of change of the tie-in signal in terms of units of physical data per unit time at which the tie-in signal will maintain full accuracy (maximum rate at which the discrete can change state).

**RECEIVER LOAD** - The impedance characteristics of the tie-in signal termination at 25°C.

**REMARKS** - Additional information, specification, etc. not covered by the format.



**REPETITION PERIOD - (VIDEO)** - Time required for a repetitive cycle in the various fields of view.

**RESOLUTION** - The minimum increment by which a parameter changes.

**SCALE FACTOR - (ANALOG)** - The nominal ratio of the incremental change in analog signal to the incremental change in physical data (i.e., - volts/knot, - volts/foot, - volts/degree, etc.). In general, the absolute scale factor will change with changes in primary input voltage, but the ratios will remain constant. Scale Factor is not applicable to switching signals.

**SCALE FACTOR - (DIGITAL)** - The number of places and direction that the binary point is shifted in converting a binary quantity to its fractional representation in the interface data word (left shift positive, right shift negative).

**SENSITIVITY - (SYNCHRO)** - Applicable only to control type synchro tie-ins. The nominal voltage gradient as measured at the rotor of the reference synchro under total configuration as per synchro chain drawings (defined as the voltage at maximum coupling times the sine of one degree). Unless otherwise specified on a particular interface sheet, the tolerance on the sensitivity resulting from the transmitting element is +5 percent. An additional tolerance of +5 percent can result from MIL-STD-704A line voltage variation.

**SENSITIVITY - (ANALOG)** - The minimum increment by which a parameter changes.

**SHIELD** - The subcontractor shall define the termination of the shield (i.e., Ground, Float, Connector pin number for carry through).

**SIGNAL INTERVAL - (VIDEO)** - The time interval during which video is present.

**SIGNAL LABEL** - The unique signal label which is utilized as an abbreviation to represent the signal name.

**SIGNAL NAME** - Name of the electrical signal.

**SIGNAL RANGE** - The upper and lower set of values which physical data may assume.

**SIGNAL TYPE** - The distinct type of signal being generated.

**SOURCE** - The subsystem from which a particular signal originates.

**SOURCE CODE** - A single alphanumeric character used in the signal specification to designate the source (see Table 1).

**SOURCE IMPEDANCE** - Output impedance of the transmitting element.

**SUBADDRESS** - Identification of block of word(s) to be transmitted/received over the data bus.

**TRANSMISSION RATE** - The rate at which a parameter shall be transmitted from the origin to the destination.

**UNITS** - Parameter measure, e.g., ft/second, semicircles, degrees.

**VOLTAGE RANGE** - The variation in voltage required in representing the physical range of the signal.

**3.2.3 Avionic serial digital interface description.** Digital communication between avionic subsystems shall be in a bit serial, word serial format, over time division multiplexed serial data buses. All serial digital communication between avionic subsystems shall conform to the detail requirements delineated in this section. These requirements were generated utilizing MIL-STD-1553 dated 30 August 1973 for reference.

**3.2.3.1 Serial digital functional interface.** The serial digital data bus shall function asynchronously in a command/response mode, and transmission shall occur in a half-duplex manner. Sole control of information transmission shall reside with the bus controller, which shall initiate all transmissions. The information flow on the data bus shall be comprised of messages which are, in turn, formed by three types of words (command, data and status) as defined in 3.2.3.3.7. All elements of the avionic subsystem interfaces shall conform to the electromagnetic interference and electromagnetic compatibility requirements specified in paragraph 3.2.7.

# SUBSYSTEMS ABBREVIATION AND CODE

| CODE | ABBREV | SUBSYSTEM                        | CODE | ABBREV | SUBSYSTEM                  |
|------|--------|----------------------------------|------|--------|----------------------------|
| F    | FCC    | FIRE CONTROL COMPUTER            | A    | API    | AUTO PILOT                 |
| R    | FCR    | FIRE CONTROL RADAR               | B    | ILS    | INSTRUMENT LANDING SYSTEM  |
| H    | HUD    | HEAD UP DISPLAY                  | D    | KBC    | KB-26 CAMERA               |
| S    | SHS    | STORES MANAGEMENT SUBSYSTEM      | G    | LGP    | LANDING GEAR CONTROL       |
| Z    | REO    | RADAR/EO DISPLAY SET             | J    | LCP    | LIGHTING CONTROL PANEL     |
| I    | IRU    | INERTIAL NAVIGATION UNIT         | O    | VDR    | VIDEO RECORDER             |
| P    | FCN    | FIRE CONTROL/NAVIGATION PANEL    | T    | ISC    | INSTRUMENT MODE SELECT     |
| C    | ADC    | CENTRAL AIR DATA COMPUTER        |      |        | COUPLER                    |
| E    | TSL    | TARGET IDENTIFICATION SET, LASER | U    | FQC    | FUEL QUANTITY CONTROL UNIT |
| M    | THR    | THROTTLE GRIP                    | M    | ICS    | INTERCOM SYSTEM            |
| S    | FTC    | SIDE STICK CONTROLLER            | L    | PPL    | POWER PANEL                |
| 6    | ADI    | ATTITUDE DIRECTOR INDICATOR      | X    | HSI    | HORIZONTAL SITUATION IN-   |
| 1    | BIX    | BLANKER                          |      |        | DICATOR                    |
| 2    | CPL    | CAUTION PANEL                    |      |        |                            |
| 8    | CWL    | CREW STATION WARNING LIGHTS      | K    | GSR    | GROUND SENSING RELAY       |
| 3    | ECS    | ENVIRONMENTAL CONTROL SYSTEM     |      |        |                            |
| 4    | EOS    | EO SENSOR                        |      |        |                            |
| 7    | FFT    | FUEL FLOW TRANSMITTER            |      |        |                            |

Table 1 SUBSYSTEMS ABBREVIATION AND CODE

3.2.3.2 Communication modes. The serial digital data bus shall employ three modes of information transfer: (1) bus controller to avionic subsystem transfer, (2) avionic subsystem to bus controller transfer, and (3) avionic subsystem to avionic subsystem transfer. Two special functional command modes shall also be employed: (1) dedicated function commands transmitted to individual avionic subsystems and (2) broadcast function commands issued to all subsystems simultaneously. These modes shall operate as described in paragraph 3.2.3.3.8.

### 3.2.3.3 Data transmission characteristics

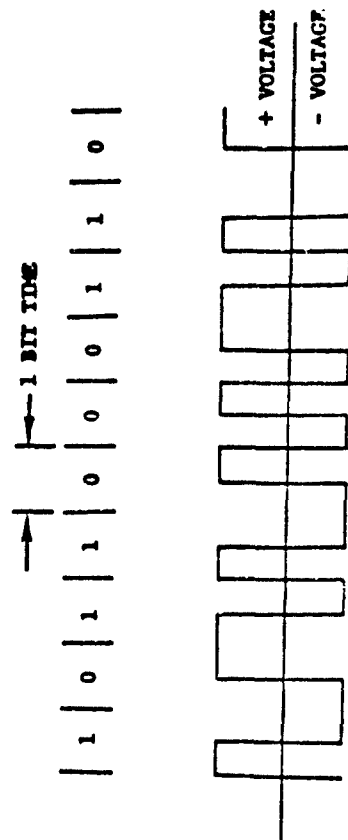
3.2.3.3.1 Data form. Digital data shall be transmitted in a form compatible with the message and word formats defined herein. A 2's complement representation of negative numbers shall be assumed for the transmission of numerical data unless otherwise specified. Any unused bit positions in a word shall be transmitted as logic zero.

3.2.3.3.2 Bit priority. The most significant bit shall be transmitted first with less significant bits following in descending order of value. The number of bits required to define a quantity shall be consistent with the resolution or accuracy required. In the event double precision quantities (information accuracy or resolution requiring more than 16 bits) are transmitted, the most significant half shall be transmitted first, followed by the least significant half.

3.2.3.3.3 Modulation. The signals shall be transferred over the data bus in serial digital pulse code modulation form.

3.2.3.3.4 Data code. The data code shall be Manchester bi-phase level as defined in MIL-STD-442b. A logic "one" shall be transmitted as a bipolar coded signal 1/0 (i.e., a positive pulse followed by a negative pulse). A logic "zero" shall be bipolar coded signal 0/1 (i.e., a negative pulse followed by a positive pulse). A transition through zero occurs at the midpoint of each bit time (see Figure 3).

3.2.3.3.5 Data rate. The data transmission rate on the bus shall be 1.0 megabit per second with a long term stability of  $\pm 0.01$  percent (i.e.,  $\pm 100$  Hz). The short term stability (i.e., stability over a 1.0 second interval) shall be at least 0.001 percent (i.e.,  $\pm 10$  Hz).



NOTES: MANCHESTER II BI-PHASE LEVEL  
 "1" REPRESENTED BY PLUS/MINUS  
 "0" REPRESENTED BY MINUS/PLUS

Figure 3 DATA CODE

3.2.3.3.6 Word size. The word size shall be 16 bits plus the sync waveform and the parity bit.

3.2.3.3.7 Word formats. The word formats shall be as shown in Figure 4 for the command, data, and status words.

3.2.3.3.7.1 Command word. A command word shall be comprised of a sync waveform, subsystem address, transmit/receive bit, subaddress/mode, data word count, and a parity bit (see Figure 4).

BIT INDEX:

|   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|

COMMAND WORD:

|  |      |                  |     |                 |                 |   |
|--|------|------------------|-----|-----------------|-----------------|---|
|  |      | 5                | 1   | 5               | 5               | 1 |
|  | SYNC | TERMINAL ADDRESS | T/R | SUBADDRESS/MODE | DATA WORD COUNT | P |

DATA WORD:

|  |      |      |   |
|--|------|------|---|
|  |      | 16   | 1 |
|  | SYNC | DATA | P |

STATUS WORD:

|  |      |                  |                   |                 |              |               |                |                  |                             |                             |                |                 |                 |   |   |   |
|--|------|------------------|-------------------|-----------------|--------------|---------------|----------------|------------------|-----------------------------|-----------------------------|----------------|-----------------|-----------------|---|---|---|
|  |      | 5                | 1                 | 1               | 1            | 1             | 1              | 1                | 1                           | 1                           | 1              | 1               | 1               | 1 | 1 | 1 |
|  | SYNC | TERMINAL ADDRESS |                   |                 |              |               |                |                  |                             |                             |                |                 |                 |   |   | P |
|  |      |                  | DATA PARITY ERROR | INSTRUMENTATION | DATA QUALITY | DATA QUANTITY | RESPONSE ERROR | ADDRESSING ERROR | BROADCAST FUNCTION RECEIVED | DEDICATED FUNCTION RECEIVED | BUS # SHUTDOWN | BUS #A SHUTDOWN | TERMINAL STATUS |   |   |   |

\*Used only by FCC for internal status information.

Figure 4. WORD FORMATS

3.2.3.3.7.1.1 Sync. The command sync waveform shall be an invalid Manchester waveform as shown on Figure 5. The width shall be three bit times, with the waveform being positive for the first one and one-half bit times, and then negative for the following one and one-half bit times. If the next bit following the sync is a logic zero, then the last half of the sync waveform will have an apparent width of two clock periods due to the Manchester encoding.

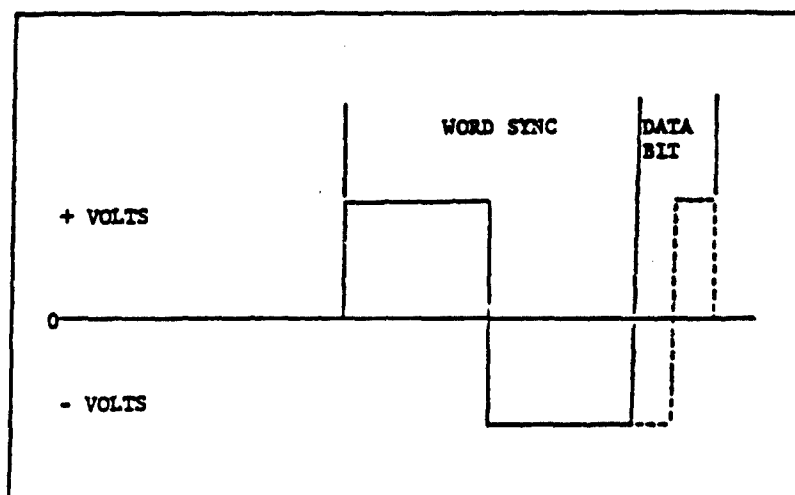


Figure 5 COMMAND AND STATUS SYNC

3.2.3.3.7.1.2 Address. The next five bits following the sync shall be the subsystem address. The most significant bit of the address shall be transmitted first.

3.2.3.3.7.1.2.1 Unique addresses. The unique address assigned to each subsystem shall be as defined in Table 2. In order to permit the use of multiple subsystems of a given type on a single bus in expanded system configurations, each subsystem shall be capable of decoding a minimum of two addresses. Selection of the specific address shall be determined by the presence or absence of continuity between pins on the subsystem input-output connector. The presence or absence of continuity shall be established in the airplane wiring.

3.2.3.3.7.1.2.2 Universal address. In addition to its unique address, each subsystem shall decode and respond to decimal address 31 (all 1's) as described in paragraph 3.2.3.3.8.5. This address is used only for broadcast function commands. Separate decoding of the transmit/receive bit and the subaddress field of the command word is not required when the command word terminal address field contains all ones.

3.2.3.3.7.1.3 Transmit/receive. The next bit following the address shall be the transmit/receive bit, which shall indicate the action required of the subsystem. A logic zero shall indicate receive, and a logic one shall indicate transmit. The transmit/receive bit shall be set to a logic one in broadcast and dedicated function command words.

3.2.3.3.7.1.4 Subaddress/mode. The next five bits following the transmit/receive bit shall be utilized for either subsystem subaddresses or to indicate function commands.

3.2.3.3.7.1.4.1 Subaddresses. Any value in the subaddress/mode field other than all ones shall be interpreted by a subsystem as the subaddress of a block of words to be received or transmitted by the subsystem. Subaddress assignments shall be indicated in Table 3.

3.2.3.3.7.1.4.2 Mode. A value of all ones in the subaddress/mode field shall indicate that the command word is a function command and that data is not to be transmitted or received.

3.2.3.3.7.1.5 Word count. The next five bits following the subaddress/mode field shall be used to indicate either the quantity of data words to be sent or received by the subsystem or the particular function command to be executed.



Table 2 AVIONIC SUBSYSTEM TERMINAL ADDRESSES

| <u>Subsystem</u> | <u>Bit<br/>Time</u> | <u>Terminal Address</u> |          |          |          |          |
|------------------|---------------------|-------------------------|----------|----------|----------|----------|
|                  |                     | <u>4</u>                | <u>5</u> | <u>6</u> | <u>7</u> | <u>8</u> |
| FCC              |                     | 0                       | 0        | 0        | X        | X        |
| PCR              |                     | 1                       | 0        | 1        | 0        | X        |
| HUD              |                     | 0                       | 1        | 1        | 0        | X        |
| SMS              |                     | 1                       | 1        | 0        | 0        | X        |
| REO              |                     | 1                       | 0        | 0        | 0        | X        |
| INU              |                     | 0                       | 0        | 1        | 0        | X        |
| PCNP             |                     | 0                       | 1        | 0        | 0        | X        |
| CADC             |                     | 1                       | 1        | 1        | 0        | X        |
| TISL             |                     | 1                       | 0        | 0        | 1        | X        |

NOTE: The "X's" shown in the five bit binary address field indicate connector programmable bits (reference paragraph 3.2.3.3.7.1.2.1). In the baseline system the bits shown as "X's" will all be set to logic "zero's." (All five bits of the terminal address field may be connector programmable.)

TABLE 3. COMMAND WORD SUBADDRESS CODE

| COMMAND WORD                                                                                                                                         |  |                    |  |                  |  |                 |  |                                  |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------|--|------------------|--|-----------------|--|----------------------------------|--|
| SYNCH                                                                                                                                                |  | FUNCTIONAL ADDRESS |  | SUBADDRESS/ MODE |  | DATA WORD COUNT |  | BIT TIME<br>PARITY<br>BIT        |  |
| STATION                                                                                                                                              |  |                    |  |                  |  |                 |  |                                  |  |
| TRANSMIT/RECEIVE                                                                                                                                     |  |                    |  | 0 1 0 1 0 0 0 0  |  | F03             |  |                                  |  |
| "1" = TRANSMIT                                                                                                                                       |  |                    |  | 0 1 0 0 0 0 1 1  |  | 105             |  |                                  |  |
| "0" = RECEIVE                                                                                                                                        |  |                    |  | 0 1 0 0 0 1 1 0  |  | 106             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 0 1 0 0 1 1 1 1  |  | 101             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 1 1 1 0 0 0 0 0  |  | 101             |  | FINE CONTROL RADAR               |  |
|                                                                                                                                                      |  |                    |  | 1 1 1 0 0 0 0 1  |  | 102             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 1 1 1 0 0 0 1 0  |  | 103             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 1 1 1 0 0 1 1 0  |  | 104             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 1 1 1 0 1 1 1 0  |  | SPACE           |  |                                  |  |
| ARMED "1" FOR<br>ENGINE/ENTER AIRCRAFT<br>(Used by Intercommunication/<br>Head Processor's Indicator<br>USED to: "1" = COVENANT<br>and "0" = STATUS) |  |                    |  |                  |  |                 |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 0 1 1 1 1 0 1 1  |  | C02             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 0 1 1 1 1 1 1 0  |  | F04             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 0 1 1 1 0 0 0 0  |  | F09             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 0 1 1 1 0 0 1 1  |  | F10             |  | HEAD UP DISPLAY                  |  |
|                                                                                                                                                      |  |                    |  | 0 1 1 1 0 1 1 1  |  | 106             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 0 1 1 1 1 0 1 0  |  | 103             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 0 1 1 1 1 1 1 0  |  | 102             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 1 1 1 0 0 0 1 1  |  | 101             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 0 1 1 0 1 0 1 1  |  | F07             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 0 1 1 0 1 0 1 0  |  | 102             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 1 1 1 0 0 1 0 0  |  | 101             |  | STORES MANAGEMENT SUBSYSTEM      |  |
|                                                                                                                                                      |  |                    |  | 1 1 1 0 0 1 0 1  |  | 102             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 1 1 1 0 0 1 1 0  |  | 103             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 1 1 1 0 0 1 1 1  |  | 104             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 0 1 1 0 1 1 1 1  |  | F05             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 0 1 1 0 1 1 1 0  |  | F12             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 0 1 1 0 1 1 0 1  |  | F13             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 0 1 1 0 1 1 0 0  |  | 106             |  | RADAR/HD DISPLAY SET             |  |
|                                                                                                                                                      |  |                    |  | 0 1 1 0 1 0 1 1  |  | 103             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 1 1 1 0 0 1 1 1  |  | 101             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 1 1 1 0 0 1 1 0  |  | 102             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 0 1 1 0 0 1 1 1  |  | C03             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 0 1 1 0 1 1 1 0  |  | F01             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 0 1 1 0 0 1 0 0  |  | F02             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 0 1 1 0 0 1 1 1  |  | F12             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 0 1 1 0 0 1 1 0  |  | F16             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 0 1 1 0 0 1 0 1  |  | F17             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 0 1 1 0 1 1 0 0  |  | 102             |  | INERTIAL NAVIGATION UNIT         |  |
|                                                                                                                                                      |  |                    |  | 1 1 1 0 0 1 0 0  |  | 101             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 1 1 1 0 0 1 0 1  |  | 102             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 1 1 1 0 1 0 0 1  |  | 103             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 1 1 1 0 0 1 0 0  |  | 104             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 1 1 1 0 0 1 0 1  |  | 105             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 0 1 1 0 1 0 1 0  |  | F04             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 0 1 1 0 0 1 0 0  |  | 103             |  | FINE CONTROL/NAVIGATION RADAR    |  |
|                                                                                                                                                      |  |                    |  | 1 1 1 0 1 0 1 0  |  | F01             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 1 1 1 0 0 1 0 0  |  | F02             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 1 1 1 0 0 1 0 1  |  | C01             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 1 1 1 0 0 1 0 0  |  | C02             |  | CENTRAL AIR DATA COMPUTER        |  |
|                                                                                                                                                      |  |                    |  | 1 1 1 0 0 1 0 1  |  | C03             |  |                                  |  |
|                                                                                                                                                      |  |                    |  | 0 1 1 0 1 0 1 0  |  | F14             |  | TARGET IDENTIFICATION SET, LAMAR |  |
|                                                                                                                                                      |  |                    |  | 0 1 1 0 1 0 1 1  |  | 101             |  |                                  |  |

If the subaddress/mode field contains all logic ones, the word count field shall be decoded by the subsystem to determine the function command to be executed. If the subaddress/mode field contains any value other than all ones, the word count field shall be decoded to indicate the quantity of words to be transmitted or received.

**3.2.3.3.7.1.5.1 Data transfer.** A maximum of 32 data words may be transmitted or received in any one message block. All ones shall indicate a decimal count of 31, and all zeros shall indicate a decimal count of 32.

**3.2.3.3.7.1.5.2 Function modes.** The word count field shall contain a bit pattern that identifies the function or functions to be performed if the subaddress/mode field contains all logic ones. Word count field bit patterns common to all subsystems shall be as shown in Table 4. If a subsystem receives a function command with the word count field all zeros or with a bit pattern in the word count field which that subsystem is not mechanized to execute, the subsystem shall reset/initialize its receiver logic and respond with its status word in accordance with the requirements of paragraphs 3.2.3.3.7.3, 3.2.3.3.8.4, and 3.2.3.3.8.5.

Table 4 FUNCTION WORD COMMANDS COMMON TO ALL SUBSYSTEMS

| <u>Word Count Field</u> |    |    |    |    |    | <u>Command Interpretation</u> |
|-------------------------|----|----|----|----|----|-------------------------------|
| Bit                     | 15 | 16 | 17 | 18 | 19 |                               |
| Time                    |    |    |    |    |    |                               |
|                         | 0  | 0  | 0  | 0  | 1  | Reset Timer                   |

**3.2.3.3.7.1.6 Parity.** The last bit in the word shall be used for parity over the preceding 15 bits. Odd parity shall be utilized.

**3.2.3.3.7.2 Data word.** A data word shall be comprised of a sync waveform, data bits, and a parity bit (see Figure 4).

**3.2.3.3.7.2.1 Sync.** The data sync waveform shall be an invalid Manchester waveform as shown on Figure 6. The width shall be three bit times, with the waveform being negative

for the first one and one-half bit times, and then positive for the following one and one-half bit times. Note that if the bits preceding and following the sync are logic ones, then the apparent width of the sync waveform will be increased to four bit times.

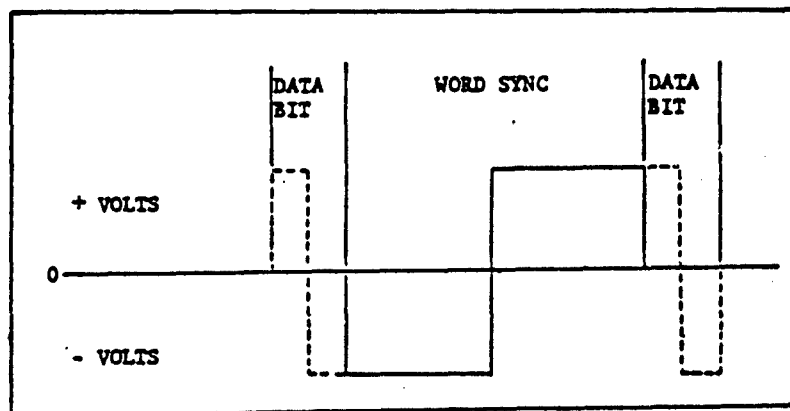


Figure 6 DATA SYNC (INVALID MANCHESTER WAVEFORM)

3.2.3.3.7.2.2 Data. The 16 bits following the sync shall be utilized for data transmission as specified in 3.2.3.3.2.

3.2.3.3.7.2.3 Parity. The last bit shall be utilized for parity as specified in 3.2.3.3.7.1.6.

3.2.3.3.7.3 Status word. A status word shall be comprised of a sync waveform, subsystem address, failure/status bits, and a parity bit (see Figure 4). Subsystems shall reset to zero all status word failure/status bits following each status word transmittal.

3.2.3.3.7.3.1 Sync. The status sync waveform shall be as specified in 3.2.3.3.7.1.1.

3.2.3.3.7.3.2 Subsystem address. The next five bits following the sync shall contain the address of the subsystem which is transmitting the status word.

3.2.3.3.7.3.3 Parity error. The first bit after the address, bit 9, shall be utilized to indicate a parity error in one or more words of a preceding message. A logic one shall indicate the presence of a data word parity error; a logic zero shall indicate its absence. This bit shall be reset to its logic zero state upon receipt of a valid command word.

3.2.3.3.7.3.4 Instrumentation bit. Bit 10, the first bit after the parity error bit, shall always be set to a logic zero.

3.2.3.3.7.3.5 Data quality bit. Bit 11 shall be used to indicate the occurrence of a data word validation error or errors in a preceding message. A logic one shall indicate a data validation error as described in paragraph 3.2.3.3.10.5. A logic zero shall indicate the absence of any of these fault conditions in the previously received data block. This bit shall be reset to its logic zero state upon receipt of a valid command word.

3.2.3.3.7.3.6 Data quantity bit. Bit 12 shall not be used by any subsystem acting as a remote terminal. The bit shall be transmitted over the bus as a logic zero. The bit shall be used for internal status information by the Fire Control Computer when the FCC is acting as a bus controller. A logic one shall indicate an improper data word quantity in a data transmission from a remote terminal. A logic zero shall indicate proper data quantity.

3.2.3.3.7.3.7 Response bit. Bit 13 shall not be used by any subsystem acting as a remote terminal. The bit shall be transmitted over the bus as a logic zero. The bit shall be used for internal status information by the Fire Control Computer when the FCC is acting as a bus controller. A logic one shall indicate that a remote terminal did not respond to a command in the proper time allowed. A logic zero shall indicate that a remote terminal response was received.

3.2.3.3.7.3.8 Addressing bit. Bit 14 shall not be used by any subsystem acting as a remote terminal. The bit shall be transmitted over the bus as a logic zero. The bit shall be used for internal status information by the Fire Control Computer when the FCC is acting as a bus controller. A logic one shall indicate that the terminal address received in a status word did not match with the associated terminal address in a command word. A logic zero shall indicate that no addressing error condition occurred.

3.2.3.3.7.3.9 Broadcast function command received bit.

Bit 15 shall be used to indicate the receipt of a broadcast function command. A logic one shall indicate the receipt of a broadcast function command. A logic zero shall indicate that no broadcast function command has been received since the previous status word transmittal.

3.2.3.3.7.3.10 Dedicated function command received bit.

Bit 16 shall be used to indicate the receipt of a dedicated function command. A logic one shall indicate the receipt of a dedicated function command. A logic zero shall indicate that no dedicated function commands have been received since the previous status word transmittal.

3.2.3.3.7.3.11 Bus B shutdown bit. Bit 17 shall be used to indicate that a transmission on bus B was terminated due to (1) receipt of a valid command word on bus A during a transmission on bus B or (2) detection of an abnormal transmission as described in paragraph 3.2.3.3.11.2. A logic one shall indicate a transmission termination. A logic zero shall indicate that no transmission termination has occurred since the previous status word transmittal.

3.2.3.3.7.3.12 Bus A shutdown bit. Bit 18 shall be used to indicate that a transmission on bus A was terminated due to (1) receipt of a valid command word on bus B during a transmission on bus A or (2) detection of an abnormal transmission as described in paragraph 3.2.3.3.11.2. A logic one shall indicate a transmission termination. A logic zero shall indicate that no transmission termination has occurred since the previous status word transmittal.

3.2.3.3.7.3.13 Terminal status bit. Bit 19 shall be used to indicate the existence of subsystem fault conditions which might affect the validity of data from that subsystem.

3.2.3.3.7.3.14 Parity. The last bit shall be utilized for parity as specified in 3.2.3.3.7.1.6.

3.2.3.3.8 Message formats. The messages transmitted on the data bus shall be in accordance with the formats shown in Figure 7. The maximum and minimum response times shall be as stated in 3.2.3.3.11.1.

3.2.3.3.8.1 Controller to subsystem transfers. The controller shall issue a receive command followed by the

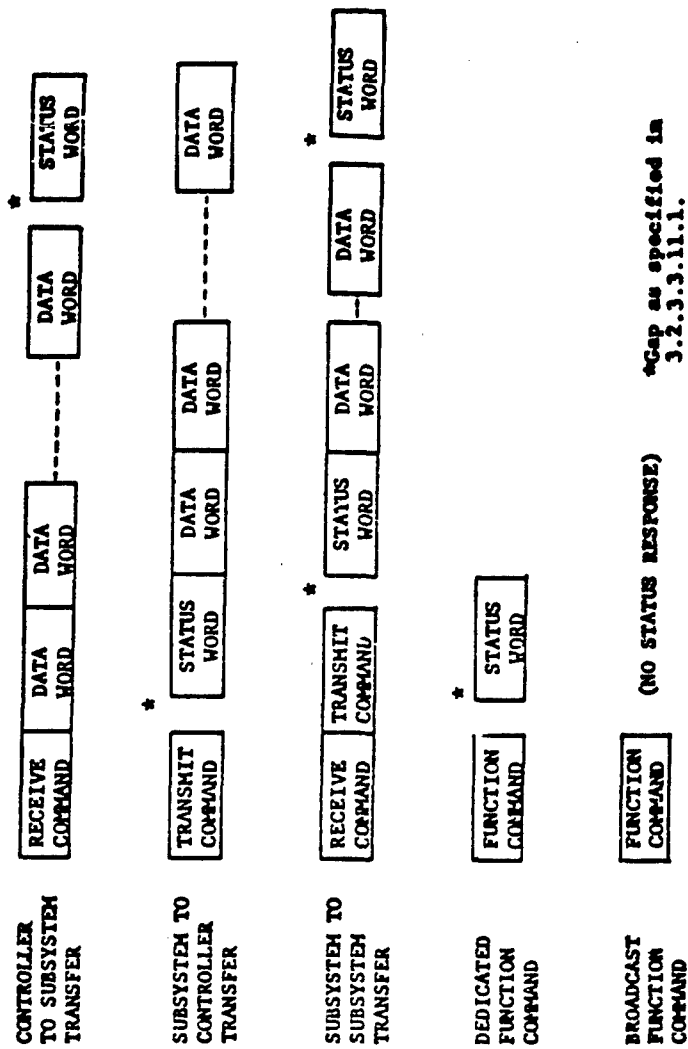


Figure 7 MESSAGE FORMATS

specified number of data words. The subsystem shall, after message validation, transmit a status word back to the controller. The command and data words shall be transmitted in a continuous fashion with no interword gaps.

3.2.3.3.8.2 Subsystem to controller transfers. The controller shall issue a transmit command to the subsystem. The subsystem shall, after verification, transmit a status word back to the controller, followed by the specified number of data words. The status and data words shall be transmitted in a continuous fashion with no interword gaps.

3.2.3.3.8.3 Subsystem to subsystem transfers. The controller shall issue a receive command to subsystem "A", followed by a transmit command to subsystem "B". Subsystem "B" shall then transmit the data as specified in 3.2.3.3.8.2 and subsystem "A" shall receive the data as specified in 3.2.3.3.8.1.

3.2.3.3.8.4 Dedicated function commands. The controller shall issue a dedicated function command to the subsystem. The subsystem shall, after execution of the action required by the function word, transmit a status word back to the controller.

3.2.3.3.8.5 Broadcast function commands. The controller shall issue a broadcast function command to all subsystems utilizing the universal address specified in paragraph 3.2.3.3.7.1.2.2. Subsystems shall execute the command indicated in the word count field. No status word shall be transmitted. The broadcast function word received bit described in paragraph 3.2.3.3.7.3.9 shall be retained for a subsequent status word transmittal.

3.2.3.3.9 Transmission line. The data bus shall utilize, as the transmission media, a twisted, shielded, wire pair.

3.2.3.3.9.1 Cable. The cable used shall be a two conductor, twisted shielded, jacketed cable with a distributed capacitance of no greater than 50 picofarads per foot.

3.2.3.3.9.2 Characteristic impedance. The characteristic impedance shall be between 63 ohms and 77 ohms at a frequency of 1 MHz.

3.2.3.3.9.3 Cable attenuation. The cable loss shall be 1 dB/100 feet or less.



3.2.3.3.9.4 Cable length. The cable length may be up to 300 feet long.

3.2.3.3.9.5 Cable shield termination. The cable shield shall be terminated to air vehicle ground at every break point and the length of the termination shall not exceed 2 inches. Insulation resistance shall be no less than 2 megohms.

3.2.3.3.9.6 Cable termination. The cable shall be coupled to the subsystem as shown in Figure 8. A long stub is defined as any stub greater than 1 foot in length while a short stub is defined as any coupling cable 1 foot or less in length. The length of any stub shall not exceed 20 feet. The two ends of the cable shall be terminated with a resistance equal to the cable characteristic impedance.

3.2.3.3.10 Subsystem/bus interface circuits

3.2.3.3.10.1 Circuit configuration. The subsystem input/output circuits shall contain two coupling transformers. Isolation resistors shall be provided as specified in 3.2.3.3.10.2.

3.2.3.3.10.2 Fault isolation. An isolation resistor shall be provided with a value of 54 ohms plus or minus 5 percent in series with each output lead of the subsystem signal input-output circuit coupling-transformer. The isolation resistors shall be located in the aircraft harness between the subsystem connector and the transmission cable. The impedance reflected on the cable shall be no less than 103 ohms for any failure of the coupling-transformer or transmitter-receiver circuit.

3.2.3.3.10.3 Subsystem output characteristics

3.2.3.3.10.3.1 Output power. The subsystem signal output circuitry shall be capable of driving the cable specified in 3.2.3.3.9.1 and not less than 33 other subsystem inputs, as specified herein, each attached to the cable by means of a cable stub of length specified in 3.2.3.3.9.6. The output circuitry shall maintain the specified operation with the exception of a 25 percent maximum reduction of the data bus signal amplitude in the event that one of the subsystems has a fault that causes it to reflect the fault impedance specified in 3.2.3.3.10.2.

3.2.3.3.10.3.2 Output voltage. The subsystem signal output shall be  $\pm 12$  volts  $\pm 10$  percent peak line-to-line when measured at the subsystem connector (point "B" on Figure 8). (This requirement should be tested with the subsystem operating into a  $143 \text{ ohm} \pm 1$  percent resistive load.)

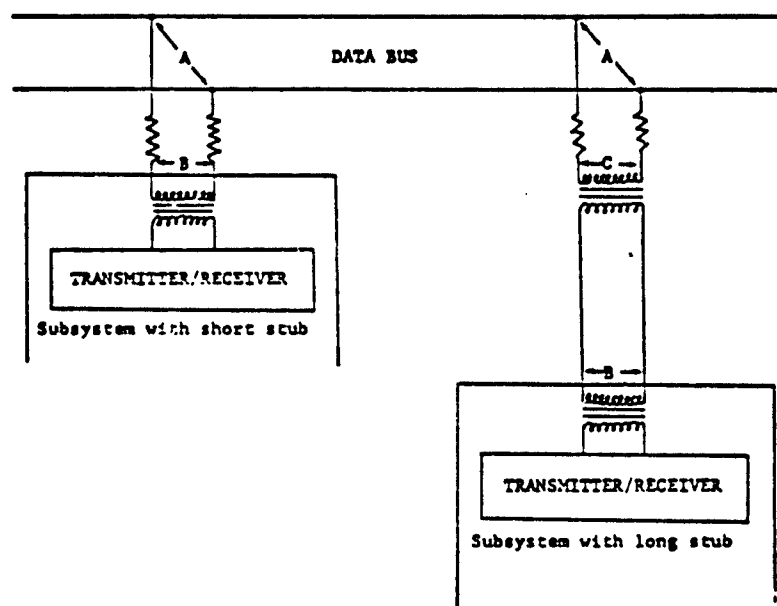


Figure 8 DATA BUS INTERFACE

3.2.3.3.10.3.3 Output waveform. The waveform seen at the point specified in 3.2.3.3.10.3.2 shall be as specified in 3.2.3.3.4. The rise and fall times of this waveform shall be 120 nanoseconds, plus or minus 80 nanoseconds, when measured at the 10 percent and 90 percent points of the signal voltage limits specified in 3.2.3.3.10.3.2. Any distortion of the waveform including overshoot and ringing shall not exceed 1.2 volts peak-to-peak, line-to-line, as measured at the point specified in 3.2.3.3.10.3.2.

3.2.3.3.10.3.4 Output noise. Any noise transmitted to the data bus when the subsystem is receiving, or has power removed, shall not exceed a value of 40.0 millivolts peak-to-peak, line-to-line, as measured at the point specified in 3.2.3.3.10.3.2.

3.2.3.3.10.4 Subsystem input characteristics

3.2.3.3.10.4.1 Input waveform compatibility. The subsystem shall be capable of receiving and operating with the incoming signals specified herein, and shall accept waveforms varying from a squarewave to a sine wave. The subsystem shall respond to an input signal whose positive or negative peak amplitude, line-to-line, is within the range of 4.0 volts to 0.6 volts. The subsystem shall not respond to an input signal with a positive or negative peak amplitude, line-to-line, within the range of 0.45 volts to 0.0 volts. The subsystem shall operate as specified in 3.2.3.3.10.4.2 with an input signal level in the range of 4.0 volts to 1.5 volts peak, line-to-line. All voltages are with respect to the subsystem input point cited in 3.2.3.3.10.3.2.

3.2.3.3.10.4.2 Noise rejection. The subsystem shall exhibit a maximum bit error rate of one part in  $10^7$ , prior to the validation checks specified in 3.2.3.3.10.5, when operating with a signal-to-noise ratio of +14 dB. The signal-to-noise ratio shall be determined with  $\pm 1.5$  volt peak, line-to-line sync and data signals as specified herein, and with white gaussian noise distributed over the frequency band of 1.0 KHz to 4.0 MHz. All measurements are relative to the subsystem input point specified in 3.2.3.3.10.3.2. For purposes of computing bit error rate, each failure of the subsystem to make a bit decision and each incorrect bit decision, i.e., a logic one interpreted to be a logic zero or a logic zero interpreted to be a logic one, shall be counted as a bit error. (Testing of this requirement shall be accomplished with a  $\pm 1.5$  volt peak, line-to-line signal having the rise time characteristics specified in paragraph 3.2.3.3.10.3.3 and additive white gaussian noise having an RMS amplitude of 300 millivolts.)

3.2.3.3.10.4.3 Common mode rejection. The subsystem shall not respond, i.e., the subsystem logic shall not indicate the receipt of sync or data bits, when any signals from dc to 2.0 MHz, with amplitudes equal to or less than +25.0 volts peak, line-ground, are applied at point A of Figure 8. Any signals, with amplitudes equal to or less than +50.0 volts peak, similarly applied, shall not damage or permanently impair the operation of the subsystem.

3.2.3.3.10.4.4 Input impedance. The subsystem input impedance, when the subsystem is not transmitting, or has power removed, shall be a minimum of 2000 ohms within the frequency range of 100 KHz to 1.0 MHz. This impedance is that measured line-to-line at point "B" of Figure 8.

3.2.3.3.10.5 Data validation. Logic shall be provided in each subsystem to recognize improperly coded signals, data dropouts, or excessively noisy signals. Each word shall conform to the following minimum validating criteria:

- a. The word begins with a valid sync field
- b. The bits are in a valid Manchester II code.
- c. The word has 16 bits plus parity.
- d. The word parity is odd.

Where a word fails to conform to the preceding criteria, the word shall be considered invalid and shall not be used by the receiving subsystem. If an invalid word sync occurs, or if the number of words in a received data block is different from the value encoded in the word count field of the command word associated with the data block, the subsystem shall inhibit its status word transmission and reset/initialize its receiver logic.

3.2.3.3.11 Terminal operation. Each avionic subsystem shall operate in response to commands received from the bus controller. Data transferred from the controller to the subsystem shall be held on a message basis until the last data word is properly received by the subsystem, at which time the entire block of data words shall be utilized by the subsystem. Subsystems containing a central memory element may store the data words of a message in that central memory and indicate any errors to the processing element of the subsystem if such errors should occur. The subsystem shall be capable of receiving a command word at any time on a bus

except when it is transmitting on that bus. A second command word sent to a subsystem after it is already operating on one shall invalidate the first command and cause the subsystem to begin operation on the second command. Receipt of a valid command word (including a broadcast function command word) shall reset/initialize terminal logic, i.e., it shall clear any previous command to the subsystem to receive data which has not been executed.

3.2.3.3.11.1 Response time. The subsystem shall respond to a valid transmit data command during the time period 2.0 to 5.0 microseconds after receipt of the last bit of the command word except for the condition described in 3.2.3.4.2. The subsystem shall respond to a valid receive data command during the time period 2.0 to 5.0 microseconds after receipt of the last bit of the last data word. The subsystem shall respond to a valid dedicated function command during the time period 2.0 to 5.0 microseconds after receipt of the last bit of the command word except for the condition described in 3.2.3.4.2.

3.2.3.3.11.2 Subsystem interface fail-safe operation. The subsystem shall contain the self-test circuitry necessary to detect erroneous transmission of data on to the data bus. This circuitry shall include a transmission time-out which will preclude signal transmission periods of excessive duration. When the self-test circuitry detects any such erroneous transmission, it shall automatically shut down the transmitter portion of the subsystem during the time period 0.66 to 1.0 milliseconds after the transmission was initiated. The transmitter shut down shall be reset following receipt of a valid command word on the shut down bus.

3.2.3.3.11.3 Time coherence. Each subsystem shall be responsible for maintaining the time coherence of information it transmits over the bus. The subsystem design shall provide mutually consistent samples of information and deterministic transport lags.

3.2.3.3.11.3.1 Sample consistency. The subsystem design shall ensure that messages transmitted over the bus by the subsystem contain only mutually consistent samples of information. Different words used to transmit multiple precision parameters shall all be members of the same sample set. Functionally related parameters updated at the same rate shall all be members of the same sample set. Suitable buffering and transmission control logic shall be provided to prevent the transmission of a partially updated message that would contain mutually inconsistent data.

3.2.3.3.11.3.2 Transport lag. The subsystem design shall provide for the transmission of data with deterministic transport lags. Since an individual subsystem cannot control the transmission time of information over the bus, it shall (1) provide time tags that can be used to determine when a set of parameters was sampled or a message established, (2) accept synchronizing function word commands from the bus controller and maintain a repeatable operation sequence, or (3) use a combination of time tagging and synchronization to establish deterministic transport lags. Unless specifically excepted by General Dynamics, each subsystem shall provide a 16-bit timer in the subsystem that can be used to time tag designated parameters or messages. The timer shall have a resolution of 64 microseconds per count and shall be capable of being reset by a function word command.

3.2.3.4 Redundancy. The avionic serial digital interface architecture shall be as depicted in Figure 9. Dual redundancy shall exist in (1) the transmission cables, (2) the interface electronics of each avionic subsystem, and (3) the bus control function.

3.2.3.4.1 Transmission cables. Two separately routed transmission cables having the characteristics specified in paragraph 3.2.3.3.9 shall be utilized to provide signal path redundancy.

3.2.3.4.2 Interface electronics. Each subsystem having an avionic serial digital data bus interface shall be capable of receiving command words over either of the two buses and transmitting/receiving data over either bus. A subsystem shall respond to commands to transmit or receive data only over the bus on which a command is received. If a subsystem is transmitting data on one data bus and a valid transmit/receive command is received on the other bus, the subsystem shall terminate its communication on the first bus and respond to the command received on the second bus. When a subsystem is commanded to terminate a communication, it shall do so word synchronous. That is, turn off shall occur at the end of a word, not mid-bit or mid-sync or mid-word. In this mode, if a subsystem response is expected, the response gap time may be as long as 25 microseconds following the command word. Command words transmitted over both buses will not overlap.

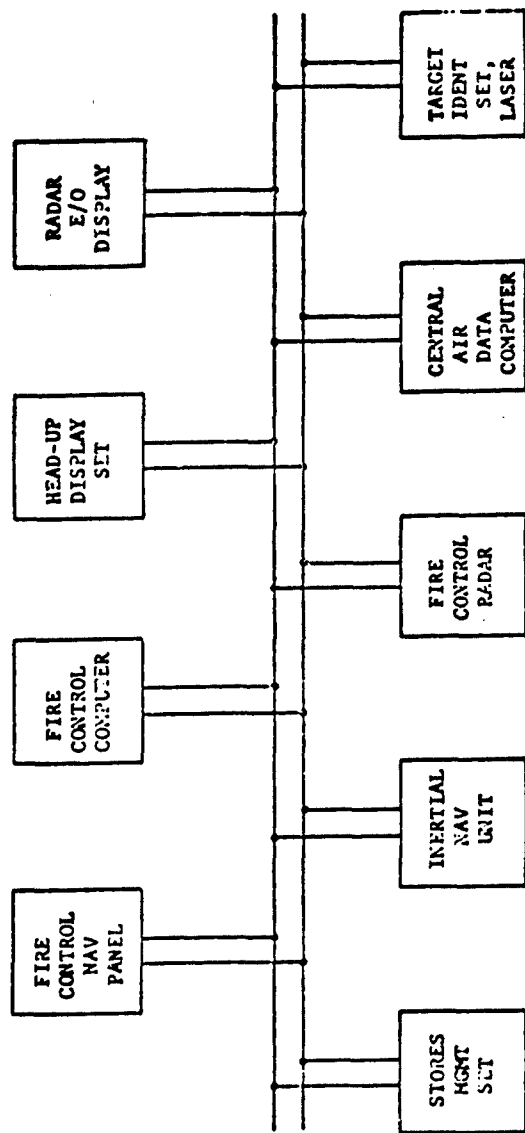


Figure 9 P-16 AVIONIC SERIAL DIGITAL INTERFACE

3.2.3.4.3 Bus controllers. The primary bus control function shall reside in the Fire Control Computer. In the event that the Fire Control Computer becomes unable to perform bus control, the Inertial Navigation Subsystem shall assume the responsibility for bus control. A discrete from the Fire Control Computer to the Inertial Navigation Subsystem shall indicate when the Inertial Navigation Subsystem is to perform the bus control function. The discrete logic shall be such that when the Fire Control Computer is disabled (powered down) the Inertial Navigation Subsystem is commanded to perform bus control.

3.2.3.5 Bus control. The bus control function shall be accomplished by either the Fire Control Computer or the Inertial Navigation Subsystem as specified in paragraph 3.2.3.4.3. The bus control function shall (1) supervise all serial digital data transmissions and (2) manage the data bus redundancy.

3.2.3.5.1 Transmission supervision. The bus control function shall initiate all communication sequences by issuing command words over the data bus requesting subsystems to transmit or receive data or to execute special functions. The sequence of these commands shall be established by operational software in the subsystem providing the bus control function. The bus control function shall also monitor each communication sequence and initiate corrective action for command words which are not properly executed.

3.2.3.5.2 Redundancy management. The bus controller shall manage the serial digital data bus redundancy. The bus controller may use one bus for all communications or it may interleave communications on the two buses, i.e., complete a communication on one bus and use the other bus for the next communication.



**3.2.4 Standard Discrete Signal Interface Definition.** The characteristics of standard Low Level Complementary and High Level discrete signals are defined in this section.

**3.2.4.1 Standard Definition for Low Level Complementary Discretes**

**Driver** (See Figure 10)

Type: Differential

Voltage: Differential = +2.0 volts

Logic "1" Output = +2.4 to 5.5 VDC @  $I_{OH} = -10\text{ma}$

Logic "0" Output = .4 VDC maximum @  $I_{OL} = 20\text{ma}$

Output Impedance: Active, 15-30 ohms typical

Short Circuit Protection: Infinite duration short to ground.

Output Noise: The driver while under normal load Impedance (i.e., receiver connected) shall not generate any spurious outputs greater than +450 MVDC differential for more than 200 microseconds when in the process of being turned off or turned on.

Output Low-clamp Voltage: -1.5 VDC max @  $I_{OLC} = -40\text{ ma}$

**Receiver** (See Figure 10)

Type: Differential

Voltage: Logic "1" input = +2.0 VDC differential min

Logic "0" input = -2.0 VDC differential min or open circuit or powered down driver having the characteristics above

Input Load Current: 2.0 Ma maximum

Filtering: The receiver shall operate normally without degradation within all the EMC requirements (including paragraph 3.3.2.2(a)) of the CEI specification. The logical delay caused by the receiver filtering to meet this requirement shall be subject to General Dynamics approval and shall be specified on the interface sheet for each individual signal. In addition, the spurious output produced by the driver and having the characteristics stated above for the driver shall not produce false triggering of the receiver.

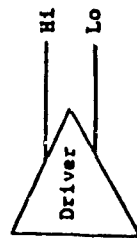
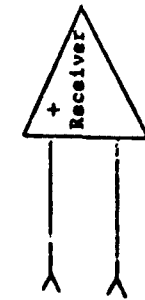


Figure 10 STANDARD LOW-LEVEL COMPLEMENTARY  
DISCRETE INTERFACE

Input Protection: The receiver shall not be damaged by a short circuit on the input to ground.

3.2.4.2 Standard Definition for High Level Single Ended Discretes. The characteristics of high level single ended discretes are described below and in Figure 11:

Receiver

Type: High Level

Voltage: Logic "1" input - The receiver shall operate normally, i.e., produce a logic "1" when the input voltage is in the range of 22.5 volts min to 30 volts max.

Logic "0" input - open circuit

Input Load Current: 6 ma maximum

Input Protection: Short circuit to ground

Input Logic "0" voltage: This voltage which appears at the input of each receiver during open circuit shall be nominally 0 volts (.5 volts maximum). Other receivers having the above characteristics may be connected to the same input (see Figure 11). This condition shall not degrade the performance of any receiver connected to the line.

Filtering - The receiver shall operate normally without degradation for any transient input voltage spike of less than 50 microseconds duration within the limits of paragraph 3.2.7 of MIL-E-6051D dated 7 September 1967. The receiver shall also operate normally within all the EMC requirements (including paragraph 3.3.2.2(a)) of the applicable item specification. The logical delay caused by the receiver filtering to meet this requirement shall be subject to GD approval and shall be specified on the interface sheet for each individual signal.

Transients - The receiver shall not be damaged for any input voltage spike within limits 1 and 4, Figures of MIL-STD-704A, dated 9 August 1966.

3.2.5 Electrical Connectors. Electrical connectors shall be in accordance with 16PP008 "Electrical Connector Selection and Requirements for the F-16", 17 March 1975.

3.2.6 Circuit Classification Requirements. This subsection contains circuit classifications and grounding, shielding, and wire grouping requirements for all signal types contained within

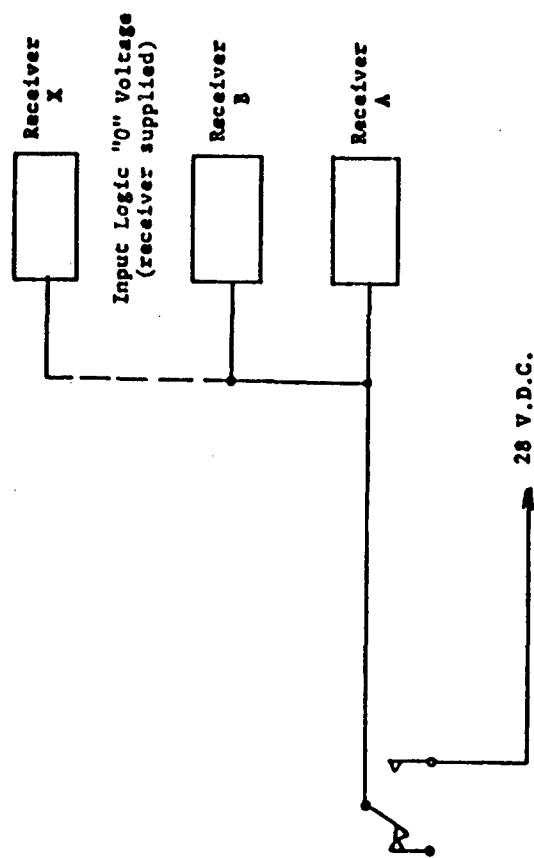


Figure 11 HI LEVEL DISCRETE INTERFACE

the F-16 system. These requirements, in addition to the requirements of MIL-W-5088E and MIL-E-5400P, must be met within all equipment as well as the airframe to be compatible with electromagnetic requirements. Wire and cable grouping within equipments shall be such that airframe wiring may comply with the following requirements.

**3.2.6.1 Circuit Type Definition.** Aircraft wiring is made up of individual wiring circuits combined into wiring harnesses. These individual circuits will range from the simplicity of a system's power input to the complexities of multiplexing. Some of these typical aircraft circuits are defined and described below.

1. A. C. Power Circuit - Any circuit in which 115/200 volt 400 hertz power is supplied by the aircraft or ground power sources.
2. D. C. Power Circuit - Any circuit operated by D. C. voltage with the current in excess of 1/2 ampere.
3. A. C. Control Circuit - Any circuit in which A. C. power is used for control purposes.
4. Audio Circuit - An audio frequency circuit is defined as a circuit carrying information in the frequency range of from 0 to 15,000 hertz.
5. Video Circuit - An extremely wide band information circuit.
6. Synchro Circuit - A circuit which transmits three-wire, variable-voltage shaft position signals between synchronous devices.
7. Discrete - A circuit for the purpose of transmitting a single valued word.
8. Analog Circuit - A circuit for AC or DC variable voltage signals.
9. R. F. Circuit - A circuit operating in the frequency range above 15,000 hertz.
10. Digital Circuit - A circuit which transmits a series of information bits at a predetermined voltage amplitude.

11. **Multiplexing Circuit** - A circuit used to transmit a large quantity of signals over a single path by using time sharing and/or frequency division methods.

12. **Weapons Control Circuit** - A circuit transmitting signals that arm and/or release weapons.

13. **Antenna Circuit** - A circuit carrying high level R. F. signals to be transmitted outside the airplane or low level signals from the antenna to a receiver. These are usually coaxial cables.

14. **Secure Communications Circuits** - An information circuit from which undesired signal data emanations are reduced to the point that unauthorized information detection is not possible.

15. **AMAC Circuit** - A circuit defined by Sandia Drawing 185475.

**3.2.6.2 Circuit Classification.** Each circuit in the airborne weapon system shall be considered in terms of a specific classification. The classifications shall be established on basis of the closest similarity to one of the types described in the following paragraphs.

**3.2.6.2.1 Class I - Power and Control Circuits.** This classification includes primary A. C. power circuits, D. C. power circuits, switching circuits, and any other interference producing circuit not susceptible to power line frequencies and transients.

**3.2.6.2.2 Class II - High Level Susceptible Circuits.** This classification includes audio circuits, video circuits, synchro circuits, digital circuits, and other semi-high-level signal circuits.

**3.2.6.2.3 Class III - Low Level Susceptible Circuits.** This classification includes low level analog circuits and other low level susceptible circuits.

**3.2.6.2.4 Class IV - Antenna Cables.** This classification includes any cable carrying an R. F. signal to an antenna for transmission from the aircraft or carrying a received signal from an antenna to a receiver.

3.2.6.2.3 - Class V - Electro-Explosive Device Circuits. This classification includes all circuits used to energize/detonate electro-explosive devices.

3.2.6.2.6 Class VI - AMAC Circuits. All nuclear weapon circuits defined by Sandia Drawing 185475 shall be isolated from all other circuits.

3.2.6.2.7 Class VII - Secure Circuits. A secure circuit is an information circuit from which undesired signal data emanations are reduced so that unauthorized information detection is not possible.

3.2.6.3 Wire Grouping. Wires in each of the above circuit classifications should be grouped together into harnesses. To maintain maximum isolation between different circuit classifications, the different circuits should terminate at the avionics units and intermediate points in separate connectors. If it becomes necessary to include more than one circuit class in a single connector, each class will be separated by a row of ground contacts. Class VI and VII circuits should not be routed through connectors with wires of any other class.

3.2.6.4 Airframe Cable Routing. In the interest of eliminating cross talk and co-channel interference from coupling of signals between wires and harnesses, it is mandatory to maintain the proper degree of isolation between different circuit classifications. In wiring layout and routing, the maximum practical separation must be maintained in accordance with the general rules described below. A two-inch separation between cable types is arbitrarily set as a minimum design goal.

3.2.6.4.1 Power and Control Circuits. Routing and channeling of power circuits shall maintain maximum spacing from low level circuits. If multiple A. C. power sources are available, a complete set shall be provided power from only one of these sources.

3.2.6.4.2 High Level Susceptible Circuits. High level susceptible circuits shall be isolated from power and other high level interference circuits. Low level interference wiring may be routed with high level susceptible circuits, providing isolation is maintained through the proper shielding and/or twisting of wires.

3.2.6.4.3 Low Level Susceptible Circuits. Low level susceptible circuits shall be isolated from power and other interference

circuits. Low level susceptible circuits may be routed with low interference Class II circuits provided proper isolation is maintained through use of shields, shield terminations, and connectors as described in this document.

3.2.6.4.4 Antenna Cables. Antenna coaxial cables shall comply with the requirements of MIL-W-5088E(i.e., they shall be separated from any other antenna cable or cable group).

3.2.6.4.5 AMAC Circuits. AMAC circuits shall be isolated from all other circuits carrying electrical power. In the routing of AMAC circuits, maximum spacing shall be maintained. Connectors used for AMAC circuits shall be such as to preclude any mismatching to any other circuit connectors.

3.2.6.4.6 Secure Circuits. Secure circuits shall be completely isolated from all other aircraft wiring.

3.2.7 Electromagnetic Interference and Compatibility. The subject equipment shall be designed to meet MIL-STD-461A, Notice 3, and shall be tested in accordance with MIL-STD-462, Notice 2. The EMC plan in accordance with MIL-STD-461A(3) shall be the controlling document for EMC design.

3.2.7.1 Design Requirements. The generation of and susceptibility to electromagnetic interference shall be controlled in all units of electrical/electronic equipment. These units shall meet MIL-STD-461A, Notice 3 requirements as specified and/or modified below. The specific requirements and modifications of MIL-STD-461A and Notice 3 are as follows:

TEST METHOD

|          |          |          |      |
|----------|----------|----------|------|
| CZ01 (7) | CS02     | CS06     | RS03 |
| CZ03 (1) | CS03 (2) | RE02     |      |
| CE06 (2) | CS04 (2) | RE03 (4) |      |
| CS01     | CS05 (2) | RS02 (5) |      |

The numbers in parentheses above refer to the notes which follow:



(1) Change frequency range to .10 MHz to 50 MHz. Data shall be collected from .014MHz to .10MHz for information purposes only.

(2) Applies to communication and radar equipment only.

(3) Deleted

(4) Applies for radar only and only in the frequency range from 8 GHz to 15 GHz.

(5) The procedures and limits of Method RS02 (a) and (b) shall apply except that the voltage E of Part (b) shall be 400 volts across 5 ohms.

(6) Deleted

(7) This test shall be performed for data purposes only.

In addition, the following EMC requirements shall apply.

1. Transient (impulse) susceptibility. No change in indications, malfunction, or degradation of performance shall be indicated in any equipment and/or its load when exposed to an impulse type electromagnetic field generated by a type MS25271 relay (or an acceptable equivalent) when wired for continuous operation with a switch in series with the positive side of the line from a 28 volt DC power source. No suppression components (shielding, diodes, etc.) shall be attached to the relay or its wiring. The unshielded positive lead leaving the switch shall be laid over three sides of the test sample and then connected to the relay. The unshielded return lead from the relay shall be taped to and in parallel with input power leads, signal leads, and interconnecting leads. The total length of each external wiring harness paralleled with the relay circuit shall not be less than 60 inches. The 28 volt input shall be reversed and the transient repeated.

2. Magnetic susceptibility. Display equipment shall not be affected by a magnetic field which has a magnitude of 4 gauss at the equipment envelope and a gradient of 20 gauss per foot.

3.2.7.2 Bonding. All electrical and electronic units shall have a designed bonding interface and this interface will be shown on ICDs. Each unit shall exhibit a DC impedance of 2.5 milliohms or less from the unit case to the aircraft structure

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Ground and shall be bonded in accordance with MIL-3-50873, Class R. The equipment mounting fixtures shall comply with the same requirement except that suitable jumpers may be used across any necessary vibration isolators.

3.2.7.3 Grounding. Grounding shall be as follows:

1. Input power returns shall be brought out of the equipment on separate connector pins or connections.
2. Signal grounds within the equipment shall be electrically connected to each other and to chassis at multiple points. The length of ground wires to chassis shall be held to a minimum.
3. Chassis ground shall be brought out of the equipment on a separate connector pin or connection. Chassis shall always have a defined bond path to air vehicle structure and this bond path shall be shown on ICDs.

3.2.7.4 Shielding. Wire shields shall not be used as a signal return, except for coaxial, and shall not be used to conduct power currents. All wire shields shall be covered by a layer of insulation. All shielded wire shall be multiple point grounded to the signal ground system or chassis. Coaxial cables shall have the shield grounded at each end. The requirement for multiple shielded cables for EMI protection shall be held to a minimum.

## 9. FUTURE MODIFICATIONS

For production, the following systems and modifications may be incorporated:

- ECP0036 - Compass Sail/Compass Tie (ALR-69)
- ECP0076 - Relocation of Fire Control/Navigation Panel (after \*30 aircraft)
- Airborne Video Tape Recorder
- AN/ARC-186 - VHF - AM/FM Radio Set
- High Technology Ejection Seat
- PAVE PENNY Group A provisions (no impact on avionics space -- pylon-mounted)

The following systems have been mentioned as possible additions to the F-16 aircraft, but no definitive plans have been formulated and no space-power-cooling factors are defined for the F-16.

- Engine Diagnostic System - in PMD as a growth system
- Global Positioning System - in PMD as a growth system
- Joint Tactical Information Distribution System - in PMD as a growth system
- Internal Electronic Countermeasures - decision on implementation is expected shortly. Form-fit-function factors could be frozen by 1981 to 1982.
- AIM-7 Radar Missile - in PMD as a growth system. (Requires CW illuminator box space in avionics bay.)
- Airborne Laser Designator - in PMD as a growth system
- SEEK TALK UHF Radio Improvement

Data relevant to these possible changes are given in Table 9-1.

Table 9-1. AN/ARC-186 - VHF - AM/FM RADIO SET

Description

For the production F-16 aircraft, the AN/ARC-186 VHF - AM/FM radio set will be supplied rather than the AN/ARC-115 VHF-AM Radio Set. The only technical description available on the AN/ARC-186 is:

Frequency Band: 30 to 88 MHz FM  
108 to 115.975 MHz FM - receive only  
116 to 152 MHz AM

Power: Input: 28 Vdc to 50 W maximum - receive mode  
28 Vdc to 150 W maximum - transmit mode

RF: 10 W - both bands (16 W maximum on FM)  
Lighting: 5 Vac or 28 Vac

Sensitivity: 0.5 microvolts FM at 10 dB s/n

Weight: <9.0 lbs.

Specification: ENAC Technical Exhibit 77-25

Antenna: To be developed (adds extended frequency range for VHF-FM band)

Physical Data: Dimensions are the same as AN/ARC-164 and AN/ARC-115

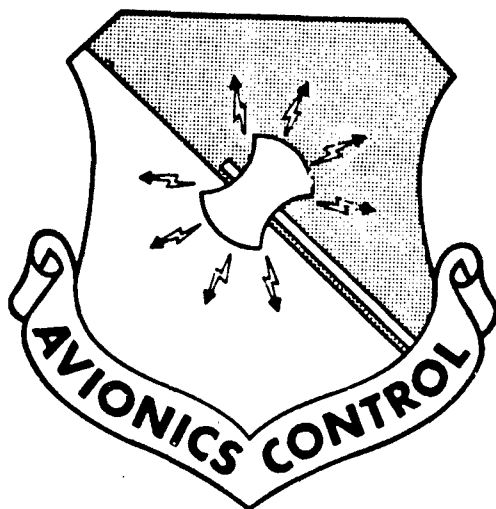
Interface Schematic: Same as AN/ARC-115

#### 10. DATA SOURCES

The following data sources were used to compile this summary:

- T.O. 1F-16A-1, Flight Manual, 8 July 1977
- F-16A Aircraft Configuration Data for JTIDS, 10 February 1978
- Preliminary JTIDS Configuration Data Analysis, May 1978
- GPS Phase II User Equipment Interface Requirement for the F-16A Aircraft, 15 November 1977

**AVIONICS INTERFACE DATA SUMMARY  
FOR  
F-111A**



**October 1979**

**Issued by  
The Deputy for Avionics Control  
ASD/AX  
A Joint AFSC/AFLC Organization**

## FOREWORD

This document is one of a series of reports that describe Avionics interfaces for various USAF aircraft. It was prepared for the Deputy for Avionics Control, Aeronautical Systems Division (ASD/AX), Wright-Patterson AFB, Ohio by ARINC Research Corporation, Annapolis, Maryland under Contract F33657-79-C-0567.





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1. INTRODUCTION

This document contains configuration data relating to the integration of additional avionics into the F-111A aircraft.

This document will be revised periodically as additional modifications are planned and incorporated into the aircraft. Queries regarding information contained herein should be addressed to:

The Deputy for Avionics Control  
Code: ASD/AXP  
Wright-Patterson AFB, Ohio

This document was compiled from Air Force source materials by ARINC Research Corporation under Contract F33657-79-C-0567.

The applicable Technical Orders are included in the references listed in Section 10.

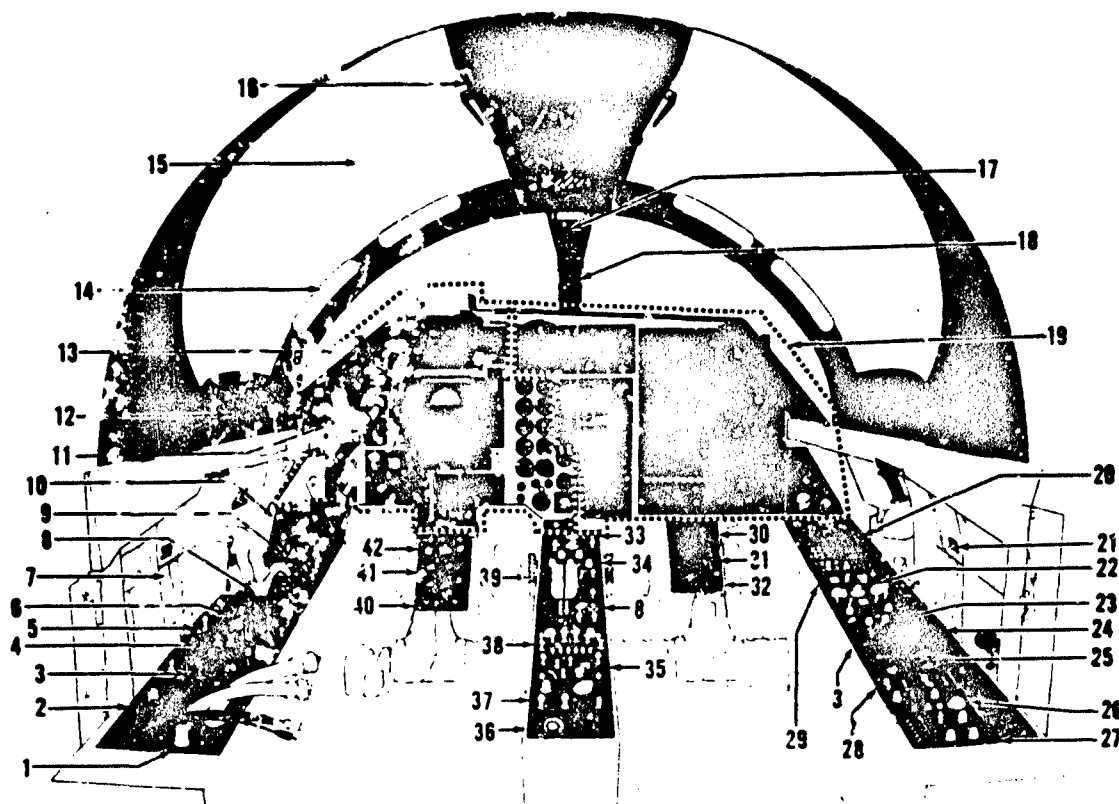
## 2. COCKPIT SPACE

Figures 2-1 through 2-3 depict the consoles and instrument panels for the F-111A. The available F-111A cockpit control panel space is very limited, and several modification programs will be competing for control panel space.

As shown in Figure 2-1, there is a 5-5/8 inches high by 5-3/4 inches wide blank panel in the left console. This blank panel is located between legend number 1 (Left Station Oxygen-Suit Control Panel) and legend number 3 (Interphone Panel). According to GD document FZM-12-13968, page 40, Figure E-7, a portion of this panel space is reserved for Data Link.

Certain configurations of the F-111A have some blank panel space in the right console, rather than the full complement of camera and ECM control panels, shown as legend numbers 24 through 28 in Figure 2-1. GD document FZM-12-13968, page 40, Figure E-7 identifies growth space in the right console.

The AN/AJQ-20 Bomb Nav Control Panel, legend number 17 or Figure 2-3 in the Right Main Instrument Panel, will be replaced by a smaller Digital Bomb/Nav Computer Control Panel. PAVE TACK is a competitor for the new space generated by this change.

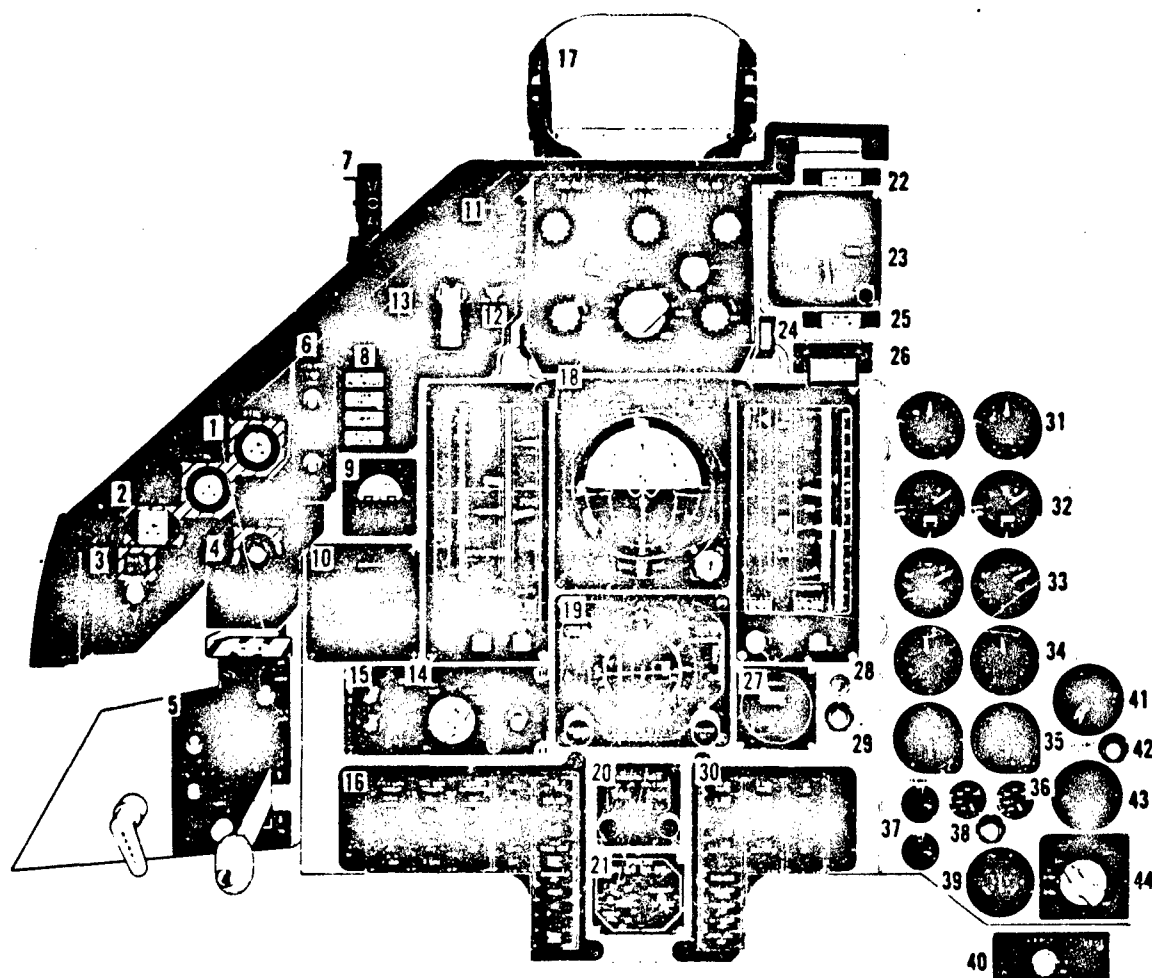


• See TO 1F-111A 1-2

- |                                                          |                                                             |
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| 8. Left Sidewall (See fig 1-21)                          | 31. Burst Control Panel (See fig 1-66)                      |
| 9. Throttle Panel (2) (See fig 1-4)                      | 32. TACAN Control Panel (See fig 1-59)                      |
| 10. Miscellaneous Switch Panel (See fig 1-61)            | 33. LS Control Panel (See fig 1-60)                         |
| 11. Auxiliary Gage Panel (See fig 1-17)                  | 34. Fuel Control Panel (See fig 1-8)                        |
| 12. Self Contained Attitude Indicator                    | 35. TFR Control Panel (See fig 1-84)                        |
| 13. Internal Canopy Latch Handles (2)                    | 36. Electrical Control Panel (See fig 1-11) (A)             |
| 14. Left Main Instrument Panel (See fig 1-5)             | 37. IFF Control Panel (See fig 1-62) (E)                    |
| 15. Mirrors (4)                                          | 38. Scope Camera Control Panel (See fig 1-76) (A)           |
| 16. Canopy                                               | 39. Air Conditioning Control Panel (See fig 1-43) (E)       |
| 17. Thermal Curtain (2)                                  | 40. Air Conditioning Control Panel (See fig 1-43) (A)       |
| 18. Canopy Center Beam Assembly                          | 41. Electrical Control Panel (See fig 1-11) (E)             |
| 19. Magnetic Compass                                     | 42. IFF Control Panel (See fig 1-62) (A)                    |
| 20. Right Main Instrument Panel (See fig 1-34)           | •ECM Pod Control Panel (E)                                  |
| 21. Armament Select Panel (See fig 1-68) (A)             | Ejection Handles (2)                                        |
| 22. Weapons Control Panel (See fig 1-71) (E)             | 40. Antenna Select Panel (See fig 1-63)                     |
| 23. Right Sidewall (See fig 1-45)                        | 41. Windshield Wash/Anti-icing Control Panel (See fig 1-46) |
| 24. Attack Radar Control Panel (See fig 1-78)            | 42. Compass Control Panel (See fig 1-33)                    |
| 25. HF Radio Control Panel (See figs 1-55 or 1-56)       |                                                             |

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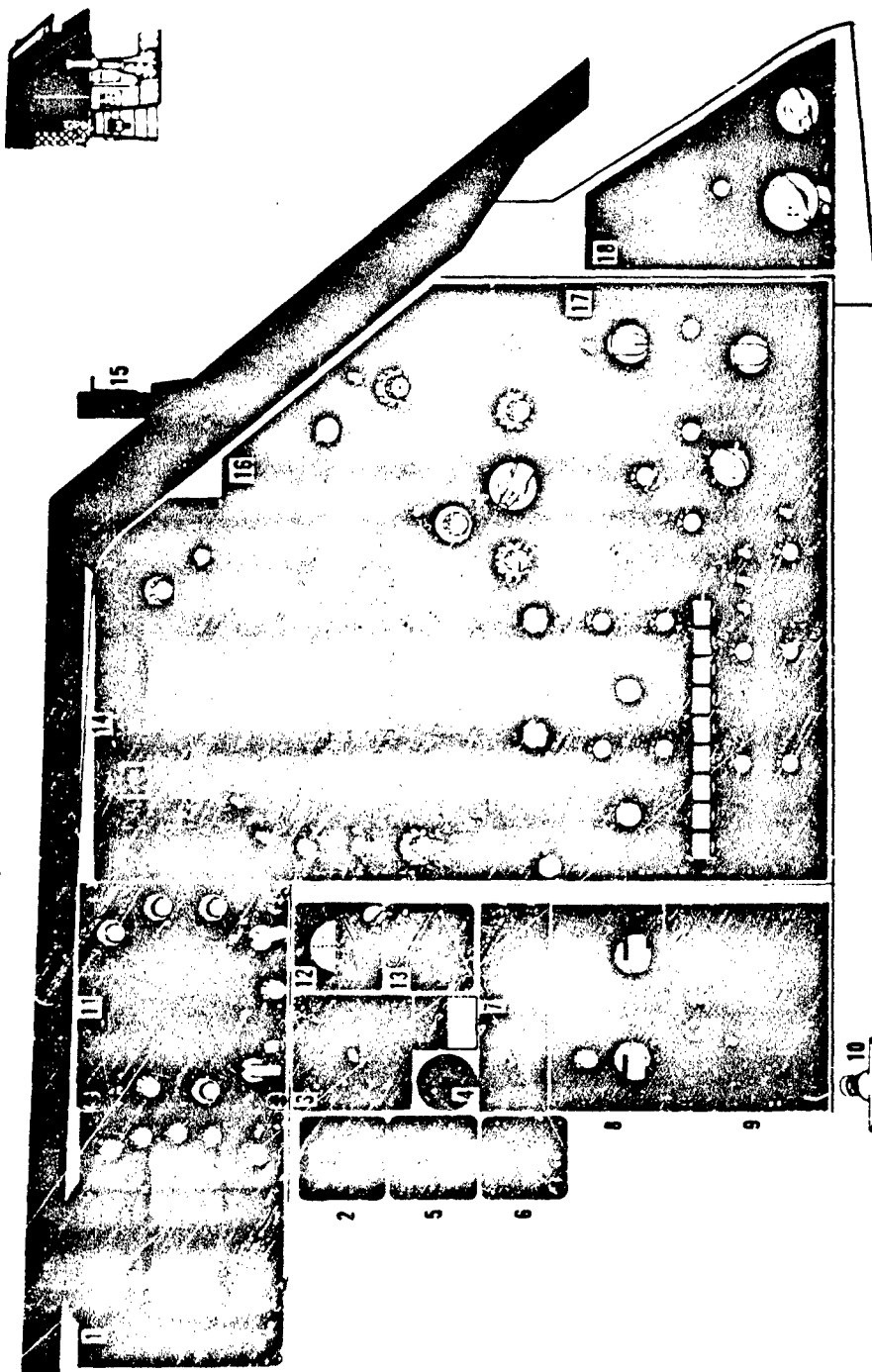
Figure 2-1. CREW STATION GENERAL ARRANGEMENT (TYPICAL)



- |                                                          |                                                                     |                                                   |
|----------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------|
| 1. Engine Fire Pushbutton Warning Lamps.                 | 16. Left Main Caution Lamp Panel.                                   | 31. Engine Tachometers.                           |
| 2. Fuselage Fire Pushbutton Warning Lamp.                | 17. Lead Computing Optical Sight and Control Panel. (See fig. 1-89) | 32. Engine Turbine Inlet Temperature Indicators.  |
| 3. Agent Discharge/Fire Detect Test Switch.              | 18. Upper Warning and Caution Lamp Panel.                           | 33. Engine Fuel Flow Indicators.                  |
| 4. External Stores Jettison Button.                      | 19. Integrated Flight Instruments. (See fig. 1-35)                  | 34. Engine Nozzle Position Indicators.            |
| 5. Landing Gear Control Panel (See fig. 1-18).           | 20. Dual Bombing Timer. (See fig. 1-70)                             | 35. Engine Pressure Ratio Indicators.             |
| 6. Pilot's ECM Pod Control Panel (See T.O. 1F-111A 1-2). | 21. Control Surface Position Indicator.                             | 36. Engine Oil Pressure Indicators.               |
| 7. Angle-of-Attack Indicator.                            | 22. Nose Wheel Steering/Air Refueling Indicator Lamp.               | 37. Hydraulic Pressure Indicators.                |
| 8. Left Warning and Caution Panel.                       | 23. Radar Altimeter Indicator.                                      | 38. Oil Quantity Indicator Test Button.           |
| 9. Self Contained Altitude Indicator.                    | 24. Stall Warning Lamp.                                             | 39. Oil Quantity Indicator.                       |
| 10. Wing Sweep Flap/Slot Position Indicator.             | 25. Radar Altitude Low Warning Lamp.                                | 40. Air Refueling Receptacle Lights Control Knob. |
| 11. Upper Warning and Caution Panel.                     | 26. Master Caution Lamp.                                            | 41. Fuselage Fuel Quantity Indicator.             |
| 12. Gun/Camera Control Switch.                           | 27. Bomb Max Distance-Time Indicator.                               | 42. Fuel Quantity Indicator Test Button.          |
| 13. Air/Air IR Missile Switch (E) Rounds Counter. (A)    | 28. Takeoff Trim Indicator Lamp.                                    | 43. Total/Select Fuel Quantity Indicator.         |
| 14. Instrument System Coupler Control Panel.             | 29. Takeoff Trim Button.                                            | 44. Fuel Quantity Indicator Selector Knob.        |
| 15. Landing Gear Position Indicator Lamps.               | 30. Right Main Caution Lamp Panel.                                  |                                                   |

ASSEMBLED-PN 4A

Figure 2-2. LEFT MAIN INSTRUMENT PANEL (TYPICAL)



- 1. Terrain Following Radar Scope Panel. (See fig 1-85)
- 2. Standby Airspeed Indicator
- 3. Bearing-Distance Heading Indicator
- 4. True Airspeed Indicator
- 5. Vertical Velocity Indicator
- 6. Clock
- 7. SAM Sector Indicator/ECM Panel
- 8. Offset Aimpoint Panel (See fig 1-65)
- 9. UHF Radio Control Panel (See fig 1-54)
- 10. Landing Gear Emergency Release Handle
- 11. Countermeasures Receiving Set Indicator Control Panel
- 12. Standby Altitude Indicator
- 13. Standby Altimeter
- 14. Countermeasures Receiving Set Threat Panel
- 15. Angle-of-Attack Indexer
- 16. Attack Radar Scope Panel (See fig 1-80)
- 17. Bomb Nav Control Panel (See fig 1-64)
- 18. Nuclear Weapons Control Panel (See fig 1-89)

\*Refer to TO 1F-111A-1-2

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Figure 2-3. RIGHT MAIN INSTRUMENT PANEL (TYPICAL)

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### 3. AVIONICS SPACE

Current and future F-111A space availability are detailed in the F<sup>2</sup>E Summaries, (Table 3-1 and Figure 3-1). The one space that exists currently is under door 1202; the dimensions of that space are 8.26" x 12.0" x 18.0", for a total volume of 1.08 ft<sup>3</sup>. Other space possibilities (contingent on equipment modifications) are also outlined in the F<sup>2</sup>E summary.



| Table 3-1. F <sup>2</sup> E SUMMARY - F-111A                                                                                                                          |                                             |                                                  |                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|--------------------------------------------------|-----------------------------------------------------|
| F <sup>2</sup> E Criteria                                                                                                                                             | Potential Available Space                   |                                                  |                                                     |
| Location Access                                                                                                                                                       | A<br>Next to KIT-1A<br>Door 1202            | B<br>APN-167 Dual<br>Altimeter<br>Door 1201      | C<br>ARC-112 HF<br>Amp-Power Supply<br>Door 1201    |
| Rectangular*<br>Size (H, W, D)<br>Volume ft <sup>3</sup>                                                                                                              | 8.62 x 12.0 x 18.04<br>1.08 ft <sup>3</sup> | 6.5 x 15 x 14.5<br>0.85 ft <sup>3</sup>          | 9.5 x 9.9 x 20.2<br>1.10 ft <sup>3</sup>            |
| Type of Cooling<br>Available                                                                                                                                          | Forced Air                                  | Forced Air                                       | Forced Air                                          |
| Temperature - Altitude<br>Vibration                                                                                                                                   | Normal<br>Equipment Area                    | Normal<br>Equipment Area                         | Normal<br>Equipment Area                            |
| Possible Candidates<br>for this Space                                                                                                                                 | KY-28                                       | None Known                                       | None Known                                          |
| Remarks                                                                                                                                                               | Current                                     | Replace with 2<br>ARN-194 Altimeters,<br>Stacked | Replace HF Comm<br>with Single LRU<br>in Location G |
| *Where LRU is currently installed, the dimensions given represent dimensions of LRU; when no LRU is installed, the dimensions given are those of the available space. |                                             |                                                  |                                                     |

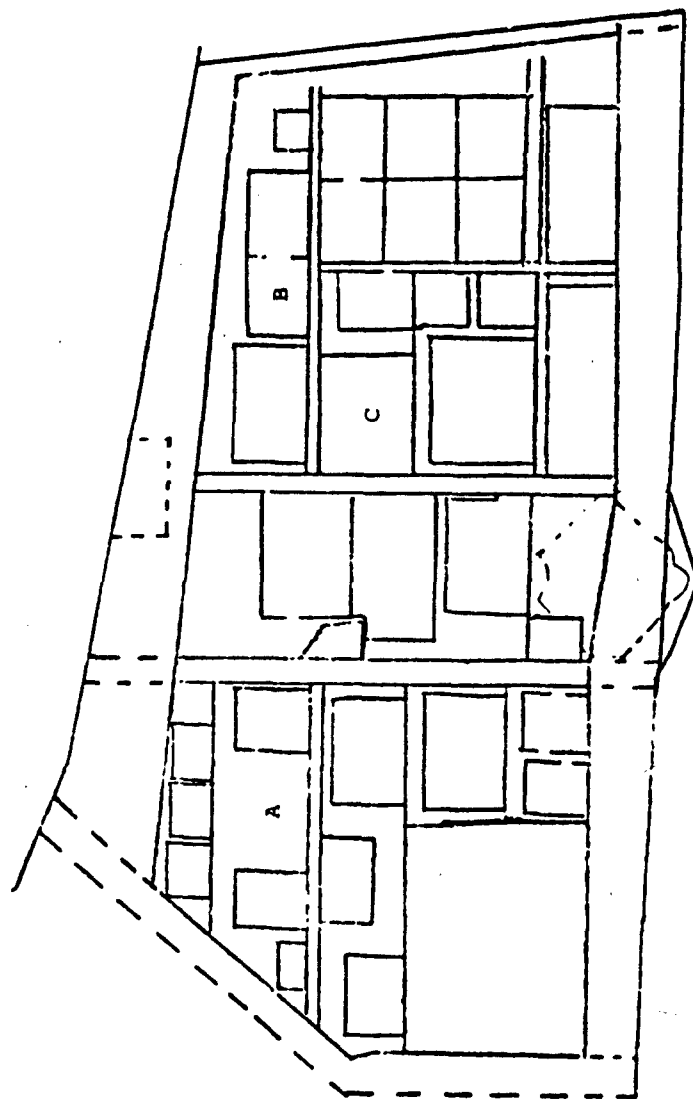


Figure 3-1. F-111A FORWARD RIGHT-HAND EQUIPMENT BAY SPACE LOCATIONS

#### 4. ELECTRICAL POWER SYSTEM

##### 4.1 Introduction

115/200 volt, three phase, 400 cycle ac power and 28 volt dc power are provided for the electrical power system in the F-111A. This power is generated by two 62.5 kVA ac generator drive assemblies, one mounted on each engine. These generators are supplemented by two 150 AMP transformer rectifier units that convert the ac power to 28 volts dc. An aircraft battery supplies 28 volts dc to the battery bus and the dc start busses. The electrical power system consists of the following systems:

- Main ac power system
- External ac power and monitor system
- Emergency ac power system
- Dc power system

##### 4.2 Power Requirements

In the F-111A, there is a basic avionics electrical power requirement of 40 kVA.

##### 4.3 Power Generation and Distribution

The main sources of electrical power are 62.5 kVA indirect drive generators. The control units for these generators are in the forward equipment bay. The electrical power distribution system has three ac busses: A left main ac bus, a right main ac bus, and an essential ac bus.

##### 4.4 Emergency ac Power System

The emergency ac power system provides electrical power for operation of safety-of-flight equipment in the event the main ac power system fails or hydraulic power is applied to the aircraft without electrical power, or both. The emergency ac power generator is operated by the utility hydraulic system.

##### 4.5 DC Power System

The dc power system supplies the aircraft with the necessary 28-volt direct current power. The main dc power system uses two ac-to-dc power converters to supply the main and essential dc busses. The aircraft battery ensures that standby power is available to power engine starts, aircraft position lights, and pylon refuel/defuel valves without external power units.

## 5. ENVIRONMENTAL CONTROL SYSTEM

### 5.1 General

The Environmental Control System (ECS) provides temperature controlled air for the cockpit and a temperature controlled flow of cooling air to the forward electronics bay and to the weapons bay. The ECS operates by ducting hot air from the sixteenth stage compressor of each engine through two air-to-air heat exchangers, an air-to-water heat exchanger, and a cooling turbine. The cooling turbine further cools the air to temperatures suitable for the cockpit and electronic equipment bays.

### 5.2 Cabin Air Conditioning

Cabin air conditioning is governed by a temperature controller that receives signals from temperature sensors and a cockpit control panel. The temperature controller allows hot air to mix with the cooled air stream to obtain air at the cockpit-selected temperature. Conditioned air flows from the cabin into the forward equipment bay.

### 5.3 Equipment Air Conditioning

Electronic equipment that is cooled by the ECS is grouped in the forward equipment area, cabin equipment area, aft(check) equipment area, main landing gear wheelwell area, and tail electronics area. The equipment is cooled by both area cooling and forced-air-flow cooling. Area cooling is achieved by supplying cold air to the equipment area as required to maintain the temperature at 150° ( $\pm 10^\circ$ ) F. In addition, a cold air flow can be forced over or into a single component or group of components.

## 6. CURRENT AVIONICS

Tables 6-1 through 6-27 contain LRU data relating to the F-111A avionics systems that make up the current or near-term configuration. Where no entries are shown, the data were not available for this report. Data pertaining to future avionics modifications are presented in Section 9.

| Table 6-1. F-111A AVIONICS CONFIGURATION DATA: AM/ARC-112 HF COMMUNICATIONS SET* NSN: 5821-00-494-9235 |                       |            |                     |       |       |                       |                 |                |    |                  |                |          |
|--------------------------------------------------------------------------------------------------------|-----------------------|------------|---------------------|-------|-------|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                                   | Nomenclature          | Location   | Dimensions (Inches) |       |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                        |                       |            | H                   | W     | D     |                       |                 | AC             | DC |                  |                |          |
| HF Comm                                                                                                | AM/ARC-112            |            |                     |       |       |                       |                 |                |    |                  |                |          |
| Control Panel                                                                                          | C06454/ARC-112        | Cockpit    | 2.62                | 5.75  | 5.0   | 73.5                  | 2               | 1.1            |    | 1,100W           | Convection     | Cockpit  |
| Amp-PWR Sup                                                                                            | AM-4239/ARC-112**     | Door 1201  | 8.5                 | 9.25  | 17.87 | 1405                  | 40              | 1.1            |    |                  | Forced Air     | MT-3355  |
| RCVR-TRANS                                                                                             | RT-759/ARC-112†       | Door 1201  | 10.                 | 11.62 | 16.0  | 42.5                  |                 |                |    |                  | Forced Air     | MT-3356  |
| Ant Coupler Set                                                                                        | AM/ARC-112 (CM-7149A) |            | 6.0                 | 5.0   | 12.62 |                       |                 |                |    |                  |                |          |
| Ant Coupl Cont                                                                                         | C-6455/ARC-112        | Door 1201  | 15.25               | 6.5   | 1.75  | 173.5                 | 7.4             |                |    |                  | Convection     | MT-3357  |
| Coupler                                                                                                | CJ-1402/ARC-112       | 4471/2     | 10.25               | 10.0  | 12.75 | 1307                  | 14.8            |                |    |                  | Convection     | Hard     |
| Antenna Dorsal Assy                                                                                    | 12TS01-XXX            |            |                     |       |       |                       |                 |                |    |                  |                | Hard     |
| Antenna Vertical Stabilizer Assy                                                                       | 12T010-XXX            |            |                     |       |       |                       |                 |                |    |                  |                | Hard     |
| Variable Capacitor                                                                                     | CB-17/ARC             | Cover 1460 |                     |       |       |                       |                 |                |    |                  | Convection     | Hard     |

\*See Table 6-2 for ARC-112 as a possible replacement system.

\*\*AM-4239 installed on MT-3355: 9.5"H x 9.9"W x 20.2"D, 1,900 in<sup>3</sup>.

\*See Table 6-2 for ARC-112 as a possible replacement system.  
 \*\*AM-4239 installed on MT-3355: 9.5"H x 9.9"W x 20.2"D, 1,900 in.<sup>3</sup>.  
 †RT-759 installed on MT-3356: 11"H x 12.8"W x 18.4"D, 2,591 in.<sup>3</sup>.

| Table 6-2. F-111A AVIONICS CONFIGURATION DATA: AN/ARC-123 HF RADIO AS A POSSIBLE REPLACEMENT SYSTEM FOR ARC-112 NSM: 5821-00-496-9234 |                                                      |           |                     |      |      |                       |                 |                |    |                  |                |                     |
|---------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|-----------|---------------------|------|------|-----------------------|-----------------|----------------|----|------------------|----------------|---------------------|
| Name                                                                                                                                  | Nomenclature                                         | Location  | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting            |
|                                                                                                                                       |                                                      |           | H                   | W    | D    |                       |                 | AC             | DC |                  |                |                     |
| Control<br>Rcvr-Mtr                                                                                                                   | C-7073/ARC                                           | Cockpit   | 3.75                | 5.75 | 6.25 | 135                   | 4               |                |    |                  | Convection     | Panel               |
|                                                                                                                                       | RT-822/ARC-123                                       | Door 1201 | 7.62                | 3.62 | 13.6 | 375                   | 13              |                |    |                  | Forced Air     | MT-3660/<br>ARC-123 |
| Amp.-Pwr. Sup.                                                                                                                        | AM-4573/ARC-123                                      | Door 1201 | 7.62                | 4.87 | 17.2 | 638                   | 23              | 1.1            |    |                  | Forced Air     | MT-3660/<br>ARC-123 |
| Shockmount<br>Base                                                                                                                    | MT-3660/ARC-123                                      | Door 1201 | 6.87                | 11.2 | 20.2 | 1554                  | H               |                |    | 1100W            | Forced Air     | Shock Mount         |
| RT and<br>AM Installed<br>On Mount                                                                                                    | RT-822/ARC-123<br>AM-4573/ARC-123<br>MT-3660/ARC-123 | Door 1201 | 8.75<br>INCL. SWAY  | 11.2 | 20.2 | 1980                  | 44              | 1.1            |    |                  |                |                     |

| Table 6-1. F-111A AVIONICS CONFIGURATION DATA: AM/ARC-109 UHF COMM SET AND ARC-164 AS A POSSIBLE REPLACEMENT SYSTEM NSN: 5821-00-496-9236 |                 |                                  |                                             |      |       |                       |                 |                |      |                  |                |                     |
|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------------------|---------------------------------------------|------|-------|-----------------------|-----------------|----------------|------|------------------|----------------|---------------------|
| Name                                                                                                                                      | Nomenclature    | Location                         | Dimensions (Inches)                         |      |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |      | Heat Dissipation | Cooling Method | Mounting            |
|                                                                                                                                           |                 |                                  | H                                           | W    | D     |                       |                 | AC             | DC   |                  |                |                     |
| UHF Comm                                                                                                                                  | AM/ARC-109      |                                  |                                             |      |       |                       |                 |                |      |                  |                |                     |
| RCVR-Trans*                                                                                                                               | RT-749/ARC-109  | Door 1202                        | 6.78                                        | 8.84 | 14.81 | 888                   | 29              | 0.37           |      | 370W             | Forced Air     | RT-3322/<br>ARC-109 |
| Control                                                                                                                                   | C-6364/ARC-109  | Cockpit                          | 4.87                                        | 5.75 | 6.87  | 192                   | 4.5             |                |      |                  | Convection     | Cockpit             |
| Ant. Sel                                                                                                                                  | C-4808          | Door 1202                        | 3.0                                         | 3.25 | 4.5   | 44                    | 1.5             |                |      |                  | Convection     | Hard                |
| Antenna**                                                                                                                                 | AS-1918         | Upper & Lower                    | 9.7                                         | 3.5  | 7.5   |                       | 2               |                |      |                  |                | Hard                |
| RF Switch                                                                                                                                 | SA-521          | Door 1202                        | 2.8                                         | 3.2  | 3.2   | 29                    | 0.6             |                |      |                  |                | Hard                |
| Possible Replacement RT Incl. Control                                                                                                     | RT-1168/ARC-164 | Cockpit Repl. for C-6364/ARC-109 | 4.87<br>Overall depth is 8.62" Inc Controls | 5.75 | 7.17  | 200                   | 9.2             |                | 0.11 | 110W             | Convection     | Cockpit             |
| *RT-749 installed on RT-3322, Incl. SMAY: 7.2"W x 9.5"H x 17.5"D, 3,200 lb.<br>**Antennas shared with TACAM.                              |                 |                                  |                                             |      |       |                       |                 |                |      |                  |                |                     |



| Table 6-4. F-111A AVIONICS CONFIGURATION DATA: AN/AIC-25 INTL.COM RESN: 5811-00-457-5041 |                |                     |                     |      |      |                       |                 |                |    |                  |                |          |
|------------------------------------------------------------------------------------------|----------------|---------------------|---------------------|------|------|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                     | Nomenclature   | Location            | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                          |                |                     | H                   | W    | D    |                       |                 | AC             | DC |                  |                |          |
| Intercom Set<br>Controls - 2<br>Required                                                 | AN/AIC-25      | LH/RH               | Each                |      |      |                       |                 |                | 02 |                  |                |          |
|                                                                                          | C-6567/AN-25** | Cockpit<br>Controls | 3.75                | 5.75 | 5.62 | 121                   | 4.2             |                |    | 20W              | Convection     | Cockpit  |
| Intercom<br>Stations - 2<br>Required                                                     | C-6624/AIC-25  | LH/RH<br>Wheelwells | 4.10                | 1.62 | 5.12 | 81                    | 2.7             |                |    |                  |                | Hard     |
| *C-6567 Intercom control depth is 6.75 in including knobs.                               |                |                     |                     |      |      |                       |                 |                |    |                  |                |          |

| Table 6-5. F-111A AVIONICS CONFIGURATION DATA: AM/ARA-50 UNIP-ADP MSW: 5826-00-883-5777 |                |           |                     |       |       |                       |                 |                |      |                  |                |             |
|-----------------------------------------------------------------------------------------|----------------|-----------|---------------------|-------|-------|-----------------------|-----------------|----------------|------|------------------|----------------|-------------|
| Name                                                                                    | Nomenclature   | Location  | Dimensions (Inches) |       |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |      | Heat Dissipation | Cooling Method | Mounting    |
|                                                                                         |                |           | H                   | W     | D     |                       |                 | AC             | DC   |                  |                |             |
| UIF-10F                                                                                 | AM/ARA-50;     |           | 8                   | 7.25  | 7     | 406                   | 6.5             | 0.04           | 0.01 | 50W              | Forced Air     | Shock Mount |
| Ampl. b-l. Assy.                                                                        | AM-3624/ARA-50 | Door 1202 | Including Mount     |       |       |                       |                 |                |      |                  |                |             |
| Installed Mount                                                                         | MT-1955/ARA-50 |           |                     |       |       |                       |                 |                |      |                  |                |             |
| Loop Ant.                                                                               | AS-909/ARA-48  | Door 1410 | 3.75                | 10.75 | 10.75 | 433                   | 10              |                |      |                  | Convection     | Hard        |

| Name                             | Nomenclature                        | Location  | Dimensions (Inches) |      |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |                 | Heat Dissipation | Cooling Method | Mounting |
|----------------------------------|-------------------------------------|-----------|---------------------|------|-------|-----------------------|-----------------|----------------|-----------------|------------------|----------------|----------|
|                                  |                                     |           | H                   | W    | D     |                       |                 | AC             | DC              |                  |                |          |
| Instruments<br>Attitude Dir Ind. | ARJ-11/A<br>NSN: 6610-424-8740      | Cockpit   | 5.25                | 5.0  | 10.68 | 280.4                 | 8.1             |                |                 | 36/10W           | Convection     | Cockpit  |
| Att. Ind.                        | ARJ-42/A-2<br>NSN: 6670-00-200-8744 | Cockpit   | 2.40                | 2.40 | 7.61  | 43.8                  | 2.5             | 0.002          | 0.034/<br>0.008 | 36/10W           | Convection     | Cockpit  |
| Horizontal<br>Siz Ind.           | AQU4/A<br>NSN: TBD                  | Cockpit   | 4.25                | 5.00 | 8.37  | 178                   | 8.0             |                |                 | 54W              | Convection     | Cockpit  |
| Tot/Sel<br>Fuel Quan.            |                                     | Cockpit   | 2.0                 | Dia  |       | 3.14                  | 1.5             |                |                 |                  | Convection     | Cockpit  |
| Recorder Flt<br>Load Type        | HXK 116/A2 406<br>NSN: TBD          | Door 1104 |                     |      |       |                       |                 |                |                 |                  | Forced Air     | Shock    |
| BDME                             | E516S0014C0<br>NSN: TED             | Cockpit   |                     |      |       |                       |                 |                |                 |                  | Convection     | Cockpit  |

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| Table 6-7. F-111A AVIONICS CONFIGURATION DATA: FLIGHT DIRECTOR COMPUTER NSN: 6610-00-179-5146 |              |           |                     |     |      |                       |                 |                |       |                  |
|-----------------------------------------------------------------------------------------------|--------------|-----------|---------------------|-----|------|-----------------------|-----------------|----------------|-------|------------------|
| Name                                                                                          | Nomenclature | Location  | Dimensions (Inches) |     |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |       | Heat Dissipation |
|                                                                                               |              |           | H                   | W   | D    |                       |                 | AC             | DC    |                  |
| Flight Director Computer                                                                      | CPU-76/A     | Door 1101 | 7.35                | 5.5 | 9.48 | 393                   | 10.0            | 0.016          | 0.085 | 26W              |
|                                                                                               |              |           |                     |     |      |                       |                 |                |       | Forced Air       |
|                                                                                               |              |           |                     |     |      |                       |                 |                |       | Shock            |

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| Table 6-8. F-111A AVIONICS CONFIGURATION DATA: AN/APN-167 RADAR ALTIMETER RSN: 5841-00-772-1819 |                 |           |                     |     |      |                       |                 |                |      |                  |                |              |
|-------------------------------------------------------------------------------------------------|-----------------|-----------|---------------------|-----|------|-----------------------|-----------------|----------------|------|------------------|----------------|--------------|
| Name                                                                                            | Nomenclature    | Location  | Dimensions (Inches) |     |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |      | Heat Dissipation | Cooling Method | Mounting     |
|                                                                                                 |                 |           | H                   | W   | D    |                       |                 | AC             | DC   |                  |                |              |
| Radar Alt.                                                                                      | AN/APN-167      |           |                     |     |      |                       |                 |                |      |                  |                |              |
| Radar Trans Panel                                                                               | RT-771/APN-167  | Door 1201 | 6.5                 | 15  | 14.5 | 14.14                 | 26.0            | 086            | 0.01 | 192W             | Forced Air     | RT ( )       |
| Antenna                                                                                         | AS-1758/APN-167 |           | 4.5                 | 4.5 | 9.25 | 187                   | 1.1             |                |      |                  | Convection     | Hard Cockpit |
| Radar Alt Ind.                                                                                  | K5186000100     | Cockpit   |                     |     |      |                       | 1.6/1.8*        |                |      |                  | Convection     | Cockpit      |
| Radar Alt.                                                                                      |                 |           |                     |     |      |                       |                 |                |      |                  |                |              |
| Low Warning Lamp                                                                                |                 | Cockpit   |                     |     |      |                       |                 |                |      |                  |                |              |
| *Two indicators in aircraft.                                                                    |                 |           |                     |     |      |                       |                 |                |      |                  |                |              |

| Table 6-9. F-111A AVIONICS CONFIGURATION DATA: CANC |                                    |                      |                     |    |       |                       |                 |                |    |                  |                          |                |
|-----------------------------------------------------|------------------------------------|----------------------|---------------------|----|-------|-----------------------|-----------------|----------------|----|------------------|--------------------------|----------------|
| Name                                                | Nomenclature                       | Location             | Dimensions (Inches) |    |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method           | Mounting       |
|                                                     |                                    |                      | H                   | W  | D     |                       |                 | AC             | DC |                  |                          |                |
| Alt Data Comp.                                      | 1904011-4<br>NSN: 6610-00-108-0544 | Door 1101            | 8                   | 14 | 19.25 |                       | 47.5            | 115 Vac<br>1ø  |    |                  | Forced Air               | 1632714-3      |
| Angle of Attack Trans. Control                      | 1294075-1<br>1290002-5             | Door 1102<br>Cockpit |                     |    |       |                       |                 |                |    |                  | Forced Air<br>Convection | Shock<br>Panel |
| Angle of Attack Trans. Sync.                        | MS24178-2                          | Door 1102            |                     |    |       |                       |                 |                |    |                  | Forced Air               | Shock          |

| Table 6-10. F-111A AVIONICS CONFIGURATION DATA: AM/ARM-52 TACAN NSM; TBO<br>(BEFORE T.O. 1P-111-1146, AM/ARM-118 INSTALLATION)* |                                 |                                      |                        |       |       |                             |                    |                   |      |                                    |                   |                    |
|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------|--------------------------------------|------------------------|-------|-------|-----------------------------|--------------------|-------------------|------|------------------------------------|-------------------|--------------------|
| Name                                                                                                                            | Nomenclature                    | Location                             | Dimensions<br>(Inches) |       |       | Volume<br>(Cubic<br>Inches) | Weight<br>(Pounds) | Aircraft<br>Power |      | Heat<br>Dissipation                | Cooling<br>Method | Mounting           |
|                                                                                                                                 |                                 |                                      | M                      | W     | D     |                             |                    | AC                | DC   |                                    |                   |                    |
| Control                                                                                                                         | C-1928/ARM-52                   | Cockpit                              | 3                      | 5.75  | 4     | 69                          | 2                  |                   |      |                                    | Convection        | Panel              |
| Rcvr-Xmtz                                                                                                                       | MT-893/ARM-52                   | Door 1202                            | 7.35                   | 10    | 16.9  | 12 42                       | 43.25              |                   |      |                                    | Forced Air        | MT-1729/<br>ARM-52 |
| Antenna**                                                                                                                       | AS-1918                         | Upper & Lower                        | 9.7                    | 3.5   | 7.5   | 255                         | 2                  |                   |      |                                    | Convection        | Hard               |
| RF Switch                                                                                                                       | SA-521/A                        | Door 1202                            | 2.6                    | 3.2   | 3.2   | 29                          | 0.6                |                   |      |                                    |                   |                    |
| Rcvr-Xmtz<br>Alternate                                                                                                          | MT-184/ARM-52                   | Alternate System for Early Aircraft. |                        |       |       | Replaced by MT-873/ARM-52   |                    |                   |      |                                    |                   |                    |
| MT Installed<br>on Mount                                                                                                        | MT-893/ARM-52<br>MT-1729/ARM-52 | Pod., RH Bay<br>Door 1202            | 9.00                   | 11.00 | 21.44 | 2123                        | 49                 | 0.25              | 0.06 | 0.31 kW;<br>118/min Air<br>at 71°C | Forced Air        | Shock Mount        |
| *See Table 6-11 for AM/ARM-118.<br>**Antennas are shared with UHF Comm.                                                         |                                 |                                      |                        |       |       |                             |                    |                   |      |                                    |                   |                    |

| Table 6-11. F-111A AVIONICS CONFIGURATION DATA: TACAN, AM/ARN-118 (AFTER T.O. 1P-111-1148, REPLACING AM/ARN-52) MSN: 5826-01-015-0839 |                                                                           |                          |                                       |      |                             |                       |                 |                |      |                                      |                                                |                          |
|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|--------------------------|---------------------------------------|------|-----------------------------|-----------------------|-----------------|----------------|------|--------------------------------------|------------------------------------------------|--------------------------|
| Name                                                                                                                                  | Nomenclature                                                              | Location                 | Dimensions (Inches)                   |      |                             | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |      | Heat Dissipation                     | Cooling Method                                 | Mounting                 |
|                                                                                                                                       |                                                                           |                          | H                                     | W    | D                           |                       |                 | AC             | DC   |                                      |                                                |                          |
| TACAN<br>Rcvr-Mnt, D/A<br>Converter, on<br>Mount<br><br>Control                                                                       | AM/ARN-118*<br>WP-1159/A<br>MX-9577/A<br>MT-4682/A<br><br>C-10056/ARN-118 | Door 1202<br><br>Cockpit | 8.85<br>Including Handles<br>and Sigs | 11.7 | 20.5                        | 2121                  | 38.5            | 0.20           | 0.03 | 0.23 RM<br>No Forced Air<br>Required | RT had<br>Internal<br>Blower<br><br>Convection | Shock Mount<br><br>Panel |
|                                                                                                                                       |                                                                           |                          |                                       |      |                             |                       |                 |                |      |                                      |                                                |                          |
|                                                                                                                                       |                                                                           |                          |                                       |      | 1.9 D Behind<br>Front Panel |                       |                 |                |      |                                      |                                                |                          |
| *These units replace AM/ARN-52 Rcvr-Mnt, Mount, and Control listed in Table 6-10.                                                     |                                                                           |                          |                                       |      |                             |                       |                 |                |      |                                      |                                                |                          |

\*These units replace AM/ARN-52 Rcvr-Mnt, Mount, and Control listed in Table 6-10.



| Table 6-12. F-111A AVIONICS COLOCATION DATA: ILS AM/ARM-58 AND ARM-112 AS A POSSIBLE REPLACEMENT SYSTEM NSN: 5826-00-883-5795*         |                   |                                           |                     |      |      |                       |                 |                |      |                  |                |          |
|----------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------------------------------|---------------------|------|------|-----------------------|-----------------|----------------|------|------------------|----------------|----------|
| Name                                                                                                                                   | Nomenclature      | Location                                  | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |      | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                                                        |                   |                                           | W                   | H    | D    |                       |                 | AC             | DC   |                  |                |          |
| ILS                                                                                                                                    | AM/ARM-58         |                                           |                     |      |      |                       |                 |                |      |                  |                |          |
| Rcvr Localizer                                                                                                                         | R-843/ARM-58      | Door 2204                                 | 7.75                | 6.87 | 5.59 | 298                   | 8               |                | 0.02 | 20W              | Convection     | Hard     |
| Rcvr Glide Slip/ MEK BCN                                                                                                               | R-844/ARM-58      | Door 2204                                 | 9.75                | 6.87 | 5.01 | 336                   | 9               |                | 0.03 | 30W              | Convection     | Hard     |
| Control                                                                                                                                | C-6176/ARM-58A    |                                           | 3.0                 | 5.75 | 5.0  | 86                    | 1.1             |                |      |                  | Convection     |          |
| MEK BCN Ant                                                                                                                            | 16D00500          |                                           |                     |      |      |                       | 1.0             |                |      |                  |                | Hard     |
| Glide Slope                                                                                                                            | P/O Radome        | Nose Radome                               |                     |      |      |                       | .8              |                |      |                  |                | Hard     |
| Localizer Antennas                                                                                                                     | P/O Doors         | Doors 1102 and 1202                       |                     |      |      |                       |                 |                |      |                  |                | Hard     |
| Possible Replacement System                                                                                                            | R-1755/ ARM-112** | Door 2204 After Mechanical Mod of ILS Bay | 5                   | 3.75 | 11.5 | 216                   | 7               |                | 0.02 | 20W              | Convection     | Hard     |
| **For ARM-58A, NSN: 5826-00-498-3311.<br>**R-1755 functionally replaces R-843 and R-844 and provides 20 additional localizer channels. |                   |                                           |                     |      |      |                       |                 |                |      |                  |                |          |

| Name                        | Nomenclature   | Location | Dimensions (Inches) |   |     | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|-----------------------------|----------------|----------|---------------------|---|-----|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
|                             |                |          | H                   | W | D   |                       |                 | AC             | DC |                  |                |          |
| Initial Nav. system         | AM/AJQ-20A     |          |                     |   |     |                       | 75.0            |                |    |                  | Forced Air     | Shock    |
| Stabilized Platform         | MX-6767/AJQ-20 | Duo 1102 |                     |   |     |                       |                 |                |    |                  |                |          |
| AMTK Induct Type Flux Valve | TAU-79/A       |          | 4.0 dia.            |   | 2.0 | 25.1                  | 1.8             |                |    |                  |                |          |
| Nav Comp                    | CP-812/AJQ-20  | Cockpit  |                     |   |     |                       | 77.8            |                |    |                  | Convection     | Panel    |
| Ballistics Computer         | CP-937/AJQ-20A |          |                     |   |     |                       |                 |                |    |                  |                |          |

| Table 6-14. F-111A AVIONICS CONFIGURATION DATA: INTERFERENCE BLANKER NSN: 5965-00-813-5469 |              |           |                     |   |   |                       |                 |                |    |                  |                |          |
|--------------------------------------------------------------------------------------------|--------------|-----------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                       | Nomenclature | Location  | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                            |              |           | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| Interference Blanker                                                                       | MX-6770/U    | Door 1102 |                     |   |   | TBD                   |                 |                |    |                  | Forced Air     | Shock    |

| TABLE 6-15. F-111A AVIONICS CONFIGURATION DATA: IFF TRANSPONDER AM/APX-64 NSM: 5895-00-115-7812 |                          |                 |                               |       |       |                       |                 |                |      |                  |                 |             |
|-------------------------------------------------------------------------------------------------|--------------------------|-----------------|-------------------------------|-------|-------|-----------------------|-----------------|----------------|------|------------------|-----------------|-------------|
| Name                                                                                            | Nomenclature             | Location        | Dimensions (Inches)           |       |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |      | Heat Dissipation | Cooling Method  | Mounting    |
|                                                                                                 |                          |                 | H                             | W     | D     |                       |                 | AC             | DC   |                  |                 |             |
| IFF Transponder                                                                                 | AM/APX-64                | Door 1201       | 8.58<br>Including MT and SNAY | 12.69 | 20.16 | 2195                  | 30.0            | 0.18           | 0.02 | 200W             | Internal Blower | Shock Mount |
| Recv-Xmttr in Mount                                                                             | MT-728/APX-64<br>MT-1497 |                 |                               |       |       |                       |                 |                |      |                  |                 |             |
| Control                                                                                         | C-6717/APX-64            | Cockpit         | 5.25                          | 5.75  | 5.00  | 151                   | 2.5             |                |      | 8W               | Convection      | Cockpit     |
| Test Set Airborne                                                                               | TS-1841/APX              | Door 1201       | 3.15                          | 3.25  | 7.81  | 80                    | 3.0             |                | 0.01 | 10W              | Convection      | MT-3513     |
| Antenna*                                                                                        | AS-1919                  | Upper and Lower |                               |       |       |                       | 2.0             |                |      |                  |                 |             |
| Transponder Computer                                                                            | KIT-1A/T SEC             | Door 1202       | 8.62<br>Including MT and SNAY | 6.6   | 14.25 | 810                   | 12.0            |                |      | 30W              |                 | MT-4579/U   |
| Replacement Recv-Xmttr                                                                          | MT-1063B/<br>APX-101**   | Not Defined     | 5.8                           | 6     | 10.8  | 376                   | 14              | 64             | 64   |                  | Convection      | Not Defined |
| *Antennas are shared with UHF data link.<br>**APX-101 will replace APX-64 per APR.              |                          |                 |                               |       |       |                       |                 |                |      |                  |                 |             |

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| Table 6-16. F-111A AVIONICS CONFIGURATION DATA: TFR AN/APQ-110 PARTIAL LISTING NSN: 5841-00-772-1811 |                 |             |                     |      |      |                       |                 |                |    |                  |                |          |
|------------------------------------------------------------------------------------------------------|-----------------|-------------|---------------------|------|------|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                                 | Nomenclature    | Location    | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                      |                 |             | H                   | W    | D    |                       |                 | AC             | DC |                  |                |          |
| TP Radar Sys                                                                                         | AN/APQ-110      |             |                     |      |      |                       | 13.8            |                |    |                  | Forced Air     | MT-3359  |
| TP Cntr                                                                                              | CP-799/APQ-110  | Door 1201   |                     |      |      |                       | 27.9            |                |    | 90W              |                |          |
| Ant Rcvr                                                                                             | AS-2138-128/APQ | Nose Radome |                     |      |      |                       |                 |                |    |                  |                |          |
| TP Ind                                                                                               | IP-771/APQ-110  | Cockpit     |                     |      |      |                       | 23.7            |                |    | 126W             | Convection     | Cockpit  |
| TP Radar Set Control                                                                                 | C-6456/APQ-110  | Cockpit     | 3.0                 | 5.75 | 7.31 | 126.1                 | 2.6             |                |    | 11W              | Convection     | Cockpit  |
| Amp-Pwr Supply                                                                                       | AM-4240/APQ-110 | Door 1201   | 6.0                 | 6.75 | 7.31 | 713                   | 17.6            |                |    |                  | Forced Air     | MT-3359  |
| Sync-Rcvr                                                                                            | SN-379/APQ-110  | Door 1102   |                     |      |      |                       | 26.8            |                |    |                  | Forced Air     | MT-3359  |
| Ant. Rcvr                                                                                            | AS-1717/APQ     |             |                     |      |      |                       |                 |                |    |                  |                |          |

| Table 6-17. F-111A AVIONICS CONFIGURATION DATA: ATTACK RADAR SET APQ-113 MSN: 780 |                 |             |                                  |       |       |                       |                 |                |    |                  |                |                 |
|-----------------------------------------------------------------------------------|-----------------|-------------|----------------------------------|-------|-------|-----------------------|-----------------|----------------|----|------------------|----------------|-----------------|
| Name                                                                              | Nomenclature    | Location    | Dimensions (Inches) <sup>1</sup> |       |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting        |
|                                                                                   |                 |             | H                                | W     | D     |                       |                 | AC             | DC |                  |                |                 |
| Antenna Assy                                                                      | AS-1749/APQ-113 | Nose Radome | 26.0                             | 35.0  | 32.0  | 29,120                | 53.0            |                |    |                  |                |                 |
| Antenna Back-Shell                                                                | AB-502/APQ-113  | Nose Radome | 19.0                             | 21.0  | 8.0   | 3,192                 | 27.0            |                |    |                  |                |                 |
| Antenna Control                                                                   | C-6498/APQ-113  | Nose Radome | 10.0                             | 27.0  | 8.0   | 2,160                 | 34.0            |                |    | 984              | Forced Air     | MT-1184/APQ-113 |
| Modulator Receiver Transmitter                                                    | MD-1008/APQ-113 | Door 1101   | 21.0                             | 13.0  | 21.0  | 5,733                 | 101.0           |                |    | 114              | Forced Air     | MT-1184/APQ-113 |
| Electrical Synchronizer                                                           | SN-180/APQ-113  | Door 1101   | 13.75                            | 13.0  | 20.75 | 3,574                 | 71.0            |                |    | 392W             | Forced Air     | MT-1184/APQ-113 |
| Indicator Receiver                                                                | IP-777/APQ-113  | Cockpit     | 9.25                             | 16.25 | 30.5  | 4,585                 | 41.0            |                |    |                  | Convection     | Cockpit         |
| Radar Set Control                                                                 | C-6491/APQ-113  | Cockpit     | 3.75                             | 5.75  | 6.5   | 140                   | 3.0             |                |    |                  | Convection     | Cockpit         |
| Antenna-Indicator Control                                                         | C-6490/APQ-113  | Cockpit     | 8.75                             | 5.0   | 3.5   | 153                   | 2.0             |                |    |                  | Convection     | Cockpit         |
| Electrical Equipment Rack                                                         | MT-1184/APQ-113 | Door 1101   | 34.25                            | 13.25 | 25.75 | 9,870                 | 6.0             |                |    |                  |                |                 |
| <sup>1</sup> Total system power dissipation is 1.637W ac, 0.14W dc.               |                 |             |                                  |       |       |                       |                 |                |    |                  |                |                 |

| Name                    | Nomenclature   | Location | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|-------------------------|----------------|----------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
|                         |                |          | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| Receiver Control        | C-8250/AAR-14  |          |                     |   |   |                       |                 |                |    |                  |                |          |
| Search Track Scanner    | CV-2630/AAR-14 |          |                     |   |   |                       |                 |                |    |                  |                |          |
| Video Signale Processor | CM-389/AAR-14  |          |                     |   |   |                       |                 |                |    |                  |                |          |

Data for this equipment are Classified.

| Table 6-19. F-111A AVIONICS CONFIGURATION DATA: RADAR WARNING ALR-23 PARTIAL LISTING MSN: 5865-00-104-9842 |                       |           |                     |      |       |                       |                 |                |     |                  |                |                    |
|------------------------------------------------------------------------------------------------------------|-----------------------|-----------|---------------------|------|-------|-----------------------|-----------------|----------------|-----|------------------|----------------|--------------------|
| Name                                                                                                       | Nomenclature          | Location  | Dimensions (Inches) |      |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |     | Heat Dissipation | Cooling Method | Mounting           |
|                                                                                                            |                       |           | H                   | W    | D     |                       |                 | AC             | DC  |                  |                |                    |
| AN/ALR-23                                                                                                  | AN/ALR-23             |           |                     |      |       |                       | 68.29           | 1.35           | .12 | 729W             |                | CH-542/NA-1/ALR-23 |
| PROCESSOR                                                                                                  | CM-319 (xa-21)/ALR-23 | Door 1101 | 7.76                | 7.00 | 16.25 | 883                   | 21.37           |                |     | 33W              | Forced Air     |                    |
| VIDEO STD.                                                                                                 |                       |           |                     |      |       |                       |                 |                |     |                  |                |                    |
| SCRAMET SEARCH/                                                                                            | (V-185)/ALR-23        | Door 4491 | 7.63                |      | 15.45 | 185                   | 27.02           |                |     | 60W              |                |                    |
| TRACK                                                                                                      | 23(V)                 |           | dia.                |      |       |                       |                 |                |     |                  |                |                    |
| CONVERTER                                                                                                  | MS-CJ78(XA-21)/ALR-23 | Door 4492 | 6.80                |      | 22.0  | 235                   |                 |                |     |                  |                |                    |
| CYBERNETIC                                                                                                 |                       |           | dia.                |      |       |                       |                 |                |     |                  |                |                    |
| CONTROL, CP                                                                                                | C-6474/ALR-23         | Cockpit   | 2.5                 | 5.75 | 2.62  | 37.7                  | 1.13            |                |     | 136W             | Convection     | Cockpit            |



Table 6-20. F-111A AVIONICS CONFIGURATION DATA: AN/APS-109 ECM NSM: 5865-00-813-5413

| Name           | Nomenclature    | Location | Dimensions<br>(Inches) |      |      | Volume<br>(Cubic<br>Inches) | Weight<br>(Pounds) | Aircraft<br>Power |    | Heat<br>Dissipation | Cooling<br>Method | Mounting                                            |
|----------------|-----------------|----------|------------------------|------|------|-----------------------------|--------------------|-------------------|----|---------------------|-------------------|-----------------------------------------------------|
|                |                 |          | H                      | W    | D    |                             |                    | AC                | DC |                     |                   |                                                     |
| Antenna Band 3 | AS-1781/APS-109 | Radome   |                        |      |      |                             |                    |                   |    |                     |                   |                                                     |
| Antenna Band 3 | AS-1725/APS-109 | Radome   |                        |      |      |                             |                    |                   |    |                     |                   |                                                     |
| Antenna Band 1 | AS-1723/APS-109 | Radome   |                        |      |      |                             |                    |                   |    |                     |                   |                                                     |
| Antenna        | AS-1719/APS-109 | Radome   |                        |      |      |                             |                    |                   |    |                     |                   |                                                     |
| Receiver       | R-1643/APS-109  | TBD      |                        |      |      |                             |                    |                   |    |                     |                   |                                                     |
| Vid. Sig. Proc | CM 392/APS-109  |          | 10                     | 3.37 | 22.8 |                             |                    | 115 Vac           |    |                     |                   | WT-42251<br>APS-109<br>WT-4225/<br>APS-109<br>Panel |
| Indicator      | SB-3355/APS-109 |          |                        |      |      |                             |                    |                   |    |                     |                   |                                                     |

| Table 6-21. F-111A AVIONICS CONFIGURATION DATA: ECM AN/ALR-39 NSM: 5865-00-432-6014 |                               |          |                     |   |   |                       |                 |                |    |                  |                |            |
|-------------------------------------------------------------------------------------|-------------------------------|----------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|------------|
| Name                                                                                | Nomenclature                  | Location | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting   |
|                                                                                     |                               |          | H                   | W | D |                       |                 | AC             | DC |                  |                |            |
| Receiver                                                                            | R-15071/ALR-39                | Cockpit  |                     |   |   |                       |                 |                |    |                  |                |            |
| Power Supply                                                                        | 131297-000 (or)<br>216801-000 |          |                     |   |   |                       |                 |                |    |                  |                |            |
| Antenna Lead Band Blade                                                             | AT-741/A                      |          |                     |   |   |                       |                 |                |    |                  |                |            |
| Antenna                                                                             | 12E 2946-5                    |          |                     |   |   |                       |                 |                |    |                  |                |            |
| Antenna                                                                             | 12E2949-803                   |          |                     |   |   |                       |                 |                |    |                  |                |            |
| Antenna                                                                             | 12E2945-5                     |          |                     |   |   |                       |                 |                |    |                  |                |            |
| Control                                                                             | 30-1311-1                     |          |                     |   |   |                       |                 |                |    |                  |                |            |
| Data Analysis                                                                       | UX-8369A1<br>(LR-39)          |          |                     |   |   |                       |                 |                |    |                  |                | Convection |

Details of AN/ALR-39 are Classified.

| Table 6-22. F-111A AVIONICS CONFIGURATION DATA: ECM AM/ALR-41 NSN: 5865-00-432-6015 |               |           |                     |      |   |                       |                 |                |    |                  |                |          |
|-------------------------------------------------------------------------------------|---------------|-----------|---------------------|------|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                | Nomenclature  | Location  | Dimensions (Inches) |      |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                     |               |           | H                   | W    | D |                       |                 | AC             | DC |                  |                |          |
| RECEIVER                                                                            | R-1633/ALR-41 | Door 1202 |                     |      |   |                       |                 |                |    |                  |                |          |
| Ant. RFL.                                                                           |               |           |                     |      |   |                       |                 |                |    |                  |                |          |
| Ant. Low Band Blade                                                                 |               |           |                     |      |   |                       |                 |                |    |                  |                |          |
| Power Supply                                                                        | SC-1115-7     | Door 1201 |                     |      |   |                       |                 |                |    |                  |                |          |
| Ant. RECF                                                                           |               |           |                     |      |   |                       |                 |                |    |                  |                |          |
| Control                                                                             | 12F0002-5     | Cockpit   |                     | 5.75 |   |                       |                 |                |    |                  |                |          |
| Details of AM/ALR-41 are Classified.                                                |               |           |                     |      |   |                       |                 |                |    |                  |                |          |

| Name         | Nomenclature  | Location  | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|--------------|---------------|-----------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
|              |               |           | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| RTT          | 13840G1       | Door 1101 |                     |   |   |                       |                 |                |    |                  | Forced Air     | Shock    |
| Transmitter  | 13891G1       | Door 1101 |                     |   |   |                       |                 |                |    |                  | Forced Air     | Shock    |
| Power Supply | 13892G1       | Door 1101 |                     |   |   |                       |                 |                |    |                  | Forced Air     | Shock    |
| Control      | C-3780/ALQ-41 | Cockpit   |                     |   |   |                       |                 |                |    |                  | Convection     | Panel    |
| Antenna      |               |           |                     |   |   |                       |                 |                |    |                  |                |          |
| Antenna      |               |           |                     |   |   |                       |                 |                |    |                  |                |          |

Details of AM/ALQ-41 are Classified.

| Table 6-24. F-111A AVIONICS CONFIGURATION DATA: ECM AM/ALQ-94 ESM: 5865-00-890-0422 |                |           |                     |   |   |                       |                 |                |    |                  |                |                    |
|-------------------------------------------------------------------------------------|----------------|-----------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|--------------------|
| Name                                                                                | Manufacturer   | Location  | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting           |
|                                                                                     |                |           | H                   | W | D |                       |                 | AC             | DC |                  |                |                    |
| Amp Mid Band                                                                        | AM-4851/ALQ-94 | Door 1101 |                     |   |   |                       |                 |                |    |                  | Forced Air     | MT-3878/<br>ALQ-94 |
| Receiver Mid                                                                        | R-1498/ALQ-94  | Door 1101 |                     |   |   |                       |                 |                |    |                  | Forced Air     | MT-3878/<br>ALQ-94 |
| Amp Low Band                                                                        | AM-4850/ALQ-94 | Door 1101 |                     |   |   |                       |                 |                |    |                  | Forced Air     | MT-3877/<br>ALQ-94 |
| Receiver Low                                                                        | R-1497/ALQ-94  | Door 1101 |                     |   |   |                       |                 |                |    |                  | Forced Air     | MT-3877/<br>ALQ-94 |
| Amp High Band                                                                       | AM-4852/ALQ-94 | Door 1201 |                     |   |   |                       |                 |                |    |                  | Forced Air     | MT-3879/<br>ALQ-94 |
| Receiver High                                                                       | R-1499/ALQ-94  | Door 1201 |                     |   |   |                       |                 |                |    |                  | Forced Air     | MT-3879/<br>ALQ-94 |
| Control                                                                             | C-7410/ALQ-94  | Cockpit   |                     |   |   |                       |                 |                |    |                  | Convection     | Panel              |
| Ant. No. 3                                                                          |                |           |                     |   |   |                       |                 |                |    |                  |                |                    |
| Ant. No. 5                                                                          |                |           |                     |   |   |                       |                 |                |    |                  |                |                    |
| Ant. No. 7                                                                          |                |           |                     |   |   |                       |                 |                |    |                  |                |                    |
| Ant. No. 9                                                                          |                |           |                     |   |   |                       |                 |                |    |                  |                |                    |
| Ant. High                                                                           |                |           |                     |   |   |                       |                 |                |    |                  |                |                    |
| Ant. Mid                                                                            |                |           |                     |   |   |                       |                 |                |    |                  |                |                    |
| Ant. Low                                                                            |                |           |                     |   |   |                       |                 |                |    |                  |                |                    |

Details of AM/ALQ-94 are Classified.

| Table 6-25. F-111A AVIONICS CONFIGURATION DATA: CM DISP. SET (PARTIAL LISTING) AN/ALE-28 MM: 5065-00-105-0987* |               |          |                     |      |      |                       |                 |                |       |                  |                |          |
|----------------------------------------------------------------------------------------------------------------|---------------|----------|---------------------|------|------|-----------------------|-----------------|----------------|-------|------------------|----------------|----------|
| Sym.                                                                                                           | Nomenclature  | Location | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |       | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                                |               |          | H                   | W    | D    |                       |                 | AC             | DC    |                  |                |          |
| CM Disp Set                                                                                                    | AN/ALE-28     | Cockpit  | 4.12                | 5.75 | 6.25 | 148                   | 4.6             | .15            | .075  | 111W             | Convection     | Cockpit  |
| Control                                                                                                        | C-6471/ALE-28 |          | 2.25                | 7.00 | 5.11 | 83.6                  | 2.2             |                |       | 20W              |                |          |
| Control Seq-Eject                                                                                              | C-6472/ALE-28 |          | 11.6                | 9.8  | 32.4 | 3,683                 | 51              |                |       | 2,094W           |                |          |
| Elect Force Disp                                                                                               | D-22/ALE-28   |          | 1.12                | 5.75 | 4.0  | 25.76                 | 0.4             | 0.005          | 0.007 | 12W              |                |          |
| Disposables Cont. Panel                                                                                        |               | Cockpit  |                     |      |      |                       |                 |                |       |                  | Convection     | Cockpit  |
| *Also 5065-00-114-3146.                                                                                        |               |          |                     |      |      |                       |                 |                |       |                  |                |          |

| Table 6-26. P-111A AVIONICS CONFIGURATION DATA: RECORDER SET AM/A240-6 MM; TND |                |          |                     |   |     |                       |                 |                |    |                  |                |          |
|--------------------------------------------------------------------------------|----------------|----------|---------------------|---|-----|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                           | Nomenclature   | Location | Dimensions (Inches) |   |     | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                |                |          | H                   | W | D   |                       |                 | AC             | DC |                  |                |          |
| Rec. Mech. Assy                                                                | MXK-316/A240-6 |          |                     |   | TND |                       |                 |                |    |                  |                |          |
| Aug. Rec. Set                                                                  | MXK-315/A240-6 |          |                     |   |     |                       |                 |                |    |                  |                |          |

| Table 6-27. F-111A AVIONICS CONFIGURATION DATA: AM/ASG-23 LEAD COMPUTING OPTICAL SIGHT SYSTEM NSN: 1276-00-244-6805 |                |           |                     |      |      |                       |                 |                |    |                  |                |          |
|---------------------------------------------------------------------------------------------------------------------|----------------|-----------|---------------------|------|------|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                                                | Nomenclature   | Location  | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                                     |                |           | H                   | W    | D    |                       |                 | AC             | DC |                  |                |          |
| Optical Disp. Sight                                                                                                 | SU-29/ASG-23   | Cockpit   | 8.9                 | 6.8  | 23   | 1,392                 | 20.0            |                |    |                  | Convection     | Cockpit  |
| Lead and Launch Comp. Amp.                                                                                          | AM-4301/ASG-23 | Door 1102 | 4.9                 | 8.02 | 15.2 | 597                   | 20.0            |                |    |                  | Forced Air     | Shock    |
| Lead Computing Gyro                                                                                                 | CN-1060/ASG-23 | Door 1102 | 10.5                | 10.5 | 9.0  | 992                   | 14.0            |                |    |                  | Forced Air     | Hard     |
| Amplifier Mounting Rack                                                                                             |                | Door 1102 | 1.0                 | 8.35 | 15.7 |                       | 1.0             |                |    |                  |                |          |



## 7. ANTENNA LOCATIONS

Figure 7-1 shows the approximate locations of the antennas on the F-111A. Antenna nomenclature from current technical orders is as follows:

| <u>Antenna</u>                                                | <u>Nomenclature or Part Number</u> |
|---------------------------------------------------------------|------------------------------------|
| 1. Glide Slope Strip                                          | 12Z519-7                           |
| Glide Slope Plate                                             | 12Z517-1                           |
| 2. ADF                                                        | AS-909/ARA-48                      |
| 3. IFF (Upper) and UHF Data Link                              | 11D020100-6                        |
| 4. Radio Beacon Set                                           | AN/URT-27 or -33                   |
| 5. UHF No. 1 and TACAN Upper                                  | 11D020100-6                        |
| 6. HF Dorsal                                                  | 12T501-807                         |
| HF Vertical                                                   | 12T010-849                         |
| 7. IFF Lower                                                  | AT-741B/A                          |
| 8. Localizer (2)                                              | TBD                                |
| 9. Low and Medium Frequency Radar Homing (4)                  | LH Installation 12E2239-5          |
| 10. Forward Radar Warning (2)                                 | RH Installation 12E2239-6          |
| 11. High Frequency Radar Homing (4)                           |                                    |
| 12. Terrain Following Radar (2)                               |                                    |
| 13. Attack Radar                                              |                                    |
| 14. AN/ALQ-94 ECM No. 3                                       | AS-2136/APQ-110                    |
| AN/ALQ-94 ECM No. 5                                           | AS-1749/APQ-113                    |
| AN/ALQ-94 ECM No. 7                                           | 12E2907-1                          |
| 15. Radar Altimeter                                           | 12E2908-1                          |
| 16. AN/ALR-62                                                 | 12E2909-1                          |
| 17. AN/ALQ-94 High Band Wing Glove (4)                        | LG81G3                             |
| AN/ALQ-94 Medium Band Wing Glove (2)                          | 311190-1                           |
| AN/ALQ-94 Low Band Wing Glove (4)                             | 12E2989-1                          |
| AN/ALQ-94 Mid Band, Transmit Wing Glove (4)                   | 12E2987-1                          |
| 18. AN/ALR-62 (2)                                             | 12E2988-1                          |
| 19. Aft Radar Warning (2)                                     | 12E2999-1                          |
| 20. AN/ALQ-94 ECM No. 9 LH Assembly (3 antennas per assembly) | 12E2982-1                          |
| AN/ALQ-94 ECM No. 9 RH Assembly (3 antennas per assembly)     | 12E805-1                           |
| 21. UHF No. 2 and TACAN Lower                                 | 12E2910-1                          |
| 22. AN/ALQ-94 ECM No. 3                                       | 12E2910-1                          |
| AN/ALQ-94 ECM No. 5                                           | 11D20100-3                         |
| AN/ALQ-94 ECM No. 7                                           | 12E2907-1                          |
| 23. Marker Beacon                                             | 12E2908-1                          |
|                                                               | 12E2909-1                          |
|                                                               | 16D00500                           |

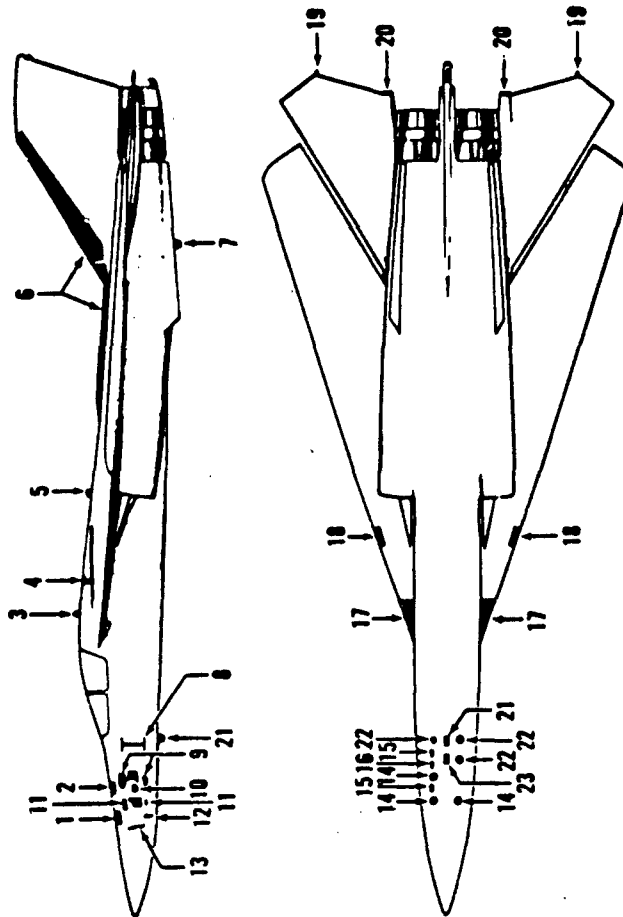


Figure 7-1. ANTENNA LOCATIONS (TYPICAL)

1. Glide Slope.
2. ADF.
3. IFF (Upper) and UHF Data Link.
4. Radio Beacon Set.
5. UHF #1 and TACAN Upper.
6. HF.
7. IFF Lower.
8. Localizer (2).
9. Low and Medium Frequency Radar Homing (4).
10. Forward Radar Warning (2).
11. High Frequency Radar Homing (4).
12. TFR (2).
13. Attack Radar.
14. AN/ALQ-94 (3).
15. Radar Altimeter.
16. AN/ALR-62.
17. AN/ALO-94 (12).
18. AN/ALR-62 (2).
19. Air Radar Warning (2).
20. AN/ALO-94 (6).
21. UHF #2 and TACAN Lower.
22. AN/ALO-94 (3).
23. Marker Beacon.

## 8. INTERFACE DATA

This section contains examples of interface signal characteristics. These data were extracted from applicable sections of the Interface Control Documents (ICDs) for integration of GPS user equipment in the F-111A aircraft. Each sheet discusses a particular signal. The top line contains the signal name, type of signal (digital, analog, discrete, or synchronous), signal source and load, and whether the signal is an input or output of the GPS user equipment. A functional description follows, together with a description of the signal's characteristics.

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM | TO           |
|-------------|---------|-----|------|--------------|
| Bearing     | Synchro | 0   | UE   | HSI and BDHI |

## Functional Description

Provides angular information to the bearing pointer\* to display relative bearing of the aircraft's present position to selected waypoint. The relative bearing is the difference, in degrees, between the lubber line and the bearing pointer as read from the compass card.

\*No. 1 pointer on BDHI

## Signal Characteristics

RANGE: 0° to 360°  
 ACCURACY: +0.5°  
 INDEX REFERENCE: Aircraft Heading  
 POSITIVE DIRECTION SENSE: Increasing Bearing  
 SCALE FACTOR: 1° = 10  
 RESOLUTION: HSI  $\pm 2.5^\circ$ , BDHI  $\pm 0.5^\circ$

## Electrical Characteristics (continued on next page)

LOAD: 1) HSI, AQU-4/A, Bearing Pointer, 3-Wire Synchro, Bendix Type AY-500-5 or equal  
 2) BDHI, ES165001400, No. 1 Pointer, 3-Wire Synchro, Bendix Type AY-100 HY-59-A1 or equal

SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Triad  
 Wire Size: No. 22 AWG

A/C: F-111A/E  
 REF: MIL-I-27848  
 12R5-4-65-3  
 1F-111A-2-18-1  
 1F-111E-2-10-1

|       |       |          |                   |
|-------|-------|----------|-------------------|
| DATE  | ISSUE | REVISION | DESCRIPTION       |
| A     |       |          | ICD-GPS-014 & 017 |
| SCALE | REV   | SHEET    | 10-2              |

# ELECTRICAL CHARACTERISTICS

| LOAD 1                                                                       |             |         | LOAD 2                                                                                  |             |         |
|------------------------------------------------------------------------------|-------------|---------|-----------------------------------------------------------------------------------------|-------------|---------|
| HSI, AQU-4/A, Bearing Pointer, 3-Wire Synchro, Bendix Type AY-500-5 or equal |             |         | BDHI, E 51650U1400, No. 1 Pointer, 3-Wire Synchro, Bendix Type AY-100 HY-59-A1 or equal |             |         |
| ROTOR                                                                        |             |         |                                                                                         |             |         |
| Input Voltage                                                                | 26          | Volts   | Primary Winding                                                                         | Stator      |         |
| Frequency                                                                    | 400         | Cycles  | Primary Voltage (400 Hz)                                                                | 11.8        | Volts   |
| Input Current                                                                | --          | ma      | Secondary Voltage                                                                       | 20.3        | Volts   |
| Input Power                                                                  | --          | Watts   | Input Current                                                                           | .020        | Amps    |
| Resistance (DC)                                                              | 530         | Ohms    | Input Power                                                                             | .060        | Watts   |
|                                                                              |             |         | Max. Error Spread                                                                       | +6          | Minutes |
|                                                                              |             |         | Max. Null Voltage                                                                       | 30          | mv      |
|                                                                              |             |         | Zro                                                                                     | 595 + J2130 |         |
|                                                                              |             |         | Zso                                                                                     | 750 + J369  |         |
|                                                                              |             |         | Rotor DC Resistance                                                                     | 409         | Ohms    |
|                                                                              |             |         | Stator DC Resistance                                                                    | 1200        | Ohms    |
| STATOR                                                                       |             |         |                                                                                         |             |         |
| Input Voltage                                                                | 11.8        | Volts   |                                                                                         |             |         |
| Input Current                                                                | 20          | ma      |                                                                                         |             |         |
| Input Power                                                                  | 0.090       | Watts   |                                                                                         |             |         |
| Resistance (DC)                                                              | 188         | Ohms    |                                                                                         |             |         |
| Rotor Output Voltage                                                         | 19          | Volts   |                                                                                         |             |         |
| Phase Shift (S to R)                                                         | 15          | Degrees |                                                                                         |             |         |
| Accuracy (Max)                                                               | 15          | Minutes |                                                                                         |             |         |
| Null Voltage (Max)                                                           | 50          | mv      |                                                                                         |             |         |
| IMPEDANCE                                                                    |             |         |                                                                                         |             |         |
| Zso                                                                          | 222 + j470  | Ohms    |                                                                                         |             |         |
| Zro                                                                          | 940 + J2260 | Ohms    |                                                                                         |             |         |
| Zrss                                                                         | 1050 + j450 | Ohms    |                                                                                         |             |         |

|      |              |                   |
|------|--------------|-------------------|
| DATE | CDR, NAVY NO | ISSUED NO         |
| A    |              | ICD-GPS-014 & 017 |
| NAME | REV          | SHEET 10-3        |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME     | TYPE    | I/O | FROM | TO         |
|-----------------|---------|-----|------|------------|
| Distance, Units | Synchro | 0   | UE   | HSI & BDHI |

## Functional Description

Provides angular information to rotate the units digit in the range window. Displays aircraft present position distance to selected waypoint in 1 nm increments (0.5 nm indexed). Driven independently of other digits, but read in conjunction with them in order to provide the least significant digit.

## Signal Characteristics

RANGE: 0 to 9 ( $0^0$  to  $360^0$ )  
 ACCURACY:  $\pm 0.1$  ( $\pm 3.6^0$ )  
 INDEX REFERENCE: 0  
 POSITIVE DIRECTION SENSE: To decreasing values (distance to go)  
 SCALE FACTOR:  $36^0 = 1$  numeral  
 RESOLUTION:  $\pm 3^0$

## Electrical Characteristics (continued on next page)

- LOAD: 1) HSI, AQU-4/A, Distance Display, 3-Wire Synchro, Clifton Type CRC-8-A-1 or equal  
 2) BDHI, ES165001400, Distance Display, 3-Wire Synchro, Bendix Type AY 080-DD-46-A1 or equal

SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Two Single Conductors (X, Y) -  
 Wire Size: No. 22 AWG

Note: "Z" grounded through 26 Vac common.

A/C: F-111A/E  
 REF: MIL-I-27848  
 T.O. 12R5-4-65-3  
 1F-111A-2-18-1  
 1F-111E-2-1A-1

| REV   | DATE | BY    | CHKD | APP'D | DESCRIPTION       |
|-------|------|-------|------|-------|-------------------|
| A     |      |       |      |       | ICD-GPS-014 & 017 |
| SCALE | REV  | SHEET | 10-4 |       |                   |

# ELECTRICAL CHARACTERISTICS

| LOAD 1                                                                          |           |         | LOAD 2                                                                                     |           |         |
|---------------------------------------------------------------------------------|-----------|---------|--------------------------------------------------------------------------------------------|-----------|---------|
| HSI, AQU-4/A, Distance Display, 3-Wire Synchro, Clifton Type CRC-8-A-1 or equal |           |         | BDHI, E5165001400, Distance Display, 3-Wire Synchro, Bendix Type, AY 080-DD-46-A1 or equal |           |         |
| Primary Winding                                                                 | Rotor     |         | Primary Winding                                                                            | Rotor     |         |
| Primary Voltage (400 Hz)                                                        | 26        | Volts   | Primary Voltage (400 Hz)                                                                   | 26        | Volts   |
| Secondary Voltage                                                               | 11.8      | Volts   | Secondary Voltage                                                                          | 11.8      | Volts   |
| Input Current                                                                   | 100       | ma      | Input Current                                                                              | 187       | ma      |
| Input Power                                                                     | .54       | Watts   | Input Power                                                                                | 1.1       | Watts   |
| Accuracy                                                                        | 30        | Feet    | Max. Error Spread                                                                          | +1.25     | Degrees |
| Impedance, Zro                                                                  | 54 + j260 | Ohms    | Impedance, Zro                                                                             | 32 + j150 |         |
| Impedance, Zso                                                                  | 12 + j45  | Ohms    | Impedance, Zso                                                                             | 6.8 + j26 |         |
|                                                                                 |           |         | Impedance, Zrs                                                                             | 57 + j14  |         |
| Rotor DC Resistance                                                             | 37        | Ohms    | Rotor DC Resistance                                                                        | 24        | Ohms    |
| Stator DC Resistance                                                            | 12        | Ohms    | Stator DC Resistance                                                                       | 7.3       | Ohms    |
| Phase Shift                                                                     | 8.5       | Degrees |                                                                                            |           |         |

|      |             |                   |
|------|-------------|-------------------|
| DATE | CONTROL NO. | REVISION NO.      |
| A    |             | ICD-GPS-014 & 017 |
| DATE | REV         | DATE              |
|      |             | 10-5              |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME   | TYPE    | I/O | FROM | TO         |
|---------------|---------|-----|------|------------|
| Distance Tens | Synchro | 0   | UE   | HSI & BDHI |

## Functional Description

Provides angular information to rotate the tens digit in the range window. Displays aircraft present position distance to selected waypoint in 10 nm increments. Driven independently of other distance digits but read in conjunction with them.

## Signal Characteristics

RANGE: 0 to 9 (0° to 360°)  
 ACCURACY:  $\pm 0.1$  ( $\pm 3.6^\circ$ )  
 INDEX REFERENCE: 0  
 POSITIVE DIRECTION SENSE: To decreasing values (distance to go)  
 SCALE FACTOR:  $36^\circ = 1$  numeral  
 RESOLUTION:  $\pm 3^\circ$

## Electrical Characteristics (continued on next page)

- LOAD: 1) HSI, AQU-4/A, Distance Display, 3-Wire Synchro, Clifton Type  
 CRC-8-A-1 or equal  
 2) BDHI, ES165001400, Distance Display, 3-Wire Synchro, Bendix  
 Type AY 080-DD-46-A1 or equal

SOURCE: (TPD-1)

## Interconnection Data

Wire Type & No.: Two Single Conductors (X, Y)

Wire Size: No. 22 AWG

Note: "Z" grounded through 25 Vac common.

A/C: F-111A/E  
 REF: MIL-I-27848  
 12RS-4-65-3  
 1F-111A-2-18-1  
 1F-111E-2-18-1

| REV   | DATE | BY    | CHKD | APP'D | DESCRIPTION       |
|-------|------|-------|------|-------|-------------------|
| A     |      |       |      |       | ICD-GPS-014 & 017 |
| SCALE | REV  | SHEET | 10-6 |       |                   |



# ELECTRICAL CHARACTERISTICS

| LOAD 1                                                                          |           |         | LOAD 2                                                                                   |           |         |
|---------------------------------------------------------------------------------|-----------|---------|------------------------------------------------------------------------------------------|-----------|---------|
| HSI, AQU-4/A, Distance Display, 3-Wire Synchro, Clifton Type CRC-8-A-1 or equal |           |         | BDHI, E5165001400, Distance Display, 3-Wire Synchro, Bendix Type AY080-DD-46-A1 or equal |           |         |
| Primary Winding                                                                 | Rotor     |         | Primary Winding                                                                          | Rotor     |         |
| Primary Voltage (400 Hz)                                                        | 26        | Volts   | Primary Voltage (400 Hz)                                                                 | 26        | Volts   |
| Secondary Voltage                                                               | 11.8      | Volts   | Secondary Voltage                                                                        | 11.8      | Volts   |
| Input Current                                                                   | 100       | ma      | Input Current                                                                            | 187       | ma      |
| Input Power                                                                     | .54       | Watts   | Input Power                                                                              | 1.1       | Watts   |
| Accuracy                                                                        | 30        | Feet    | Max. Error Spread                                                                        | +1.25     | Degrees |
| Impedance, Zro                                                                  | 54 + j260 |         | Impedance, Zro                                                                           | 32 + j150 |         |
| Impedance, Zso                                                                  | 12 + j45  |         | Impedance, Zso                                                                           | 6.8 + j26 |         |
|                                                                                 |           |         | Impedance, Zrs                                                                           | 57 + j14  |         |
| Rotor DC Resistance                                                             | 37        | Ohms    | Rotor DC Resistance                                                                      | 24        | Ohms    |
| Stator DC Resistance                                                            | 12        | Ohms    | Stator DC Resistance                                                                     | 7.3       | Ohms    |
| Phase Shift                                                                     | 8.5       | Degrees |                                                                                          |           |         |

|                   |      |      |      |      |      |      |
|-------------------|------|------|------|------|------|------|
| REV               | DATE | BY   | CHKD | DATE | BY   | CHKD |
| A                 |      |      |      |      |      |      |
| ICD-GPS-014 & 017 |      |      |      |      |      |      |
| SCALE             | REV  | DATE | BY   | CHKD | DATE | BY   |
|                   |      |      |      |      | 10-7 |      |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME        | TYPE    | I/O | FROM | TO         |
|--------------------|---------|-----|------|------------|
| Distance, hundreds | Synchro | O   | UE   | HSI & BDHI |

## Functional Description

Provides angular information to rotate the hundreds digit in the range window. Displays aircraft present position distance to the selected waypoint in 100 nm increments. Driven independently of the other distance digits, but read in conjunction with them in order to provide the most significant digit for the distance value.

## Signal Characteristics

RANGE: 0 to 9 (0° to 360°)  
 ACCURACY:  $\pm 0.1$  ( $\pm 3.6^\circ$ )  
 INDEX REFERENCE: 0  
 POSITIVE DIRECTION SENSE: To decreasing values (distance to go)  
 SCALE FACTOR:  $36^\circ = 1$  numeral  
 RESOLUTION:  $\pm 3^\circ$

## Electrical Characteristics (continued on next page)

LOAD: 1) HSI, AQU-4/A, Distance Display, 3-Wire Synchro, Clifton Type CRC-8-A-1 or equal  
 2) BDHI, E5165001400, Distance Display, 3-Wire Synchro, Bondix Type AY 080-DD-46-A1 or equal

SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Two Single Conductors (X, Y)  
 Wire Size: No. 22 AWG

Note: "Z" grounded through AC common.

A/C: F-111A/E  
 REF: MIL-I-27848  
 12R5-4-65-3  
 1F-111A-2-18-1  
 1E-111E-2-18-1

| DATE  | CODE | REV  | DESCRIPTION       |
|-------|------|------|-------------------|
| A     |      |      | 100-GPS-014 & 017 |
| REACT | REV  | DATE | 10-8              |

# ELECTRICAL CHARACTERISTICS

| LOAD 1                                                                          |           |         | LOAD 2                                                                                   |           |         |
|---------------------------------------------------------------------------------|-----------|---------|------------------------------------------------------------------------------------------|-----------|---------|
| HSI, AQU-4/A, Distance Display, 3-Wire Synchro, Clifton Type CRC-8-A-1 or equal |           |         | BDHI, E5165001400, Distance Display, 3-Wire Synchro, Bendix Type AY080-DD-46-A1 or equal |           |         |
| Primary Winding                                                                 | Rotor     |         | Primary Winding                                                                          | Rotor     |         |
| Primary Voltage (400 Hz)                                                        | 26        | Volts   | Primary Voltage (400 Hz)                                                                 | 26        | Volts   |
| Secondary Voltage                                                               | 11.8      | Volts   | Secondary Voltage                                                                        | 11.8      | Volts   |
| Input Current                                                                   | 100       | ma      | Input Current                                                                            | 187       | ma      |
| Input Power                                                                     | .54       | Watts   | Input Power                                                                              | 1.1       | Watts   |
| Accuracy                                                                        | 30        | Feet    | Max. Error Spread                                                                        | +1.25     | Degrees |
| Impedance, Zro                                                                  | 54 + j260 |         | Impedance, Zro                                                                           | 32 + j150 |         |
| Impedance, Zso                                                                  | 12 + j45  |         | Impedance, Zso                                                                           | 6.8 + j26 |         |
|                                                                                 |           |         | Impedance, Zrs                                                                           | 57 + j14  |         |
| Rotor DC Resistance                                                             | 37        | Ohms    | Rotor DC Resistance                                                                      | 24        | Ohms    |
| Stator DC Resistance                                                            | 12        | Ohms    | Stator DC Resistance                                                                     | 7.3       | Ohms    |
| Phase Shift                                                                     | 8.5       | Degrees |                                                                                          |           |         |

|          |                 |                   |
|----------|-----------------|-------------------|
| DATE     | LOAD 1 UNIT NO. | REVISION NO.      |
| A        |                 | ICD-GPS-014 & 017 |
| REVISION | REV             | SHEET 10-9        |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME   | TYPE     | I/O | FROM | TO         |
|---------------|----------|-----|------|------------|
| Distance Flag | Discrete | 0   | UE   | HSI & BDHI |

## Functional Description

Provides a discrete signal to operate the distance warning flag. The flag is normally out of view when the range indicator is operating and the range data is valid. The flag covers the range indicator when the distance information is not valid or the device supplying the distance data is not operating.

## Signal Characteristics

RANGE: 28 Vdc applied, Flag out of view  
28 Vdc not applied, Flag in view

## Electrical Characteristics

LOAD: 1) HSI (AQU-4/A), distance shutter mechanism, 28 Vdc meter movement  
2) BDHI (E5165001400), distance shutter mechanism, 28 Vdc meter movement, 625 Ohms  $\pm$  10%

SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Pair  
Wire Size: No. 22 AWG

A/C: F-111A/E  
REF: MIL-I-27848  
12R5-4-65-3  
1F-111A-2-18-1  
1F-111E-2-18-1

| DATE  | CODE REVISION | DRAWING NO.       |
|-------|---------------|-------------------|
| A     |               | ICD-GPS-014 & 017 |
| SCALE | REV           | SHEET             |
|       |               | 10-10             |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME     | TYPE     | I/O | FROM | TO  |
|-----------------|----------|-----|------|-----|
| Thousand, Digit | Discrete | O   | UE   | HSI |

## Functional Description

Provides a discrete output signal to operate the thousand digit of the HSI when the distance to a selected waypoint is greater than 999 nautical miles.

## Signal Characteristics

Thousand Digit In View: 28 Vdc applied  
Thousand Digit Out of View: 28 Vdc not applied

## Electrical Characteristics

LOAD: HSI (AQU-4/A), thousand digit shutter  
Input Voltage: 28 Vdc  
Input Current: 150 ma

SOURCE: (TBD-1)

## Interconnection Data

(TBD-3)

A/C: F-111A/E  
REF: MIL-I-27848  
T.O. 5FB-16-4-3

| DATE | CODE | REVISION | ISSUING OFFICE    |
|------|------|----------|-------------------|
| A    |      |          | IC1-GPS-014 & 017 |
| NAME | REV  | SHEET    |                   |
|      |      | 10-11    |                   |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE   | I/O | FROM | TO  |
|-------------|--------|-----|------|-----|
| To-From     | Analog | 0   | UE   | HSI |

## Functional Description

Provides a d.c. analog signal to drive the To-From indicator. If the aircraft is flying toward the waypoint and has not intercepted a reference line perpendicular to the aircraft ground track and through the waypoint, the indication will be To. Once past the waypoint reference line, the indication will be From as long as this waypoint is still selected.

## Signal Characteristics

RANGE: To = +225  $\mu$ a Max  
Blank = no signal  
From = -225  $\mu$ a Max

## Electrical Characteristics

LOAD: HSI (AQU-4/A), To-From Arrow, meter movement 200 Ohms  $\pm$  15 resistance

SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Pair  
Wire Size: No. 22 AWG

A/C: F-111A/E  
REF: MIL-I-27848  
1F-111A-2-18-1  
1F-111E-2-18-1

| DATE | CODE | REVISION | DESCRIPTION        |
|------|------|----------|--------------------|
| A    |      |          | 1011-015-014 & 017 |
| DATE | REV  | SHEET    | 10-12              |

# INTERFACE SIGNAL CHARACTERISTIC

| SIGNAL NAME          | TYPE   | I/O | FROM | TO                       |
|----------------------|--------|-----|------|--------------------------|
| Horizontal Deviation | Analog | O   | UE   | Flight Director Computer |

## Functional Description

Provides a variable d.c. signal that indicates the displacement of the aircraft to the left or right of a selected course. The displacement represented by the indicating device will be controlled by UE software and will be dependent upon aircraft flight phase. Deflection of the indicating device may represent angular displacement (e.g., 10° for a TACAN approach; 2.5° for ILS) or distance. For an area navigation system, the Area Navigation Subcommittee of the Air Transport Association's Air Traffic Control Committee has recommended the following ranges for the flight modes indicated: (a) Enroute: 2-6 miles full scale, (b) Terminal: 1-2 miles full scale and (c) Approach: 600-3000 feet full scale. Choice of presentation (distance/degrees) and scales are (TBD-1).

## Signal Characteristics

RANGE: 0 to +150  $\mu$ a  
 RESOLUTION: 3  $\mu$ a  
 ACCURACY: +10  $\mu$ a  
 INDEX REFERENCE: Selected course  
 POSITIVE DIRECTION SENSE: Fly right (+)  
 SCALE FACTOR: 75  $\mu$ a/dot on the indicator.  
 Distance/angular displacement scale factor (TBD-1)

## Electrical Characteristics

LOAD: Flight Director Computer, CPU-76/A, 1000 Ohms  $\pm$  3%  
 SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Pair  
 Wire Size: No. 22 AWG

A/C: F-111A/E  
 REF: MIL-I-27848 ARINC Characteristic 582-5  
 MIL-C-83013  
 IF-111A-2-18-1  
 IE-111E-2-18-1

| DATE | CODE | ISSUED BY | REVISION          |
|------|------|-----------|-------------------|
| A    |      |           | ICD-GPS-014 & 017 |
| ICD  | REV  | DATE      | 10-13             |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME               | TYPE     | I/O | FROM | TO                       |
|---------------------------|----------|-----|------|--------------------------|
| Horizontal Deviation Flag | Discrete | 0   | UE   | Flight Director Computer |

## Functional Description

Provides a discrete signal to operate the deviation warning flag or circuit when the deviation data is unreliable or a malfunction has occurred in the course deviation circuitry.

## Signal Characteristics

RANGE: Deviation signal valid: 245-500 mv.  
Deviation signal invalid: <180 mv

## Electrical Characteristics

LOAD: Flight Director Computer, CPU-76/A, 1000 Ohms,  $\pm$  3% resistance

SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Pair  
Wire Size: No. 22 AWG

A/C: F-111A/E  
REF: MIL-I-27848  
MIL-C-83013  
1F-111A-2-18-1  
1F-111E-2-18-1

|       |        |         |                   |
|-------|--------|---------|-------------------|
| DATE  | ISSUED | REVISED | REVISIONS         |
| A     |        |         | ICD-GPS-014 & 017 |
| SCALE | REV    | SHEET   | 10-14             |



# INTERFACE SIGNAL CHARACTERISTIC

| SIGNAL NAME        | TYPE   | I/O | FROM | TO                       |
|--------------------|--------|-----|------|--------------------------|
| Vertical Deviation | Analog | O   | UE   | Flight Director Computer |

## Functional Description

Provides a variable d.c. signal that indicates the displacement of the aircraft above or below a desired flight path. The displacement represented by the indicating device will be controlled by UE software and will be dependent upon aircraft flight phase. Deflection of the indicating device may represent angular displacement (e.g., 0.5° for ILS) or distance. For an area navigation system, the Area Navigation Subcommittee of the Air Transport Association's Air Traffic Control Committee has recommended the following ranges for the flight modes indicated: (a) Enroute: 200 to 2000 feet full scale, (b) Terminal: 60-200 feet full scale and (c) Approach: 40-100 feet full scale. Choice of presentation (distance/degrees) and scales are (TBD-1).

## Signal Characteristics

RANGE: 0 to + 150  $\mu$ a  
 RESOLUTION: 3  $\mu$ a  
 ACCURACY: +10  $\mu$ a  
 INDEX REFERENCE: Desired flight path  
 POSITIVE DIRECTION SENSE: Fly Down (+)  
 SCALE FACTOR: 75  $\mu$ a/dot on the indicator.  
 Distance/angular displacement scale factor (TBD-1)

## Electrical Characteristics

LOAD: Flight Director Computer, CPU-76/A, 1000 Ohms  $\pm$  3%  
 SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Pair  
 Wire Size: No. 22 AWG

A/C: F-111A/E  
 REF: MIL-C-83013  
 1F-111A-2-17-1  
 1F-111E-2-17-1  
 ARINC Characteristic 582-5

|      |      |      |     |                   |     |
|------|------|------|-----|-------------------|-----|
| APP  | CODE | DATE | REV | ISSUED            | NO  |
| A    |      |      |     | ICD-GPS-014 & 017 |     |
| DATE | REV  | DATE | REV | DATE              | REV |
|      |      |      |     | 10-15             |     |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME             | TYPE     | I/O | FROM | TO                       |
|-------------------------|----------|-----|------|--------------------------|
| Vertical Deviation Flag | Discrete | O   | UE   | Flight Director Computer |

## Functional Description

Provides a discrete signal to the Flight Director Computer when the UE vertical deviation signal is unreliable. This signal is similar to glideslope flag signal.

## Signal Characteristics

RANGE: Deviation signal valid: 245-500 m.v.  
Deviation signal invalid:  $\pm 180$  mv.

## Electrical Characteristics

LOAD: Flight Director Computer, CPU-76/A, 1000 Ohms  $\pm 3\%$   
SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Pair  
Wire Size: No. 22 AWG

A/C: F-111A/E  
REF: MIL-C-83013  
1F-111A-2-17-1  
1F-111E-2-17-1

| REV | DATE | BY | CHKD | APP'D | DESCRIPTION       |
|-----|------|----|------|-------|-------------------|
| A   |      |    |      |       | ICM-GPS-014 & 017 |
| REV |      |    |      |       | DATE 10-16        |

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# INTERFAC SIGNAL CHARACTERISTICS

| SIGNAL NAME         | TYPE    | I/O | FROM | TO   |
|---------------------|---------|-----|------|------|
| Digital Output Data | Digital | O   | UE   | IBNS |

## Functional Description

Provides position, velocity and time and other parameters (TBD-3) to the IBNS to update the Inertial Navigation Set and to aid in navigation and bombing solutions. (See Appendix II.)

## Signal Characteristics

Word/Frame Structure: (TBD-3)  
 Information Identifier: (TBD-3)  
 Data Standard: (TBD-3)  
 Timing Tolerances: (TBD-3)

## Electrical Characteristics

(TBD-3)

## Interconnection Data

(TBD-3)

A/C: F-111A/E  
 RLF:

|     |                   |              |
|-----|-------------------|--------------|
| A   | 1000 0001 000     | 00000000 000 |
|     | ICD-GPS-014 & 017 |              |
| REV | REV               | REV 11 10-17 |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME      | TYPE    | I/O | FROM                              | TO |
|------------------|---------|-----|-----------------------------------|----|
| Magnetic Heading | Synchro | I   | AFRS-Electronic Control Amplifier | UE |

## Functional Description

Provides angular reference signal of aircraft heading relative to magnetic north.

## Signal Characteristics

RANGE: 0° to 360°  
 ACCURACY: ±0.5°  
 INDEX REFERENCE: Magnetic North  
 POSITIVE DIRECTION SENSE: Nose Right  
 SCALE FACTOR: 1° = 1°  
 RESOLUTION: (TBD-3)

## Electrical Characteristics (continued on next page)

SOURCE: Auxiliary Flight Reference System, Electronic Control Amplifier (ASK 25A/A24G-26), 3-Wire Synchro, Clifton CGH-8-A-7 or equal

LOAD: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Triad  
 Wire Size: No. 22 AWG

A/C: F-111A/E  
 REF: MIL-C-38418  
 T.O. 1F-111A-2-12-1  
 T.O. 5F4-21-3  
 T.O. 5F4-21-4  
 T.O. 1F-111E-2-12-1

| DATE  | LOAN COPY NO. | DRAWING NO.       |
|-------|---------------|-------------------|
| A     |               | ICD-GPS-014 & 017 |
| SCALE | REV           | INSET             |
|       |               | 10-18             |

# ELECTRICAL CHARACTERISTICS

| SOURCE 1                                |                    |
|-----------------------------------------|--------------------|
| Synchro, Clifton Type CGH-6--7 or equal |                    |
| Input Voltage                           | 115V 400Hz         |
| Input Current                           | 29 ma              |
| Input Power                             | 0.8 w              |
| Output Voltage (Max)                    | 11.8V              |
| Sensitivity                             | 206 mv/deg         |
| Phase Shift                             | 11 deg             |
| DC Rotor Resistance                     | 700 Ohms           |
| DC Stator Resistance                    | 10.4 Ohms          |
| Impedance, Zro                          | 950 + j3, 350 Ohms |
| Impedance, Zso                          | 10 + j36 Ohms      |
| Impedance, Zrss                         | 1550 + j420 Ohms   |
| Max Null Voltage                        | 75 mv              |
| Accuracy (Max Error Spread)             | 14 minutes         |

|      |                   |
|------|-------------------|
| DATE | 100-GPS-014 G 017 |
| REV  | 10-19             |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME   | TYPE    | I/O | FROM                      | TO |
|---------------|---------|-----|---------------------------|----|
| True Airspeed | Synchro | I   | Central Air Data Computer | UE |

## Functional Description

Provides an input of true airspeed in synchro format.

## Signal Characteristics

RANGE:  
 ACCURACY:  
 INDEX REFERENCE: (TBD-2)  
 POSITIVE DIRECTION SENSE:  
 SCALE FACTOR:  
 RESOLUTION:

## Electrical Characteristics (continued on next page)

SOURCE: Central Air Data Computer, 1903633-4, 3-wire Synchro, Bendix type AY 200S 16A7 or equal

LOAD: (TBD-1)

## Interconnection Data

Wire type & No.: 2 Shielded Conductors (X, Y)  
 Wire Size: No. 22 AWG

Note: "Z" ties to shield ground

A/C: F-111A/E  
 REF: T.O. SF5-4-17-3  
 T.O. 1F-111A-2-16-1  
 T.O. 1F-111E-2-16-1

|       |                     |                   |
|-------|---------------------|-------------------|
| DATE  | LOGS - REVISION NO. | REVISION NO.      |
| A     |                     | ICD-GPS-014 & 017 |
| SCALE | REV                 | SHEET 10-20       |

# ELECTRICAL CHARACTERISTICS

| SOURCE 1                                                                                                                                                                                                                                                                                                                                                            |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Synchro, Bendix Type AY 300S 16A7 or equal                                                                                                                                                                                                                                                                                                                          |  |
| Primary Winding Rotor<br>Input Voltage 26 Vac, 400 Hz<br>Input Current 91 ma<br>Input Power 0.6 watts<br>Output Voltage (Max) 11.8V<br>Phase Shift 9.5° lead<br>DC Rotor Resistance 50 ohms<br>AC Stator Resistance 16 ohms<br>Impedance, Zro 70 + j305 ohms<br>Impedance, Zso 16.5 + j50 ohms<br>Max Null Voltage 30 mv<br>Accuracy (Max error spread) ±10 minutes |  |

|      |       |      |                   |
|------|-------|------|-------------------|
| DATE | ISSUE | REV  | DATE              |
| A    |       |      | ICD-GPS-014 & 017 |
| DATE | REV   | DATE | 10-21             |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME         | TYPE    | I/O | FROM                      | TO |
|---------------------|---------|-----|---------------------------|----|
| Barometric Altitude | Synchro | I   | Central Air Data Computer | UE |

## Functional Description

Provides an input of barometric altitude in synchro format.

## Signal Characteristics

RANGE:  
 ACCURACY:  
 INDEX REFERENCE: (TBD-2)  
 POSITIVE DIRECTION SENSE:  
 SCALE FACTOR:

## Electrical Characteristics (continued on next page)

SOURCE: Central Air Data Computer, 1903633-4, 3-wire synchro  
 Bendix type AY 300C 43A1 or equal  
 LOAD: (TBDG)

## Interconnection Data

Wire Type & No.: Shielded Pair and One Shielded Conductor  
 Wire Size: No. 22 AWG

A/C: F-111A/E  
 REF: T.O. 5F5-4-17-3  
 T.O. 1F-111A-2-16-1  
 T.O. 1F-111E-2-16-1

|     |      |    |                   |
|-----|------|----|-------------------|
| REV | DATE | BY | DESCRIPTION       |
| A   |      |    | ICD-GPS-014 & C17 |
| REV | DATE | BY | DESCRIPTION       |
|     |      |    | 10-22             |



# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME     | TYPE  | I/O | FROM                 | TO |
|-----------------|-------|-----|----------------------|----|
| Blanking Pulses | Pulse | I   | Interference Blanker | UE |

## Functional Description

The interference blanker provides blanking pulses to prevent interference between systems operating in the same frequency spectrum.

## Signal Characteristics (see pages 10-24 and 10-25)

## Electrical Characteristics

SOURCE: Interference Blanker, MX-8103/A

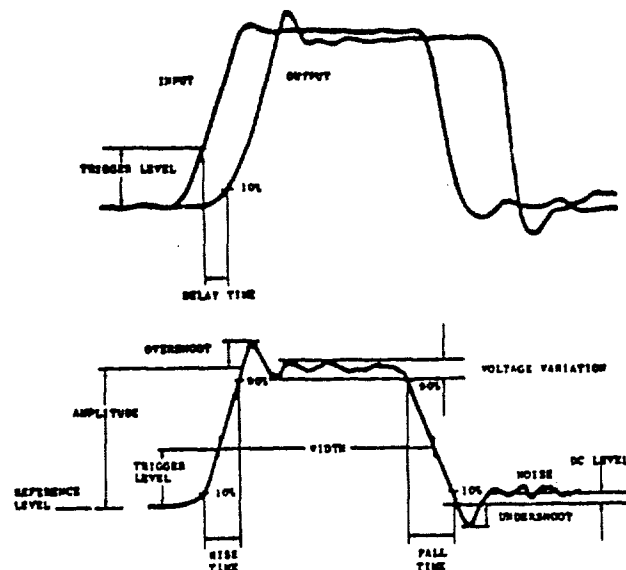
LOAD: (TBD-1)

## Interconnection Data

Wire Type & No.: Coaxial Cable, RG-58 C/U

A/C: F-111A/E  
REF: T.O. 12P3-4-22-12  
T.O. 1F-111A-2-22  
T.O. 1F-111E-2-22

|      |             |                   |
|------|-------------|-------------------|
| DATE | CODE & DATE | REVISION NO.      |
| A    |             | ICD-GPS-014 & 017 |
| DATE | REV         | SHEET 10-23       |



- AMPLITUDE - AVERAGE DC-LEVEL OF THE PULSE TOP. OVERSHOOT EXCLUDED.
- RISE TIME - TIME INTERVAL BETWEEN THE 10% AMPLITUDE LEVEL AND THE 90% AMPLITUDE LEVEL ON THE LEADING EDGE OF THE PULSE.
- FALL TIME - TIME INTERVAL BETWEEN THE 90% AMPLITUDE LEVEL AND THE 10% AMPLITUDE LEVEL ON THE TRAILING EDGE OF THE PULSE.
- WIDTH - TIME INTERVAL BETWEEN THE POINT WHERE THE PULSE CROSSES THE NOMINAL TRIGGER LEVEL ON THE LEADING EDGE OF THE PULSE AND THE POINT WHERE THE PULSE CROSSES THE NOMINAL TRIGGER LEVEL ON THE TRAILING EDGE OF THE PULSE.
- VOLTAGE - VARIATION - PEAK VALUES OF THE CHANGE IN VOLTAGE, GREATER OR LESS THAN THE AMPLITUDE LEVEL, THAT OCCURS ON THE DC COMPONENT PULSE.
- OVERSHOOT - MAXIMUM POSITIVE VOLTAGE ATTAINED BY THE LEADING EDGE OF THE PULSE ABOVE THE AMPLITUDE LEVEL.
- UNDERSHOOT - MAXIMUM NEGATIVE VOLTAGE ATTAINED BY THE TRAILING EDGE OF THE PULSE AS MEASURED FROM THE ZERO LINE.
- NOISE - ALL DEVIATIONS IN VOLTAGE FROM THE DIRECT RESIDUAL LEVEL THAT OCCURS BETWEEN THE 10% LEVEL ON THE TRAILING EDGE OF ONE PULSE AND THE 10% LEVEL ON THE LEADING EDGE OF THE FOLLOWING PULSE. WITH THE EXCEPTION OF THE OVERSHOOT AND THE LEADING AND TRAILING EDGES, SHALL BE CONSIDERED NOISE. FOR NOISE MEASUREMENTS THE LOW VOLTAGE INPUT PULSE RISE TIME SHALL NOT BE LESS THAN 10 NANOSECONDS AND THE FALL TIME SHALL NOT BE LESS THAN 10 NANOSECONDS.
- TRIGGER - LEVEL - THAT INPUT VOLTAGE BELOW WHICH THE OUTPUT OF A CHANNEL IS 0 AND ABOVE WHICH THE OUTPUT OF THE CHANNEL IS THE SPECIFIED VOLTAGE.
- DELAY - TIME - TIME INTERVAL BETWEEN THE NOMINAL TRIGGER LEVEL ON THE INPUT PULSE TO THE 10% LEVEL ON THE RESULTING OUTPUT PULSE LEADING EDGE.

Blanking Pulse Characteristics  
(continued)

| DATE  | CON. NO. BY | FOR APPROVAL BY   |
|-------|-------------|-------------------|
| A     |             | ICD-GPS-014 & 017 |
| SCALE | REV         | SHEET             |
|       |             | 10-24             |

| CHARACTERISTIC                       | HIGH VOLTAGE<br>INPUT CHANNEL                     | LOW VOLTAGE<br>INPUT CHANNEL                      | HIGH VOLTAGE<br>OPTIMIZED CHANNEL | LOW VOLTAGE<br>OPTIMIZED CHANNEL |
|--------------------------------------|---------------------------------------------------|---------------------------------------------------|-----------------------------------|----------------------------------|
| RISE TIME                            | 20 OHM PARASITICS                                 | 2 OHM PARASITICS                                  | 125 PS                            | 125 PS                           |
| FALL TIME                            | 40 OHM PARASITICS                                 | 3 OHM PARASITICS                                  | 125 PS                            | 125 PS                           |
| RISE                                 | 500 PARASITICS                                    | 100 PARASITICS                                    |                                   |                                  |
| FALL                                 | DC COUPLED CIRCUITS LIMITED<br>ONLY BY DUTY CYCLE | DC COUPLED CIRCUITS LIMITED<br>ONLY BY DUTY CYCLE |                                   |                                  |
| SWITCH VARIATION FROM<br>INPUT PULSE |                                                   |                                                   |                                   |                                  |
| AMPLITUDE                            |                                                   |                                                   |                                   |                                  |
| MINIMUM                              | 15 VOLTS                                          | 5 VOLTS                                           | 20 VOLTS                          | 20 VOLTS                         |
| NOMINAL                              | 25 VOLTS                                          | 7 VOLTS                                           | 25 VOLTS                          | 25 VOLTS                         |
| MAXIMUM                              | 10 VOLTS                                          | 9 VOLTS                                           | 30 VOLTS                          | 30 VOLTS                         |
| VOLTAGE VARIATION ABOUT<br>PULSE     |                                                   |                                                   |                                   |                                  |
| SEPARATION RATE                      |                                                   |                                                   |                                   |                                  |
| MINIMUM                              | DC (WITHIN DUTY CYCLE LIMIT)                      | DC (WITHIN DUTY CYCLE LIMIT)                      | DC (WITHIN DUTY CYCLE LIMIT)      | DC (WITHIN DUTY CYCLE LIMIT)     |
| MAXIMUM                              | 3 HERTZ                                           | 10 HERTZ                                          | 1 HERTZ                           | 1 HERTZ                          |
| DUTY CYCLE (ON/OFF TIME)             | 200 ON 10 OFF VOLTS<br>255 ON 10 OFF VOLTS        | 150 ON 10 OFF VOLTS<br>215 ON 10 OFF VOLTS        | SAME AS INPUT                     | SAME AS INPUT                    |
| SWITCHING                            | 0 TO 1 VOLTS                                      | 0 TO 1 VOLTS                                      | 0 TO 1 VOLTS                      | 0 TO 1 VOLTS                     |
| ON/OFF                               | 0 TO 1 VOLTS                                      | 0 TO 1 VOLTS                                      | 0 TO 1 VOLTS                      | 0 TO 1 VOLTS                     |
| DC LEVEL BETWEEN PULSES              | 0 TO 1.5 VOLTS                                    | 0 TO 1.5 VOLTS                                    | 0 TO 1.5 VOLTS                    | 0 TO 1.5 VOLTS                   |
| NOISE                                |                                                   |                                                   |                                   |                                  |
| DELAY TIME                           |                                                   |                                                   |                                   |                                  |
| HIGH VOLT INPUT                      |                                                   |                                                   |                                   |                                  |
| LOW VOLT INPUT                       |                                                   |                                                   |                                   |                                  |
| LOAD IMPEDANCE                       |                                                   |                                                   |                                   |                                  |
| RESISTANCE                           | 200 (120) OHMS                                    | 93 (120) OHMS                                     | 200 TO 250 OHMS                   | 93 TO 100 OHMS                   |
| CAPACITANCE                          |                                                   |                                                   |                                   |                                  |
| TRIGGER LEVEL                        | 10 (15) VOLTS                                     | 3 (11) VOLTS                                      |                                   |                                  |

Blanking Pulse Characteristics  
(continued)

|     |     |       |                   |
|-----|-----|-------|-------------------|
| REV | CON | DATE  | DESCRIPTION       |
| A   |     |       | ICD-GPS-014 0 017 |
| REV | REV | DATE  | DESCRIPTION       |
|     |     | 10-25 |                   |

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# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM | TO |
|-------------|---------|-----|------|----|
| Pitch       | Synchro | I   | AFRS | UE |

## Functional Description

Provides an input signal proportional to fuselage pitch attitude with respect to the earth's horizon. Signal amplitude is proportioned to amount of fuselage displacement from level flight and phase indicates direction of displacement

## Signal Characteristics

RANGE: 0° to +90°  
 ACCURACY: +0.5°  
 INDEX REFERENCE: 0° Pitch  
 POSITIVE DIRECTION SENSE: Nose Up  
 SCALE FACTOR: 1° = 1°  
 RESOLUTION: (TBD-3)

## Electrical Characteristics (continued on next page)

SOURCE: AFRS, 3-Wire Synchro, Clifton Type CGH-8-A-7 or equal  
 Electronic Control Amplifier (ASK-25A/A24G-26)  
 LOAD: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Triad  
 Wire Size: No. 22 AWG

A/C: F-111A/E  
 REF: T.O. 1F-111A-2-12-1, T.O. 5F4-2-21-3,  
 T.O. 5F4-2-21-4, MIL-C-38418  
 T.O. 1F-111E-2-12-1

| DATE | ISSUE | REVISION          |
|------|-------|-------------------|
| A    |       | 1CD-GPS-014 A J17 |
| NAME | REV   | DATE              |
|      |       | 10-26             |

# ELECTRICAL CHARACTERISTICS

| SOURCE 1                                 |                    |
|------------------------------------------|--------------------|
| Synchro, Clifton Type CGH-8-A-7 or equal |                    |
| Input Voltage                            | 115V 400 Hz        |
| Input Current                            | 29 ma              |
| Input Power                              | 0.8w               |
| Output Voltage (Max)                     | 11.8V              |
| Sensitivity                              | 206 mv/deg         |
| Phase Shift                              | 11°                |
| DC Rotor Resistance                      | 700 Ohms           |
| DC Stator Resistance                     | 10.4 Ohms          |
| Impedance Zro                            | 950 + j3, 850 Ohms |
| Impedance Zso                            | 10 + j36 Ohms      |
| Impedance Zrss                           | 1550 + j420 Ohms   |
| Max Null Voltage                         | 75 mv              |
| Accuracy (max error spread)              | 14 minutes         |

|       |                   |
|-------|-------------------|
| A     | ICD-GPS-014 & 017 |
| 10-27 |                   |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM | TO |
|-------------|---------|-----|------|----|
| Roll        | Synchro | I   | AFRS | UE |

## Functional Description

Provides an input signal proportioned to fuselage roll attitude with reference to the earth's horizon. Signal amplitude is proportioned to amount of fuselage displacement from level flight and phase indicates direction of displacement

## Signal Characteristics

RANGE: 0° to +90°  
 ACCURACY: +0.5°  
 INDEX REFERENCE: Zero Roll  
 POSITIVE DIRECTION SENSE: Right Wing Down  
 SCALE FACTOR: 1° = 1°  
 RESOLUTION: (TBD-3)

## Electrical Characteristics (continued on next page)

SOURCE: Auxiliary Flight Reference System, Electronic Control Amplifier (ASK-25A/A24G-26), 3-Wire Synchro, Clifton CGH-8-A-7 or equal

LOAD: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Triad  
 Wire Size: No. 22 AWG

A/C: F-111A/E  
 REF: T.O. 1F-111A-2-12-1, T.O. 5F4-21-3,  
 T.O. 5F4-21-4, MIL-C-38413  
 T.O. 1F-111E-2-12-1

|          |                   |
|----------|-------------------|
| <b>A</b> | ICD-GPS-014 & 017 |
| REV      | 10-28             |

# ELECTRICAL CHARACTERISTICS

| SOURCE 1                                    |                   |
|---------------------------------------------|-------------------|
| Synchro, Clifton Type CGH-8-A-7<br>or equal |                   |
| Input Voltage                               | 115V 400 Hz       |
| Input Current                               | 29 ma             |
| Input Power                                 | 0.8w              |
| Output Voltage (max)                        | 11.8V             |
| Sensitivity                                 | 206 mv/deg        |
| Phase Shift                                 | 11°               |
| DC Rotor Resistance                         | 700 Ohms          |
| DC Stator Resistance                        | 10.4 Ohms         |
| Impedance Zro                               | 950 + j3,850 Ohms |
| Impedance Zso                               | 10 + j36 Ohms     |
| Impedance Zrss                              | 1550 + j420 Ohms  |
| Max Null Voltage                            | 75 m              |
| Accuracy (max error<br>spread)              | 14 minutes        |

|      |      |          |                   |
|------|------|----------|-------------------|
| DATE | CODE | APPROVAL | REVISION          |
| A    |      |          | 100-GPS-014 & 017 |
| NAME | REV  | DATE     | 10-29             |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME        | TYPE    | I/O | FROM | TO |
|--------------------|---------|-----|------|----|
| Digital Input Data | Digital | I   | IBNS | UE |

## Functional Description

Provides the UE with position, velocities, covariances and other parameters (TBD-3). (See Appendix II.)

## Signal Characteristics

Word/Frame Structure: (TBD-3)  
 Information Identifier: (TBD-3)  
 Data Standard: (TBD-3)  
 Timing Tolerance: (TBD-3)

## Electrical Characteristics

(TBD-3)

## Interconnection Data

(TBD-3)

A/C: F-111A/E  
 REF:

|      |          |     |      |          |                   |
|------|----------|-----|------|----------|-------------------|
| DATE | 10-01-80 | BY  | SP-1 | CDR/USMC | 10-01-80          |
| A    |          |     |      |          | ICD-GPS-014 A 017 |
| NAME |          | REV |      | DATE     | 10-30             |



# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM | TO |
|-------------|---------|-----|------|----|
| Course Set  | Synchro | I   | HSI  | UE |

## Functional Description

Provides an electrical reference signal of the course manually selected by the Course Set control on the HSI. This signal will be used by the UE as a reference for positioning the course deviation and To-From indicators on the HSI.

## Signal Characteristics

RANGE:  $0^{\circ}$  to  $360^{\circ}$   
 ACCURACY:  $\pm 0.5^{\circ}$   
 RESOLUTION:  $1.0^{\circ}$   
 INDEX REFERENCE: Magnetic North  
 POSITIVE DIRECTION SENSE: Right Hand Increments  
 SCALE FACTOR:  $1^{\circ} = 1^{\circ}$

## Electrical Characteristics (Continued on next page)

SOURCE: HSI (AQU-4/A), Course Resolver, Kearfott Type  
 CP409310:3 or equal  
 LOAD: (100-1)

## Interconnection Data

Wire Type & No.: Seven single conductors (twisted)  
 Wire Size: No. 24 AWG

A/C: F-111A/E  
 REF: 1F-111A-2-18-1  
 MIL-I-27648  
 5F8-16-4-3  
 5F8-16-4-4

| TYPE | CODE | REV  | DATE  |
|------|------|------|-------|
| A    |      |      |       |
| NAME | REV  | DATE | 10-31 |

ICD-GPS-014 & 017

# ELECTRICAL CHARACTERISTICS

| SOURCE                                                              |                   |  |
|---------------------------------------------------------------------|-------------------|--|
| HSI, AQU-4/A, Course Resolver,<br>Kearfott Type CR40931018 or equal |                   |  |
| Primary Winding                                                     | Rotor             |  |
| Input Voltage                                                       | 26 Vac            |  |
| Frequency                                                           | 400 Hz            |  |
| Input Current                                                       | 20 ma             |  |
| Input Power                                                         | 150 mw            |  |
| Input Impedance                                                     | 1680 / 73.5° ohms |  |
| Output Impedance                                                    | 1400 / 77.5° ohms |  |
| DC Resistance (rotor)                                               | 190 ohms          |  |
| DC Resistance (stator)                                              | 170 ohms          |  |
| Output Voltage                                                      | 22 Vac            |  |
| Sensitivity                                                         | 384 mv/deg        |  |
| Maximum null Voltage                                                | 46 mv             |  |
| Maximum error from<br>electrical zero                               | 10 minutes        |  |
| Transformation ratio                                                | .846              |  |

|     |      |                   |
|-----|------|-------------------|
| REV | DATE | DESCRIPTION       |
| A   |      | ICD-GPS-014 : 017 |
| REV | DATE | DESCRIPTION       |
|     |      | 0-32              |

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## 9. FUTURE MODIFICATIONS

Table 9-1 lists the avionics suite expected to be installed in each of the F-111 family aircraft by 1985. This chart is useful for comparing the members of the F-111 family. Figures 9-1 and 9-2 show current and planned equipment bay space allocations. Here, the Ballistics Computer is shown removed in the planned arrangement. The KY-28 Secure Voice has been located in the right-hand equipment bay. Other systems added are AN/ALQ-137, AN/ALR-62, GPS, and AN/ARC-164.

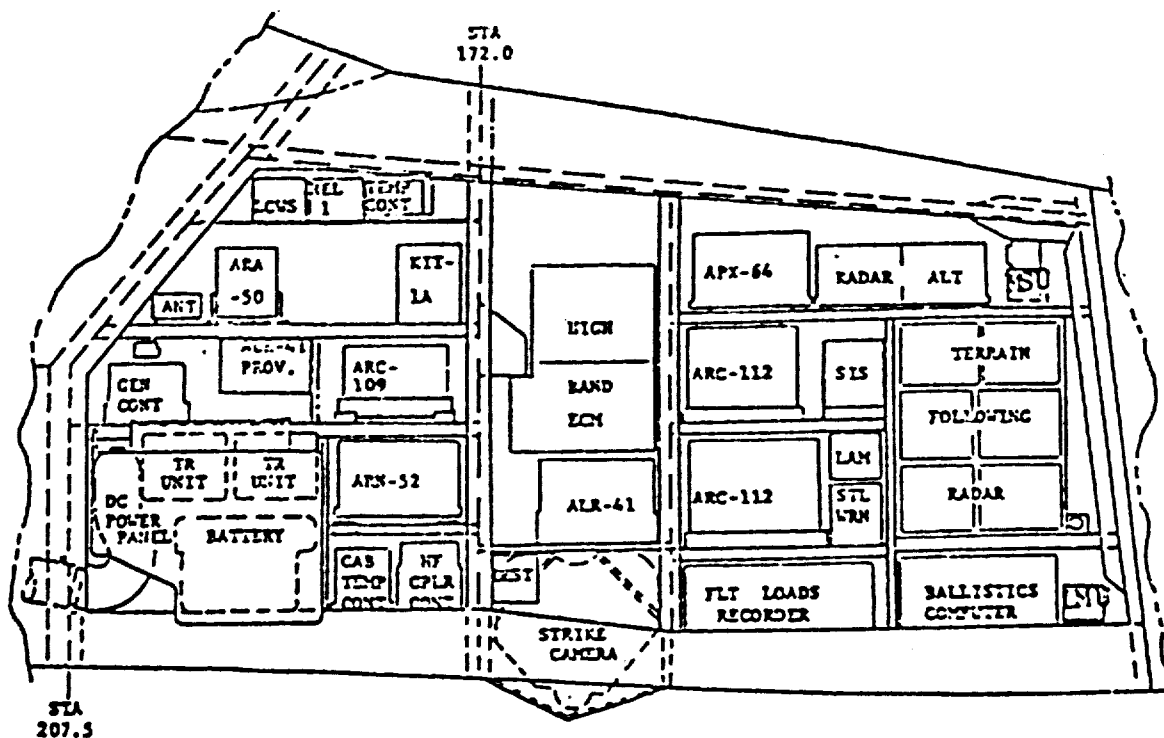
GPS UE will physically and functionally replace the AN/ARN-118 TACAN System. The GPS receiver will be installed at the present TACAN location under Door 1202. The antenna is installed above the forward, right-hand equipment bay.

The AN/ARC-164 is planned to replace the ARC-109 in most F-111As by 1985. The AN/ARC-164 Radio Set has two basic configurations, the console mount and the remote mount.

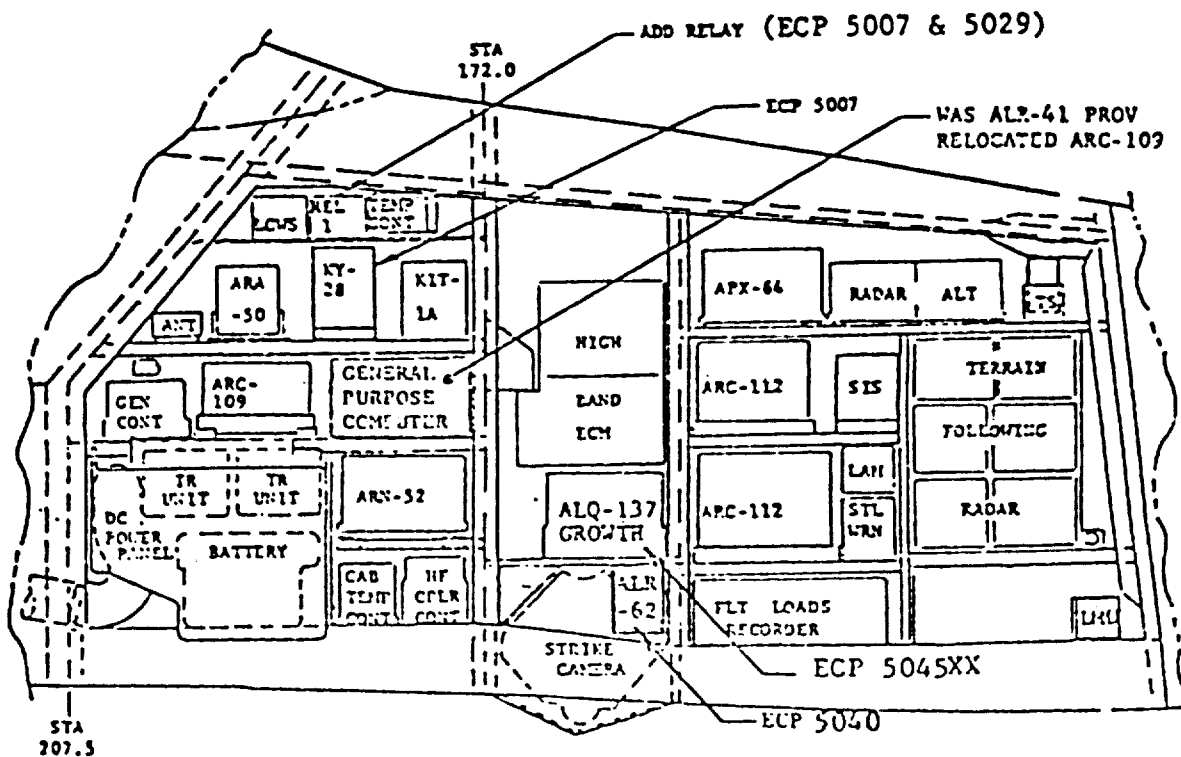
| Table 9-1. PRINCIPAL AVIONICS TO BE INSTALLED IN THE F-111 FAMILY BY 1985 |                                  |                           |                                          |                           |                                  |
|---------------------------------------------------------------------------|----------------------------------|---------------------------|------------------------------------------|---------------------------|----------------------------------|
| Equipment                                                                 | F-111A                           | F-111D                    | F-111E                                   | F-111F                    | EP-111A                          |
| UHF                                                                       | ARC-109 → ARC-164                | ARC-109 → ARC-164         | ARC-109 → ARC-164                        | ARC-109 → ARC-164         | ARC-109 → ARC-164                |
| HF                                                                        | ARC-112/123                      | ARC-123                   | ARC-123                                  | ARC-123                   | ARC-112                          |
| Intercom                                                                  | AIC-25                           | AIC-25                    | AIC-25                                   | AIC-25                    | AIC-25                           |
| INS                                                                       | AJQ-20 Digital Bomb Navigational | AJN-16                    | AJQ-20 (Maybe Digital Bomb Navigational) | AJN-16                    | AJQ-20 Digital Bomb Navigational |
| TACAN                                                                     | ARN-118 (Maybe GPS)              | ARN-52/118 (Maybe GPS)    | ARN-52/118 (Maybe GPS)                   | ARN-84 (Maybe GPS)        | ARN-118 (Maybe GPS)              |
| IILS                                                                      | ARN-58 (Maybe CAT II MLS)        | ARN-58 (Maybe CAT II MLS) | ARN-58                                   | ARN-58 (Maybe CAT II MLS) | ARN-58 (Maybe CAT II MLS)        |
| UHF-DP                                                                    | ARA-50 (Maybe GPS)               | ARA-50 (Maybe GPS)        | ARA-50 (Maybe GPS)                       | ARA-50 (Maybe GPS)        | ARA-50 (Maybe GPS)               |
| Radar Altimeter                                                           | APN-167                          | APN-167                   | APN-167                                  | APN-167                   | APN-167                          |
| TFR                                                                       | APQ-110                          | APQ-128                   | APQ-110                                  | APQ-146/128/134           | APQ-110                          |
| Attack Radar                                                              | APQ-113                          | APQ-130                   | APQ-113                                  | APQ-144/114               | Deodify to Naval Radar           |
| Lead Computer Sight                                                       | ASG-23                           | --                        | ASG-23                                   | ASG-27/25                 | Demodify                         |
| Auto Gun                                                                  | M61-A1                           | M61-A1                    | M61-A1                                   | M61-A1                    | Demodify                         |
| IFF A/G                                                                   | APX-64                           | APX-64                    | APX-64                                   | APX-64                    | APX-64                           |
| IFF Crypto                                                                | KIT-1A                           | KIT-1A                    | KIT-1A                                   | KIT-1A                    | KIT-1A                           |
| HSI                                                                       | AQU-4/A                          | AQU-4/A                   | AQU-4/A                                  | AQU-4/A                   | AQU-4/A                          |
| CADC                                                                      | 1903633-4                        | 1903634-3                 | 1903633-4                                | 1903634-3                 | 1903633-4                        |
| Flight Director System                                                    | CPU-76                           | --                        | CPU-76A                                  | CPU-76A                   | CPU-76, ARU-11                   |
| Auxiliary Flight Reference System                                         | A24G-26A                         | A24G-26A                  | A24G-26A                                 | A24G-26A                  | A24G-26A                         |
| RUAW                                                                      | APS-109                          | APS-109                   | APS-109                                  | APS-109                   | ALR-62 (TTMS)                    |
| ECM Receivers                                                             | ALR-23                           | ALR-23                    | --                                       | ALR-23                    | ALR-23 (TTMS)                    |
|                                                                           | AAR-34                           | AAR-34                    | AAR-34                                   | AAR-34                    | ALQ-137 (SPS)                    |
| Jamming Transmitters                                                      | ALQ-94, 41                       | ALQ-94                    | ALQ-94, 119                              | ALQ-94                    | ALQ-99E (JSS)                    |
| Interference Blanker                                                      | MX-6770                          | MX-8106                   | MX-6770A                                 | MX-8103                   | MX-9879/A                        |
| Dispenser                                                                 | ALE-28                           | ALE-28                    | ALE-28                                   | ALE-28                    | ALE-28                           |
| Strike Camera                                                             | KB-18A                           | KB-18A                    | KB-18A                                   | KB-18A                    | Demodify                         |
| Flight Control System                                                     | FC-11                            | FC-11                     | FC-11                                    | FC-11                     | FC-11                            |

(continued)

| Table 9-1. (continued)       |                         |                         |                         |                                |                    |
|------------------------------|-------------------------|-------------------------|-------------------------|--------------------------------|--------------------|
| Equipment                    | F-111A                  | F-111D                  | F-111E                  | F-111F                         | EP-111A            |
| Fuel and Trim Assembly       | 12C1154-879             | 12C1154-867             | 12C1154-879             | 12C1154-875                    | 12C1154-879        |
| Doppler                      | --                      | APN-189 (Maybe GPS)     | --                      | --                             | --                 |
| Nav Data Entry Panel         | --                      | ID-1764/AYK             | --                      | --                             | --                 |
| Nav Data Display Panel       | --                      | ID-1622/AYK             | --                      | ID-1748/AYK                    | --                 |
| General Purpose Computer     | --                      | AYK-6 (2)               | --                      | AYK-6 (2)                      | --                 |
| Weapons Bay Gun System       | --                      | ?                       | ?                       | --                             | Demodify           |
| Multiplex Converter Unit     | --                      | CV-2492/A               | --                      | CV-2497/A                      | --                 |
| Horizontal Situation Display | --                      | AVN-3                   | --                      | --                             | --                 |
| Integrated Display Set       | --                      | AVA-9                   | --                      | --                             | --                 |
| IFF Interrogator             | --                      | APX-76                  | --                      | --                             | --                 |
| Computer Control Unit        | --                      | --                      | --                      | C-8586/AYK                     | --                 |
| UHF Crypto                   | --                      | --                      | --                      | --                             | KV-28              |
| Nav Radar                    | --                      | --                      | --                      | --                             | APQ-160 (Demodify) |
| Modifications                |                         |                         |                         |                                |                    |
| F2824                        | Terrain Follow Radar    | --                      | Terrain Follow Radar    | --                             | --                 |
| F2930                        | ALQ-119 ECM (Some A/C)  | ALQ-119 ECM (Some A/C)  | ALQ-119 ECM             | --                             | --                 |
| T13315A                      | SIS (Some A/C)          | SIS (Some A/C)          | SIS                     | SIS (Some A/C)                 | --                 |
| T17305A                      | APN-167 LARA (Some A/C) | APN-167 LARA (Some A/C) | APN-167 LARA (Some A/C) | APN-167 LARA (Some A/C)        | --                 |
| T17310A                      | LARA Override System    | LARA Override System    | LARA Override System    | LARA Override System           | --                 |
| T37063A                      | APQ-113 TFR (Some)      | APQ-130 TFR             | APQ-113 TFR             | APQ-144 TFR                    | --                 |
| F2957                        | ALR-62 RWR (Some)       | ALR-62 RWR              | ALR-62 RWR              | ALR-62 RWR                     | --                 |
| F0000                        | Jam System (Some A/C)   | --                      | --                      | --                             | --                 |
| F15312B                      | --                      | AVA-9 IDS               | --                      | --                             | --                 |
| T37236A                      | --                      | --                      | --                      | Multiplex Converter (Some A/C) | --                 |
| Planned Avionics             |                         |                         |                         |                                |                    |
| Video Tape Recorder          | --                      | CVTR                    | CVTR                    | CVTR                           | CVTR               |



VIEW LOOKING INTO EQUIP BAY  
F-111A EQ. 103 - 159  
CURRENT



VIEW LOOKING INTO EQUIP BAY  
F-111A EQ. 103 - 159

Figure 9-1. F-111A EQUIPMENT BAY CURRENT VS. PLANNED

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NOTE: F-111A 31-102 have no provisions for internal ECM except 34-42 and 82-102 have ALQ-41

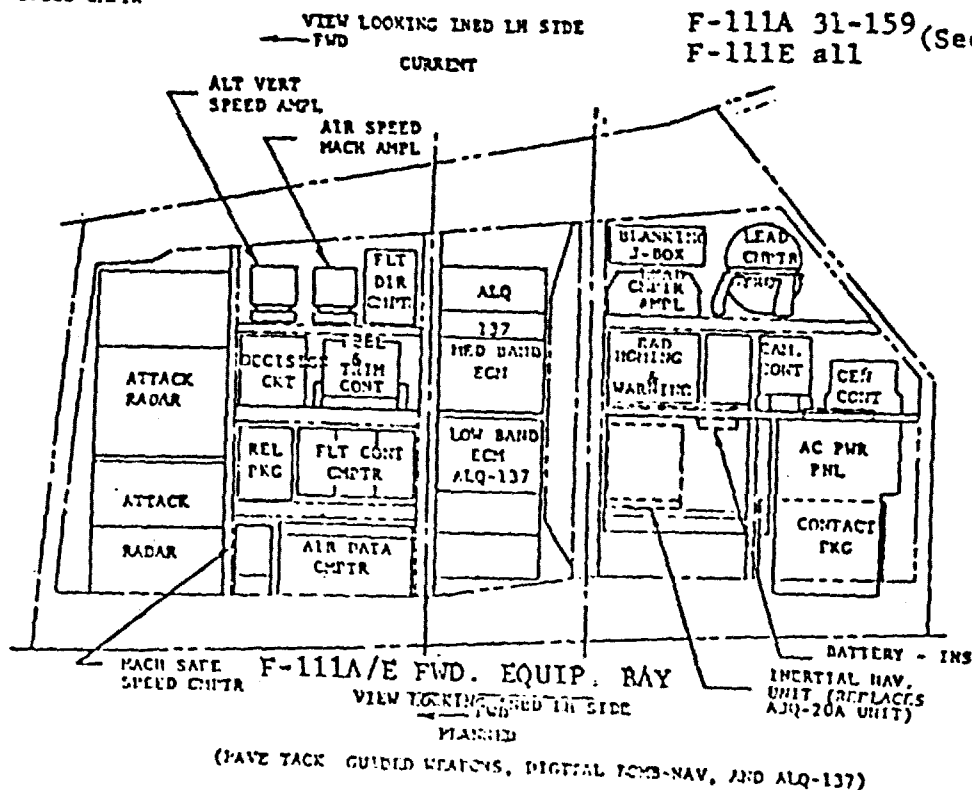
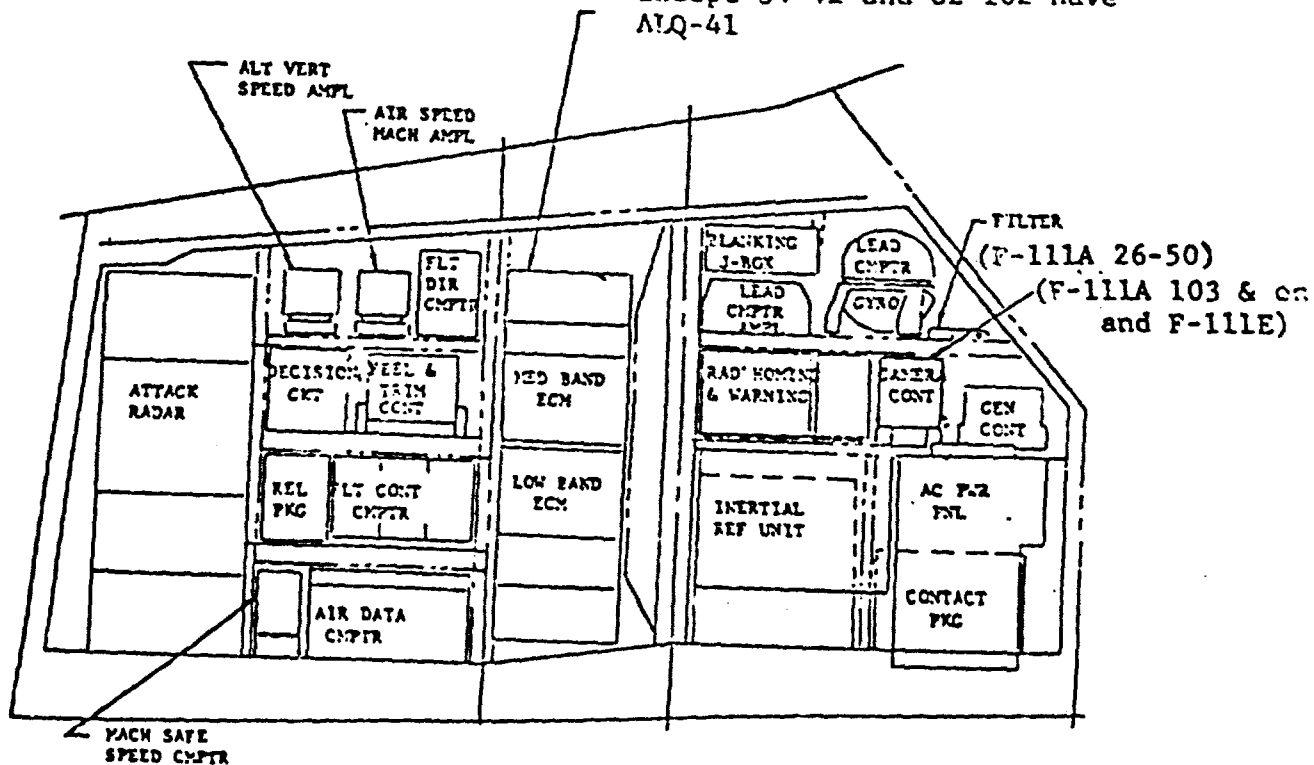


Figure 9-1. (continued)

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## 10. DATA SOURCES

The following sources of data were used in preparing this summary:

- Aircraft and avionics configuration data assembled by ARINC Research, principally in the form of copies of applicable sections, tables, and figures from the aircraft technical orders, as well as from equipment technical orders listed at the end of this section.
- Avionics Planning Baseline Document - October 1978
- GPS Phase II User Equipment Interface Requirements for the F-111A Aircraft; 1 September 1977

### List Of Technical Orders

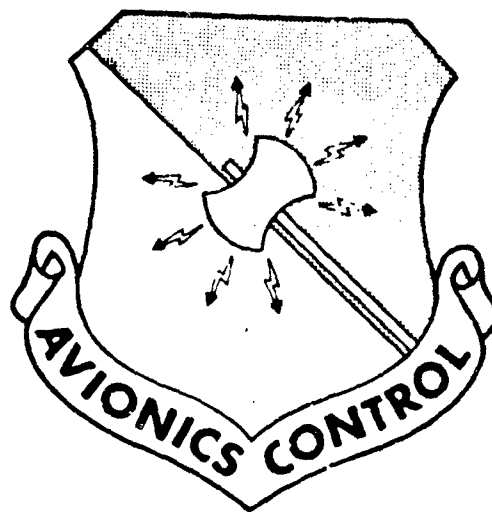
| <u>T.O. #</u>  | <u>Title</u>                                                   | <u>Change</u> | <u>Date</u>           |
|----------------|----------------------------------------------------------------|---------------|-----------------------|
| 1F-111A-01     | List of Publications                                           |               | 4/21/72               |
| 1F-111A-1      | Flight Manual                                                  | 5             | 12/1/78               |
| 1F-111A-1-1    | Performance Data                                               | 1             | 9/19/75               |
| 1F-111A-2-1    | General Info                                                   | 27            | 12/24/76              |
| 1F-111A-2-3-1  | Auto Flight Control                                            | 7             | 6/3/77                |
| 1F-111A-2-4-1  | Flight Control System                                          | 8             | 8/26/77               |
| 1F-111A-2-5-1  | Fire Power Control                                             | 4             | 9/12/75               |
| 1F-111A-2-12-1 | Instrument Systems                                             | 18            | 1/5/77                |
| 1F-111A-2-13-1 | Electrical Power & Lighting System                             | 20            | 10/29/76              |
| 1F-111A-2-16-1 | Air Data Systems                                               | Basic         | 10/18/74              |
| 1F-111A-2-17-1 | Communications and Instrument Landing Systems                  | 10            | 10/24/75              |
| 1F-111A-2-18-1 | Auto Direction Finder, Inter-Communications TACAN, IFF Systems | 12            | 1/5/77                |
| 1F-111A-2-19   | Attack and Terrain Following Radar Systems                     | 17            | 11/7/75               |
| 1F-111A-2-22   | Systems Integration                                            | 11            | 6/13/75               |
| 1F-111A-4-9    | Auto Flight Control                                            | 11            | 2/4/76                |
| 1F-111A-4-10   | Air Data Computer Systems                                      | 5             | 1/10/75               |
| 1F-111A-4-11   | Instrument Systems                                             | 27            | 3/18/77               |
| 1F-111A-4-12   | Power and Lighting Systems                                     | 26            | 2/11/77<br>(#25 miss) |



List Of Technical Orders  
(continued)

| <u>T.O. #</u>   | <u>Title</u>                                                   | <u>Change</u> | <u>Date</u> |
|-----------------|----------------------------------------------------------------|---------------|-------------|
| 1F-111A-4-14    | Auto Direction Finder Commun-<br>ications TACAN, & IFF Systems | 2             | 7/23/76     |
| 1F-111A-4-17    | Penetration aids and Electronic<br>Counter Measures            | Basic         | 7/16/76     |
| 1F-111A-4-19    | Parts Index                                                    | 5             | 7/27/77     |
| 1F-111A-4-20    | Armament Systems                                               | 2             | 2/11/77     |
| 1F-111A-4-21    | Comm. and Instrument Landing                                   | 14            | 4/16/76     |
| 1F-111A-4-22    | Fire Power Control Systems                                     | 1             | 10/15/76    |
| 1F-111A-4-23    | Attack and Terrain Following<br>Radar System                   | 1             | 2/11/77     |
| 1F-111A-34-1    | Non-Nuclear Munitions Delivery                                 | Basic         | 2/6/76      |
| 1F-111A-34-1-1  | Non-Nuclear Munitions Delivery                                 | Basic         | 2/6/76      |
| 12P2-2APQ110-12 | Terrain Following Radar Set                                    | 10            | 3/15/74     |
| 12P2-2APQ110-52 | Terrain Following Indicator                                    | 3             | 3/22/74     |
| 12P2-2APQ13-12  | Radar Set                                                      | Basic         | 1/28/77     |
| 12P4-2APX64-2   | Radio Receiver Transmitters                                    | 17            | 11/22/77    |
| 12P5-2APN167-12 | Altimeter Set                                                  | 12            | 5/3/74      |
| 12R1-2ARA50-2   | Direction Finder Group                                         | 2             | 2/1/72      |
| 12R2-2AIC25-2   | Intercomm Set                                                  | 10            | 12/1/76     |
| 12R2-2ARC109-4  | Radio Set                                                      | 9             | 6/15/76     |
| 12R2-2ARC109-42 | Radio Receiver                                                 | 2             | 6/1/77      |
| 12R2-2ARC112-42 | Radio Set                                                      | 6             | 12/1/76     |
| 12R2-2ARC123-2  | Radio Set                                                      | 15            | 10/15/76    |
| 12R5-2ARN52-2   | TACAN                                                          | Changed       | 10/1/69     |
| 12R5-2ARN52-12  | TACAN                                                          | 4             | 2/15/73     |
| 12R5-2ARN58-2   | Radio Receiving                                                | 6             | 5/13/77     |
| 12R5-2ARN118-1  | TACAN                                                          | Basic         | 10/15/76    |
| 12R5-2URT27-2   | Radio Beacon Set                                               | 10            | 6/1/77      |
| 12R2-2ARC164-2  | Radio Set                                                      | Basic         | 6/20/76     |

**AVIONICS INTERFACE DATA SUMMARY  
FOR  
F-111E**



**October 1979**

**Issued by  
The Deputy for Avionics Control  
ASD/AX  
A Joint AFSC/AFLC Organization**

## FOREWORD

This document is one of a series of reports that describe Avionics interfaces for various USAF aircraft. It was prepared for the Deputy for Avionics Control, Aeronautical Systems Division (ASD/AX), Wright-Patterson AFB, Ohio by ARINC Research Corporation, Annapolis, Maryland under Contract F33657-79-C-0567.

| Record of Changes |         |              |          |
|-------------------|---------|--------------|----------|
| Change            | Subject | Date Entered | Initials |
|                   |         |              |          |

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| Table 6-23          | F-111E Avionics Configuration Data:<br>Lead Computing Optical Sight System<br>AN/ASG-23 NSN: 1270-00-244-6805 | 6-24        |
| Table 7-1           | Antenna Locations (Typical)                                                                                   | 7-2         |
| Figure 9-1          | Current Versus Planned Left-Hand and<br>Right-Hand Equipment Bays                                             | 9-2         |
| Table 9-1           | Principal Avionics to be Installed in<br>the F-111 Family by 1985                                             | 9-4         |

## 1. INTRODUCTION

This document contains configuration data relating to the integration of additional avionics into the F-111E aircraft.

This document will be revised periodically as additional modifications are planned and incorporated into the aircraft. Queries regarding information contained herein should be addressed to:

The Deputy for Avionics Control  
Code: ASD/AXP  
Wright-Patterson AFB, Ohio

This document was compiled from Air Force source materials by ARINC Research Corporation under Contract F33657-79-C-0567.

The applicable Technical Orders are included in the references listed in Section 10.



## 2. COCKPIT SPACE

### 2.1 Available Control Panel Space

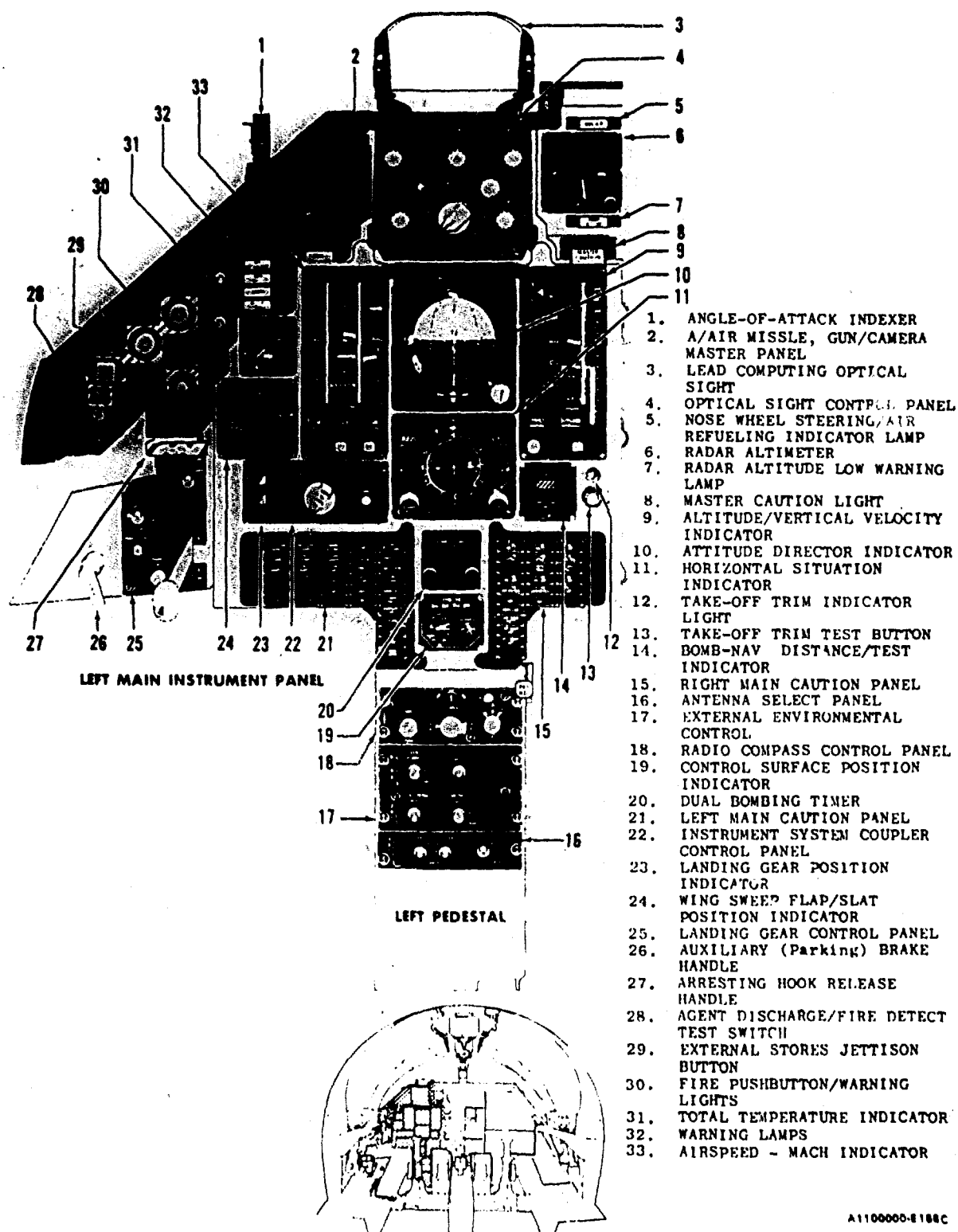
Figures 2-1 through 2-5 depict the consoles and instrument panels for the F-111E. In the present F-111E cockpit configuration, blank control panel space is limited. Two small blank panels exist, one on the left console and one on the right console.

A 1-3/4 inch high by 5-3/4 inch wide space is available on the left console, between legend numbers 9 and 10 of Figure 2-3. This space is near the rear of the console.

On the right console, a 2-3/8 inch high by 5-3/4 inch wide blank space exists. This space is located between legend numbers 1 and 17 of Figure 2-5 and is within convenient reach of the Weapons Systems Officer.

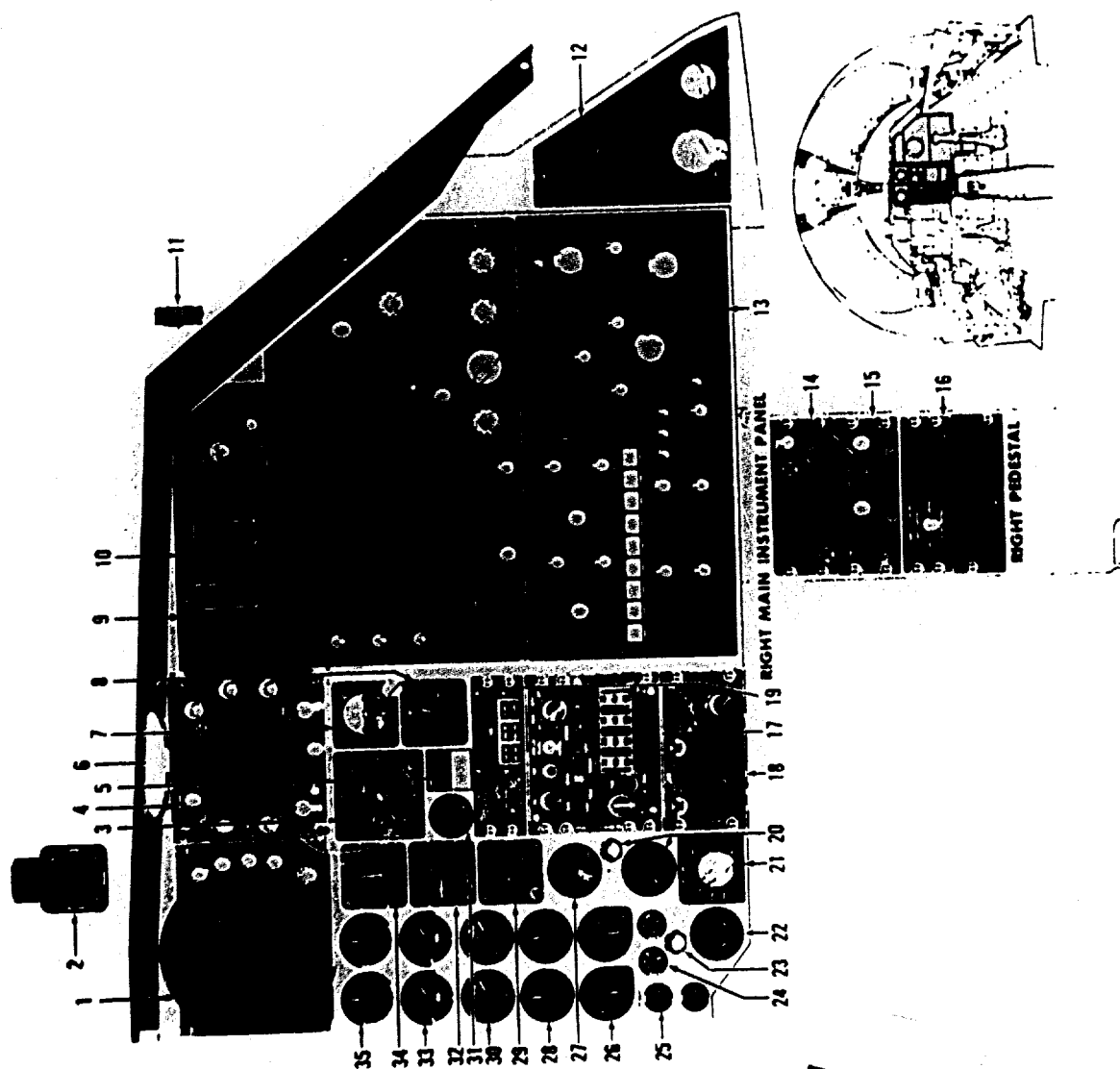
### 2.2 Displays

Currently all of the F-111E oscilloscope displays are in the Right Main Instrument Panel (Figure 2-2, legend 1, 4, and 10, Terrain Following Radar Scope Panel, RHAW Scope Panel, and Attack Radar Scope Panel, respectively. The ASG-23 optical sight display does not have any alphanumeric characters or symbol capability potential.



A1100000-0100C

Figure 2-1. LEFT MAIN INSTRUMENT PANEL



1. TERRAIN FOLLOWING RADAR DISPLAY
2. STANDBY MAGNETIC COMPASS
3. BEARING-DISTANCE-HEADING INDICATOR
4. RADAR MONITORING AND WARNING CONTROL-INDICATOR PANEL
5. RADIO CALL
6. RADAR MONITORING AND WARNING CONTROL-INDICATOR FILTER ASSY (Stowed position)
7. STANDBY ATTITUDE INDICATOR
8. STANDBY ALTITUDE
9. THREAT DISPLAY, INDICATOR, WARNING, AND CAUTION LIGHTS
10. ATTACK RADAR DISPLAY PANEL
11. ANGLE-OF-ATTACK INDEXER
12. NUCLEAR WEAPONS CONTROL PANEL AND CAUTION LIGHTS
13. BOB-NAV CONTROL PANEL
14. ILS CONTROL PANEL
15. BURST CONTROL PANEL
16. AIR POINT TARGET ELEVATION
17. UHF RADIO CONTROL PANEL
18. TACAN CONTROL PANEL
19. SAW SECTOR PANEL
20. FULL QUANTITY INDICATOR TEST BUTTON - AND TOTAL SELECT FUEL QUANTITY INDICATOR
21. FUEL GAGE SELECT
22. OIL QUANTITY INDICATOR
23. OIL QUANTITY INDICATOR TEST BUTTON
24. ENGINE OIL PRESSURE INDICATOR (2)
25. HYDRAULIC PRIMARY AND UTILITY OIL PRESSURE INDICATOR
26. ENGINE PRESSURE RATIO (2)
27. FUSELAGE FUEL QUANTITY INDICATOR
28. NOZZLE POSITION INDICATOR (2)
29. CLOCK
30. ENGINE FUEL FLOW INDICATOR (2)
31. TRUE AIRSPEED INDICATOR
32. RATE-OF-CLIMB (Vertical velocity) INDICATOR
33. TURBINE INLET TEMPERATURE INDICATOR (2)
34. STANDBY AIRSPEED INDICATOR
35. ENGINE TACHOMETER (2)

Figure 2-2. RIGHT MAIN INSTRUMENT PANEL

401-20000-43718

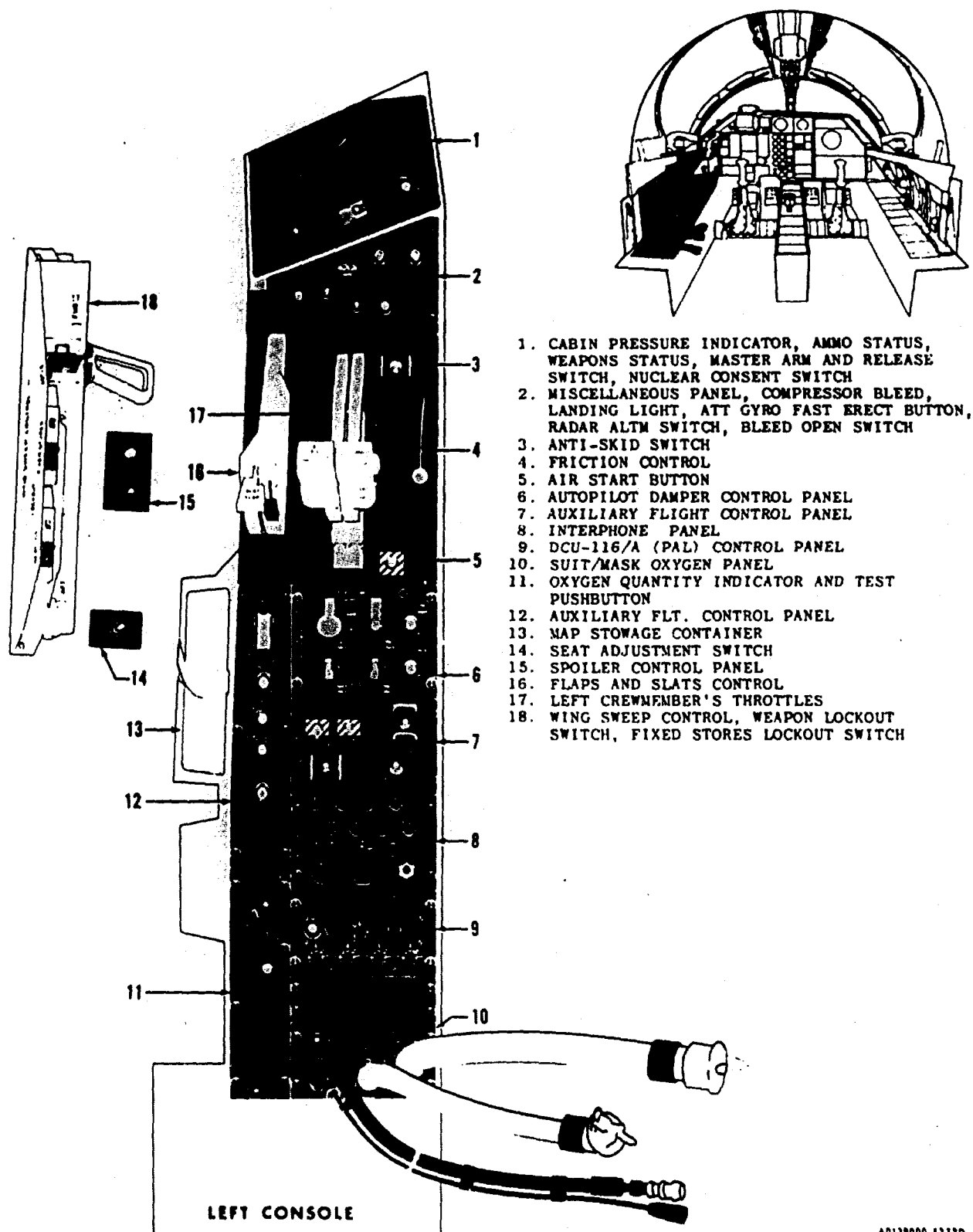
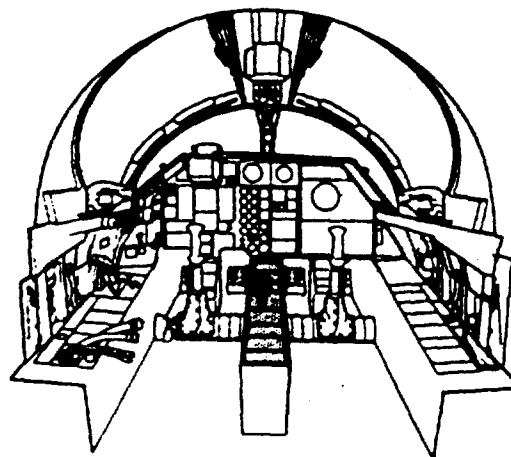
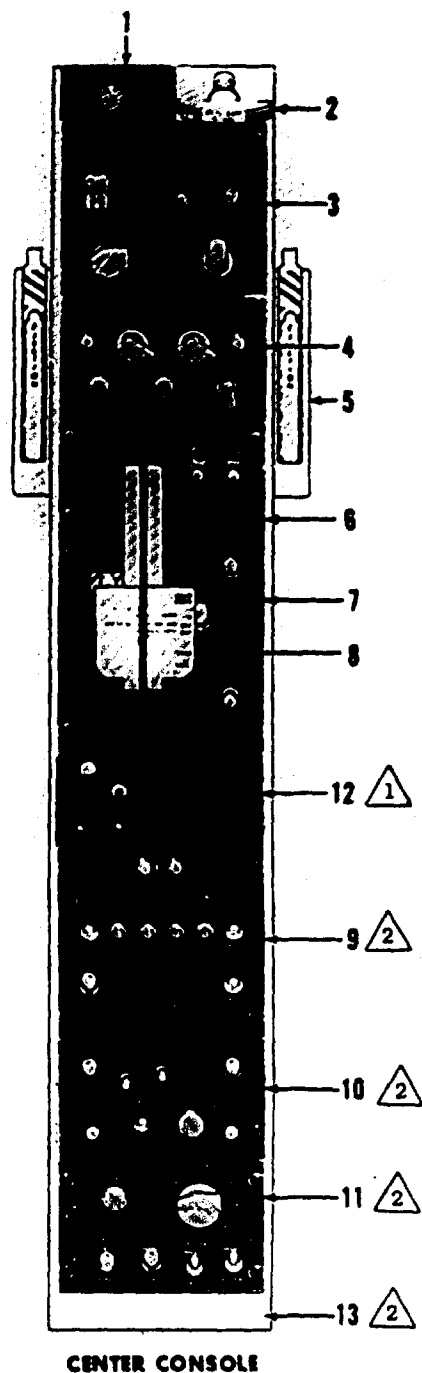


Figure 2-3. LEFT CONSOLE



1. AIR REFUEL RECEPTACLE LIGHT CONTROL KNOB
2. ALTERNATE GEAR DOWN HANDLE
3. FUEL CONTROL PANEL
4. TFR CONTROL PANEL
5. CREW MODULE EJECTION HANDLE (2)
6. SPIKE CONTROL PANEL
7. GROUND START SWITCH, AIR START BUTTON, RBS TONE SWITCH
8. RIGHT CREWMEMBERS THROTTLES
9. IFF CONTROL PANEL
10. ELECTRICAL CONTROL PANEL
11. AIR CONDITIONING CONTROL PANEL  
(AIR FLOW switch effective on AF S/N 68-030 thru 68-084 and on 67-115 thru 68-029 after T.O. 1F-111-687) (EMER position of AIR SOURCE switch is effective on AF S/N 68-070 thru 68-084 and on 67-115 thru 68-029 after T.O. 1F-111-572)
12. ECM CONTROL PANEL/ALQ-119



13. CONTROL PANEL SCOPE CAMERA

NOTES:



AFTER T.O. 1F-111E-521



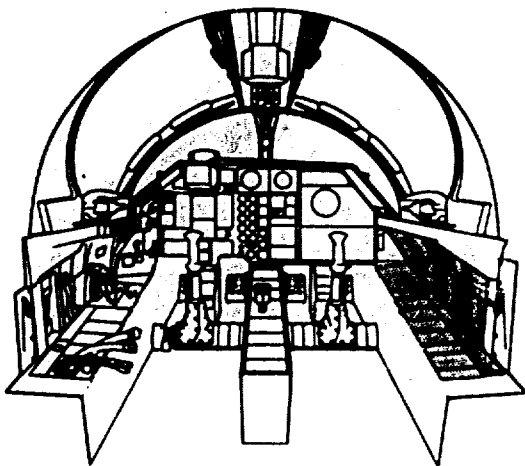
RELOCATED AFTER T.O. 1F-111E-521D

F-111-0309

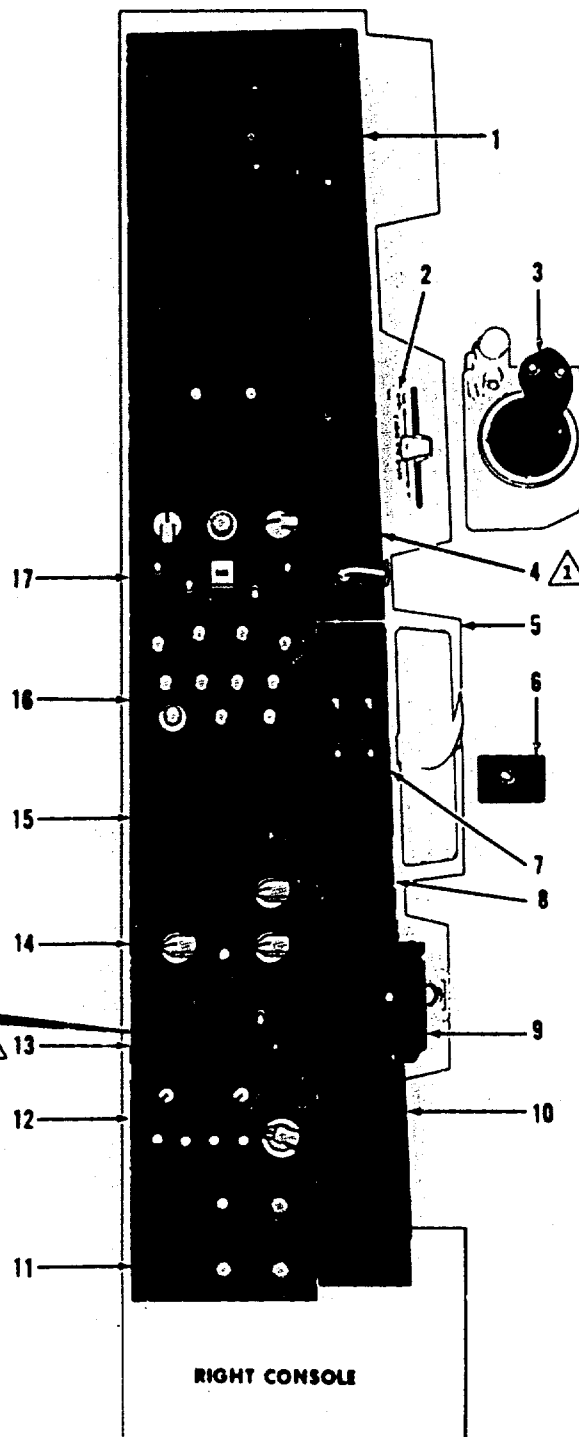
Figure 2-4. CENTER CONSOLE

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1. WEAPONS CONTROL PANEL
2. CABIN AIR DISTRIBUTION CONTROL LEVER
3. ATTACK RADAR TRACKING CONTROL HANDLE
4. RADIO BEACON SET
5. MAP STOWAGE CONTAINER
6. SEAT ADJUSTMENT SWITCH
7. STRIKE CAMERA CONTROL PANEL
8. WEAPONS BAY TEMPERATURE INDICATOR
9. UTILITY LIGHT
10. STOWAGE
11. CMDS CONTROL PANEL
12. CMRS CONTROL PANEL
13. CONTROL PANEL SCOPE CAMERA
14. ECM CONTROL PANEL/ALQ-94
15. INTERCOMMUNICATION PANEL
16. HF RADIO CONTROL PANEL
17. ATTACK RADAR CONTROL PANEL
18. ECM CONTROL PANEL ALQ-87



NOTES:

- 1 PRIOR TO T.O. 1F-111-613
- 2 PRIOR TO T.O. 1F-111E-521
- 3 AFTER T.O. 1F-111E-521D

F-111-0308

Figure 2-5. RIGHT CONSOLE

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### 3. AVIONICS SPACE

The avionics space availability in the F-111E is detailed in Table 3-1 and Figure 3-1. The only space that does not have a candidate equipment designated is under door 1201; that space has a volume of 0.82 cubic feet. This space is available only if two ARN-194 altimeters are employed in a stacked configuration.

| Table 3-1. F <sup>2</sup> E SUMMARY -- F-111E |                                                                                                                                                                       |                               |                                            |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|--------------------------------------------|
| F <sup>2</sup> E Criteria                     | Potential Available Space                                                                                                                                             |                               |                                            |
| Location Reference and Description            | A<br>Right of SIS<br>3 Door 1201                                                                                                                                      | B<br>Left KIT-1A<br>Door 1202 | C<br>Radar Altimeter<br>Door 1201          |
| Rectangular* Size (H, W, D)                   | 8.62" x 6.6" x 14.25"                                                                                                                                                 | 8.7" x 12.0" x 14.3"          | 6.5" x 15" x 14.5"                         |
| Volume                                        | .469 Ft <sup>3</sup>                                                                                                                                                  | .864 Ft <sup>3</sup>          | .818 Ft <sup>3</sup>                       |
| Type Cooling Available                        | Forced-Air Cooled                                                                                                                                                     | Forced-Air Cooled             | Forced-Air Cooled                          |
| Temperature-Altitude                          | Normal Equipment Area                                                                                                                                                 | Normal Equipment Area         | Normal Equipment Area                      |
| Vibration                                     | KIT 1A Relocation                                                                                                                                                     | Digital Scan Converter        | None                                       |
| Possible Candidates for this Space            | Exists                                                                                                                                                                | Exists                        | Replace with 2 ARN-194 Altimeters, Stacked |
| Remarks                                       | *Where LRU is currently installed, the dimensions given represent dimensions of LRU; when no LRU is installed, the dimensions given are those of the available space. |                               |                                            |



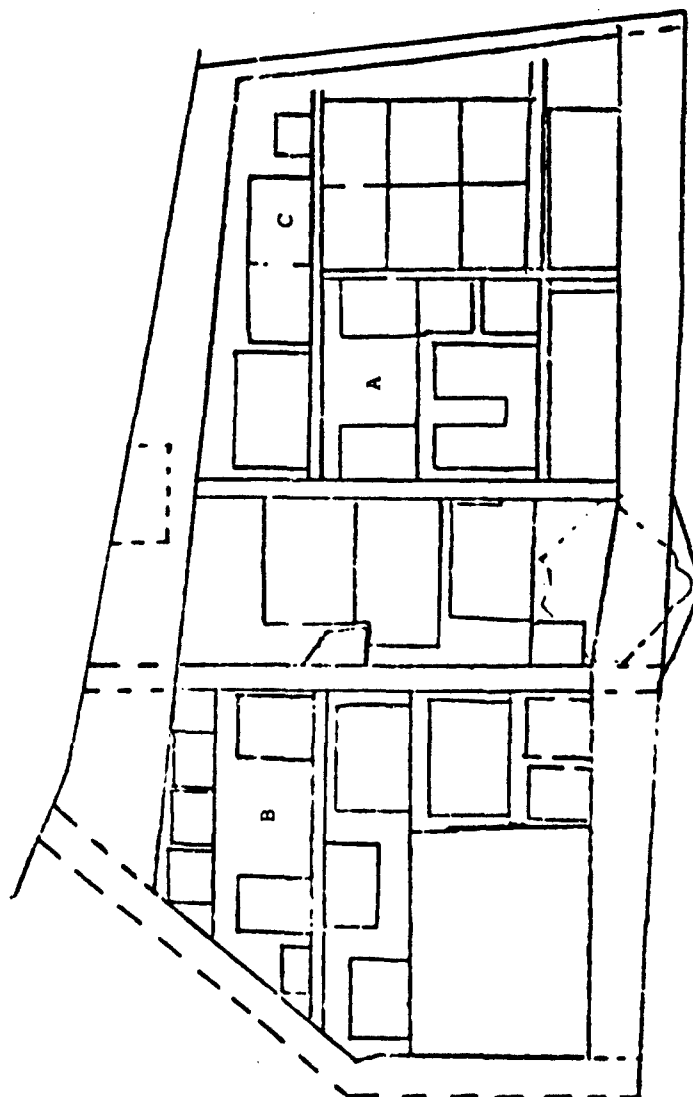


Figure 3-1. FORWARD RIGHT-HAND EQUIPMENT BAY SPACE LOCATIONS

#### 4. ELECTRICAL POWER SYSTEM

##### 4.1 Introduction

115/200 volt, three phase, 400 cycle ac power and 28 volt dc power is provided for the electrical power system in the F-111E. This power is generated by two 62.5 kVA ac generator drive assemblies, one mounted on each engine. These generators are supplemented by two 150 amp transformer rectifier units that convert the ac power to 28 volts dc. An aircraft battery supplies 28 volts dc to the battery bus and the dc start busses. The electrical power system consists of the following systems:

- Main ac power system
- External ac power and monitor system
- Emergency ac power system
- Dc power system

##### 4.2 Power Requirements

In the F-111E, there is a basic avionics electrical power requirement of 40 kVA.

##### 4.3 Power Generation and Distribution

The major sources of electrical power are 62.5 kVA indirect drive generators. The control units for these generators are in the forward equipment bay. The electrical power distribution system has three ac busses: A left main ac bus, a right main ac bus, and an essential ac bus.

##### 4.4 Emergency ac Power System

The emergency ac power system provides electrical power for operation of safety-of-flight equipment in the event the main ac power system fails or hydraulic power is applied to the aircraft without electrical power, or both. The emergency ac power generator is operated by the utility hydraulic system.

##### 4.5 Dc Power System

The dc power system supplies the aircraft with the necessary 28-volt direct current power. The main dc power system uses two ac-to-dc power converters to supply the main and essential dc busses. The aircraft battery ensures that standby power is available to power engine starts, aircraft position lights, and pylon refuel/defuel valves without external power units.

## 5. ENVIRONMENTAL CONTROL SYSTEM

### 5.1 General

The Environmental Control System (ECS) provides temperature controlled air for the cockpit and a temperature controlled flow of cooling air to the forward electronics bay and to the weapons bay. The ECS operates by ducting hot air from the sixteenth stage compressor of each engine through two air-to-air heat exchangers, an air-to-water heat exchanger, and a cooling turbine. The cooling turbine further cools the air to temperatures suitable for the cockpit and electronic equipment bays.

### 5.2 Cabin Air Conditioning

Cabin air conditioning is governed by a temperature controller that receives signals from temperature sensors and a cockpit control panel. The temperature controller allows hot air to mix with the cooled air stream to obtain air at the cockpit-selected temperature. Conditioned air flows from the cabin into the forward equipment bay.

### 5.3 Equipment Air Conditioning

Electronic equipment that is cooled by the ECS is grouped in the forward equipment area, cabin equipment area, aft (check) equipment area, main landing gear wheelwell area, and tail electronics area. The equipment is cooled by both area cooling and forced-air-flow cooling. Area cooling is achieved by supplying cold air to the equipment area as required to maintain the temperature at 150° ( $\pm 10^\circ$ ) F. In addition, a cold air flow can be forced over or into a single component or group of components.

## 6. CURRENT AVIONICS

Tables 6-1 through 6-23 contain LRU data relating to the F-111E avionics systems that make up the current or near-term configuration. Where no entries are shown, the data were not available for this report. Data pertaining to future avionics modifications are presented in Section 9.

| Table 6-1. F-111E AVIONICS CONFIGURATION DATA: HF RADIO AM/ARC-123 NSN: 5821-00-496-9234 |                 |           |                     |      |      |                       |                 |                |    |                  |                |                 |
|------------------------------------------------------------------------------------------|-----------------|-----------|---------------------|------|------|-----------------------|-----------------|----------------|----|------------------|----------------|-----------------|
| Name                                                                                     | Nomenclature    | Location  | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting        |
|                                                                                          |                 |           | H                   | W    | D    |                       |                 | AC             | DC |                  |                |                 |
| CONTROL                                                                                  | MT-7073/ARC     | Cockpit   |                     | 5.75 |      |                       |                 |                |    |                  | Convection     | Panel           |
| RECEIVER-TRANSMITTER                                                                     | MT-3122/ARC-123 | Door 1201 | 7.62                | 3.62 | 13.6 | 375                   | 13.12           |                |    |                  | Forced Air     | MT-3660/ARC-123 |
| RECEIVER-TRANSMITTER                                                                     | MT-3122/ARC-123 | Door 1201 | 7.62                | 4.87 | 17.2 | 638.3                 | 23.13           | 115V 3ø        |    |                  | Forced Air     | MT-3660/ARC-123 |
| SHACK MOUNT BASE                                                                         | MT-3146/ARC-123 | Door 1201 | 6.87                | 11.2 | 20.2 | 1554                  | 8.54            |                |    |                  |                |                 |

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| Table 6-2. F-111E AVIONICS CONFIGURATION DATA: AN/ARC-109 UHF COMMUNICATIONS SET NSN: 5821-00-496-9236 |                |           |                     |      |       |                       |                 |                |    |                  |                |                 |
|--------------------------------------------------------------------------------------------------------|----------------|-----------|---------------------|------|-------|-----------------------|-----------------|----------------|----|------------------|----------------|-----------------|
| Name                                                                                                   | Nomenclature   | Location  | Dimensions (Inches) |      |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting        |
|                                                                                                        |                |           | H                   | W    | D     |                       |                 | AC             | DC |                  |                |                 |
| UHF Communications Receiver-Transmitter                                                                | AN/ARC-109     |           |                     |      |       |                       | 38.8            | 150            |    | 150W             |                | MT-3321/ARC-109 |
| Control                                                                                                | RT-749/ARC-109 | Door 1202 | 6.87                | 8.87 | 14.87 | 906.1                 | 28.7            |                |    |                  | Forced Air     | Cockpit         |
| Antenna Selector                                                                                       | C-6364/ARC-109 | Cockpit   | 4.87                | 5.75 | 5.0   | 140                   | 4.4             |                |    |                  | Convection     | MT-1932A        |
| Antenna                                                                                                | C-480d/ARC     | Door 1202 | 3.0                 | 3.25 | 4.5   | 43.9                  | 1.5             |                |    |                  | Forced Air     | Hard            |
| Indicator                                                                                              | AS-171H        |           |                     |      |       |                       | 1.0             |                |    |                  |                |                 |
|                                                                                                        | ID-1013/ARC    |           |                     |      |       |                       |                 |                |    |                  |                |                 |

| Table 6-3. P-111C AVIONICS CONFIGURATION DATA: AN/AIC-25 INTERCOM NSN: 5831-00-457-5041 |                                |          |                        |      |      |                             |                    |                   |    |                     |                   |          |
|-----------------------------------------------------------------------------------------|--------------------------------|----------|------------------------|------|------|-----------------------------|--------------------|-------------------|----|---------------------|-------------------|----------|
| Name                                                                                    | Nomenclature                   | Location | Dimensions<br>(Inches) |      |      | Volume<br>(Cubic<br>Inches) | Weight<br>(Pounds) | Aircraft<br>Power |    | Heat<br>Dissipation | Cooling<br>Method | Mounting |
|                                                                                         |                                |          | H                      | W    | D    |                             |                    | AC                | DC |                     |                   |          |
| Intercom Set<br>(Control)<br>Intercom<br>Station                                        | AN/AIC-25                      | Cockpit  | 1.75                   | 5.75 | 5.62 | 121.2                       | 4.2                |                   | 02 | 20W                 | Convection        | Cockpit  |
|                                                                                         | C-6567/AIC-25<br>C-6624/AIC-25 |          | 4.14                   | 1.62 | 5.12 | 81.2                        | 2.7                |                   |    |                     |                   |          |

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| Table 6-4. F-111E AVIONICS CONFIGURATION DATA: UHF-ADF AN/ABA-50 NSN: 5826-00-883-5777 |                             |           |                     |       |       |                       |                 |                |      |                  |                |                            |
|----------------------------------------------------------------------------------------|-----------------------------|-----------|---------------------|-------|-------|-----------------------|-----------------|----------------|------|------------------|----------------|----------------------------|
| Name                                                                                   | Nomenclature                | Location  | Dimensions (Inches) |       |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |      | Heat Dissipation | Cooling Method | Mounting                   |
|                                                                                        |                             |           | H                   | W     | D     |                       |                 | AC             | DC   |                  |                |                            |
| UHF-ADF Amplifier Relay Assembly                                                       | AN/ABA-50<br>AN-3624/ABA-50 | Door 1202 | 6.6                 | 7.1   | 8.0   | 375                   | 5.4             | 0.04           | 0.01 | 50W              | Forced Air     | MT-1955/<br>ABA-50<br>Hard |
| UHF/ADF Loop Antenna                                                                   | AS-909/ABA-48               |           | 3.5                 | 10.25 | 10.25 | 368                   | 10              |                |      |                  |                |                            |

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| Table 6-5. F-111E AVIONICS CONFIGURATION DATA: INSTRUMENTS |                                     |           |                     |      |       |                       |                 |                |                 |                  |                |          |
|------------------------------------------------------------|-------------------------------------|-----------|---------------------|------|-------|-----------------------|-----------------|----------------|-----------------|------------------|----------------|----------|
| Name                                                       | Nomenclature                        | Location  | Dimensions (Inches) |      |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |                 | Heat Dissipation | Cooling Method | Mounting |
|                                                            |                                     |           | H                   | W    | D     |                       |                 | AC             | DC              |                  |                |          |
| Instruments                                                |                                     |           |                     |      |       |                       |                 |                |                 |                  |                |          |
| Attitude Directional Indicator                             | ARD-11/A<br>NSN: 6610-00-424-8740   | Cockpit   | 5.25                | 5.0  | 10.66 | 280.4                 | 8.1             |                |                 | 36/10W           | Convection     | Cockpit  |
| Attitude Indicator                                         | ARD-42/A-2<br>NSN: 6610-00-210-8741 | Cockpit   | 2.40                | 2.40 | 7.61  | 43.8                  | 2.5             | 0.002          | 0.034/<br>0.008 | 36/10W           | Convection     | Cockpit  |
| Horizontal size Indicator                                  | AQU/A<br>NSN: TBD                   | Cockpit   | 4.25                | 5.00 | 8.37  | 178                   | 8.0             |                |                 | 54W              | Convection     | Cockpit  |
| Tot/Sec Fuel Quantity                                      |                                     | Cockpit   | 2.0                 | Dia  |       | 3.14                  | 1.5             |                |                 |                  | Convection     | Cockpit  |
| Recorder Flight Load Type                                  | HXX 316/A2 406<br>NSN: TBD          | Door 1201 |                     |      |       |                       |                 |                |                 |                  | Forced Air     | Shock    |
| BDHI                                                       | E5165001400<br>NSN: TBD             | Cockpit   |                     |      |       |                       |                 |                |                 |                  | Convection     | Cockpit  |

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| Table 6-6. F-111E AVIONICS CONFIGURATION DATA: FLIGHT DIRECTOR COMPUTER MSN: 6610-00-179-5146 |              |           |                     |     |      |                       |                 |                |       |                  |                |          |
|-----------------------------------------------------------------------------------------------|--------------|-----------|---------------------|-----|------|-----------------------|-----------------|----------------|-------|------------------|----------------|----------|
| Name                                                                                          | Nomenclature | Location  | Dimensions (Inches) |     |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |       | Heat Dissipation | Cooling Method | Mounting |
|                                                                                               |              |           | H                   | W   | D    |                       |                 | AC             | DC    |                  |                |          |
| Flight Director Computer                                                                      | CPU-76/A     | Door 1101 | 7.53                | 5.5 | 9.48 | 393                   | 10.0            | 0.016          | 0.085 | 26W              | Forced Air     | Shock    |

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| Name                      | Nomenclature   | Location  | Dimensions (Inches) |     |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |      | Heat Dissipation | Cooling Method | Mounting |
|---------------------------|----------------|-----------|---------------------|-----|------|-----------------------|-----------------|----------------|------|------------------|----------------|----------|
|                           |                |           | H                   | W   | D    |                       |                 | AC             | DC   |                  |                |          |
| Radar Altimeter           | AN/APN-167     |           |                     |     |      |                       |                 |                |      |                  |                |          |
| Receiver-Transmitter Dual | RT-771/APN-167 | Door 1201 | 6.5                 | 15  | 14.5 | 14.4                  | 26.0            | 0.086          | 0.01 | 1974             | Forced Air     | W ( )    |
| Antenna                   | AN-158/APN-167 |           | 4.5                 | 4.5 | 9.25 | 187                   | 1.1             |                |      |                  | Convection     | Hard     |
| Radar Altimeter Indicator | K186000100     | Cockpit   |                     |     |      |                       | 1.6/1.8*        |                |      |                  | Convection     | Cockpit  |
| Low Warning Lamp          |                | Cockpit   |                     |     |      |                       |                 |                |      |                  |                | Cockpit  |

\*Two indicators in aircraft.

| Table 6-8. F-111E AVIONICS CONFIGURATION DATA: CADC |                       |           |                     |    |       |                       |                 |                |    |                  |                |           |
|-----------------------------------------------------|-----------------------|-----------|---------------------|----|-------|-----------------------|-----------------|----------------|----|------------------|----------------|-----------|
| Name                                                | Nomenclature          | Location  | Dimensions (Inches) |    |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting  |
|                                                     |                       |           | H                   | W  | D     |                       |                 | AC             | DC |                  |                |           |
| Air Data Computer                                   | 1-03633-4             | Door 1101 | 8                   | 14 | 19.25 |                       | 47.5            | 115 Vac        |    |                  | Forced Air     | 1852714-3 |
|                                                     | NSN: 6610-00-168-0544 |           |                     |    |       |                       |                 | 1φ             |    |                  |                |           |
|                                                     | 12F4075-3             | Door 1102 |                     |    |       |                       |                 |                |    |                  | Forced Air     | Shock     |
|                                                     | Control               | 12F0002-5 | Cockpit             |    |       |                       |                 |                |    |                  | Convection     | Panel     |
| Angle of Attack Transmitter Sync.                   | MN24378-2             | Door 1102 |                     |    |       |                       |                 |                |    |                  | Forced Air     | Shock     |

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| Table 6-9. F-111E AVIONICS CONFIGURATION DATA: AN/ARN-52 TACAM RSM: TBD<br>(BEFORE T.O. 1F-111-1148; BEING REPLACED BY AN/ARN-118) |               |           |                        |      |      |                             |                    |                   |        |                     |                   |                    |
|------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------|------------------------|------|------|-----------------------------|--------------------|-------------------|--------|---------------------|-------------------|--------------------|
| Name                                                                                                                               | Nomenclature  | Location  | Dimensions<br>(Inches) |      |      | Volume<br>(Cubic<br>Inches) | Weight<br>(Pounds) | Aircraft<br>Power |        | Heat<br>Dissipation | Cooling<br>Method | Mounting           |
|                                                                                                                                    |               |           | H                      | W    | D    |                             |                    | AC                | DC     |                     |                   |                    |
| Control<br>Display<br>Transmitter<br>Antenna<br>RF Switch<br>System                                                                | C-3/2N/ARN-52 | Cockpit   | 3                      | 5.75 | 4    | 69                          | 2                  |                   |        |                     | Convection        | Panel              |
|                                                                                                                                    | RT-893/ARN-52 | Door 1202 | 7.35                   | 10   | 16.9 | 12.42                       | 43.25              |                   |        |                     | Forced Air        | RT-1729/<br>ARN-52 |
|                                                                                                                                    | 11D20100-1    |           | 9.7                    | 3.5  | 7.5  | 255                         | 2                  |                   |        |                     |                   | Hard               |
|                                                                                                                                    | SA-521/A      | Cockpit   | 1.94                   | 2.78 | 3.19 | 17.2                        | 0.34               | 0.25              | 0.0616 |                     | Convection        | Panel              |

| Table 6-10. F-111E AVIONICS CONFIGURATION DATA: AN/ARN-118 TACAN NSN: 5826-01-015-0839<br>(AFTER T.O. 1F-111-1148, REPLACING AN/ARN-52) |                         |           |                        |      |      |                             |                    |                   |        |                     |                   |                          |
|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-----------|------------------------|------|------|-----------------------------|--------------------|-------------------|--------|---------------------|-------------------|--------------------------|
| Name                                                                                                                                    | Nomenclature            | Location  | Dimensions<br>(Inches) |      |      | Volume<br>(Cubic<br>Inches) | Weight<br>(Pounds) | Aircraft<br>Power |        | Heat<br>Dissipation | Cooling<br>Method | Mounting                 |
|                                                                                                                                         |                         |           | H                      | W    | D    |                             |                    | AC                | DC     |                     |                   |                          |
| TACAN                                                                                                                                   | AN/ARN-118              |           | 10                     | 11.7 | 19.7 | 2300                        | 25.0               | 0.250             | 0.0616 | 310W                |                   | MT-4682 (A) /<br>ARN-118 |
| Receiver-<br>Transmitter                                                                                                                | RT-1159(A) /<br>ARN-118 |           |                        |      |      |                             |                    |                   |        |                     |                   |                          |
| Control                                                                                                                                 | C-10058/ARN-118         |           |                        |      |      |                             |                    |                   |        |                     |                   |                          |
| Antenna RF<br>Switch                                                                                                                    | SA521/A                 | Cockpit   | 2.7                    | 3.2  | 3.2  | 27.7                        | 0.6                |                   |        | 28W                 |                   | MT-1665/A                |
| Antenna TACAN<br>Blade                                                                                                                  | AS-1918                 | Door 1101 |                        |      |      |                             | 1                  |                   |        |                     |                   | Hard                     |

| Table 6-11. F-111E AVIONICS CONFIGURATION DATA: ILS AN/ARN-58 NSN: 5826-00-883-5795* |                |           |                     |      |      |                       |                 |                |                |                  |                |          |
|--------------------------------------------------------------------------------------|----------------|-----------|---------------------|------|------|-----------------------|-----------------|----------------|----------------|------------------|----------------|----------|
| Name                                                                                 | Nomenclature   | Location  | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |                | Heat Dissipation | Cooling Method | Mounting |
|                                                                                      |                |           | H                   | W    | D    |                       |                 | AC             | DC             |                  |                |          |
| ILS                                                                                  | AN/ARN-58      |           |                     |      |      |                       |                 |                |                |                  |                |          |
| Receiver Localizer                                                                   | R-R43/ARN-58   | Door 2204 | 7.75                | 6.87 | 5.01 | 267                   | 7.9             |                | 0.02<br>220 mA | 48W              |                | Shock    |
| Receiver                                                                             | R-R44/ARN-58   | Door 2204 | 9.75                | 6.87 | 5.01 | 336                   | 9.6             |                |                | 48W              |                | Shock    |
| Control                                                                              | C-6376/ARN-58A |           | 3.0                 | 5.75 | 5.0  | 86.3                  | 1.1             |                |                |                  | Convection     |          |
| Marker Beacon Antenna                                                                |                |           |                     |      |      |                       | 1.0             |                |                |                  |                | Hard     |
| Slide Switch                                                                         |                |           |                     |      |      |                       | 0.8             |                |                |                  |                | Hard     |
| Localizer Antennas                                                                   |                |           |                     |      |      |                       |                 |                |                |                  |                | Hard     |
| *For ARN-58A, NSN: 5826-00-498-3313.                                                 |                |           |                     |      |      |                       |                 |                |                |                  |                |          |

| Table 6-12. F-111E AVIONICS CONFIGURATION DATA: INS AN/AJQ-20A NSN: 6605-00-170-6701 |                |           |                     |   |     |                       |                 |                |    |                  |                |          |
|--------------------------------------------------------------------------------------|----------------|-----------|---------------------|---|-----|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                 | Nomenclature   | Location  | Dimensions (Inches) |   |     | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                      |                |           | H                   | W | D   |                       |                 | AC             | DC |                  |                |          |
| Inertial Navigational System                                                         | AN/AJQ-20A     |           |                     |   |     |                       |                 |                |    |                  |                |          |
| Stabilized Platform                                                                  | MX-6767/AJQ-20 | Door 1102 |                     |   |     |                       | 75.0            |                |    | 275W             | Forced Air     | Shock    |
| Transmitter Induct Type Flux Valve                                                   | TRU-79/A       |           | 4.0 dia.            |   | 2.0 | 25.1                  | 1.8             |                |    |                  |                |          |
| Navigation Computer                                                                  | CP-812/AJQ-20  | Cockpit   |                     |   |     |                       | 77.8            |                |    | 281W             | Convection     | Panel    |
| Ballistics Computer                                                                  | CP-937/AJQ-20A |           |                     |   |     |                       |                 |                |    |                  |                |          |



| Table 6-11. F-111E AVIONICS CONFIGURATION DATA: INTERFERENCE BLANKER NSN: 5865-00-013-5469 |              |           |                     |   |   |                       |                 |                |    |                  |                |          |
|--------------------------------------------------------------------------------------------|--------------|-----------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                       | Nomenclature | Location  | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                            |              |           | H                   | V | D |                       |                 | AC             | DC |                  |                |          |
| Interference Blanker                                                                       | AN-6770/V    | Door 1102 |                     |   |   |                       |                 |                |    |                  | Forced Air     | Shock    |

| Table 6-14. F-111E AVIONICS CONFIGURATION DATA: IFF TRANSPONDER AN/APX-64 RSM: 5895-00-115-7812 |               |           |                     |       |       |                       |                 |                |       |                  |                |                |
|-------------------------------------------------------------------------------------------------|---------------|-----------|---------------------|-------|-------|-----------------------|-----------------|----------------|-------|------------------|----------------|----------------|
| Name                                                                                            | Nomenclature  | Location  | Dimensions (Inches) |       |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |       | Heat Dissipation | Cooling Method | Mounting       |
|                                                                                                 |               |           | H                   | W     | D     |                       |                 | AC             | DC    |                  |                |                |
| IFF Transponder                                                                                 | AN/APX-64     |           |                     |       |       |                       |                 | 0.3            | 0.03  |                  |                |                |
| Receiver-Transmitter                                                                            | RT-728/APX-64 | Door 1201 | 7.0                 | 11.13 | 19.21 |                       | 30.0            | 0.08           |       | 110W             | Forced Air     | MT-3497/APX-64 |
| Control                                                                                         | C-6717/APX-64 | Cockpit   | 5.25                | 5.75  | 5.00  | 151                   | 2.5             |                |       | 7.5W             | Convection     | Cockpit        |
| Test Set Airborne                                                                               | TS-1843/APX   | Door 1201 | 3.15                | 3.25  | 7.81  | 79.9                  | 3.0             |                | 0.105 | 10.5W            | Forced Air     | MT-3517        |
| Antenna Blade                                                                                   | AS-1919       |           |                     |       |       |                       | 2.0             |                |       |                  |                |                |
| Transponder Computer                                                                            | VIT-1A/T SEC  | Door 1202 | 8.67                | 6.6   | 14.25 | 810.7                 | 12.0            | 0.075          | 0.012 | 30W              | Forced Air     | MT-4579/U      |

| Table e-15. F-111E AVIONICS CONFIGURATION DATA: TFR AM/ANQ-110 (PARTIAL LISTING) NSN: 5841-00-772-1811 |                |             |                     |      |      |                       |                 |                |    |                  |                |          |
|--------------------------------------------------------------------------------------------------------|----------------|-------------|---------------------|------|------|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                                   | Nomenclature   | Location    | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                        |                |             | H                   | W    | D    |                       |                 | AC             | DC |                  |                |          |
| TV Radar System                                                                                        | AM/AN-110      |             |                     |      |      |                       | 13.8            |                |    |                  | Forced Air     | WT-3359  |
| TV Computer                                                                                            | CP-770/AN-110  | Door 1201   |                     |      |      |                       |                 |                |    |                  |                |          |
| Antenna Receiver                                                                                       | AS-2140/AN-128 | Wing Radome |                     |      |      |                       |                 |                |    |                  |                |          |
| TV Indicator                                                                                           | II-771/AN-110  | Cockpit     |                     |      |      |                       | 23.7            |                |    | 126W             | Convection     | Cockpit  |
| TV Radar Set Control                                                                                   | CR-6400/AN-110 | Cockpit     | 3.0                 | 5.75 | 7.31 | 126.1                 | 2.6             |                |    | 11W              | Convection     | Cockpit  |
| Amplifier-Power Supply                                                                                 | AP-4240/AN-110 | Door 1201   | 6.0                 | 6.75 | 7.31 | 713.0                 | 17.6            |                |    |                  | Forced Air     | WT-3359  |
| Synthetic Transmitter                                                                                  | ST-370/AN-110  | Door 1201   |                     |      |      |                       | 26.8            |                |    |                  | Forced Air     | WT-3359  |
| Antenna Receiver                                                                                       |                |             |                     |      |      |                       |                 |                |    |                  |                |          |

| Table 6-16. F-111E AVIONICS CONFIGURATION DATA: ATTACK RADAR SET APQ-113 NSN: TBD |                 |             |                     |       |       |                       |                 |                 |    |                  |                |                 |  |
|-----------------------------------------------------------------------------------|-----------------|-------------|---------------------|-------|-------|-----------------------|-----------------|-----------------|----|------------------|----------------|-----------------|--|
| Name                                                                              | Nomenclature    | Location    | Dimensions (Inches) |       |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power* |    | Heat Dissipation | Cooling Method | Mounting        |  |
|                                                                                   |                 |             | H                   | W     | D     |                       |                 | AC              | DC |                  |                |                 |  |
| Antenna Assembly                                                                  | AS-174/APQ-113  | Nose Radome | 26.0                | 35.0  | 32.0  | 29,120                | 55.0            |                 |    |                  |                |                 |  |
| Antenna Pedestal                                                                  | AB-902/APQ-113  | Nose Radome | 19.0                | 21.0  | 8.0   | 3,192                 | 37.0            |                 |    |                  |                |                 |  |
| Antenna Control                                                                   | C-6498/APQ-113  | Nose Radome | 10.0                | 27.0  | 8.0   | 2,160                 | 38.0            |                 |    | 98W              |                |                 |  |
| Modulator Receiver Transmitter                                                    | MD-608/APQ-113  | Door 1101   | 21.0                | 13.0  | 21.0  | 5,733                 | 101.0           |                 |    | 1kW              | Forced Air     | MT-3384/APQ-113 |  |
| Electrical Synchronizer                                                           | SN-380/APQ-113  | Door 1101   | 13.25               | 13.0  | 20.75 | 3,574                 | 78.0            |                 |    | 392W             | Forced Air     | MT-3384/APQ-113 |  |
| Indicator Recorder                                                                | IP-777/APQ-113  | Cockpit     | 9.25                | 16.25 | 30.5  | 4,585                 | 63.0            |                 |    |                  | Convection     | Cockpit         |  |
| Radar Set Control                                                                 | C-6499/APQ-113  | Cockpit     | 3.75                | 5.75  | 6.5   | 140                   | 3.0             |                 |    |                  | Convection     | Cockpit         |  |
| Antenna-Indicator Control                                                         | C-6500/APQ-113  | Cockpit     | 8.75                | 5.0   | 3.5   | 153                   | 2.0             |                 |    |                  | Convection     | Cockpit         |  |
| Electrical Equipment Rack                                                         | MT-3384/APQ-113 | Door 1101   | 34.25               | 13.25 | 25.75 | 9,870                 | 6.0             |                 |    |                  |                |                 |  |
| *Total system power dissipation is 1.637 kwac; 0.1 kwdc.                          |                 |             |                     |       |       |                       |                 |                 |    |                  |                |                 |  |

| Table 6-17. F-111E AVIONICS CONFIGURATION DATA: INFRARED RADAR AN/AAR-34 NSM: TBD |                |          |                     |   |   |                       |                 |                |    |                  |                |          |
|-----------------------------------------------------------------------------------|----------------|----------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                              | Nomenclature   | Location | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                   |                |          | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| Receiver Control                                                                  | CV-8250/AAR-34 |          |                     |   |   |                       |                 |                |    |                  |                |          |
| Search Track                                                                      | CV-2630/AAR-34 |          |                     |   |   |                       |                 |                |    |                  |                |          |
| Scanner                                                                           |                |          |                     |   |   |                       |                 |                |    |                  |                |          |
| Video Signals Processor                                                           | CM-389/AAR-34  |          |                     |   |   |                       |                 |                |    |                  |                |          |
| DETAILS OF THE AN/AAR-34 ARE CLASSIFIED.                                          |                |          |                     |   |   |                       |                 |                |    |                  |                |          |



| Table 6-19. F-111E AVIONICS CONFIGURATION DATA: ECM AM/ALQ-94 MSM: 5065-00-890-0422 |                |           |                     |   |   |                       |                 |                |    |                  |                |                |
|-------------------------------------------------------------------------------------|----------------|-----------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------------|
| Name                                                                                | Nomenclature   | Location  | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting       |
|                                                                                     |                |           | H                   | W | D |                       |                 | AC             | DC |                  |                |                |
| Amplifier Mid Band                                                                  | AM-4851/ALQ-94 | Door 1101 |                     |   |   |                       |                 |                |    |                  | Forced Air     | MT-3878/ALQ-94 |
| Receiver Mid                                                                        | R-1496/ALQ-94  | Door 1101 |                     |   |   |                       |                 |                |    |                  | Forced Air     | MT-3878/ALQ-94 |
| Amplifier Low Band                                                                  | AM-4850/ALQ-94 | Door 1101 |                     |   |   |                       |                 |                |    |                  | Forced Air     | MT-3877/ALQ-94 |
| Receiver Low                                                                        | R-1497/ALQ-94  | Door 1101 |                     |   |   |                       |                 |                |    |                  | Forced Air     | MT-3877/ALQ-94 |
| Amplifier High Band                                                                 | AM-4852/ALQ-94 | Door 1201 |                     |   |   |                       |                 |                |    |                  | Forced Air     | MT-3879/ALQ-94 |
| Receiver High                                                                       | R-1499/ALQ-94  | Door 1201 |                     |   |   |                       |                 |                |    |                  | Forced Air     | MT-3879/ALQ-94 |
| Control                                                                             | C-7410/ALQ-94  | Cockpit   |                     |   |   |                       |                 |                |    |                  | Convection     | Panel          |
| Antenna No. 1                                                                       |                |           |                     |   |   |                       |                 |                |    |                  |                |                |
| Antenna No. 5                                                                       |                |           |                     |   |   |                       |                 |                |    |                  |                |                |
| Antenna No. 7                                                                       |                |           |                     |   |   |                       |                 |                |    |                  |                |                |
| Antenna No. 9                                                                       |                |           |                     |   |   |                       |                 |                |    |                  |                |                |
| Antenna High                                                                        |                |           |                     |   |   |                       |                 |                |    |                  |                |                |
| Antenna Mid                                                                         |                |           |                     |   |   |                       |                 |                |    |                  |                |                |
| Antenna Low                                                                         |                |           |                     |   |   |                       |                 |                |    |                  |                |                |

DETAILS OF THE AM/APS-109 ARE CLASSIFIED.

| Table 6-20. F-111E AVIONICS CONFIGURATION DATA: CM DISPENSER SET (PARTIAL LISTING) AM/ALE-28 NSN: 5865-00-105-8987* |               |          |                     |      |      |                       |                 |                |       |                  |                |          |
|---------------------------------------------------------------------------------------------------------------------|---------------|----------|---------------------|------|------|-----------------------|-----------------|----------------|-------|------------------|----------------|----------|
| Name                                                                                                                | Nomenclature  | Location | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |       | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                                     |               |          | H                   | W    | D    |                       |                 | AC             | DC    |                  |                |          |
| CM Dispenser Set                                                                                                    | AM/ALE-28     |          |                     |      |      |                       |                 |                |       |                  |                |          |
| Control                                                                                                             | C-6471/ALE-28 | Cockpit  | 4.12                | 5.75 | 6.25 | 148.0                 | 4.6             | 0.15           | 0.075 | 111W             |                |          |
| Control Sequence Eject                                                                                              | C-6472/ALE-28 |          | 2.25                | 7.00 | 5.31 | 83.6                  | 2.2             |                |       | 20W              | Convection     | Cockpit  |
| Eject Force Display                                                                                                 | D-22/ALE-28   |          | 11.6                | 9.8  | 32.4 | 3,683.0               | 51.0            |                |       | 2.05W            |                |          |
| Disarmable Control Panel                                                                                            |               | Cockpit  | 1.12                | 5.75 | 4.0  | 25.76                 | 0.4             | 0.005          | 0.007 | 17W              | Convection     | Cockpit  |
|                                                                                                                     |               |          |                     |      |      |                       |                 |                |       |                  |                |          |
| *1100 NSN: 5865-00-114-7146.                                                                                        |               |          |                     |      |      |                       |                 |                |       |                  |                |          |

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| Table 6-21. F-111E AVIONICS CONFIGURATION DATA: PHOTOGRAPHIC EQUIPMENT |                                   |          |                     |   |   |                       |                 |                |    |                  |                |          |
|------------------------------------------------------------------------|-----------------------------------|----------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                   | Nomenclature                      | Location | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                        |                                   |          | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| ANAL Camera<br>Still Picture                                           | 140-176 NSN:<br>6720-00-051-0422  | T40      |                     |   |   |                       |                 |                |    |                  |                |          |
| Reconnaissance Camera<br>Still Picture                                 | 140-176A NSN:<br>6720-00-051-0427 | T40      |                     |   |   |                       |                 |                |    |                  |                |          |
| Control Box<br>Camera Still<br>Picture                                 | 140-176A NSN:<br>6720-00-051-0427 | T40      |                     |   |   |                       |                 |                |    |                  |                |          |

| Table 6-22. P-111E AVIONICS CONFIGURATION DATA: RECORDER SET RA/A24U-6 RSM: TBD |                |          |                     |   |   |                       |                 |                |    |                  |                |          |
|---------------------------------------------------------------------------------|----------------|----------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                            | Nomenclature   | Location | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                 |                |          | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| Recorder Mechanism Assembly<br>Main Unit<br>Recorder Set                        | MXE-316/A24U-6 | TBD      |                     |   |   |                       |                 |                |    |                  |                |          |
|                                                                                 | MXE-315/A24U-6 | TBD      |                     |   |   |                       |                 |                |    |                  |                |          |

| Table 6-23. F-111E AVIONICS CONFIGURATION DATA: LEAD COMPUTING OPTICAL SIGHT SYSTEM AN/ASG-23 NSN: 1270-00-244-6805 |                |           |                     |      |      |                       |                 |                |    |                  |                |          |
|---------------------------------------------------------------------------------------------------------------------|----------------|-----------|---------------------|------|------|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                                                | Nomenclature   | Location  | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                                     |                |           | H                   | W    | D    |                       |                 | AC             | DC |                  |                |          |
| Optical Display Sight                                                                                               | SU-29/ASG-23   | Cockpit   | 8.9                 | 6.8  | 23.0 | 1,392                 | 20.0            |                |    |                  | Convection     | Cockpit  |
| Lead and Launch Computer Amplifier                                                                                  | AN-4301/ASG-23 | Door 1102 | 4.9                 | 8.02 | 15.2 | 597                   | 20.0            |                |    |                  | Forced Air     | Shock    |
| Lead Computing Gyro                                                                                                 | CN-1060/ASG-23 | Door 1102 | 10.5                | 10.5 | 9.0  | 992                   | 14.0            |                |    |                  | Forced Air     | Hard     |
| Amplifier Mounting Rack                                                                                             |                | Door 1102 | 1.0                 | 8.35 | 15.7 |                       | 1.0             |                |    |                  |                |          |

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## 7. ANTENNA LOCATIONS

Figure 7-1 shows the approximate locations of the antennas on the F-111E. Antenna nomenclature from the current technical orders is as follows:

| <u>Antenna</u>                               | <u>Nomenclature or<br/>Part Number</u>                   |
|----------------------------------------------|----------------------------------------------------------|
| 1. Glide Slope Strip                         | 12Z519-7                                                 |
| Glide Slope Plate                            | 12Z517-1                                                 |
| 2. ADF                                       | AS-909/ARA-48                                            |
| 3. IFF (Upper) and UHF Data Link             | 11D020100-6                                              |
| 4. Radio Beacon Set                          | AN/URT-27 or -33                                         |
| 5. UHF No. 1 and TACAN Upper                 | 11D020100-6                                              |
| 6. HF Dorsal                                 | 12T501-807                                               |
| HF Vertical                                  | 12T010-849                                               |
| 7. IFF Lower                                 | AT-741B/A                                                |
| 8. Localizer (2)                             | TBD                                                      |
| 9. Low and Medium Frequency Radar Homing (4) | } LH Installation 12E2239-5<br>RH Installation 12E2239-6 |
| 10. Forward Radar Warning (2)                |                                                          |
| 11. High Frequency Radar Homing (4)          | } AS-2136/APQ-110<br>AS-1749/APQ-113                     |
| 12. Terrain Following Radar (2)              |                                                          |
| 13. Attack Radar                             | AS-1749/APQ-113                                          |
| 14. AN/ALQ-94 ECM No. 3                      | 12E2907-1                                                |
| AN/ALQ-94 ECM No. 5                          | 12E2908-1                                                |
| AN/ALQ-94 ECM No. 7                          | 12E2909-1                                                |
| 15. Radar Altimeter                          | LG81G3                                                   |
| 16. AN/ALR-62                                | 311190-1                                                 |
| 17. AN/ALQ-94 High Band Wing Glove (4)       | 12E2989-1                                                |
| AN/ALQ-94 Medium Band Wing Glove (2)         | 12E2987-1                                                |
| AN/ALQ-94 Low Band Wing Glove (4)            | 12E2988-1                                                |
| AN/ALQ-94 Mid Band, Transmit Wing Glove (2)  | 12E2999-1                                                |
| 18. AN/ALR-62 (2)                            | 12E2982-1                                                |
| 19. Aft Radar Warning (2)                    | 12E805-1                                                 |
| 20. AN/ALQ-94 ECM No. 9 LH (3)               | 12E2910-3                                                |
| AN/ALQ-94 ECM No. 9 RH (3)                   | 12E2910-1                                                |
| 21. UHF No. 2 and TACAN Lower                | 11D020100-3                                              |
| 22. AN/ALQ-94 ECM No. 3                      | 12E2907-1                                                |
| AN/ALQ-94 ECM No. 5                          | 12E2908-1                                                |
| AN/ALQ-94 ECM No. 7                          | 12E2909-1                                                |
| 23. Marker Beacon                            | 16D00500                                                 |

# Antenna Locations (Typical)

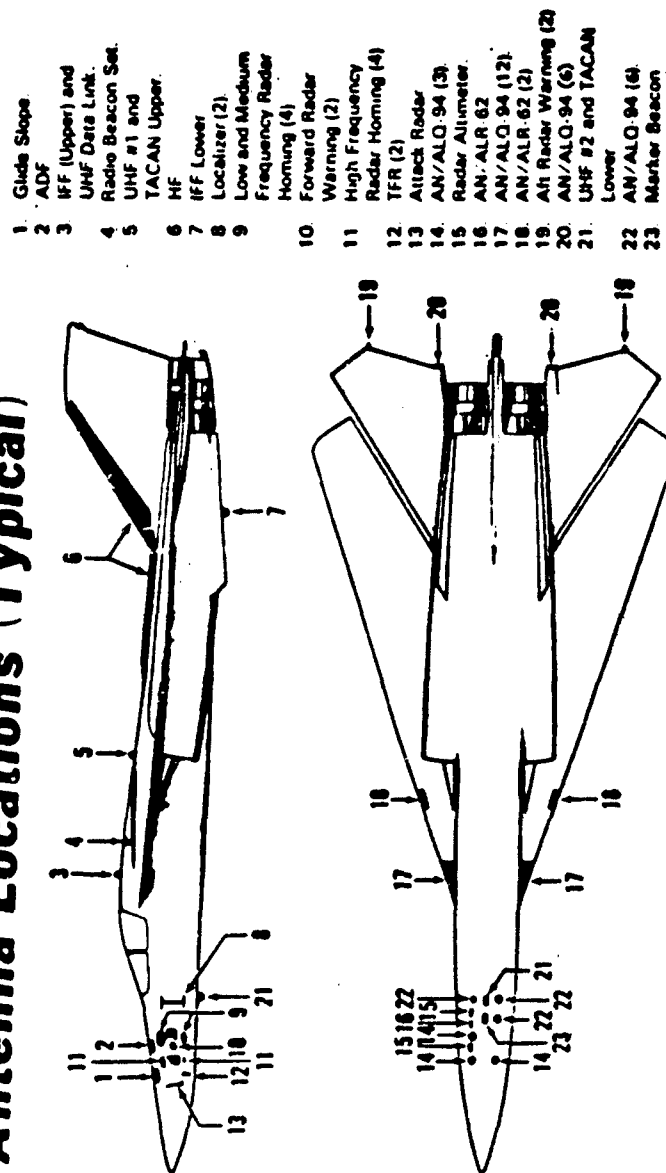


Figure 7-1. ANTENNA LOCATIONS (TYPICAL)

## 8. INTERFACE DATA

This section contains examples of interface signal characteristics. These data were extracted from applicable sections of the Interface Control Documents (ICDs) for integration of GPS user equipment in the F-111E aircraft.

Each sheet discusses a particular signal. The top line contains the signal name, type of signal (digital, analog, discrete, or synchronous), signal source and load, and whether the signal is an input or output of the GPS user equipment. A functional description follows, together with a description of the signal's characteristics.

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM | TO           |
|-------------|---------|-----|------|--------------|
| Bearing     | Synchro | O   | UE   | HSI and BDHI |

## Functional Description

Provides angular information to the bearing pointer\* to display relative bearing of the aircraft's present position to selected waypoint. The relative bearing is the difference, in degrees, between the lubber line and the bearing pointer as read from the compass card.

\*No. 1 pointer on BDHI

## Signal Characteristics

RANGE: 0° to 360°  
 ACCURACY: +0.5°  
 INDEX REFERENCE: Aircraft Heading  
 POSITIVE DIRECTION SENSE: Increasing Bearing  
 SCALE FACTOR: 1° = 10  
 RESOLUTION: HSI ± 2.5°, BDHI ± 0.5°

## Electrical Characteristics (continued on next page)

LOAD: 1) HSI, AQU-4/A, Bearing Pointer, 3-Wire Synchro, Bendix Type AY-500-5 or equal  
 2) BDHI, ES165001400, No. 1 Pointer, 3-Wire Synchro, Bendix Type AY-100 MY-59-A1 or equal

SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Triad  
 Wire Size: No. 22 AWG

A/C: F-111A/E  
 REF: MIL-I-27848  
 12R5-4-65-3  
 1F-111A-2-18-1  
 1F-111E-2-18-1

|   |                   |            |
|---|-------------------|------------|
| A | ICD-GPS-014 & 017 |            |
|   | REV               | SHEET 10-2 |

# ELECTRICAL CHARACTERISTICS

| LOAD 1                                                                       |             |         | LOAD 2                                                                                  |             |         |
|------------------------------------------------------------------------------|-------------|---------|-----------------------------------------------------------------------------------------|-------------|---------|
| HSI, AQU-4/A, Bearing Pointer, 3-Wire Synchro, Bendix Type AY-500-5 or equal |             |         | BDHI, E 5165001400, No. 1 Pointer, 3-Wire Synchro, Bendix Type AY-100 HY-59-A1 or equal |             |         |
| ROTOR                                                                        |             |         |                                                                                         |             |         |
| Input Voltage                                                                | 26          | Volts   | Primary Winding                                                                         | Stator      |         |
| Frequency                                                                    | 400         | Cycles  | Primary Voltage (400 Hz)                                                                | 11.8        | Volts   |
| Input Current                                                                | --          | ma      | Secondary Voltage                                                                       | 20.3        | Volts   |
| Input Power                                                                  | --          | Watts   | Input Current                                                                           | .020        | Amps    |
| Resistance (DC)                                                              | 530         | Ohms    | Input Power                                                                             | .060        | Watts   |
|                                                                              |             |         | Max. Error Spread                                                                       | +6          | Minutes |
|                                                                              |             |         | Max. Null Voltage                                                                       | 30          | mv      |
|                                                                              |             |         | Zro                                                                                     | 595 + J2130 |         |
|                                                                              |             |         | Zso                                                                                     | 750 + J369  |         |
|                                                                              |             |         | Rotor DC Resistance                                                                     | 409         | Ohms    |
|                                                                              |             |         | Stator DC Resistance                                                                    | 1200        | Ohms    |
| STATOR                                                                       |             |         |                                                                                         |             |         |
| Input Voltage                                                                | 11.8        | Volts   |                                                                                         |             |         |
| Input Current                                                                | 20          | ma      |                                                                                         |             |         |
| Input Power                                                                  | 0.090       | Watts   |                                                                                         |             |         |
| Resistance (DC)                                                              | 188         | Ohms    |                                                                                         |             |         |
| Rotor Output Voltage                                                         | 19          | Volts   |                                                                                         |             |         |
| Phase Shift (S to R)                                                         | 15          | Degrees |                                                                                         |             |         |
| Accuracy (Max)                                                               | 15          | Minutes |                                                                                         |             |         |
| Null Voltage (Max)                                                           | 50          | mv      |                                                                                         |             |         |
| IMPEDANCE                                                                    |             |         |                                                                                         |             |         |
| Zso                                                                          | 222 + j470  | Ohms    |                                                                                         |             |         |
| Zro                                                                          | 940 + J2260 | Ohms    |                                                                                         |             |         |
| Zrss                                                                         | 1050 + j450 | Ohms    |                                                                                         |             |         |

|     |                   |
|-----|-------------------|
| A   | ICD-GPS-014 & 017 |
| REV | 10-3              |



# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME     | TYPE    | I/O | FROM | TO         |
|-----------------|---------|-----|------|------------|
| Distance, Units | Synchro | O   | UE   | HSI & BDWI |

## Functional Description

Provides angular information to rotate the units digit in the range window. Displays aircraft present position distance to selected waypoint in 1 nm increments (0.5 nm indexed). Driven independently of other digits, but read in conjunction with them in order to provide the least significant digit.

## Signal Characteristics

RANGE: 0 to 9 (0° to 360°)  
 ACCURACY:  $\pm 0.1$  ( $\pm 3.6^\circ$ )  
 INDEX REFERENCE: 0  
 POSITIVE DIRECTION SENSE: To decreasing values (distance to go)  
 SCALE FACTOR:  $36^\circ = 1$  numeral  
 RESOLUTION:  $\pm 3^\circ$

## Electrical Characteristics (continued on next page)

LOAD: 1) HSI, AQU-4/A, Distance Display, 3-Wire Synchro, Clifton Type CRC-8-A-1 or equal  
 2) BDWI, E5165001400, Distance Display, 3-Wire Synchro, Bendix Type AY 080-DD-46-A1 or equal

SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Two Single Conductors (X, Y) -  
 Wire Size: No. 22 AWG

Note: "Z" grounded through 26 Vac common.

A/C: F-111A/E  
 REF: MIL-I-27848  
 T.O. 12RS-4-65-3  
 1F-111A-2-18-1  
 1F-111E-2-1A-1

|      |               |                   |
|------|---------------|-------------------|
| DATE | TIME 00 00 00 | REMARKS 00        |
| A    |               | ICD-GPS-014 & 017 |
| NAME | REV           | PAGE 10-4         |

# ELECTRICAL CHARACTERISTICS

| LOAD 1                                                                          |           |         | LOAD 2                                                                                     |           |         |
|---------------------------------------------------------------------------------|-----------|---------|--------------------------------------------------------------------------------------------|-----------|---------|
| HSI, AQU-4/A, Distance Display, 3-Wire Synchro, Clifton Type CRC-8-A-1 or equal |           |         | BDHI, ES165001400, Distance Display, 3-Wire Synchro, Bendix Type, AY 080-00-46-A1 or equal |           |         |
| Primary Winding                                                                 | Rotor     |         | Primary Winding                                                                            | Rotor     |         |
| Primary Voltage (400 Hz)                                                        | 26        | Volts   | Primary Voltage (400 Hz)                                                                   | 26        | Volts   |
| Secondary Voltage                                                               | 11.8      | Volts   | Secondary Voltage                                                                          | 11.8      | Volts   |
| Input Current                                                                   | 100       | ma      | Input Current                                                                              | 187       | ma      |
| Input Power                                                                     | .54       | Watts   | Input Power                                                                                | 1.1       | Watts   |
| Accuracy                                                                        | 30        | Feet    | Max. Error Spread                                                                          | +1.25     | Degrees |
| Impedance, Zro                                                                  | 54 + j260 | Ohms    | Impedance, Zro                                                                             | 32 + j150 |         |
| Impedance, Zso                                                                  | 12 + j45  | Ohms    | Impedance, Zso                                                                             | 6.8 + j26 |         |
|                                                                                 |           |         | Impedance, Zrs                                                                             | 57 + j14  |         |
| Rotor DC Resistance                                                             | 37        | Ohms    | Rotor DC Resistance                                                                        | 24        | Ohms    |
| Stator DC Resistance                                                            | 12        | Ohms    | Stator DC Resistance                                                                       | 7.3       | Ohms    |
| Phase Shift                                                                     | 8.5       | Degrees |                                                                                            |           |         |

|                   |      |      |     |      |      |
|-------------------|------|------|-----|------|------|
| REV               | DATE | BY   | REV | DATE | BY   |
| A                 |      |      |     |      |      |
| ICD-GPS-014 0 017 |      |      |     |      |      |
| DATE              | REV  | DATE | REV | DATE | REV  |
|                   |      |      |     |      | 10-5 |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME   | TYPE    | I/O | FROM | TO         |
|---------------|---------|-----|------|------------|
| Distance Tens | Synchro | 0   | UE   | HSI & BDHI |

## Functional Description

Provides angular information to rotate the tens digit in the range window. Displays aircraft present position distance to selected waypoint in 10 nm increments. Driven independently of other distance digits but read in conjunction with them.

## Signal Characteristics

RANGE: 0 to 9 (0° to 360°)  
 ACCURACY:  $\pm 0.1$  ( $\pm 3.6^\circ$ )  
 INDEX REFERENCE: 0  
 POSITIVE DIRECTION SENSE: To decreasing values (distance to go)  
 SCALE FACTOR:  $360^\circ = 1$  numeral  
 RESOLUTION:  $\pm 3^\circ$

## Electrical Characteristics (continued on next page)

LOAD: 1) HSI, AQU-4/A, Distance Display, 3-Wire Synchro, Clifton Type CRC-8-A-1 or equal  
 2) BDHI, E5165001400, Distance Display, 3-Wire Synchro, Bendix Type AY 080-DD-46-A1 or equal  
 SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Two Single Conductors (X, Y)  
 Wire Size: No. 22 AWG  
 Note: "Z" grounded through 26 Vac common.

A/C: F-111A/E  
 REF: MIL-I-27848  
 12R5-4-65-3  
 1F-111A-2-18-1  
 1F-111E-2-18-1

|                   |      |      |      |      |      |
|-------------------|------|------|------|------|------|
| REV               | DATE | BY   | CHKD | DATE | BY   |
| A                 |      |      |      |      |      |
| ICD-GPS-014 & 017 |      |      |      |      |      |
| SCALE             | REV  | DATE | BY   | CHKD | DATE |
|                   |      |      |      |      | 10-6 |

## ELECTRICAL CHARACTERISTICS

| LOAD 1                                                                          |           |         |  | LOAD 2                                                                                   |           |         |  |
|---------------------------------------------------------------------------------|-----------|---------|--|------------------------------------------------------------------------------------------|-----------|---------|--|
| HSI, AQU-4/A, Distance Display, 3-Wire Synchro, Clifton Type CRC-8-A-1 or equal |           |         |  | BDHI, E5165001400, Distance Display, 3-Wire Synchro, Bendix Type AY080-00-46-A1 or equal |           |         |  |
| Primary Winding                                                                 | Rotor     |         |  | Primary Winding                                                                          | Rotor     |         |  |
| Primary Voltage (400 Hz)                                                        | 26        | Volts   |  | Primary Voltage (400 Hz)                                                                 | 26        | Volts   |  |
| Secondary Voltage                                                               | 11.8      | Volts   |  | Secondary Voltage                                                                        | 11.8      | Volts   |  |
| Input Current                                                                   | 100       | ma      |  | Input Current                                                                            | 187       | ma      |  |
| Input Power                                                                     | .54       | Watts   |  | Input Power                                                                              | 1.1       | Watts   |  |
| Accuracy                                                                        | 30        | Feet    |  | Max. Error Spread                                                                        | +1.25     | Degrees |  |
| Impedance, Zro                                                                  | 54 + j260 |         |  | Impedance, Zro                                                                           | 32 + j150 |         |  |
| Impedance, Zso                                                                  | 12 + j45  |         |  | Impedance, Zso                                                                           | 6.8 + j26 |         |  |
|                                                                                 |           |         |  | Impedance, Zrs                                                                           | 57 + j14  |         |  |
| Rotor DC Resistance                                                             | 37        | Ohms    |  | Rotor DC Resistance                                                                      | 24        | Ohms    |  |
| Stator DC Resistance                                                            | 12        | Ohms    |  | Stator DC Resistance                                                                     | 7.3       | Ohms    |  |
| Phase Shift                                                                     | 8.5       | Degrees |  |                                                                                          |           |         |  |

|          |          |                   |       |
|----------|----------|-------------------|-------|
| DATE     | 12-28-68 | TIME              | 10:00 |
| <b>A</b> |          | ICD-GP5-014 & 017 |       |
| TIME     | 09:00    | DATE              | 10-7  |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME        | TYPE    | I/O | FROM | TO         |
|--------------------|---------|-----|------|------------|
| Distance, Hundreds | Synchro | 0   | UE   | HSI & BDHI |

## Functional Description

Provides angular information to rotate the hundreds digit in the range window. Displays aircraft present position distance to the selected waypoint in 100 nm increments. Driven independently of the other distance digits, but read in conjunction with them in order to provide the most significant digit for the distance value.

## Signal Characteristics

RANGE: 0 to 9 (0° to 360°)  
 ACCURACY:  $\pm 0.1$  ( $\pm 3.6^\circ$ )  
 INDEX REFERENCE: 0  
 POSITIVE DIRECTION SENSE: To decreasing values (distance to go)  
 SCALE FACTOR:  $36^\circ = 1$  numeral  
 RESOLUTION:  $\pm 3^\circ$

## Electrical Characteristics (continued on next page)

- LOAD: 1) HSI, AQU-4/A, Distance Display, 3-Wire Synchro, Clifton Type CRC-8-A-1 or equal  
 2) BDHI, E5165001400, Distance Display, 3-Wire Synchro, Bendix Type AY C80-DD-46-A1 or equal

SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Two Single Conductors (X, Y)  
 Wire Size: No. 22 AWG

Note: "Z" grounded through AC common.

A/C: F-111A/E  
 REF: MIL-I-27848  
 12R5-4-65-3  
 1F-111A-2-18-1  
 1E-111E-2-18-1

|   |      |        |          |
|---|------|--------|----------|
| A | DATE | ISSUED | REVISION |
|   | 10-8 |        |          |

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# ELECTRICAL CHARACTERISTICS

| LOAD 1                                                                          |           |         | LOAD 2                                                                                   |           |         |
|---------------------------------------------------------------------------------|-----------|---------|------------------------------------------------------------------------------------------|-----------|---------|
| HSI, AQU-4/A, Distance Display, 3-Wire Synchro, Clifton Type CRC-8-A-1 or equal |           |         | BDHI, E5165001400, Distance Display, 3-Wire Synchro, Bendix Type AY080-DD-46-A1 or equal |           |         |
| Primary Winding                                                                 | Rotor     |         | Primary Winding                                                                          | Rotor     |         |
| Primary Voltage (400 Hz)                                                        | 26        | Volts   | Primary Voltage (400 Hz)                                                                 | 26        | Volts   |
| Secondary Voltage                                                               | 11.8      | Volts   | Secondary Voltage                                                                        | 11.8      | Volts   |
| Input Current                                                                   | 100       | ma      | Input Current                                                                            | 187       | ma      |
| Input Power                                                                     | .54       | Watts   | Input Power                                                                              | 1.1       | Watts   |
| Accuracy                                                                        | 30        | Feet    | Max. Error Spread                                                                        | +1.25     | Degrees |
| Impedance, Zro                                                                  | 54 + j260 |         | Impedance, Zro                                                                           | 32 + j150 |         |
| Impedance, Zso                                                                  | 12 + j45  |         | Impedance, Zso                                                                           | 6.8 + j26 |         |
|                                                                                 |           |         | Impedance, Zrs                                                                           | 57 + j14  |         |
| Rotor DC Resistance                                                             | 37        | Ohms    | Rotor DC Resistance                                                                      | 24        | Ohms    |
| Stator DC Resistance                                                            | 12        | Ohms    | Stator DC Resistance                                                                     | 7.3       | Ohms    |
| Phase Shift                                                                     | 8.5       | Degrees |                                                                                          |           |         |

|       |      |       |                   |
|-------|------|-------|-------------------|
| REV   | DATE | APP'D | ICD-GPS-014 & 017 |
| A     |      |       |                   |
| SCALE | REV  | DATE  | 10-9              |

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# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME   | TYPE     | I/O | FROM | TO         |
|---------------|----------|-----|------|------------|
| Distance Flag | Discrete | O   | UE   | HSI & BDHI |

## Functional Description

Provides a discrete signal to operate the distance warning flag. The flag is normally out of view when the range indicator is operating and the range data is valid. The flag covers the range indicator when the distance information is not valid or the device supplying the distance data is not operating.

## Signal Characteristics

RANGE: 28 Vdc applied, Flag out of view  
28 Vdc not applied, Flag in view

## Electrical Characteristics

LOAD: 1) HSI (AQU-4/A), distance shutter mechanism, 28 Vdc meter movement  
2) BDHI (E5165001400), distance shutter mechanism, 28 Vdc meter movement, 625 Ohms  $\pm$  10%

SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Pair  
Wire Size: No. 22 AWG

A/C: F-111A/E  
REF: MIL-I-27849  
12R5-4-65-3  
1F-111A-2-18-1  
1F-111E-2-18-1

|      |      |      |      |                   |     |      |      |      |      |
|------|------|------|------|-------------------|-----|------|------|------|------|
| REV  | DATE | BY   | CHKD | DATE              | BY  | CHKD | DATE | BY   | CHKD |
| A    |      |      |      |                   |     |      |      |      |      |
|      |      |      |      | ICD-GPS-014 & 017 |     |      |      |      |      |
| DATE | REV  | DATE | REV  | DATE              | REV | DATE | REV  | DATE | REV  |
|      |      |      |      |                   |     |      |      |      |      |
|      |      |      |      | 10-10             |     |      |      |      |      |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME     | TYPE     | I/O | FROM | TO  |
|-----------------|----------|-----|------|-----|
| Thousand, Digit | Discrete | O   | UE   | HSI |

## Functional Description

Provides a discrete output signal to operate the thousand digit of the HSI when the distance to a selected waypoint is greater than 999 nautical miles.

## Signal Characteristics

Thousand Digit In View: 28 Vdc applied  
Thousand Digit Out of View: 28 Vdc not applied

## Electrical Characteristics

LOAD: HSI (AQU-4/A), thousand digit shutter  
Input Voltage: 28 Vdc  
Input Current: 150 ma

SOURCE: (TBD-1)

## Interconnection Data

(TBD-3)

A/C: F-111A/E  
REF: MIL-I-27848  
T.O. 5FB-16-4-3

|      |        |         |     |                   |
|------|--------|---------|-----|-------------------|
| DATE | ISSUED | REVISED | BY  | REVISION          |
| A    |        |         |     | 100-GPS-014 & 017 |
| REV  | REV    | REV     | REV | 10-11             |



# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE   | I/O | FROM | TO  |
|-------------|--------|-----|------|-----|
| To-From     | Analog | 0   | UE   | HSI |

## Functional Description

Provides a d.c. analog signal to drive the To-From indicator. If the aircraft is flying toward the waypoint and has not intercepted a reference line perpendicular to the aircraft ground track and through the waypoint, the indication will be To. Once past the waypoint reference line, the indication will be From as long as this waypoint is still selected.

## Signal Characteristics

RANGE: To = +225  $\mu$ a Max  
Blank = no signal  
From = -225  $\mu$ a Max

## Electrical Characteristics

LOAD: HSI (AQU-4/A), To-From Arrow, meter movement 200 Ohms  $\pm$  15 resistance

SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Pair  
Wire Size: No. 22 AWG

A/C: F-111A/E  
REF: MIL-I-27848  
1F-111A-2-18-1  
1F-111E-2-18-1

| DATE | CODE | REV  | DESCRIPTION      |
|------|------|------|------------------|
| A    |      |      | ICD-MS-014 & 017 |
| DATE | REV  | DATE | 10-12            |

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# INTERFACE SIGNAL CHARACTERISTIC

| SIGNAL NAME          | TYPE   | I/O | FROM | TO                       |
|----------------------|--------|-----|------|--------------------------|
| Horizontal Deviation | Analog | 0   | UE   | Flight Director Computer |

## Functional Description

Provides a variable d.c. signal that indicates the displacement of the aircraft to the left or right of a selected course. The displacement represented by the indicating device will be controlled by UE software and will be dependent upon aircraft flight phase. Deflection of the indicating device may represent angular displacement (e.g., 10° for a TACAN approach; 2.5° for ILS) or distance. For an area navigation system, the Area Navigation Subcommittee of the Air Transport Association's Air Traffic Control Committee has recommended the following ranges for the flight modes indicated: (a) Enroute: 2-6 miles full scale, (b) Terminal: 1-2 miles full scale and (c) Approach: 600-3000 feet full scale. Choice of presentation (distance/degrees) and scales are (TBD-1).

## Signal Characteristics

RANGE: 0 to  $\pm 150 \mu\text{a}$   
 RESOLUTION:  $3 \mu\text{a}$   
 ACCURACY:  $\pm 10 \mu\text{a}$   
 INDEX REFERENCE: Selected course  
 POSITIVE DIRECTION SENSE: Fly right (+)  
 SCALE FACTOR:  $75 \mu\text{a/dot}$  on the indicator.  
 Distance/angular displacement scale factor (TBD-1)

## Electrical Characteristics

LOAD: Flight Director Computer, CPU-76/A, 1000 Ohms  $\pm 3\%$   
 SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Pair  
 Wire Size: No. 22 AWG

A/C: F-111A/E  
 REF: MIL-I-27848 ARINC Characteristic 582-5  
 MIL-C-83013  
 1F-111A-2-18-1  
 1E-111E-2-18-1

|     |                   |
|-----|-------------------|
| A   | ICD-GPS-014 & 017 |
| REV | 10-13             |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME               | TYPE     | I/O | FROM | TO                       |
|---------------------------|----------|-----|------|--------------------------|
| Horizontal Deviation Flag | Discrete | O   | UE   | Flight Director Computer |

## Functional Description

Provides a discrete signal to operate the deviation warning flag or circuit when the deviation data is unreliable or a malfunction has occurred in the course deviation circuitry.

## Signal Characteristics

RANGE: Deviation signal valid: 245-500 mv.  
Deviation signal invalid: <180 mv

## Electrical Characteristics

LOAD: Flight Director Computer, CPU-76/A, 1000 Ohms,  $\pm$  3% resistance

SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Pair  
Wire Size: No. 22 AWG

A/C: F-111A/E  
REF: MIL-I-27848  
MIL-C-83013  
1F-111A-2-18-1  
1F-111E-2-18-1

|      |       |          |                   |
|------|-------|----------|-------------------|
| DATE | ISSUE | REVISION | DESCRIPTION       |
| A    |       |          | ICD-GPS-014 & 017 |
| DATE | REV   | DATE     | 10-14             |

# INTERFACE SIGNAL CHARACTERISTIC

| SIGNAL NAME        | TYPE   | I/O | FROM | TO                       |
|--------------------|--------|-----|------|--------------------------|
| Vertical Deviation | Analog | 0   | UE   | Flight Director Computer |

## Functional Description

Provides a variable d.c. signal that indicates the displacement of the aircraft above or below a desired flight path. The displacement represented by the indicating device will be controlled by UE software and will be dependent upon aircraft flight phase. Deflection of the indicating device may represent angular displacement (e.g., 0.5° for ILS) or distance. For an area navigation system, the Area Navigation Subcommittee of the Air Transport Association's Air Traffic Control Committee has recommended the following ranges for the flight modes indicated: (a) Enroute: 200 to 2000 feet full scale, (b) Terminal: 60-200 feet full scale and (c) Approach: 40-100 feet full scale. Choice of presentation (distance/degrees) and scales are (TBD-1).

## Signal Characteristics

RANGE: 0 to + 150  $\mu$ a  
 RESOLUTION: 1  $\mu$ a  
 ACCURACY:  $\pm 10 \mu$ a  
 INDEX REFERENCE: Desired flight path  
 POSITIVE DIRECTION SENSE: Fly Down (+)  
 SCALE FACTOR: 75  $\mu$ a/dot on the indicator.  
 Distance/angular displacement scale factor (TBD-1)

## Electrical Characteristics

LOAD: Flight Director Computer, CPU-76/A, 1000 Ohms  $\pm 3\%$   
 SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Pair  
 Wire Size: No. 22 AWG

A/C: F-111A/E  
 REF: MIL-C-83013  
 1F-111A-2-17-1  
 1F-111E-2-17-1  
 ARINC Characteristic 582-5

|     |                   |
|-----|-------------------|
| A   | ICD-GPS-014 & 017 |
| REV | 10-15             |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME             | TYPE     | I/O | FROM | TO                       |
|-------------------------|----------|-----|------|--------------------------|
| Vertical Deviation Flag | Discrete | O   | UE   | Flight Director Computer |

## Functional Description

Provides a discrete signal to the Flight Director Computer when the UE vertical deviation signal is unreliable. This signal is similar to glideslope flag signal.

## Signal Characteristics

RANGE: Deviation signal valid: 245-500 mv.  
Deviation signal invalid:  $\pm$ 180 mv.

## Electrical Characteristics

LOAD: Flight Director Computer, CPU-76/A, 1000 Ohms  $\pm$  3.

SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Pair  
Wire Size: No. 22 AWG

A/C: F-111A/E  
REF: MIL-C-83013  
1F-111A-2-17-1  
1F-111E-2-17-1

|      |          |                   |
|------|----------|-------------------|
| DATE | REVISION | DESCRIPTION       |
| A    |          | ICU-GPS-014 & 017 |
| DATE | REV      | 10-16             |

# INTERFACI SIGNAL CHARACTERISTICS

| SIGNAL NAME         | TYPE    | I/O | FROM | TO   |
|---------------------|---------|-----|------|------|
| Digital Output Data | Digital | O   | UE   | IBNS |

## Functional Description

Provides position, velocity and time and other parameters (TBD-3) to the IBNS to update the Inertial Navigation Set and to aid in navigation and bombing solutions. (See Appendix II.)

## Signal Characteristics

Word/Frame Structure: (TBD-3)  
 Information Identifier: (TBD-3)  
 Data Standard: (TBD-3)  
 Timing Tolerances: (TBD-3)

## Electrical Characteristics

(TBD-3)

## Interconnection Data

(TBD-3)

A/C: F-111A/E  
 RLF:

|      |          |                   |       |
|------|----------|-------------------|-------|
| DATE | 10-17-77 | REVISION          | 1     |
| A    |          | ICD-GPS-014 & 017 |       |
| REV  | 1        | REV               | 10-17 |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME      | TYPE    | I/O | FROM                              | TO |
|------------------|---------|-----|-----------------------------------|----|
| Magnetic Heading | Synchro | I   | AFRS-Electronic Control Amplifier | UE |

## Functional Description

Provides angular reference signal of aircraft heading relative to magnetic north.

## Signal Characteristics

RANGE: 0° to 360°  
 ACCURACY: ±0.5°  
 INDEX REFERENCE: Magnetic North  
 POSITIVE DIRECTION SENSE: Nose Right  
 SCALE FACTOR: 1° = 1°  
 RESOLUTION: (TBD-?)

## Electrical Characteristics (continued on next page)

SOURCE: Auxiliary Flight Reference System, Electronic Control Amplifier (ASK 25A/A24G-26), 3-wire Synchro, Clifton CGM-8-A-7 or equal

LOAD: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Triad  
 Wire Size: No. 22 AWG

A/C: F-111A/E  
 REF: MIL-C-38418  
 T.O. 1F-111A-2-12-1  
 T.O. SF4-21-3  
 T.O. SF4-21-4  
 T.O. 1F-111E-2-12-1

|      |      |                   |
|------|------|-------------------|
| APP  | DATE | REVISION          |
| A    |      | ICD-GPS-014 & 017 |
| DATE | REV  | DATE              |
|      |      | 10-18             |

# ELECTRICAL CHARACTERISTICS

| SOURCE 1                                 |                   |
|------------------------------------------|-------------------|
| Synchro, Clifton Type CGH-6-A-7 or equal |                   |
| Input Voltage                            | 117V 400Hz        |
| Input Current                            | 29 ma             |
| Input Power                              | 0.8 w             |
| Output Voltage (Max)                     | 11.8V             |
| Sensitivity                              | 200 mv/deg        |
| Phase Shift                              | 10 deg            |
| DC Rotor Resistance                      | 700 Ohms          |
| DC Stator Resistance                     | 10.4 Ohms         |
| Impedance, Zro                           | 950 + j3,850 Ohms |
| Impedance, Zso                           | 10 + j36 Ohms     |
| Impedance, Zrss                          | 1550 + j420 Ohms  |
| Max Null Volt-g.                         | 75 mv             |
| Accuracy (Max Error Spread)              | 14 minutes        |

|       |      |      |                   |
|-------|------|------|-------------------|
| REV   | DATE | BY   | APPROVED BY       |
| A     |      |      | ICD-GPS-014 & G17 |
| SCALE | REV  | DATE | 10-19             |



# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME   | TYPE    | I/O | FROM                      | TO |
|---------------|---------|-----|---------------------------|----|
| True Airspeed | Synchro | I   | Central Air Data Computer | UE |

## Functional Description

Provides an input of true airspeed in synchro format.

## Signal Characteristics

RANGE:  
 ACCURACY:  
 INDEX REFERENCE: (TSC-2)  
 POSITIVE DIRECTION SENSE:  
 SCALE FACTOR:  
 RESOLUTION:

## Electrical Characteristics (continued on next page)

SOURCE: Central Air Data Computer, 1903633-4, 3-Wire Synchro, Bendix type AY 300S 16A7 or equal

LOAD: (TBD-1)

## Interconnection Data

Wire Type & No.: 2 Shielded Conductors (X, Y)  
 Wire Size: No. 22 AWG

Note: "Z" ties to shield ground

A/C: F-111A/E  
 REF: T.O. 5F5-4-17-3  
 T.O. 1F-111A-2-16-1  
 T.O. 1F-111E-2-16-1

|   |       |     |       |
|---|-------|-----|-------|
| A | DATE  | REV | ISSUE |
|   | 10-20 |     |       |

ICD-GPS-014 & 017

# ELECTRICAL CHARACTERISTICS

| SOURCE 1                                                                                                                                                                                                                                      |                                                                                                                                                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Synchro, Bendix Type AY 300S 16A7 or equal                                                                                                                                                                                                    |                                                                                                                                                        |
| Primary Winding<br>Input Voltage<br>Input Current<br>Input Power<br>Output Voltage (Max)<br>Phase Shift<br>DC Rotor Resistance<br>AC Stator Resistance<br>Impedance, Zro<br>Impedance, Zso<br>Max Null Voltage<br>Accuracy (Max error spread) | Rotor<br>26 Vac, 400 Hz<br>91 ma<br>0.6 watts<br>11.8V<br>9.5° lead<br>50 ohms<br>16 ohms<br>70 + j305 ohms<br>16.5 + j50 ohms<br>30 mv<br>±10 minutes |

|       |                |          |                   |
|-------|----------------|----------|-------------------|
| DATE  | LABORATORY NO. | TEST NO. | TESTING NO.       |
| A     |                |          | ICD-GPS-014 & 017 |
| TABLE | REV            | DATE     | 10-21             |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME         | TYPE    | I/O | FROM                      | TO |
|---------------------|---------|-----|---------------------------|----|
| Barometric Altitude | Synchro | I   | Central Air Data Computer | UE |

## Functional Description

Provides an input of barometric altitude in synchro format.

## Signal Characteristics

RANGE:  
 ACCURACY:  
 INDEX REFERENCE: (TBD-2)  
 POSITIVE DIRECTION SENSE:  
 SCALE FACTOR:

## Electrical Characteristics (continued on next page)

SOURCE: Central Air Data Computer, 1903633-4, 3-wire synchro  
 Bendix type AY 300C 43A1 or equal

LOAD: (TBDG)

## Interconnection Data

Wire Type & No.: Shielded Pair and One Shielded Conductor  
 Wire Size: No. 22 AWG

A/C: F-111A/E  
 REF: T.O. 5F5-4-17-3  
 T.O. 1F-111A-2-16-1  
 T.O. 1F-111E-2-16-1

|     |                   |
|-----|-------------------|
| A   | ICD-GPS-014 & 017 |
| REV | 10-22             |

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8-22

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME     | TYPE  | I/O | FROM                 | TO |
|-----------------|-------|-----|----------------------|----|
| Blanking Pulses | Pulse | I   | Interference Blanker | UE |

## Functional Description

The interference blanker provides blanking pulses to prevent interference between systems operating in the same frequency spectrum.

## Signal Characteristics (see pages 10-24 and 10-25)

## Electrical Characteristics

SOURCE: Interference Blanker, MX-8103/A

LOAD: (TBD-1)

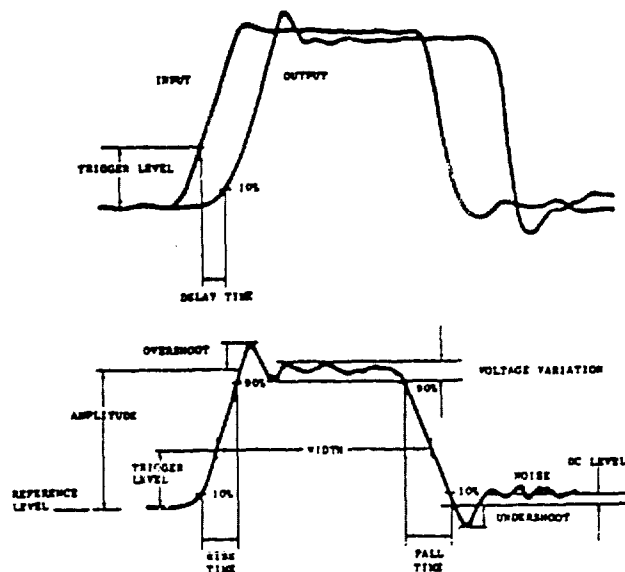
## Interconnection Data

Wire Type & No.: Coaxial Cable, RG-58 C/U

A/C: F-111A/E  
REF: T.O. 12P3-4-22-12  
T.O. 1F-111A-2-22  
T.O. 1F-111E-2-22

| DATE  | CODE IDENT NO | DESCRIPTION, NO   |
|-------|---------------|-------------------|
| A     |               | ICD-GPS-014 & 017 |
| SCALE | REV           | SHEET             |
|       |               | 10-23             |

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- AMPLITUDE - AVERAGE DC-LEVEL OF THE PULSE TOP, OVERSHOOT EXCLUDED.
- RISE TIME - TIME INTERVAL BETWEEN THE 10% AMPLITUDE LEVEL AND THE 90% AMPLITUDE LEVEL ON THE LEADING EDGE OF THE PULSE.
- FALL TIME - TIME INTERVAL BETWEEN THE 90% AMPLITUDE LEVEL AND THE 10% AMPLITUDE LEVEL ON THE TRAILING EDGE OF THE PULSE.
- WIDTH - TIME INTERVAL BETWEEN THE POINT WHERE THE PULSE CROSSES THE NOMINAL TRIGGER LEVEL ON THE LEADING EDGE OF THE PULSE AND THE POINT WHERE THE PULSE CROSSES THE NOMINAL TRIGGER LEVEL ON THE TRAILING EDGE OF THE PULSE.
- VOLTAGE - PEAK VALUE OF THE CHANGE IN VOLTAGE, GREATER OR LESS THAN THE AMPLITUDE LEVEL, THAT OCCURS ON THE DC COMPONENT PULSE.
- VARIATION
- OVERSHOOT - MAXIMUM POSITIVE VOLTAGE ATTAINED BY THE LEADING EDGE OF THE PULSE ABOVE THE AMPLITUDE LEVEL.
- UNDERSHOOT - MAXIMUM NEGATIVE VOLTAGE ATTAINED BY THE TRAILING EDGE OF THE PULSE AS MEASURED FROM THE ZERO LINE.
- NOISE - ALL DEVIATIONS IN VOLTAGE FROM THE DIRECT RESIDUAL LEVEL THAT OCCURS BETWEEN THE 10% LEVEL ON THE TRAILING EDGE OF ONE PULSE AND THE 10% LEVEL ON THE LEADING EDGE OF THE FOLLOWING PULSE, WITH THE EXCEPTION OF THE UNDERSHOOT AND THE LEADING AND TRAILING EDGES. SHALL BE CONSIDERED NOISE. FOR NOISE MEASUREMENTS THE LOW VOLTAGE INPUT PULSE RISE TIME SHALL NOT BE LESS THAN 20 NANSECONDS AND THE FALL TIME SHALL NOT BE LESS THAN 40 NANSECONDS.
- TRIGGER - THAT INPUT VOLTAGE BELOW WHICH THE OUTPUT OF A LEVEL CHANNEL IS 0 AND ABOVE WHICH THE OUTPUT OF THE CHANNEL IS THE SPECIFIED VOLTAGE.
- DELAY - TIME INTERVAL BETWEEN THE NOMINAL TRIGGER LEVEL ON THE INPUT PULSE TO THE 10% LEVEL ON THE RESULTING OUTPUT PULSE LEADING EDGE.
- TIME

# Blanking Pulse Characteristics (continued)

| REV   | DATE | BY   | CHKD  | APP'D |
|-------|------|------|-------|-------|
| A     |      |      |       |       |
| SCALE | REV  | TIME | 10-24 |       |

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# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM | TO |
|-------------|---------|-----|------|----|
| Pitch       | Synchro | I   | AFRS | UE |

## Functional Description

Provides an input signal proportional to fuselage pitch attitude with respect to the earth's horizon. Signal amplitude is proportioned to amount of fuselage displacement from level flight and phase indicates direction of displacement

## Signal Characteristics

RANGE:  $0^{\circ}$  to  $+90^{\circ}$   
 ACCURACY:  $\pm 0.5^{\circ}$   
 INDEX REFERENCE:  $0^{\circ}$  Pitch  
 POSITIVE DIRECTION SENSE: Nose Up  
 SCALE FACTOR:  $1^{\circ} = 1^{\circ}$   
 RESOLUTION: (TBD-3)

## Electrical Characteristics (continued on next page)

SOURCE: AFRS, 3-Wire Synchro, Clifton Type CGH-8-A-7 or equal  
 Electronic Control Amplifier (ASK-25A/A24G-26)

LOAD: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Triad  
 Wire Size: No. 22 AWG

A/C: F-111A/E  
 REF: T.O. 1F-111A-2-12-1, T.O. 5F4-2-21-3,  
 T.O. 5F4-2-21-4, MIL-C-38418  
 T.O. 1F-111E-2-12-1

|   |                   |     |       |
|---|-------------------|-----|-------|
| A | DATE              | REV | 10-26 |
|   | ICD-GPS-014 R 017 |     |       |

# ELECTRICAL CHARACTERISTICS

| SOURCE 1                                 |                   |
|------------------------------------------|-------------------|
| Synchro, Clifton Type CGH-8-A-7 or equal |                   |
| Input Voltage                            | 115V 400 Hz       |
| Input Current                            | 29 ma             |
| Input Power                              | 0.8w              |
| Output Voltage (Max)                     | 11.8V             |
| Sensitivity                              | 206 mv/deg        |
| Phase Shift                              | 11°               |
| DC Rotor Resistance                      | 700 Ohms          |
| DC Stator Resistance                     | 10.4 Ohms         |
| Impedance Zro                            | 950 + j3,850 Ohms |
| Impedance Zso                            | 10 + j36 Ohms     |
| Impedance Zrss                           | 1550 + j420 Ohms  |
| Max Null Voltage                         | 75 mv             |
| Accuracy (max error spread)              | 14 minutes        |

|     |     |                   |
|-----|-----|-------------------|
| A   |     | ICD-GPS-014 & 017 |
| REV | REV | REV 10-27         |



# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM | TO |
|-------------|---------|-----|------|----|
| Roll        | Synchro | I   | AFRS | UE |

## Functional Description

Provides an input signal proportioned to fuselage roll attitude with reference to the earth's horizon. Signal amplitude is proportioned to amount of fuselage displacement from level flight and phase indicates direction of displacement

## Signal Characteristics

RANGE:  $0^{\circ}$  to  $+90^{\circ}$   
 ACCURACY:  $\pm 0.5^{\circ}$   
 INDEX REFERENCE: Zero Roll  
 POSITIVE DIRECTION SENSE: Right Wing Down  
 SCALE FACTOR:  $1^{\circ} = 1^{\circ}$   
 RESOLUTION: (TBD-3)

## Electrical Characteristics (continued on next page)

SOURCE: Auxiliary Flight Reference System, Electronic Control Amplifier (ASK-25A/A24G-26), 3-Wire Synchro, Clifton CGH-8-A-7 or equal

LOAD: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Triad  
 Wire Size: No. 22 AWG

A/C: F-111A/E  
 REF: T.O. 1F-111A-2-12-1, T.O. 5F4-21-3,  
 T.O. 5F4-21-4, MIL-C-38418  
 T.O. 1F-111E-2-12-1

|   |       |          |                   |
|---|-------|----------|-------------------|
| A | DATE  | REVISION | DESCRIPTION       |
|   | 10-28 |          | ICD-GPS-014 & 017 |

# ELECTRICAL CHARACTERISTICS

| SOURCE 1                                 |                   |
|------------------------------------------|-------------------|
| Synchro, Clifton Type CGH-8-A-7 or equal |                   |
| Input Voltage                            | 115V 400 Hz       |
| Input Current                            | 29 ma             |
| Input Power                              | 0.8w              |
| Output Voltage (max)                     | 11.8V             |
| Sensitivity                              | 206 mv/deg        |
| Phase Shift                              | 11°               |
| DC Rotor Resistance                      | 700 Ohms          |
| DC Stator Resistance                     | 10.4 Ohms         |
| Impedance Zro                            | 950 + j3,850 Ohms |
| Impedance Zsc                            | 10 + j36 Ohms     |
| Impedance Zrss                           | 1550 + j420 Ohms  |
| Max Null Voltage                         | 25 m              |
| Accuracy (max error spread)              | 14 minutes        |

|      |      |      |                   |
|------|------|------|-------------------|
| REV  | DATE | BY   | 100-GPS-013 & 017 |
| A    |      |      |                   |
| NAME | REV  | DATE | 10-29             |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME        | TYPE    | I/O | FROM | TO |
|--------------------|---------|-----|------|----|
| Digital Input Data | Digital | I   | IBNS | UE |

## Functional Description

Provides the UE with position, velocities, covariances and other parameters (TBD-3). (See Appendix II.)

## Signal Characteristics

Word/Frame Structure: (TBD-3)  
 Information Identifier: (TBD-3)  
 Data Standard: (TBD-3)  
 Timing Tolerance: (TBD-3)

## Electrical Characteristics

(TBD-3)

## Interconnection Data

(TBD-3)

A/C: F-111A/E  
 REF:

|      |      |      |                   |
|------|------|------|-------------------|
| REV  | CODE | DATE | DESCRIPTION       |
| A    |      |      | ICD-GPS-014 1.017 |
| NAME | DES  | DATE | 10-30             |

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# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM | TO |
|-------------|---------|-----|------|----|
| Course Set  | Synchro | I   | HSI  | UE |

## Functional Description

Provides an electrical reference signal of the course manually selected by the Course Set control on the HSI. This signal will be used by the UE as a reference for positioning the course deviation and To-From indicators on the HSI.

## Signal Characteristics

RANGE: 0° to 360°  
 ACCURACY: ±0.5°  
 RESOLUTION: 1.0°  
 INDEX REFERENCE: Magnetic North  
 POSITIVE DIRECTION SENSE: Right Hand Increments  
 SCALE FACTOR: 1 = 1

## Electrical Characteristics (Continued on next page)

SOURCE: HSI (AGU-4/A), Course Resolver, Kearfott Type  
 CR40931018 or equal  
 LOAD: (TBD-1)

## Interconnection Data

Wire Type & No.: Seven single conductors (twisted)  
 Wire Size: No. 24 AWG

A/C: F-111A/E  
 REF: 1F-111A-2-18-1  
 MIL-T-27848  
 5F8-16-4-3  
 5F8-16-4-4

| DATE | REVISION | DESCRIPTION       |
|------|----------|-------------------|
| A    |          | 100-SPS-014 & 017 |
| DATE | REV      | DATE              |
|      |          | 10-31             |

# ELECTRICAL CHARACTERISTICS

| SOURCE                                                             |                               |
|--------------------------------------------------------------------|-------------------------------|
| MSI, AQU-4/A, Course Resolver,<br>Keefott Type CR40931018 or equal |                               |
| Primary Winding                                                    | Rotor                         |
| Input Voltage                                                      | 26 Vac                        |
| Frequency                                                          | 400 Hz                        |
| Input Current                                                      | 20 ma                         |
| Input Power                                                        | 150 mw                        |
| Input Impedance                                                    | 1680 $\angle 78.5^\circ$ ohms |
| Output Impedance                                                   | 1400 $\angle 78^\circ$ ohms   |
| DC Resistance (rotor)                                              | 190 ohms                      |
| DC Resistance (stator)                                             | 170 ohms                      |
| Output Voltage                                                     | 22 Vac                        |
| Sensitivity                                                        | 384 mv/deg                    |
| Maximum null voltage                                               | 46 mv                         |
| Maximum error from<br>electrical zero                              | 10 minutes                    |
| Transformation ratio                                               | .846                          |

|   |                   |
|---|-------------------|
| A | ICD-GPS-014 : 017 |
|   | C-32              |

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## 9. FUTURE MODIFICATIONS

Modifications for the F-111E include the Airborne Video Tape Recorder, GPS, Digital Bomb Navigation System, Flex Ballistics Computer, and two ECM Systems. (ALQ-137 improvements and ALR-62). Table 9-1 lists the present and future systems in the F-111 family. Figure 9-1 shows the changes in the forward equipment bays.

The ALR-62 Countermeasures Receiving Set is designed to intercept, detect, and analyze RF threat signals. The threat signals displayed show type of threat, direction, and lethality. Those signals are then forwarded to the Self-Protection Subsystem.

The five major CMRS LRUs are:

- (1) Dual Channel Receiver (DCR)
- (2) Multichannel Receiver (MCR)
- (3) Digital Processor
- (4) Control Indicator Unit
- (5) Antenna Switching Unit (ASU)

The DCR is a dual-crystal video and superheterodyne receiver that detects both CW and pulsed RF signals. RF input is from the shared SPS low-band directional antennas (LF and RF). The direction of arrival detected in logarithmic amplifiers is fed on dual outputs to the Multichannel Receiver (MCR) for video combining with other MCR signals.

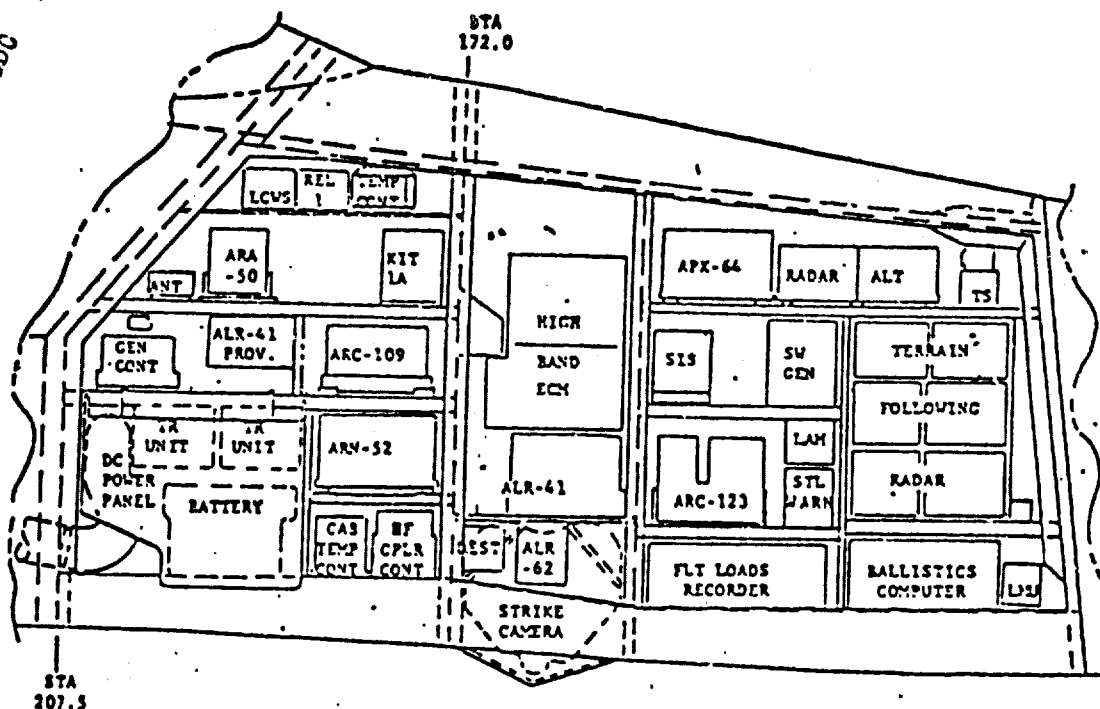
The MCR accepts inputs from six JSS directional antennas and four dedicated directional antennas. The inputs from two of the four dedicated antennas are combined into a single MCR input in the transmission line coupler. The RF signals are amplified and detected in logarithmic amplifiers, the angle of arrival is detected, and the video is combined and fed to the Digital Processor.

The Digital Processor processes the MCR video to identify threats and establish priorities on the basis of a stored program. The Digital Processor also provides display generation, interfacing with other systems, and self-testing.

The Control Indicator Unit provides a PPI display of the threat parameters on the 2.5-inch CRT (with alphanumeric and geometric symbols) and has a provision for operator control of the system.

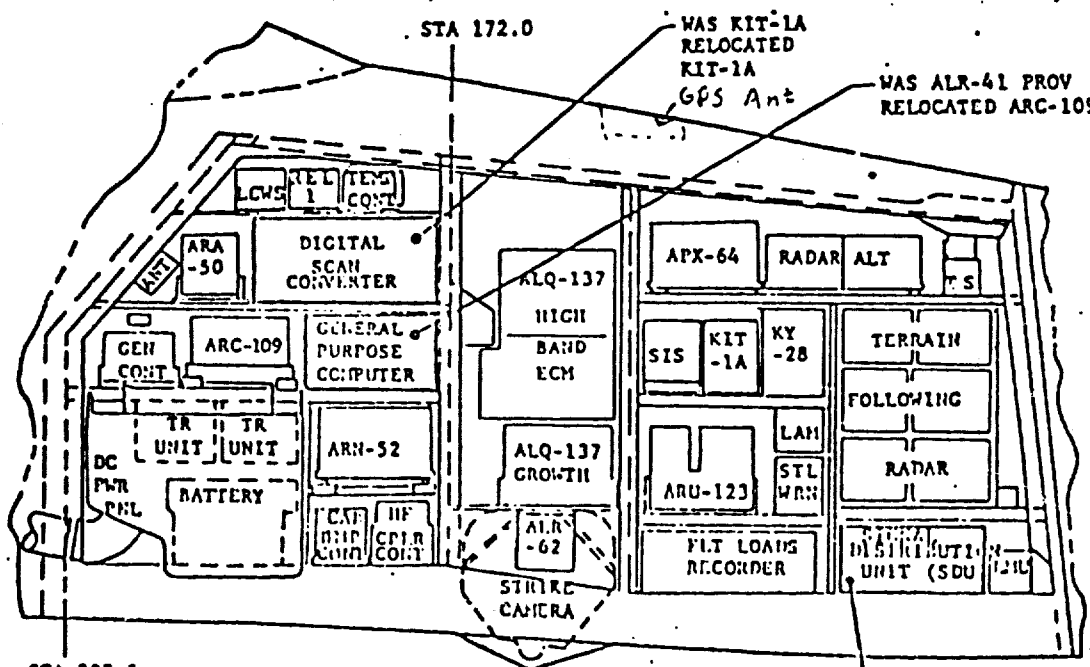
The Antenna Switching Unit (ASU) interfaces between the MCR and six JSS antennas. In the direction finding mode, the ASU sequentially switches between the six signals. In the omni mode, all signals are processed simultaneously. ASU switching is controlled by the Digital Processor.

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VIEW LOOKING INSD RH EQUIP BAY  
F-111C NO. 1-94

CURRENT



VIEW LOOKING INSD RH EQUIP. BAY  
F-111C 1-94

PLANNED

(PAVE TACK, GUIDED WEAPONS, DIGITAL BOMB-NAV, AND ALQ-137)

Figure 9-1. CURRENT VERSUS PLANNED LEFT-HAND AND RIGHT-HAND EQUIPMENT BAYS

NOTE: F-111A 31-102 have no provisions for internal ECM except 34-42 and 82-102 have ALQ-41

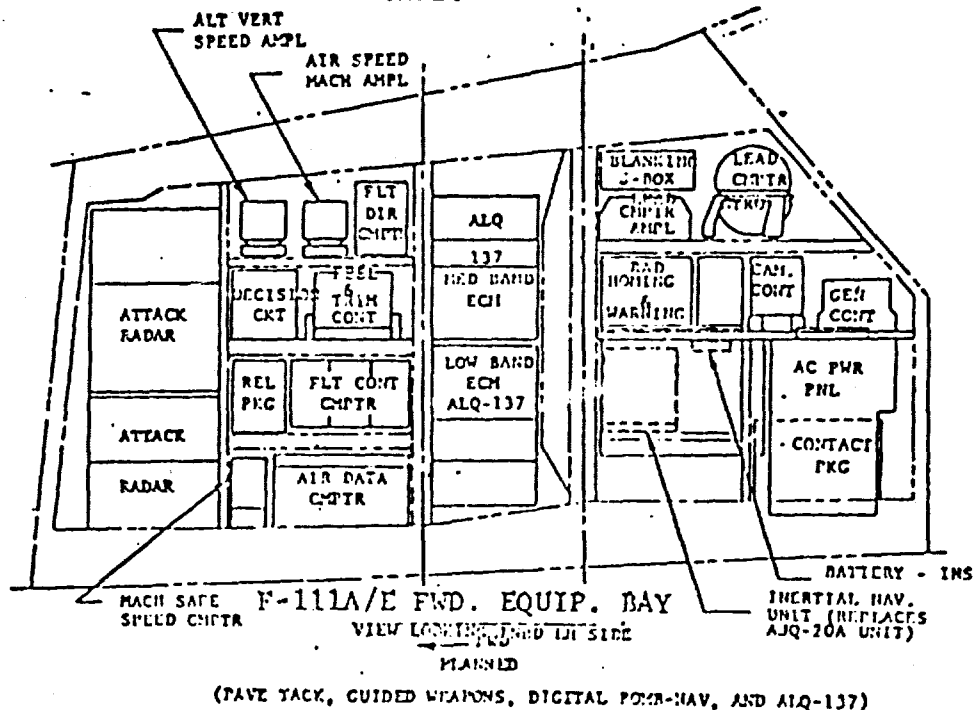
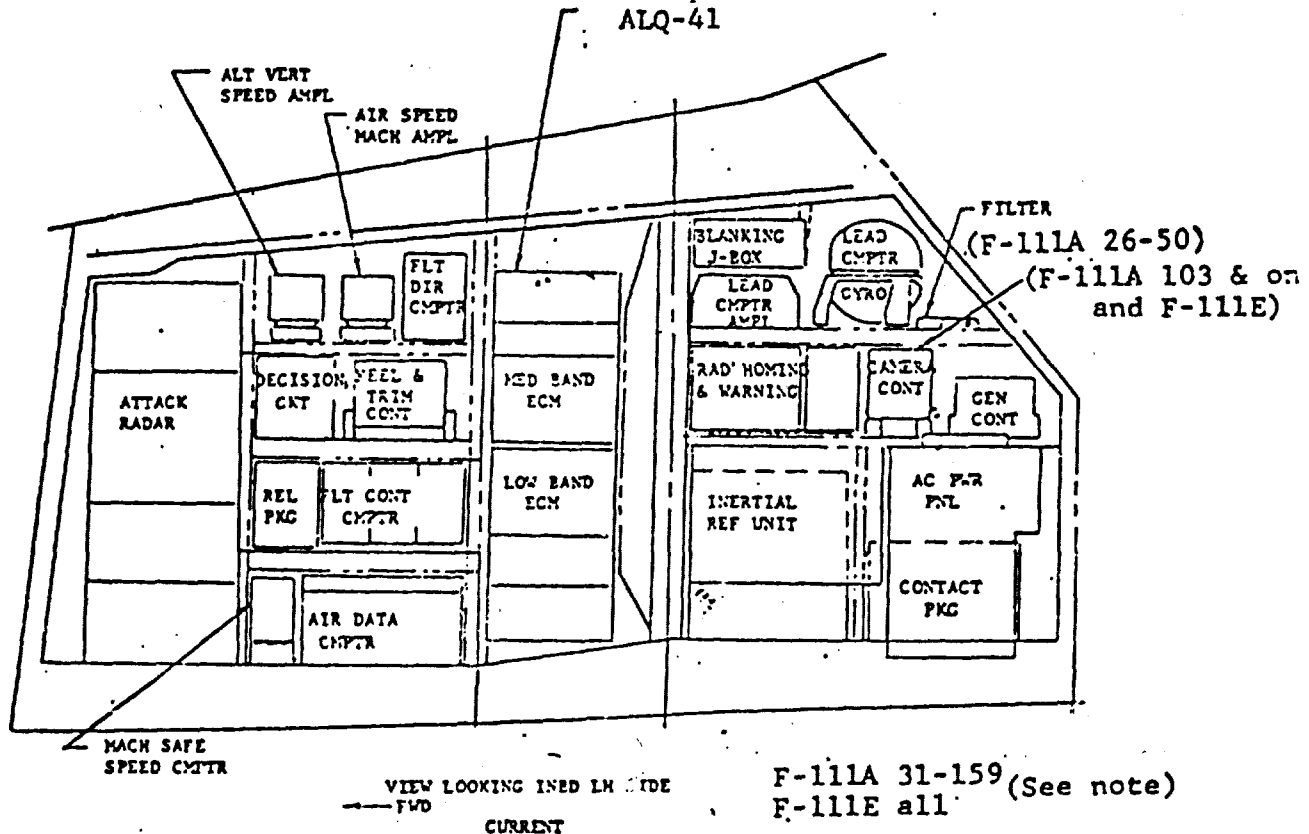


Figure 9-1. (continued)

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| Table 9-1. PRINCIPAL AVIONICS TO BE INSTALLED IN THE F-111 FAMILY BY 1985 |                                  |                           |                                          |                           |                                  |
|---------------------------------------------------------------------------|----------------------------------|---------------------------|------------------------------------------|---------------------------|----------------------------------|
| Equipment                                                                 | F-111A                           | F-111D                    | F-111E                                   | F-111F                    | F-111A                           |
| UHF                                                                       | ARC-109 → ARC-164                | ARC-109 → ARC-164         | ARC-109 → ARC-164                        | ARC-109 → ARC-164         | ARC-109 → ARC-164                |
| VHF                                                                       | ARC-112/123                      | ARC-123                   | ARC-123                                  | ARC-123                   | ARC-112                          |
| Intercom                                                                  | AIC-25                           | AIC-25                    | AIC-25                                   | AIC-25                    | AIC-25                           |
| INS                                                                       | AJQ-20 Digital Bomb Navigational | AJN-16                    | AJQ-20 (Maybe Digital Bomb Navigational) | AJN-16                    | AJQ-20 Digital Bomb Navigational |
| TACAN                                                                     | ARN-118 (Maybe GPS)              | ARN-52/118 (Maybe GPS)    | ARN-52/118 (Maybe GPS)                   | ARN-84 (Maybe GPS)        | ARN-118 (Maybe GPS)              |
| ILS                                                                       | ARN-58 (Maybe CAT II MLS)        | ARN-58 (Maybe CAT II MLS) | ARN-58                                   | ARN-58 (Maybe CAT II MLS) | ARN-58 (Maybe CAT II MLS)        |
| UHF-DF                                                                    | ARA-50 (Maybe GPS)               | ARA-50 (Maybe GPS)        | ARA-50 (Maybe GPS)                       | ARA-50 (Maybe GPS)        | ARA-50 (Maybe GPS)               |
| Radar Altimeter                                                           | APN-167                          | APN-167                   | APN-167                                  | APN-167                   | APN-167                          |
| TFR                                                                       | APQ-110                          | APQ-128                   | APQ-110                                  | APQ-146/128/134           | APQ-110                          |
| Attack Radar                                                              | APQ-113                          | APQ-130                   | APQ-113                                  | APQ-144/114               | Demodify to Naval Radar          |
| Lead Computer Sight                                                       | ASG-23                           | --                        | ASG-23                                   | ASG-27/25                 | Demodify                         |
| Auto Gun                                                                  | M61-A1                           | M61-A1                    | M61-A1                                   | M61-A1                    | Demodify                         |
| IFF A/G                                                                   | APX-64                           | APX-64                    | APX-64                                   | APX-64                    | APX-64                           |
| IFF Crypto                                                                | KIT-1A                           | KIT-1A                    | KIT-1A                                   | KIT-1A                    | KIT-1A                           |
| HSI                                                                       | AQU-4/A                          | AQU-4/A                   | AQU-4/A                                  | AQU-4/A                   | AQU-4/A                          |
| CADC                                                                      | 1903633-4                        | 1903634-3                 | 1903633-4                                | 1903634-3                 | 1903633-4                        |
| Flight Director System                                                    | CPU-76                           | --                        | CPU-76A                                  | CPU-76A                   | CPU-76, ARU-11                   |
| Auxiliary Flight Reference System                                         | A24G-26A                         | A24G-26A                  | A24G-26A                                 | A24G-26A                  | A24G-26A                         |
| RHAW                                                                      | APS-109                          | APS-109                   | APS-109                                  | APS-109                   | ALR-62 (TTWS)                    |
| ECM Receivers                                                             | ALR-23                           | ALR-23                    | --                                       | ALR-23                    | ALR-23 (TTWS)                    |
|                                                                           | AAR-34                           | AAR-34                    | AAR-34                                   | AAR-34                    | ALQ-137 (SPS)                    |
| Jamming Transmitters                                                      | ALQ-94, 41                       | ALQ-94                    | ALQ-94, 119                              | ALQ-94                    | ALQ-99E (JSS)                    |
| Interference Blanker                                                      | MX-6770                          | MX-8106                   | MX-6770A                                 | MX-8103                   | MX-9879/A                        |
| Dispenser                                                                 | ALE-28                           | ALE-28                    | ALE-28                                   | ALE-28                    | ALE-28                           |
| Strike Camera                                                             | KB-18A                           | KB-18A                    | KB-18A                                   | KB-18A                    | Demodify                         |
| Flight Control System                                                     | FC-11                            | FC-11                     | FC-11                                    | FC-11                     | FC-11                            |

(continued)

Table 9-1. (continued)

| Equipment                    | F-111A                  | F-111D                  | F-111E                  | F-111F                         | F-111A             |
|------------------------------|-------------------------|-------------------------|-------------------------|--------------------------------|--------------------|
| Fuel and Trim Assembly       | 12C1154-879             | 12C1154-867             | 12C1154-879             | 12C1154-875                    | 12C1154-879        |
| Doppler                      | --                      | APN-189 (Maybe GPS)     | --                      | --                             | --                 |
| Nav Data Entry Panel         | --                      | ID-1764/AYK             | --                      | --                             | --                 |
| Nav Data Display Panel       | --                      | ID-1622/AYK             | --                      | ID-1748/AYK                    | --                 |
| General Purpose Computer     | --                      | AYK-6 (2)               | --                      | AYK-6 (2)                      | --                 |
| Weapons Bay Gun System       | --                      | ?                       | ?                       | --                             | Demodify           |
| Multiplex Converter Unit     | --                      | CV-2492/A               | --                      | CV-2497/A                      | --                 |
| Horizontal Situation Display | --                      | AVN-3                   | --                      | --                             | --                 |
| Integrated Display Set       | --                      | AVA-9                   | --                      | --                             | --                 |
| IFF Interrogator             | --                      | APX-76                  | --                      | --                             | --                 |
| Computer Control Unit        | --                      | --                      | --                      | C-8586/AYK                     | --                 |
| UHF Crypto                   | --                      | --                      | --                      | --                             | KY-28              |
| Nav Radar                    | --                      | --                      | --                      | --                             | APQ-160 (Demodify) |
| Modifications                |                         |                         |                         |                                |                    |
| F2824                        | Terrain Follow Radar    | --                      | Terrain Follow Radar    | --                             | --                 |
| F2930                        | ALQ-119 ECM (Some A/C)  | ALQ-119 ECM (Some A/C)  | ALQ-119 ECM             | --                             | --                 |
| T13315A                      | SIS (Some A/C)          | SIS (Some A/C)          | SIS                     | SIS (Some A/C)                 | --                 |
| T17305A                      | APN-167 LARA (Some A/C) | APN-167 LARA (Some A/C) | APN-167 LARA (Some A/C) | APN-167 LARA (Some A/C)        | --                 |
| T17310A                      | LARA Override System    | LARA Override System    | LARA Override System    | LARA Override System           | --                 |
| T37063A                      | APQ-113 TFR (Some)      | APQ-130 TFR             | APQ-113 TFR             | APQ-113 TFR                    | --                 |
| F2957                        | ALR-62 RWR (Some)       | ALR-62 RWR              | ALR-62 RWR              | ALR-62 RWR                     | --                 |
| F0000                        | Jam System (Some A/C)   | --                      | --                      | --                             | --                 |
| F15112B                      | --                      | AVA-9 IDS               | --                      | --                             | --                 |
| T37236B                      | --                      | --                      | --                      | Multiplex Converter (Some A/C) | --                 |
| Planned Avionics             |                         |                         |                         |                                |                    |
| Video Tape Recorder          | --                      | CVTR                    | CVTR                    | CVTR                           | --                 |

GPS UE will physically and functionally replace the AN/ARN-118 TACAN system. The GPS receiver will be installed at the present TACAN location under door 1202. The antenna is installed above the forward equipment bays, as shown in Figure 7-1.

The function of the ALQ-137 is to detect hostile CW and the pulsed signals and automatically respond with programmed jamming against the following:

- Fire control radars of anti-aircraft artillery (AAA)
- Surface to air missiles (SAM)
- Airborne Interceptors (AI)
- Command Guidance missiles

The AN/ALQ-137 provides deception response in the E through J bands with four subsystems covering the low band, middle band, forward high band, and aft high band. Each of the four subsystems consists of a receiver and amplifier. Forward aft antennas are used to provide proper protection. Additional threat information is received from the ALR-62 Radar Warning Receiver.

The AN/ARC-164, scheduled to replace the ARC-109 in most planes by 1985, operates in the 225 MHz to 399.75 MHz military band. It provides a 7,000 channel tuneable UHF receiver; 243 MHz (nominal) auxiliary guard receiver; and a 7,000-channel, 10 watt carrier transmitter for voice communications. The AN/ARC-164 Radio Set has two basic configurations -- the console mount and the remote mount.

# 10. DATA SOURCES

The following sources of data were used in preparing this summary:

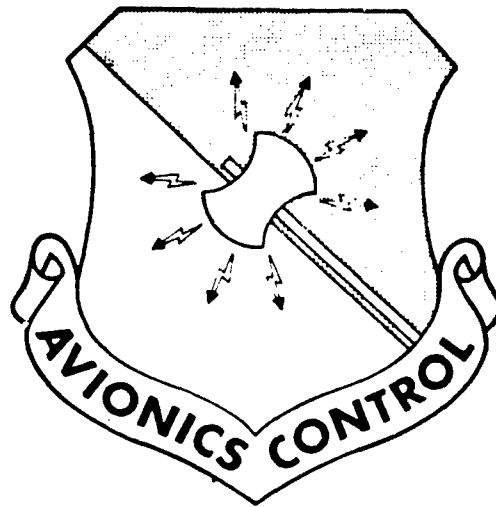
- Aircraft and avionics configuration data assembled by ARINC Research, principally in the form of copies of applicable sections, tables, and figures from the aircraft technical orders, as well as from equipment technical orders listed at the end of this section
- Avionics Planning Baseline Document -- October 1978
- GPS Phase II User Equipment Interface Requirements for the F-111A Aircraft; 1 September 1977

## LIST OF APPLICABLE TECHNICAL ORDERS

| <u>Number</u>   | <u>Title</u>                             | <u>Change<br/>Number</u> | <u>Date</u> |
|-----------------|------------------------------------------|--------------------------|-------------|
| 1F-111E-01      | LOAP                                     | --                       | 4/21/72     |
| 1F-111E-2-1     | General Information                      | 1                        | 11/17/78    |
| 1F-111E-2-3-1   | Auto Flight Control System               | 20                       | 6/3/77      |
| 1F-111E-2-4-1   | Flight Control Systems                   | 22                       | 8/26/77     |
| 1F-111E-2-5-1   | Fire Power Control System                | 22                       | 6/17/77     |
| 1F-111E-2-12-1  | Instrument Systems                       | 19                       | 8/19/77     |
| 1F-111E-2-13-1  | Electrical Power and<br>Lighting Systems | 19                       | 7/22/77     |
| 1F-111E-2-15    | Environmental Systems                    | 21                       | 8/19/77     |
| 1F-111E-2-16-1  | Air Data Computer System                 | 7                        | 1/5/77      |
| 1F-111E-2-17-1  | Communication and ILS                    | 14                       | 8/19/77     |
| 1F-111E-2-22    | Systems Integration                      | 20                       | 6/24/77     |
| 5F5-4-17-2      | Control Air Data Computer                | 1                        | 9/30/76     |
| 12P2-2APQ110-12 | TFR Set                                  | 10                       | 3/15/74     |
| 12P2-2APQ110-52 | TFR Indicator                            | 3                        | 3/22/74     |
| 12P2-APQ113-12  | Radar Set                                | 0                        | 1/28/77     |
| 12P4-2APX64-2   | Radio Receiver Transmitters              | 17                       | 11/22/77    |
| 12P5-2APN167-12 | Altimeter Set                            | 12                       | 5/3/74      |
| 12R2-2AIC25-2   | Intercom Set                             | 21                       | 3/15/77     |
| 12R2-2ARC109-4  | Radio Set                                | 9                        | 6/15/76     |
| 12R2-2ARC109-42 | Radio Receiver                           | 2                        | 6/1/77      |
| 12R2-2ARC123-2  | Radio Set                                | 15                       | 10/15/76    |
| 12R5-2ARN52-2   | TACAN Set                                | changed                  | 10/1/69     |
| 12R5-2ARN52-12  | TACAN Set                                | 4                        | 2/15/73     |
| 12R5-2ARN58-2   | Radio Receiver                           | 6                        | 5/13/77     |
| 12R5-2ARN118-1  | TACAN Set                                | 0                        | 10/15/76    |
| 12R2-2ARC164-2  | Radio Set                                | 0                        | 6/20/76     |

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**AVIONICS INTERFACE DATA SUMMARY  
FOR  
F-111F**



**October 1979**

Issued by  
The Deputy for Avionics Control  
ASD/AX  
A Joint AFSC/AFLC Organization

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## FOREWORD

This document is one of a series of reports that describe Avionics interfaces for various USAF aircraft. It was prepared for the Deputy for Avionics Control, Aeronautical Systems Division (ASD/AX), Wright-Patterson AFB, Ohio by ARINC Research Corporation, Annapolis, Maryland under Contract F33657-79-C-0567.

| Record of Changes |         |              |          |
|-------------------|---------|--------------|----------|
| Change            | Subject | Date Entered | Initials |
|                   |         |              |          |

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## 1. INTRODUCTION

This document contains configuration data relating to the integration of additional avionics into the F-111F aircraft.

This document will be revised periodically as additional modifications are planned and incorporated into the aircraft. Queries regarding information contained herein should be addressed to:

The Deputy for Avionics Control  
Code: ASD/AXP  
Wright-Patterson AFB, Ohio

This document was compiled from Air Force source materials by ARINC Research Corporation under Contract F33657-79-C-0567.

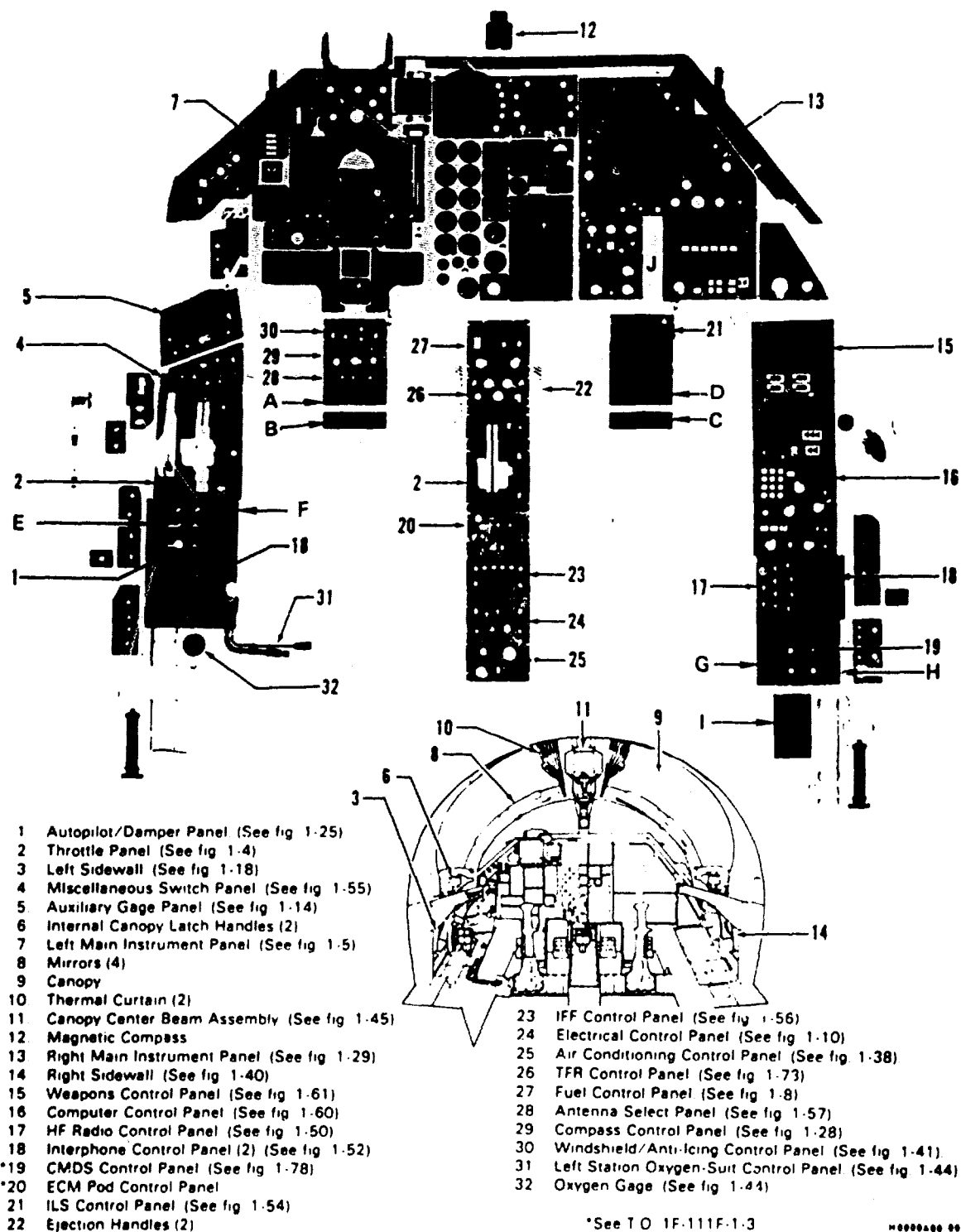
The applicable Technical Orders are included in the references listed in Section 10.

## 2. COCKPIT SPACE

Figures 2-1 through 2-5 depict the consoles and instrument panels for the F-111F. There is a relatively large amount of blank panel space in the present configuration of the F-111F cockpit, as illustrated in Figure 2-1. The general crew station arrangement of Figure 2-1 shows that blank panel space exists on the left and right vertical control panel consoles, as well as on the left- and right-side control panel consoles.

- There are two blank spaces at the bottom of the left vertical control panel console. The topmost blank, panel A, is  $5\text{-}3/4\text{W} \times 1\text{-}3/4\text{H} \times 2\text{D}$ . Below it is panel B, which is  $5\text{-}3/4\text{W} \times 1\text{-}1/2\text{H} \times 2\text{D}$ .
- There are two blank panels on the right vertical control panel console. Panel C is approximately the same size as panel B. Panel D is considerably larger. PAVE TACK and data link are proposed for the panel D area.
- Two blank panels exist on the left-side control panel console in spaces E and F, to the left and right of the autopilot damper control. Panel E is  $5\text{-}3/4\text{W} \times 1\text{-}1/4\text{H} \times 4\text{-}3/4\text{D}$ . Panel F, which is the proposed locations for ILS, is  $5\text{-}3/4\text{W} \times 2\text{-}5/8\text{H} \times 7\text{D}$ .
- The right-side control panel console contains three blank panel spaces. Panels G and H to the left and right of the CMDS control panel are approximately the same surface size as panels E and F. Panel I is  $5\text{-}11/16\text{W} \times 3\text{-}5/16\text{H} \times 7\text{-}1/2\text{D}$  and the proposed site for PAL Options II or III. Panel J is expandable to  $7\text{-}11/16\text{W} \times 4\text{-}9/16\text{H} \times 7\text{-}1/2\text{D}$ .
- A blank space, J, exists on the right main instrument panel just to the left of the navigation display. This space is  $2\text{W} \times 7\text{-}5/8\text{H}$ .

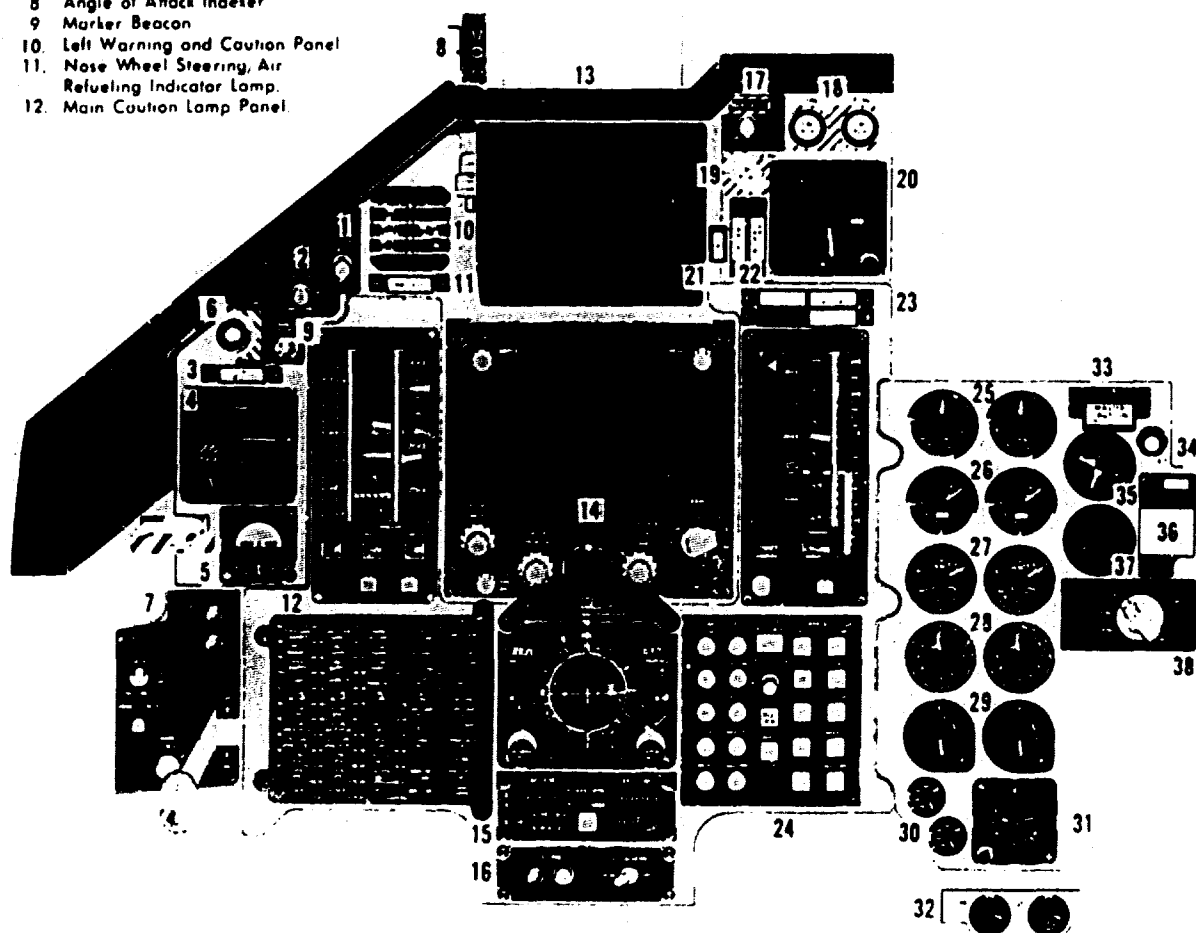
Figures 2-2 through 2-5 are illustrations of the left and right main instrument panels and the left and right sidewalls.



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Figure 2-1. CREW STATION GENERAL ARRANGEMENT (TYPICAL)

1. Air/Air IR Missile Switch.
2. Gun/Camera Control Switch.
3. Reference Not Engaged Caution Lamp.
4. Wing Sweep Flap/Slat Position Indicator.
5. Self-Contained Attitude Indicator.
6. External Stores Jettison Button.
7. Landing Gear Control Panel.
8. Angle of Attack Indexer.
9. Marker Beacon.
10. Left Warning and Caution Panel.
11. Nose Wheel Steering, Air Refueling Indicator Lamp.
12. Main Caution Lamp Panel.



- |                                              |                                                  |                                            |
|----------------------------------------------|--------------------------------------------------|--------------------------------------------|
| 13. Head Up Display and Control.             | 22. Canopy/Cabin Pressure Warning Lamps.         | 31. Clock.                                 |
| 14. Integrated Flight Instruments.           | 23. Upper Warning and Caution Lamps.             | 32. Hydraulic Pressure Indicators.         |
| 15. Flight Data Panel.                       | 24. Mode Select Coupler Panel.                   | 33. Master Caution Lamp.                   |
| 16. T.O. Trim/HSI Bearing Panel.             | 25. Engine Tachometers.                          | 34. Fuel Quantity Indicator Test Button.   |
| 17. Agent Discharge/Fire Detect Test Switch. | 26. Engine Turbine Inlet Temperature Indicators. | 35. Fuselage Fuel Quantity Indicator.      |
| 18. Engine Fire Pushbutton Warning Lamps.    | 27. Engine Fuel Flow Indicators.                 | 36. Radio Call Panel.                      |
| 19. Fuselage Fire Pushbutton Warning Lamp.   | 28. Engine Nozzle Position Indicators.           | 37. Total/Select Fuel Quantity Indicator.  |
| 20. Radar Altimeter.                         | 29. Engine Pressure Ratio Indicators.            | 38. Fuel Quantity Indicator Selector Knob. |
| 21. Stall Warning Lamp.                      | 30. Engine Oil Pressure Indicators.              |                                            |

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Figure 2-2. LEFT MAIN INSTRUMENT PANEL (TYPICAL)

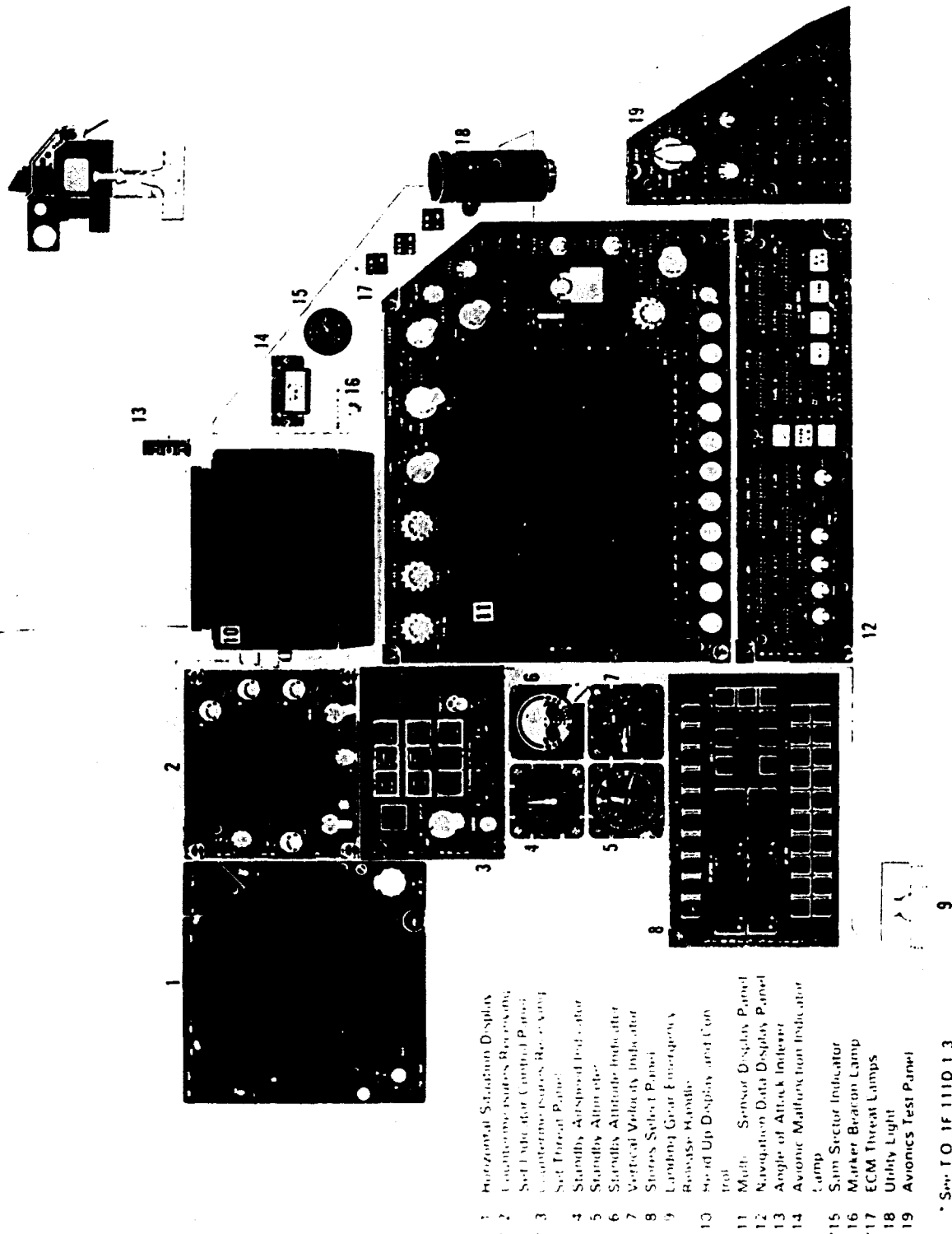
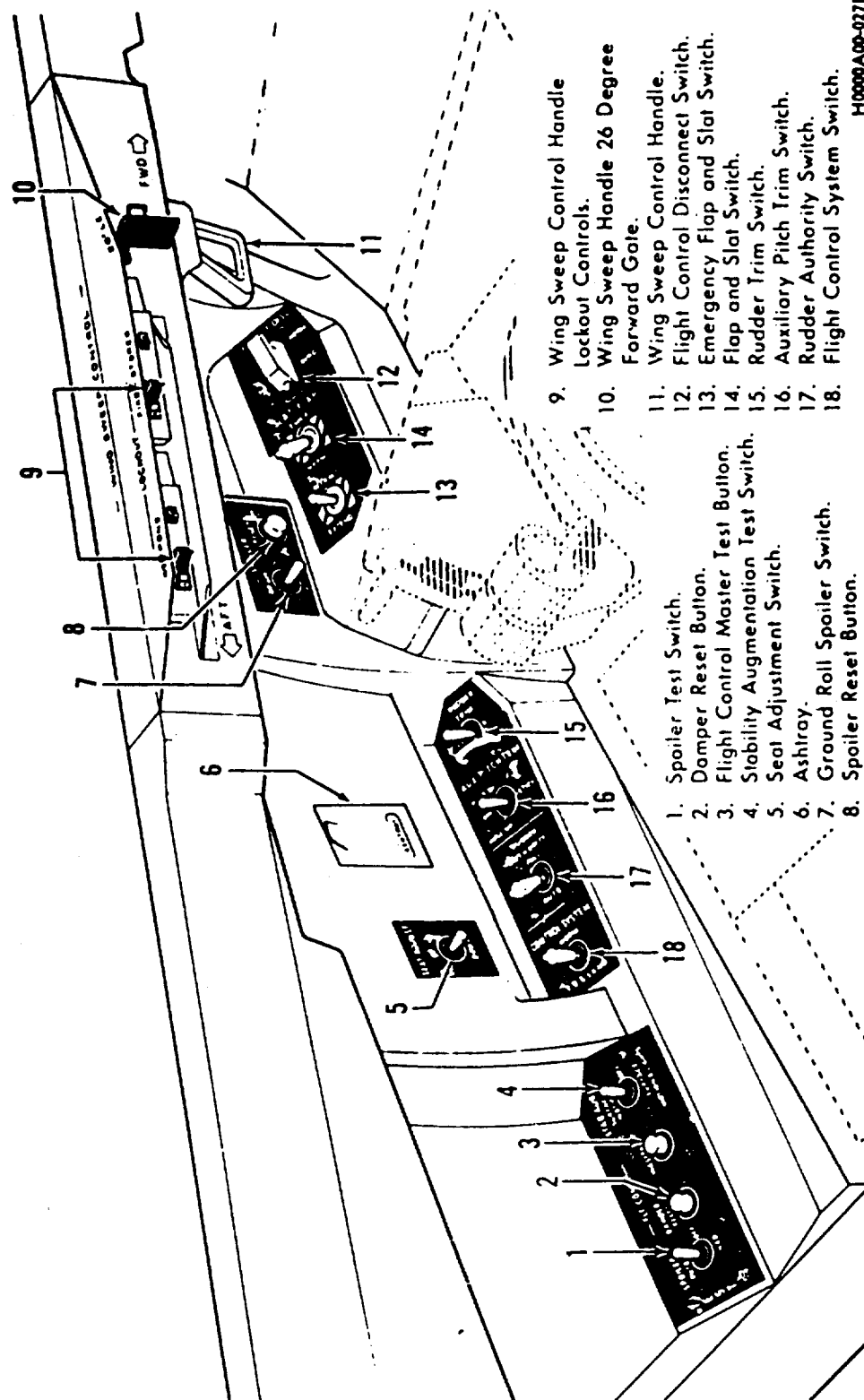


Figure 2-3. RIGHT MAIN INSTRUMENT PANEL (TYPICAL)



9. Wing Sweep Control Handle Lockout Controls.
10. Wing Sweep Handle 26 Degree Forward Gale.
11. Wing Sweep Control Handle.
12. Flight Control Disconnect Switch.
13. Emergency Flap and Slat Switch.
14. Flap and Slat Switch.
15. Rudder Trim Switch.
16. Auxiliary Pitch Trim Switch.
17. Rudder Authority Switch.
18. Flight Control System Switch.

1. Spoiler Test Switch.
2. Damper Reset Button.
3. Flight Control Master Test Button.
4. Stability Augmentation Test Switch.
5. Seat Adjustment Switch.
6. Ashtray.
7. Ground Roll Spoiler Switch.
8. Spoiler Reset Button.

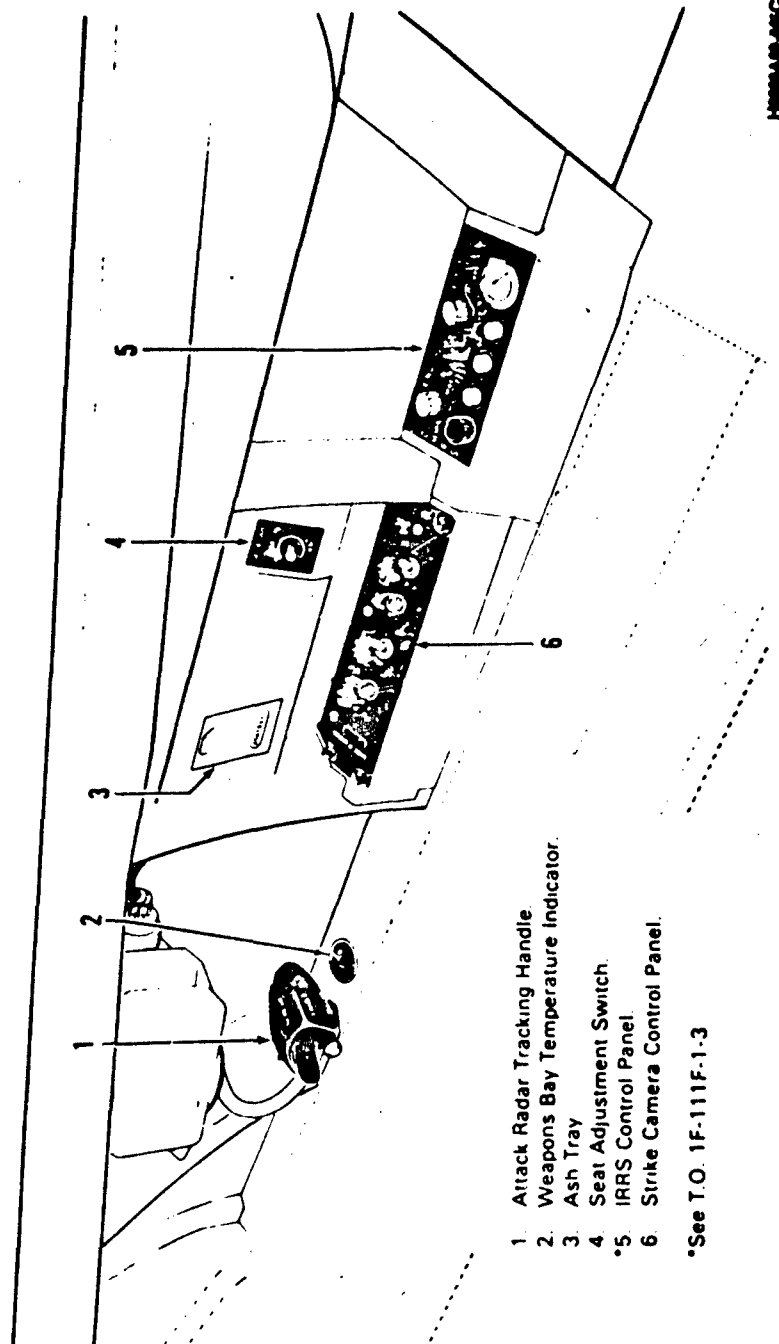
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Figure 2-4. LEFT SIDEWALL (TYPICAL)



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- 1. Attack Radar Tracking Handle.
- 2. Weapons Bay Temperature Indicator.
- 3. Ash Tray
- 4. Seat Adjustment Switch.
- \*5. IRRS Control Panel.
- 6. Strike Camera Control Panel.

\*See T.O. 1F-111F-1-3

14000000-0000

Figure 2-5. RIGHT SIDEWALL (TYPICAL)

### 3. AVIONICS SPACE

The F<sup>2</sup>E summary (Table 3-1 and Figure 3-1) illustrates the avionics space availability in the F-111F. At present there are two unused spaces under door 1202 and one space available under door 1201. Another space under door 1101 would become available if the ARA-50 is removed and the optical sight unit is turned on end.

| Table 3-1. F'E SUMMARY - F-111F                                                                                                                                 |                                        |                                                               |                                                                 |                                                                               |                                           |                                                              |                                                        |                                                      |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|---------------------------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------|------------------------------------------------------|--|
| F'E Criteria                                                                                                                                                    | Potential Available Space              |                                                               |                                                                 |                                                                               |                                           |                                                              |                                                        |                                                      |  |
|                                                                                                                                                                 | A<br>Door 1201<br>Above APX-64<br>Unit | B<br>Door 1202<br>Next to TACAN                               | B<br>ARC-109<br>Door 1202                                       | C<br>APX-64 IFF<br>Door 1201                                                  | C<br>Door 1201<br>Above Relay<br>Packages | D<br>Door 1101<br>AN/ARA-50                                  | E<br>TS-1843/APX                                       | F<br>ARC-112 HF<br>Receiver-Transmitter<br>Door 1201 |  |
| Location Reference<br>and Description                                                                                                                           |                                        |                                                               |                                                                 |                                                                               |                                           |                                                              |                                                        |                                                      |  |
| Rectangular* Size<br>(H, W, D - in.)<br>Volume (Cu. Ft.)                                                                                                        | 15 x 17.5 x 12                         | Triangle (B, H, D)<br>6.5 x 8.25 x 20<br>0.31 ft <sup>3</sup> | 7.2 x 9.5 x 17.5<br>0.68 ft <sup>3</sup>                        | 8.6 x 12.6 x 20.2<br>0.88 ft <sup>3</sup>                                     | 2.75 x 10.5 x 20<br>0.334 ft <sup>3</sup> | 7.5 x 13 x 14<br>0.790 ft <sup>3</sup>                       | 3.2 x 13 x 7.8<br>0.05 ft <sup>3</sup>                 | 11 x 12.8 x 18.4<br>1.50 ft <sup>3</sup>             |  |
| Type Cooling<br>Available                                                                                                                                       | Forced Air<br>Cooled                   | Forced Air<br>Cooled                                          | Forced Air<br>Cooled                                            | Forced Air<br>Cooled                                                          | Forced Air<br>Cooled                      | Forced Air<br>Cooled                                         | Forced Air<br>Cooled                                   | Forced Air<br>Cooled                                 |  |
| Temperature-Altitude<br>Vibration                                                                                                                               | Normal Equip-<br>ment Area             | Normal Equipment<br>Area                                      | Normal Equipment<br>Area                                        | Normal Equipment<br>Area                                                      | Normal Equipment<br>Area                  | Normal Equip-<br>ment Area                                   | Normal Equip-<br>ment Area                             | Normal Equipment<br>Area                             |  |
| Possible Candidates<br>for this Space                                                                                                                           | PAVE TACK<br>and KV-28<br>Secure Voice | None known                                                    | General Purpose<br>Computer                                     | None known                                                                    | None known                                | None known                                                   | None known                                             | None known                                           |  |
| Remarks                                                                                                                                                         |                                        |                                                               | RT-1168/ARC-<br>164 in Cockpit<br>volume of ARC-<br>109 Control | Replace with APX-<br>101 IFF Transponder<br>or APX-100 Console<br>Mounted IFF |                                           | Turn Optical<br>Sight Unit on<br>and and remove<br>AN/ARA-50 | If APX-64 is<br>replaced with<br>APX-101 or<br>APX-100 | Replace HF Comm.<br>with Single LRU<br>in Loc. F     |  |
| *Where LRU is currently installed, the dimensions given represent dimensions of LRU; when no LRU is installed, the dimensions are those of the available space. |                                        |                                                               |                                                                 |                                                                               |                                           |                                                              |                                                        |                                                      |  |

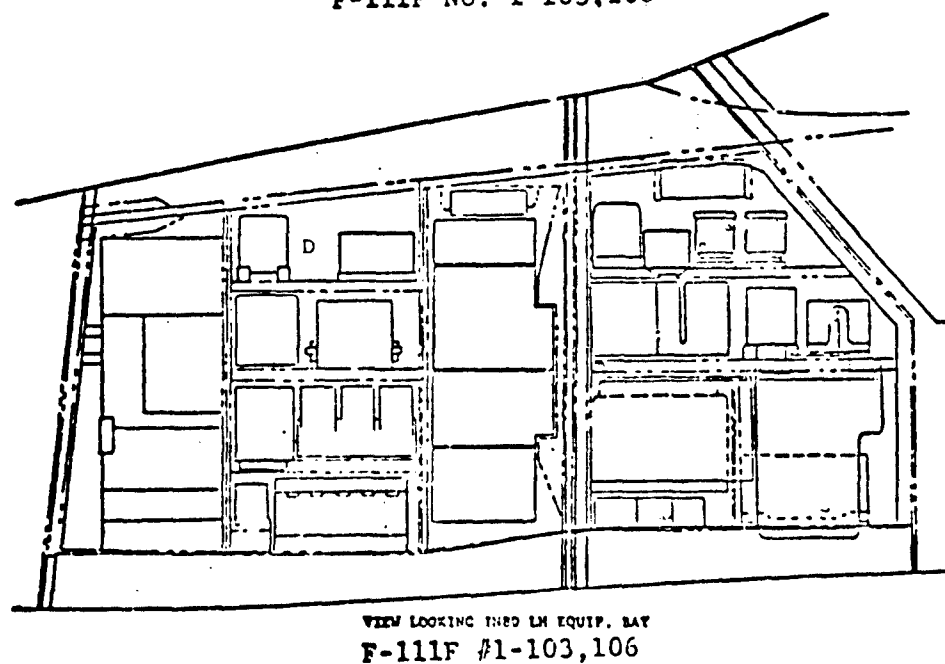
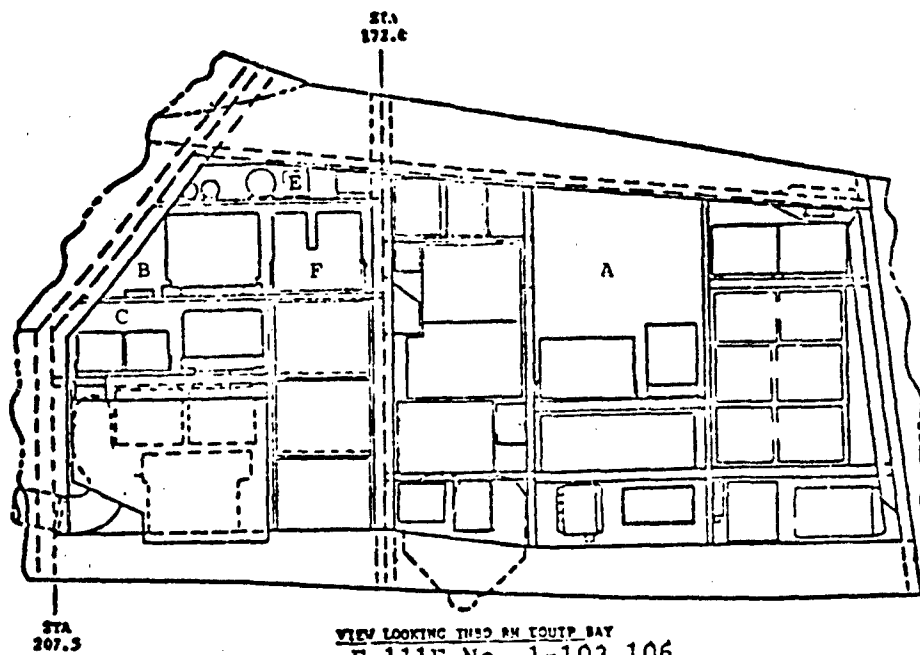


Figure 3-1. CURRENT AVIONICS SPACE AVAILABLE

#### 4. ELECTRICAL POWER SYSTEM

##### 4.1 Introduction

115/200 volt, three phase, 400 cycle ac power and 28 volt dc power are provided for the electrical power system in the F-111F. This power is generated by two 62.5 kVA ac generator drive assemblies, one mounted on each engine. These generators are supplemented by two 150 amp transformer rectifier units that convert the ac power to 28 volts dc. An aircraft battery supplies 28 volts dc to the battery bus and the dc start busses. The electrical power system consists of the following systems:

- Main ac power system
- External ac power and monitor system
- Emergency ac power system
- Dc power system

##### 4.2 Power Requirements

In the F-111A, there is a basic avionics electrical power requirement of 40 kVA.

##### 4.3 Power Generation and Distribution

The main sources of electrical power are 62.5 kVA indirect drive generators. The control units for these generators are in the forward equipment bay. The electrical power distribution system has three ac busses: A left main ac bus, a right main ac bus, and an essential ac bus.

##### 4.4 Emergency ac Power System

The emergency ac power system provides electrical power for operation of safety-of-flight equipment in the event the main ac power system fails or hydraulic power is applied to the aircraft without electrical power, or both. The emergency ac power generator is operated by the utility hydraulic system.

##### 4.5 Dc Power System

The dc power system supplies the aircraft with the necessary 28-volt direct current power. The main dc power system uses two ac-to-dc power converters to supply the main and essential dc busses. The aircraft battery ensures that standby power is available to power engine starts, aircraft position lights, and pylon refuel/defuel valves without external power units.

## 5. ENVIRONMENTAL CONTROL SYSTEM

### 5.1 General

The Environmental Control System (ECS) provides temperature controlled air for the cockpit and a temperature controlled flow of cooling air to the forward electronics bay and to the weapons bay. The ECS operates by ducting hot air from the sixteenth stage compressor and each engine through two air-to-air heat exchangers, and air-to-water heat exchanger, and a cooling turbine. The cooling turbine further cools the air to temperatures suitable for the cockpit and electronic equipment bays.

### 5.2 Cabin Air Conditioning

Cabin air conditioning is governed by a temperature controller that receives signals from temperature sensors and a cockpit control panel. The temperature controller allows hot air to mix with the cooled air stream to obtain air at the cockpit-selected temperature. Conditioned air flows from the cabin into the forward equipment bay.

### 5.3 Equipment Air Conditioning

Electronic equipment that is cooled by the ECS is grouped in the forward equipment area, cabin equipment area, aft (check) equipment area, main landing gear wheelwell area, and tail electronics area. The equipment is cooled by both area cooling and forced-air flow cooling. Area cooling is achieved by supplying cold air to the equipment area as required to maintain the temperature at 150° ( $\pm 10^\circ$ ) F. In addition, a cold air flow can be forced over or into a component or group of components.

## 6. CURRENT AVIONICS

Tables 6-1 through 6-22 contain LRU data relating to the F-111F avionics systems that make up the current or near-term configuration. Where no entries are shown, the data were not available for this report. Data pertaining to future avionics modifications are presented in Section 9.

| Table 6-1. F-111F AVIONICS CONFIGURATION DATA: HF RADIO AM/ARC-123 NSN: 5821-00-496-9234 |                 |           |                     |      |      |                       |                 |                |    |                  |                |                 |
|------------------------------------------------------------------------------------------|-----------------|-----------|---------------------|------|------|-----------------------|-----------------|----------------|----|------------------|----------------|-----------------|
| Name                                                                                     | Nomenclature    | Location  | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting        |
|                                                                                          |                 |           | H                   | W    | D    |                       |                 | AC             | DC |                  |                |                 |
| Control                                                                                  | C-7426/ARC      | Cockpit   |                     |      |      |                       |                 |                |    |                  |                | Panel           |
| Receiver-Transmitter                                                                     | RT-822/ARC-123  | Door 1202 | 7.62                | 3.62 | 13.6 | 375.0                 | 13.12           |                |    |                  | Convection     | MT-3660/ARC-123 |
| Amplifier-Power Supply                                                                   | AM-4573/ARC-123 | Door 1202 | 7.62                | 4.87 | 17.2 | 619.3                 | 23.13           | 115 V 3;       |    |                  | Forced Air     | MT-3660/ARC-123 |
| Shockmount Base                                                                          | MT-3660/ARC-123 | Door 1202 | 6.87                | 11.2 | 20.2 | 1554.0                | 8.54            |                |    |                  |                |                 |



| Table 6-2. F-111F AVIONICS CONFIGURATION DATA: UHF COMMUNICATION SET AN/ABC-109 NSN: 5821-00-496-9236 |                |           |                     |      |       |                       |                 |                |    |                  |                |                     |
|-------------------------------------------------------------------------------------------------------|----------------|-----------|---------------------|------|-------|-----------------------|-----------------|----------------|----|------------------|----------------|---------------------|
| Name                                                                                                  | Nomenclature   | Location  | Dimensions (Inches) |      |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting            |
|                                                                                                       |                |           | H                   | W    | D     |                       |                 | AC             | DC |                  |                |                     |
| UHF Communication                                                                                     | AN/ABC-109     |           |                     |      |       |                       | 38.8            | 150            |    | 150W             |                |                     |
| Receiver-Transmitter                                                                                  | RT-749/ABC-109 | Door 1202 | 6.87                | 8.87 | 14.87 | 906.1                 | 28.7            |                |    |                  | Forced Air     | RT-3327/<br>ABC-109 |
| Control                                                                                               | C-7425/ABC-109 | Cockpit   |                     |      |       |                       |                 |                |    |                  | Convection     | Cockpit             |
| Antenna Selector                                                                                      | C-4808         | Door 1202 | 3.0                 | 3.25 | 4.5   | 43.9                  | 1.5             |                |    |                  | Forced Air     | RT-1932A            |
| Antenna                                                                                               | AS-1918        |           |                     |      |       |                       | 1.0             |                |    |                  |                | Hard                |

| Table 6-3. F-111F AVIONICS CONFIGURATION DATA: INTERCOM AN/AIC-25 NSN: 5831-00-457-5041 |               |          |                     |      |      |                       |                 |                |    |                  |                |          |
|-----------------------------------------------------------------------------------------|---------------|----------|---------------------|------|------|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                    | Nomenclature  | Location | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                         |               |          | H                   | W    | D    |                       |                 | AC             | DC |                  |                |          |
| Intercom Set                                                                            | AN/AIC-25     |          |                     |      |      |                       |                 |                | 02 |                  |                |          |
| Control                                                                                 | C-7424/AIC-25 | Cockpit  |                     |      |      |                       |                 |                |    |                  |                |          |
| Intercom Station                                                                        | C-6624/AIC-25 |          | 4.38                | 3.62 | 5.12 | 81.2                  | 2.7             |                |    |                  | Convection     | Cockpit  |

| Table 6-4. F-111F AVIONICS CONFIGURATION DATA: UHF-ADF AM/ARA-50 NSN: 5826-00-883-5777 |                |           |                     |       |       |                       |                 |                |      |                  |                |                            |
|----------------------------------------------------------------------------------------|----------------|-----------|---------------------|-------|-------|-----------------------|-----------------|----------------|------|------------------|----------------|----------------------------|
| Name                                                                                   | Nomenclature   | Location  | Dimensions (Inches) |       |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |      | Heat Dissipation | Cooling Method | Mounting                   |
|                                                                                        |                |           | H                   | W     | D     |                       |                 | AC             | DC   |                  |                |                            |
| UHF-ADF Amplifier Relay Assembly                                                       | AM/ARA-50      | Door 1101 | 6.6                 | 7.1   | 8.0   | 375                   | 5.4             | 0.04           | 0.01 | 50W              | Forced Air     | MT-1955/<br>ARA-50<br>Hard |
|                                                                                        | AM-3624/ARA-50 |           | 3.5                 | 10.25 | 10.25 | 368                   | 10.0            |                |      |                  |                |                            |
| UHF/ADF Loop Antenna                                                                   | AS-909/ARA-48  |           |                     |       |       |                       |                 |                |      |                  |                |                            |

Table 6-5. F-111P AVIONICS CONFIGURATION DATA: RADAR ALTIMETER AN/APN-167 NSM: 5841-00-772-1819

| Name                          | Nomenclature    | Location  | Dimensions<br>(Inches) |      |      | Volume<br>(Cubic<br>Inches) | Weight<br>(Pounds) | Aircraft<br>Power |      | Heat<br>Dissipation | Cooling<br>Method | Mounting |
|-------------------------------|-----------------|-----------|------------------------|------|------|-----------------------------|--------------------|-------------------|------|---------------------|-------------------|----------|
|                               |                 |           | H                      | W    | D    |                             |                    | AC                | DC   |                     |                   |          |
| Radar Altimeter               | AN/APN-167      |           |                        |      |      |                             |                    |                   |      |                     |                   |          |
| Receiver-<br>Transmitter Dual | RT-771/APN-167  | Door 1202 | 6.5                    | 15.0 | 14.5 | 14.14                       | 26.0               | 0.086             | 0.01 | 192W                | Forced Air        | WT ( )   |
| Antenna                       | AS-1759/APN-167 |           | 4.5                    | 4.5  | 9.25 | 187                         | 1.1                |                   |      |                     | Convection        | Hard     |
| Radar Altimeter<br>Indicator  | KS186000100     | Cockpit   |                        |      |      |                             | 1.6/1.8*           |                   |      |                     |                   | Cockpit  |
| Lo                            |                 |           |                        |      |      |                             |                    |                   |      |                     |                   |          |

\*Two indicators in aircraft.

| Table 6-6. F-111F AVIONICS CONFIGURATION DATA: CENTRAL AIR DATA COMPUTER SYSTEM NSN: 750 |                                 |           |                     |      |       |                       |                 |                     |     |                  |                |          |
|------------------------------------------------------------------------------------------|---------------------------------|-----------|---------------------|------|-------|-----------------------|-----------------|---------------------|-----|------------------|----------------|----------|
| Name                                                                                     | Nomenclature                    | Location  | Dimensions (Inches) |      |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power      |     | Heat Dissipation | Cooling Method | Mounting |
|                                                                                          |                                 |           | H                   | W    | D     |                       |                 | AC                  | DC  |                  |                |          |
| CADC                                                                                     | 1903634-3 NSN: 6610-00-116-4624 | Door 1101 | 8.0                 | 14.0 | 19.25 | 2156                  | 47.5            | 115V<br>400ma<br>1φ | 28V |                  |                |          |
| Maximum Safe Mach Assembly                                                               | 12C1006-817                     |           | 4.5                 | 4.5  | 6.57  | 133                   | 2.5             |                     |     |                  |                |          |
| Angle of Attack Transmitter                                                              | SL2 9370-4                      |           | 4.5                 | 4.5  | 6.57  | 133                   | 2.5             |                     |     |                  |                |          |
| Total Temperature Indicator                                                              | B1508-6                         | Cockpit   | 2.25                | 2.25 | 6.47  | 32.7                  | 12.5            |                     |     |                  | Convection     | Panel    |
| Reduce Speed Warning Lamp                                                                | 65-0478-1                       | Cockpit   | 0.5                 | 3.68 | 3.2   | 5.89                  | 0.24            |                     |     |                  | Convection     | Panel    |
| Main Caution Light Panel                                                                 | 80-0170-5                       | Cockpit   | 6.1                 | 6.6  | 3.94  | 159                   | 4.8             |                     |     |                  | Convection     | Panel    |

| Table 6-7. F-111F AVIONICS CONFIGURATION DATA. TACAM M/AJM-84 REF. 5836-00-337-2006<br>(APTES 9.0. 2"-111F-518) |                |           |                    |      |      |                       |                 |                |    |                |                    |
|-----------------------------------------------------------------------------------------------------------------|----------------|-----------|--------------------|------|------|-----------------------|-----------------|----------------|----|----------------|--------------------|
| Name                                                                                                            | Nomenclature   | Location  | Dimension (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Cooling Method | Mounting           |
|                                                                                                                 |                |           | H                  | W    | D    |                       |                 | AC             | DC |                |                    |
| Control Receiver-Transmitter<br>Signal Data Converter Mount<br>RF Switch                                        | C-9475/AJM-84  | Cockpit   |                    |      |      |                       |                 |                |    |                | MR-6616/<br>AJM-84 |
|                                                                                                                 | RT-1127/AJM-84 | Door 1202 | 9.0                | 10.5 | 20.0 |                       |                 |                |    |                |                    |
|                                                                                                                 | CV-3135/AJM-84 |           |                    |      |      |                       |                 |                |    |                |                    |
|                                                                                                                 | RT-6617/AJM-84 |           |                    |      |      |                       |                 |                |    |                |                    |
|                                                                                                                 | SA-521/A       | Door 1202 | 1.94               | 2.78 | 3.19 | 19.2                  | 0.34            |                |    |                |                    |

Table 6-6. P-11F AVIONICS CONFIGURATION DATA: TACAN AN/ANM-52 REF: TNG  
PRIOR TO T.O. 1F-111F-518)

| Name                               | Nomenclature  | Location  | Dimensions<br>(Inches) |      |      | Volume<br>(Cubic<br>Inches) | Weight<br>(Pounds) | Aircraft<br>Power |        | Heat<br>Dissipation | Cooling<br>Method | Mounting           |
|------------------------------------|---------------|-----------|------------------------|------|------|-----------------------------|--------------------|-------------------|--------|---------------------|-------------------|--------------------|
|                                    |               |           | H                      | W    | D    |                             |                    | AC                | DC     |                     |                   |                    |
| Control                            | C-7712/ANM-52 | Cockpit   | 7.35                   | 17.0 | 16.9 | 17.42                       | 43.25              |                   |        |                     | Convection        | Panel              |
| Receiver-<br>Transmitter           | WT-891/ANM-52 | Door 1202 |                        |      |      |                             |                    |                   |        |                     | Forced Air        | PT-1729/<br>ANM-52 |
| Antenna                            | 11020100-1    |           | 9.7                    | 3.5  | 7.5  | 225.0                       | 2.0                |                   |        |                     |                   | Hard               |
| RF Switch                          | BA-531/A      | Door 1202 | 1.94                   | 2.78 | 3.19 | 17.2                        | 0.34               |                   |        |                     |                   |                    |
| Receiver-<br>Transmitter<br>System | PT-384/ANM-52 |           |                        |      |      |                             |                    | 0.25              | 0.0616 |                     |                   |                    |

| Table 6-9. F-111F AVIONICS CONFIGURATION DATA: ILS AN/ARN-58 NSN: 5826-00-881-5795 |                               |           |                     |      |      |                       |                 |                |       |                  |                |          |
|------------------------------------------------------------------------------------|-------------------------------|-----------|---------------------|------|------|-----------------------|-----------------|----------------|-------|------------------|----------------|----------|
| Name                                                                               | Nomenclature                  | Location  | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |       | Heat Dissipation | Cooling Method | Mounting |
|                                                                                    |                               |           | H                   | W    | D    |                       |                 | AC             | DC    |                  |                |          |
| ILS                                                                                | AN/ARN-58                     |           |                     |      |      |                       |                 |                |       |                  |                |          |
| Receiver Localizer                                                                 | R-843/ARN-58                  | Door 2204 | 7.75                | 6.87 | 5.01 | 267                   | 7.9             |                | 220mA | 48W              |                | Shock    |
| Receiver Control                                                                   | R-844/ARN-58<br>C-7422/ARN-93 | Door 2204 | 9.75                | 6.87 | 5.01 | 336                   | 9.6             |                |       | 48W              | Convection     | Shock    |
| Marker Beacon Antenna                                                              |                               |           |                     |      |      |                       | 1.0             |                |       |                  |                | Hard     |
| Glide Slope Localizer Antenna                                                      |                               |           |                     |      |      |                       | 0.8             |                |       |                  |                | Hard     |
|                                                                                    |                               |           |                     |      |      |                       |                 |                |       |                  |                | Hard     |



Table 6-10. F-111F AVIONICS CONFIGURATION DATA: INERTIAL NAVIGATION SYSTEM AJN-16 NSN: TBD

| Name                    | Nomenclature   | Location  | Dimensions<br>(Inches) |       |       | Volume<br>(Cubic<br>Inches) | Weight<br>(Pounds) | Aircraft<br>Power |    | Heat<br>Dissipation | Cooling<br>Method | Mounting |
|-------------------------|----------------|-----------|------------------------|-------|-------|-----------------------------|--------------------|-------------------|----|---------------------|-------------------|----------|
|                         |                |           | H                      | W     | D     |                             |                    | AC                | DC |                     |                   |          |
| Stabilized<br>Platform  | JX-8131/AJN-16 | Door 1102 | 12.31                  | 14.75 | 17.5  | 3178                        | 70                 |                   |    |                     | Forced Air        | Shock    |
| Naval Computer          | CP-945/AJN-16  | Door 1101 | 8.0                    | 6.5   | 19.75 | 1077                        | 26                 |                   |    |                     | Forced Air        | Shock    |
| Control-Power<br>Supply | C-7719/AJN-16  | Door 1101 | 25.0                   | 10.0  | 12.0  | 3000                        | 14                 |                   |    |                     | Forced Air        | Shock    |

| Table 6-11. F-111F AVIONICS CONFIGURATION DATA: COMPUTER SYSTEM NSN: TBD |                                        |           |                     |      |      |                       |                 |                |    |                  |                |          |
|--------------------------------------------------------------------------|----------------------------------------|-----------|---------------------|------|------|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                     | Nomenclature                           | Location  | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                          |                                        |           | H                   | W    | D    |                       |                 | AC             | DC |                  |                |          |
| General Purpose Computer                                                 | AM/AYK-6 NSN: 6605-00-166-2591         | Door 1202 | 7.6                 | 10.0 | 20.7 | 1573                  | 47.4            |                |    |                  |                | MT-4006  |
| Multiplexer Converter                                                    | CV-2797/A                              | Door 1202 |                     |      |      |                       |                 |                |    |                  |                | MT-4006  |
| Equipment Rack Control Indicator                                         | MT-4400/A<br>C-8586/AYK<br>ID-1748/AYK | Door 1202 |                     |      |      |                       |                 |                |    |                  |                |          |

| Table 6-12. F-111F AVIONICS CONFIGURATION DATA: INTERFERENCE BLANKER MSN: TBD |              |          |                     |   |   |                       |                 |                |    |                  |                |          |
|-------------------------------------------------------------------------------|--------------|----------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                          | Nomenclature | Location | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                               |              |          | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| Interference Blanker                                                          | MX-8103      |          |                     |   |   | Details of MX-8103    | are classified. |                |    |                  |                |          |

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| Table 6-13. F-111F AVIONICS CONFIGURATION DATA: IFF TRANSPONDER AN/APX-64 NSN: 5895-00-115-7812 |               |           |                     |       |       |                       |                 |                |        |                  |                |                |
|-------------------------------------------------------------------------------------------------|---------------|-----------|---------------------|-------|-------|-----------------------|-----------------|----------------|--------|------------------|----------------|----------------|
| Name                                                                                            | Nomenclature  | Location  | Dimensions (Inches) |       |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |        | Heat Dissipation | Cooling Method | Mounting       |
|                                                                                                 |               |           | H                   | W     | D     |                       |                 | AC             | DC     |                  |                |                |
| IFF Transponder                                                                                 | AN/APX-64     |           |                     |       |       |                       |                 |                |        |                  |                |                |
| Receiver-Transmitter                                                                            | RT-728/APX-64 | Door 1202 | 8.58                | 11.13 | 19.31 |                       | 30.0            | 0.3            | 0.03   | 110W             | Forced Air     | MT-3497/APX-64 |
| Control                                                                                         | C-7483/APX-64 | Cockpit   |                     |       |       |                       |                 | 0.08           |        |                  | Convection     | Cockpit        |
| Test Set Airborne                                                                               | TS-1843/APX   | Door 1202 | 3.15                | 3.25  | 7.81  | 70.9                  | 3.0             |                | 0.0105 | 10.5W            | Forced Air     | MT-3513        |
| Antenna Blade                                                                                   | AS-1919       |           |                     |       |       |                       | 2.0             |                |        |                  |                |                |
| Transponder Computer                                                                            | KIT-1A/T SEC  | Door 1102 | 2.42                | 6.6   | 14.25 | 810.7                 | 12.0            | 0.025          | 0.012  | 30W              | Forced Air     | MT-4579/U      |

| Name                                                                                                                      | Nomenclature    | Location    | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting            |
|---------------------------------------------------------------------------------------------------------------------------|-----------------|-------------|---------------------|------|------|-----------------------|-----------------|----------------|----|------------------|----------------|---------------------|
|                                                                                                                           |                 |             | H                   | W    | D    |                       |                 | AC             | DC |                  |                |                     |
| Terrain Following Computer:<br>Antenna Receiver<br>Control<br>Amplifier-Power Supply<br>Synchronizer Transmitter<br>Mount | CP-917/APQ-128  | Door 1201   | 5.3                 | 7.3  | 16.1 | 623                   | 16.4            |                |    |                  | Forced Air     | MT-3917/<br>APQ-128 |
|                                                                                                                           | AS-2136/APQ-128 | Nose Radome | 13.5                | 12.7 | 14.3 | 2451                  | 27.9            |                |    |                  |                |                     |
|                                                                                                                           | C-7510/APQ-128  | Cockpit     | 3.0                 | 5.8  | 6.3  | 110                   | 2.6             |                |    |                  |                |                     |
|                                                                                                                           | AM-4915/APQ-128 | Door 1201   | 6.0                 | 6.8  | 17.6 | 718                   | 20.8            |                |    |                  | Forced Air     | MT-3917/<br>APQ-128 |
|                                                                                                                           | SM-519/APQ-128  | Door 1201   | 6.0                 | 7.8  | 17.6 | 8237                  | 27.6            |                |    |                  | Forced Air     | MT-3917/<br>APQ-128 |
|                                                                                                                           | MT-3917/APQ-128 | Door 1201   | 19.25               | 16.3 | 18.8 | 5899                  | 24.8            |                |    |                  |                |                     |



Table 5-16. F-111F AVIONICS CONFIGURATION DATA: ECM AM/APS-109 MSB: 5845-00-813-5413

| Name                   | Nomenclature    | Location | Dimensions (Inches) |   |   | Volume (Cubic Inches)                 | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting                                            |
|------------------------|-----------------|----------|---------------------|---|---|---------------------------------------|-----------------|----------------|----|------------------|----------------|-----------------------------------------------------|
|                        |                 |          | H                   | W | D |                                       |                 | AC             | DC |                  |                |                                                     |
| Antenna Band 1         | AS-1781/APS-109 | Radome   |                     |   |   | Details of AM/APS-109 are classified. |                 |                |    |                  |                | MT-4225/<br>APS-109<br>MT-4225/<br>APS-109<br>Panel |
| Antenna Band 2         | AS-1725/APS-109 | Radome   |                     |   |   |                                       |                 |                |    |                  |                |                                                     |
| Antenna Band 3         | AS-1723/APS-109 | Radome   |                     |   |   |                                       |                 |                |    |                  |                |                                                     |
| Antenna                | AS-1719/APS-109 | Radome   |                     |   |   |                                       |                 |                |    |                  |                |                                                     |
| Receiver               | R-1643/APS-109  | TNO      |                     |   |   |                                       |                 |                |    |                  |                |                                                     |
| Video Signal Processor | VM-192-1        |          |                     |   |   |                                       |                 |                |    |                  |                |                                                     |
| Indicator              | IS-101/APS-109  |          |                     |   |   |                                       |                 |                |    |                  |                |                                                     |
| Control                | C-8461          |          |                     |   |   |                                       |                 |                |    |                  |                |                                                     |

| Table 6-17. F-111F AVIONICS CONFIGURATION DATA: ECM AAR-34 AND ALR-23 MM: 5485-00-104-9842 |                 |           |                     |   |      |                       |                 |                |    |                |
|--------------------------------------------------------------------------------------------|-----------------|-----------|---------------------|---|------|-----------------------|-----------------|----------------|----|----------------|
| Name                                                                                       | Nomenclature    | Location  | Dimensions (Inches) |   |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Cooling Method |
|                                                                                            |                 |           | H                   | W | D    |                       |                 | AC             | DC |                |
| Receiver Control                                                                           | C-8289/AAR-34   | Cockpit   |                     |   |      |                       |                 |                |    |                |
| Search Track Scanner                                                                       | CV-26301/AAR-34 | Door 4492 |                     |   |      |                       |                 |                |    |                |
| Cryogenics Converter                                                                       | NR-6708/ALR-23  | Door 4491 | 6.8 dia.            |   | 22.0 | 2.35                  |                 |                |    |                |
| Video Sig Processor                                                                        | CH-389/AAR-34   | Door 1101 |                     |   |      |                       |                 |                |    |                |
| Details of AAR-34/ALR-23 are classified.                                                   |                 |           |                     |   |      |                       |                 |                |    |                |



Table 6-18. F-111F AVIONICS CONFIGURATION DATA: ECM AN/ALQ-94 NSN: 5865-00-890-0422

| Name                | Nomenclature   | Location  | Dimensions (Inches) |   |   | Volume (Cubic Inches)                | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting       |
|---------------------|----------------|-----------|---------------------|---|---|--------------------------------------|-----------------|----------------|----|------------------|----------------|----------------|
|                     |                |           | H                   | W | D |                                      |                 | AC             | DC |                  |                |                |
| Amplifier Mid Band  | AM-4851/ALQ-94 | Door 1101 |                     |   |   | Details of AN/ALQ-94 are classified. |                 |                |    |                  | Forced Air     | MT-3878/ALQ-94 |
| Receiver Mid        | R-1498/ALQ-94  | Door 1101 |                     |   |   |                                      |                 |                |    |                  | Forced Air     | MT-3878/ALQ-94 |
| Amplifier Low Band  | AM-4850/ALQ-94 | Door 1101 |                     |   |   |                                      |                 |                |    |                  | Forced Air     | MT-3877/ALQ-94 |
| Receiver Low        | R-1497/ALQ-94  | Door 1101 |                     |   |   |                                      |                 |                |    |                  | Forced Air     | MT-3877/ALQ-94 |
| Amplifier High Band | AM-4852/ALQ-94 | Door 1201 |                     |   |   |                                      |                 |                |    |                  | Forced Air     | MT-3879/ALQ-94 |
| Receiver High       | R-1499/ALQ-94  | Door 1201 |                     |   |   |                                      |                 |                |    |                  | Forced Air     | MT-3879/ALQ-94 |
| Control             | C-7940/ALQ-94  | Cockpit   |                     |   |   |                                      |                 |                |    |                  | Convection     | Panel          |
| Antenna No. 3       |                |           |                     |   |   |                                      |                 |                |    |                  |                |                |
| Antenna No. 5       |                |           |                     |   |   |                                      |                 |                |    |                  |                |                |
| Antenna No. 7       |                |           |                     |   |   |                                      |                 |                |    |                  |                |                |
| Antenna No. 9       |                |           |                     |   |   |                                      |                 |                |    |                  |                |                |
| Antenna High        |                |           |                     |   |   |                                      |                 |                |    |                  |                |                |
| Antenna Mid         |                |           |                     |   |   |                                      |                 |                |    |                  |                |                |
| Antenna Low         |                |           |                     |   |   |                                      |                 |                |    |                  |                |                |

| Table 6-19. F-111F AVIONICS CONFIGURATION DATA: CN DISPENSER SET (PARTIAL LISTING) AM/ALE-28 NSN: 5865-00-105-8987* |               |          |                     |      |      |                       |                 |                |       |                  |                |          |
|---------------------------------------------------------------------------------------------------------------------|---------------|----------|---------------------|------|------|-----------------------|-----------------|----------------|-------|------------------|----------------|----------|
| Name                                                                                                                | Nomenclature  | Location | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |       | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                                     |               |          | H                   | W    | D    |                       |                 | AC             | DC    |                  |                |          |
| CN Dispenser Set                                                                                                    | AM/ALE-28     |          |                     |      |      |                       |                 |                |       |                  |                |          |
| Control                                                                                                             | C-6471/ALE-28 | Cockpit  | 4.12                | 5.75 | 6.25 | 148.0                 | 4.6             | 0.15           | 0.075 | 111W<br>20W      | Convection     | Cockpit  |
| Control Sequence Ejector                                                                                            | C-7682/ALE-28 |          | 11.6                | 9.8  | 32.4 | 3683.0                | 51.0            |                |       | 2.05W            |                |          |
| Eject Force Dispenser                                                                                               | D-22/ALE-28   | Cockpit  | 1.12                | 5.75 | 4.0  | 25.76                 | 0.4             | 0.005          | 0.007 | 12W              | Convection     | Cockpit  |
| Disposable Control Panel                                                                                            |               |          |                     |      |      |                       |                 |                |       |                  |                |          |
| *Also NSN: 5865-00-114-3146.                                                                                        |               |          |                     |      |      |                       |                 |                |       |                  |                |          |

| Table 6-20. F-111F AVIONICS CONFIGURATION DATA: RECORDER SET AM/A24U-6 RSH: TRD |                |          |                     |   |   |                       |                 |                |    |                  |                |          |
|---------------------------------------------------------------------------------|----------------|----------|---------------------|---|---|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                            | Nomenclature   | Location | Dimensions (Inches) |   |   | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                 |                |          | H                   | W | D |                       |                 | AC             | DC |                  |                |          |
| Recorder Mechanical Assembly                                                    | MRD-316/A24U-6 |          |                     |   |   |                       |                 |                |    |                  |                |          |
| Magnetic Recorder Set                                                           | MRD-315/A24U-6 |          |                     |   |   |                       |                 |                |    |                  |                |          |

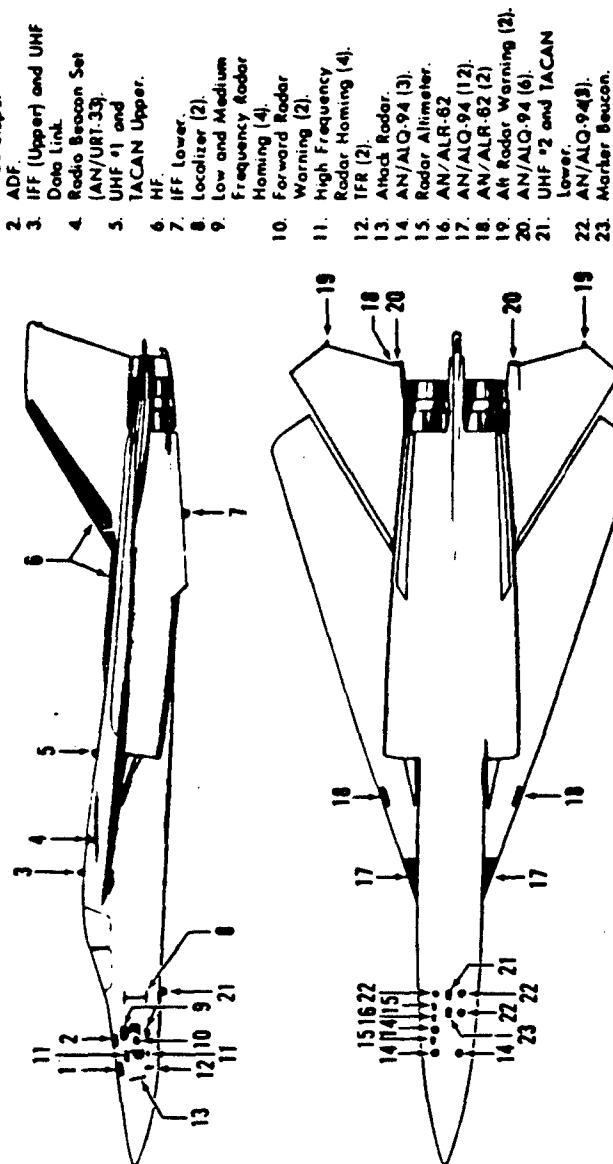
| Table 6-21. F-111F AVIONICS CONFIGURATION DATA: ANTENNA COUPLES GROUP OA-7149 MSN: 7149 |              |           |                     |      |       |                       |                 |                |    |                  |                |          |
|-----------------------------------------------------------------------------------------|--------------|-----------|---------------------|------|-------|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                    | Nomenclature | Location  | Dimensions (Inches) |      |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                         |              |           | H                   | W    | D     |                       |                 | AC             | DC |                  |                |          |
| Control                                                                                 | C-6435/ABC   | Door 1202 | 15.25               | 6.5  | 1.75  | 171.5                 | 7.4             |                |    |                  |                | MR-3357  |
| Coupler                                                                                 | CU-1402/ABC  |           | 10.25               | 10.0 | 12.75 | 1307.0                | 14.8            |                |    |                  |                |          |
| Capacitor                                                                               | CB-17/ABC    |           |                     |      |       |                       |                 |                |    |                  |                |          |

| Table 6-22. F-111F AVIONICS CONFIGURATION DATA: MISCELLANEOUS RES: YND |                |          |                     |     |      |                       |                 |                |    |                  |                |          |
|------------------------------------------------------------------------|----------------|----------|---------------------|-----|------|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                   | Nomenclature   | Location | Dimensions (Inches) |     |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                        |                |          | H                   | W   | D    |                       |                 | AC             | DC |                  |                |          |
| Horizontal Situation Display Indicator                                 | IP-1030/AYW-4  | Cockpit  | 7.7                 | 7.7 | 20.0 | 1186                  | 46.0            |                |    |                  | Convection     | Panel    |
| HSD Processor                                                          | MT-8751/AYW-4  |          |                     |     |      |                       |                 |                |    |                  |                |          |
| Amplifier-Power Supply                                                 | AM-4869/ASC-25 |          |                     |     |      |                       |                 |                |    |                  |                |          |
| Optical Display                                                        | SU-62/ASC-27   |          |                     |     |      |                       |                 |                |    |                  |                |          |

## 7. ANTENNA LOCATIONS

Figure 7-1 shows the approximately locations of the antennas on the F-111F. Antenna nomenclature from the current technical orders is as follows:

| Antenna                                      | Nomenclature or Part Number |
|----------------------------------------------|-----------------------------|
| 1. Glide Slope Strip                         | 12Z519-7                    |
| Glide Slope Plate                            | 12Z517-1                    |
| 2. ADF                                       | AS-909/ARA-48               |
| 3. IFF (Upper) and UHF Data Link             | 11D020100-6                 |
| 4. Radio Beacon Set                          | AN/URT-27 or -33            |
| 5. UHF No. 1 and TACAN Upper                 | 11D020100-6                 |
| 6. HF Dorsal                                 | 12T501-807                  |
| HF Vertical                                  | 12T010-849                  |
| 7. IFF Lower                                 | AT-741B/A                   |
| 8. Localizer (2)                             | TBD                         |
| 9. Low and Medium Frequency Radar Homing (4) | LH Installation 12E2239-5   |
| 10. Forward Radar Warning (2)                | RH Installation 12E2239-6   |
| 11. High Frequency Radar Homing (4)          |                             |
| 12. Terrain Following Radar (2)              | AS-2136/APQ-110             |
| 13. Attack Radar                             | AS-1749/APQ-113             |
| 14. AN/ALQ-94 ECM No. 3                      | 12E2907-1                   |
| AN/ALQ-94 ECM No. 5                          | 12E2908-1                   |
| AN/ALQ-94 ECM No. 7                          | 12E2909-1                   |
| 15. Radar Altimeter                          | LG81G3                      |
| 16. AN/ALR-62                                | 311190-1                    |
| 17. AN/ALQ-94 High Band Wing Glove (4)       | 12E2989-1                   |
| AN/ALQ-94 Medium Band Wing Glove (2)         | 12E2987-1                   |
| AN/ALQ-94 Low Band Wing Glove (4)            | 12E2988-1                   |
| AN/ALQ-94 Mid Band, Transmit Wing Glove (2)  | 12E2999-1                   |
| 18. AN/ALR-62 (2)                            | 12E2982-1                   |
| 19. AFT Radar Warning (2)                    | 12E805-1                    |
| 20. AN/ALQ-94 ECM No. 9 LH (3) per assembly  | 12E2910-3                   |
| AN/ALQ-94 ECM No. 9 RH (3) per assembly      | 12E2910-1                   |
| 21. UHF No. 2 and TACAN Lower                | 11D20100-3                  |
| 22. AN/ALQ-94 ECM No. 3                      | 12E2907-1                   |
| AN/ALQ-94 ECM No. 5                          | 12E2908-1                   |
| AN/ALQ-94 ECM No. 7                          | 12E2909-1                   |
| 23. Marker Beacon                            | 16D00500                    |



14000000-0000

Figure 7-1. ANTENNA LOCATIONS (TYPICAL)

## 8. INTERFACE DATA

This section contains examples of interface signal characteristics. These data were extracted from applicable sections of the Interface Control Documents (ICDs) for integration of GPS user equipment in the F-111F aircraft. Each sheet discusses a particular signal. The top line contains the signal name, type of signal (digital, analog, discrete, or synchronous), signal source and load, and whether the signal is an input or output of the GPS user equipment. A functional description follows, together with a description of the signal's characteristics.



# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM | TO           |
|-------------|---------|-----|------|--------------|
| Bearing     | Synchro | O   | UE   | HSI and BDHI |

## Functional Description

Provides angular information to the bearing pointer\* to display relative bearing of the aircraft's present position to selected waypoint. The relative bearing is the difference, in degrees, between the lubber line and the bearing pointer as read from the compass card.

\*No. 1 pointer on BDHI

## Signal Characteristics

RANGE: 0° to 360°

ACCURACY: +0.5°

INDEX REFERENCE: Aircraft Heading

POSITIVE DIRECTION SENSE: Increasing Bearing

SCALE FACTOR: 1° = 1°

RESOLUTION: HSI ±2.5°, BDHI ±0.5°

## Electrical Characteristics (continued on next page)

- LOAD: 1) HSI, AQU-4/A, Bearing Pointer, 3-Wire Synchro, Bendix Type AY-500-5 or equal  
2) BDHI, ES165001400, No. 1 Pointer, 3-Wire Synchro, Bendix Type AY-100 HY-59-A1 or equal

SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Triad  
Wire Size: No. 22 AWG

A/C: F-111F  
REF: MIL-1-27848  
12R5-4-85-3  
1F-111F-2-18-1

|      |      |             |
|------|------|-------------|
| REV  | DATE | DESCRIPTION |
| A    |      | ICD-GPS-015 |
| DATE | REV  | THREE 10-2  |

# ELECTRICAL CHARACTERISTICS

| LOAD 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  | LOAD 2                                                                                                                                                                                                                                                                                                               |  |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| MSI, AQU-4/A, Bearing Pointer, 3-Wire Synchro, Bendix Type AY-500-5 or equal                                                                                                                                                                                                                                                                                                                                                                                                                  |  |  | BDHI, E 5165001400, No. 1 Pointer, 3-Wire Synchro, Bendix Type AY-100 HY-59-A1 or equal                                                                                                                                                                                                                              |  |  |
| <b>ROTOR</b><br>Input Voltage 26 Volts<br>Frequency 400 Cycles<br>Input Current -- ma<br>Input Power -- Watts<br>Resistance (DC) 530 Ohms<br><b>STATOR</b><br>Input Voltage 11.8 Volts<br>Input Current 20 ma<br>Input Power 0.090 Watts<br>Resistance (DC) 188 Ohms<br>Rotor Output Voltage 19 Volts<br>Phase Shift (S to R) 15 Degrees<br>Accuracy (Max) 15 Minutes<br>Null Voltage (Max) 50 mv<br><b>IMPEDANCE</b><br>Zso 222 + j470 Ohms<br>Zro 940 + j2260 Ohms<br>Zrss 1050 + j450 Ohms |  |  | Primary Winding Stator<br>Primary Voltage (400 Hz) 11.8 Volts<br>Secondary Voltage 20.3 Volts<br>Input Current .020 Amps<br>Input Power .060 Watts<br>Max. Error Spread +6 Minutes<br>Max. Null Voltage 30 mv<br>Zro 595 + j2130<br>Zso 750 + j369<br>Rotor DC Resistance 409 Ohms<br>Stator DC Resistance 1200 Ohms |  |  |

|       |      |     |      |
|-------|------|-----|------|
| SIZE  | DATE | REV | 10-3 |
| A     |      |     | 10-3 |
| SCALE | REV  |     |      |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME     | TYPE    | I/O | FROM | TO         |
|-----------------|---------|-----|------|------------|
| Distance, Units | Synchro | O   | UE   | HSI & BDHI |

## Functional Description

Provides angular information to rotate the units digit in the range window. Displays aircraft present position distance to selected waypoint in 1 nm increments (0.5 nm indexed). Driven independently of other digits, but lead in conjunction with them in order to provide the least significant digit.

## Signal Characteristics

RANGE: 0 to 9 (0° to 360°)  
 ACCURACY: + 0.2 (+ 7.2°)  
 INDEX REFERENCE: 0  
 POSITIVE DIRECTION SENSE: To decreasing values (distance to go)  
 SCALE FACTOR: 36° = 1 numeral  
 RESOLUTION: +3°

## Electrical Characteristics (continued on next page)

LOAD: 1) HSI, AQU-4/A, Distance Display, 3-Wire Synchro, Clifton Type CRC-8-A-1 or equal  
 2) BDHI, E5165001400, Distance Display, 3-Wire Synchro, Bendix Type AY 080-DD-46-A1 or equal

SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Two Single Conductors (X, Y) -  
 Wire Size: No. 22 AWG

Note: "Z" grounded through 26 Vac common.

A/C: F-111F  
 REF: MIL-I-27848  
 12R5-4-65-3  
 1F-111F-2-18-1

|             |      |    |      |      |     |      |    |      |      |
|-------------|------|----|------|------|-----|------|----|------|------|
| REV         | DATE | BY | CHKD | DATE | REV | DATE | BY | CHKD | DATE |
| A           |      |    |      |      |     |      |    |      |      |
| 1CD-GPS-015 |      |    |      |      |     |      |    |      |      |
| 10-4        |      |    |      |      |     |      |    |      |      |

# ELECTRICAL CHARACTERISTICS

| LOAD 1                                                                          |           |         | LOAD 2                                                                                     |           |         |
|---------------------------------------------------------------------------------|-----------|---------|--------------------------------------------------------------------------------------------|-----------|---------|
| HSI, AQU-4/A, Distance Display, 3-Wire Synchro, Clifton Type CRC-8-A-1 or equal |           |         | BDHI, E5165001400, Distance Display, 3-Wire Synchro, Bendix Type, AY 080-DJ-46-A1 or equal |           |         |
| Primary Winding                                                                 | Rotor     |         | Primary Winding                                                                            | Rotor     |         |
| Primary Voltage (400 Hz)                                                        | 26        | Volts   | Primary Voltage (400 Hz)                                                                   | 26        | Volts   |
| Secondary Voltage                                                               | 11.8      | Volts   | Secondary Voltage                                                                          | 11.8      | Volts   |
| Input Current                                                                   | 100       | ma      | Input Current                                                                              | 187       | ma      |
| Input Power                                                                     | .54       | Watts   | Input Power                                                                                | 1.1       | Watts   |
| Accuracy                                                                        | 30        | Feet    | Max. Error Spread                                                                          | +1.25     | Degrees |
| Impedance, Zro                                                                  | 54 + j260 | Ohms    | Impedance, Zro                                                                             | 32 + j150 |         |
| Impedance, Zso                                                                  | 12 + j45  | Ohms    | Impedance, Zso                                                                             | 6.8 + j26 |         |
|                                                                                 |           |         | Impedance, Zrs                                                                             | 57 + j14  |         |
| Rotor DC Resistance                                                             | 37        | Ohms    | Rotor DC Resistance                                                                        | 24        | Ohms    |
| Stator DC Resistance                                                            | 12        | Ohms    | Stator DC Resistance                                                                       | 7.3       | Ohms    |
| Phase Shift                                                                     | 8.5       | Degrees |                                                                                            |           |         |

|             |      |     |      |     |      |     |
|-------------|------|-----|------|-----|------|-----|
| DATE        | CODE | REV | DATE | REV | DATE | REV |
| A           |      |     |      |     |      |     |
| ICD-6PS-015 |      |     | 10-5 |     |      |     |

## INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME    | TYPE    | I/O | FROM | TO         |
|----------------|---------|-----|------|------------|
| Distance, Tens | Synchro | 0   | UE   | HSI & BDHI |

### Functional Description

Provides angular information to rotate the tens digit in the range window. Displays aircraft present position distance to selected waypoint in 10 nm increments. Driven independently of other distance digits but read in conjunction with them.

### Signal Characteristics

```

RANGE: 0 to 9 (0° to 360°)
ACCURACY: +0.2 (+7.2°)
INDEX REFERENCE: 0
POSITIVE DIRECTION SENSE: To decreasing values (distance to go)
SCALE FACTOR: 36° = 1 numeral
RESOLUTION: +3°

```

## Electrical Characteristics (continued on next page)

LOAD: 1) HSI, AQU-4/A, Distance Display, 3-Wire Synchro, Clifton Type  
CRC-8-A-1 or equal  
2) BDHI, ESI65001400, Distance Display, 3-Wire Synchro, Bendix  
Type AY 680-DD-46-A1 or equal

SOURCE: (TBD-1)

### Interconnection Data

Wire Type & No.: Two Single Conductors (X, Y)  
Wire Size: No. 22 AWG

Note: "Z" grounded through 26 Vac common.

A/C: F-111F  
REF: MIL-I-27848  
12R5-4-65-3  
1F-111F-2-18-1

|              |                    |                  |
|--------------|--------------------|------------------|
| <b>A</b>     | <b>ICD-GPS-015</b> |                  |
| <b>CLASS</b> | <b>SER</b>         | <b>DATE</b> 10-6 |

# ELECTRICAL CHARACTERISTICS

| LOAD 1                                                                          |           |         |  | LOAD 2                                                                                   |           |         |  |
|---------------------------------------------------------------------------------|-----------|---------|--|------------------------------------------------------------------------------------------|-----------|---------|--|
| HSI, AQU-4/A, Distance Display, 3-Wire Synchro, Clifton Type CRC-8-A-1 or equal |           |         |  | BDHI, E5165001400, Distance Display, 3-Wire Synchro, Bendix Type AY080-DD-46-A1 or equal |           |         |  |
| Primary Winding                                                                 | Rotor     |         |  | Primary Winding                                                                          | Rotor     |         |  |
| Primary Voltage (400 Hz)                                                        | 26        | Volts   |  | Primary Voltage (400 Hz)                                                                 | 26        | Volts   |  |
| Secondary Voltage                                                               | 11.8      | Volts   |  | Secondary Voltage                                                                        | 11.8      | Volts   |  |
| Input Current                                                                   | 100       | ma      |  | Input Current                                                                            | 187       | ma      |  |
| Input Power                                                                     | .54       | Watts   |  | Input Power                                                                              | 1.1       | Watts   |  |
| Accuracy                                                                        | 30        | Feet    |  | Max. Error Spread                                                                        | +1.25     | Degrees |  |
| Impedance, Zro                                                                  | 54 + j260 | Ohms    |  | Impedance, Zro                                                                           | 32 + j150 | Ohms    |  |
| Impedance, Zso                                                                  | 12 + j45  | Ohms    |  | Impedance, Zso                                                                           | 6.8 + j26 | Ohms    |  |
|                                                                                 |           |         |  | Impedance, Zrs                                                                           | 57 + j14  | Ohms    |  |
| Rotor DC Resistance                                                             | 37        | Ohms    |  | Rotor DC Resistance                                                                      | 24        | Ohms    |  |
| Stator DC Resistance                                                            | 12        | Ohms    |  | Stator DC Resistance                                                                     | 7.3       | Ohms    |  |
| Phase Shift                                                                     | 8.5       | Degrees |  |                                                                                          |           |         |  |

|     |      |             |             |
|-----|------|-------------|-------------|
| REV | DATE | DESCRIPTION | 1CD-GPS-015 |
| A   |      |             |             |
| REV | DATE | DESCRIPTION | 10-7        |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME        | TYPE    | I/O | FROM | TO         |
|--------------------|---------|-----|------|------------|
| Distance, Hundreds | Synchro | O   | UE   | HSI & BDHI |

## Functional Description

Provides angular information to rotate the hundreds digit in the range window. Displays aircraft present position distance to the selected waypoint in 100 nm increments. Driven independently of the other distance digits, but read in conjunction with them in order to provide the most significant digit for the distance value.

## Signal Characteristics

RANGE: 0 to 9 ( $0^0$  to  $360^0$ )  
 ACCURACY:  $\pm 0.2$  ( $\pm 7.2^0$ )  
 INDEX REFERENCE: 0  
 POSITIVE DIRECTION SENSE: To decreasing values (distance to go)  
 SCALE FACTOR:  $36^0 = 1$  numeral  
 RESOLUTION:  $\pm 3^0$

## Electrical Characteristics (continued on next page)

LOAD: 1) HSI, AQU-4/A, Distance Display, 3-Wire Synchro, Clifton Type CRC-8-A-1 or equal  
 2) BDHI, E5165001400, Distance Display, 3-Wire Synchro, Bendix Type AY 080-DD-46-A1 or equal

SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Two Single Conductors (X, Y)  
 Wire Size: No. 22 AWG

Note: "Z" grounded through AC common.

A/C: F-111F  
 REF: MIL-1-27848  
 12R5-4-65-3  
 1F-111F-2-18-1

|      |      |       |             |
|------|------|-------|-------------|
| APP  | DATE | REV   | DESCRIPTION |
| A    |      |       | ICD-GPS-015 |
| DATE | REV  | SHEET | 10-8        |

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# ELECTRICAL CHARACTERISTICS

| LOAD 1                                                                          |           |         | LOAD 2                                                                                   |           |         |
|---------------------------------------------------------------------------------|-----------|---------|------------------------------------------------------------------------------------------|-----------|---------|
| HSI, AQU-4/A, Distance Display, 3-Wire Synchro, Clifton Type CRC-8-A-1 or equal |           |         | BDHI, E5165001400, Distance Display, 3-Wire Synchro, Bendix Type AY080-DD-46-A1 or equal |           |         |
| Primary Winding                                                                 | Rotor     |         | Primary Winding                                                                          | Rotor     |         |
| Primary Voltage (400 Hz)                                                        | 26        | Volts   | Primary Voltage (400 Hz)                                                                 | 26        | Volts   |
| Secondary Voltage                                                               | 11.8      | Volts   | Secondary Voltage                                                                        | 11.8      | Volts   |
| Input Current                                                                   | 100       | ma      | Input Current                                                                            | 187       | ma      |
| Input Power                                                                     | .54       | Watts   | Input Power                                                                              | 1.1       | Watts   |
| Accuracy                                                                        | 30        | Feet    | Max. Error Spread                                                                        | +1.25     | Degrees |
| Impedance, Zro                                                                  | 54 + j260 | Ohms    | Impedance, Zro                                                                           | 32 + j150 | Ohms    |
| Impedance, Zso                                                                  | 12 + j45  | Ohms    | Impedance, Zso                                                                           | 6.8 + j26 | Ohms    |
|                                                                                 |           |         | Impedance, Zrs                                                                           | 57 + j14  | Ohms    |
| Rotor DC Resistance                                                             | 37        | Ohms    | Rotor DC Resistance                                                                      | 24        | Ohms    |
| Stator DC Resistance                                                            | 12        | Ohms    | Stator DC Resistance                                                                     | 7.3       | Ohms    |
| Phase Shift                                                                     | 8.5       | Degrees |                                                                                          |           |         |

|       |          |             |
|-------|----------|-------------|
| DATE  | REVISION | DESCRIPTION |
| A     |          | ICD-GPS-015 |
| SCALE | REV      | DATE 10-9   |



# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME   | TYPE     | I/O | FROM | TO         |
|---------------|----------|-----|------|------------|
| Distance Flag | Discrete | 0   | UE   | HSI & BDHI |

## Functional Description

Provides a discrete signal to operate the distance warning flag. The flag is normally out of view when the range indicator is operating and the range data is valid. The flag covers the range indicator when the distance information is not valid or the device supplying the distance data is not operating.

## Signal Characteristics

RANGE: 28 Vdc applied, Flag out of view  
28 Vdc not applied, Flag in view

## Electrical Characteristics

LOAD: 1) HSI (AQU-4/A), distance shutter mechanism, 28 Vdc meter movement  
2) BDHI (E5165001400), distance shutter mechanism, 28 Vdc meter movement, 625 Ohms  $\pm$  10%

SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Pair  
Wire Size: No. 22 AWG

A/C: F-111F  
REF: MIL-I-27848  
12R5-4-65-3  
1F-111F-2-18-1

|     |     |             |
|-----|-----|-------------|
| REV | REV | REV         |
| A   |     | ICD-GPS-015 |
| REV | REV | REV 10-10   |

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# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME     | TYPE     | I/O | FROM | TO  |
|-----------------|----------|-----|------|-----|
| Thousand, Digit | Discrete | 0   | UE   | HSI |

## Functional Description

Provides a discrete output signal to operate the thousand digit of the HSI when the distance to a selected waypoint is greater than 999 nautical miles.

## Signal Characteristics

Thousand Digit In View: 28 Vdc applied  
Thousand Digit Out of View: 28 Vdc not applied

## Electrical Characteristics

LOAD: HSI (AQU-4/A), thousand digit shutter  
Input Voltage: 28 Vdc  
Input Current: .150 ma

SOURCE: (TBD-1)

## Interconnection Data

(TBD-3)

A/C: F-111F  
REF: MIL-I-27848  
SFB-16-4-3

|       |        |             |             |
|-------|--------|-------------|-------------|
| DATE  | DESIGN | REVISION    | DRAWING NO. |
| A     |        |             | ICD-GPS-015 |
| SCALE | REV    | SHEET 10-11 |             |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE   | I/O | FROM | TO  |
|-------------|--------|-----|------|-----|
| To-From     | Analog | O   | UE   | HSI |

## Functional Description

Provides a d.c. analog signal to drive the To-From indicator. If the aircraft is flying toward the waypoint and has not intercepted a reference line perpendicular to the aircraft ground track and through the waypoint, the indication will be To. Once past the waypoint reference line, the indication will be From as long as this waypoint is still selected.

## Signal Characteristics

RANGE: To = +225  $\mu$ a Max  
Blank = no signal  
From = -225  $\mu$ a Max

## Electrical Characteristics

LOAD: HSI (AQU-4/A), To-From Arrow, meter movement 200 Ohms  $\pm$  15%

SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Pair  
Wire Size: No. 22 AWG

A/C: F-111F  
REF: MIL-I-27848  
1F-111F-2-18-1

|           |                                  |                            |
|-----------|----------------------------------|----------------------------|
| DATE<br>A | LOGS, REVISIONS AND<br>REVISIONS | REVISIONS AND<br>REVISIONS |
| REV       | REV                              | SHEET 10-12                |

ICD-GPS-015

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME          | TYPE   | I/O | FROM | TO                       |
|----------------------|--------|-----|------|--------------------------|
| Horizontal Deviation | Analog | O   | UE   | Flight Director Computer |

## Functional Description

Provides a variable d.c. signal that indicates the displacement of the aircraft to the left or right of a selected course. The displacement represented by the indicating device will be controlled by UE software and will be dependent upon aircraft flight phase. Deflection of the indicating device may represent angular displacement (e.g., 10° for a TACAN approach; 2.5° for ILS) or distance. For an area navigation system, the Area Navigation Subcommittee of the Air Transport Association's Air Traffic Control Committee has recommended the following ranges for the flight modes indicated: (a) Enroute: 2-6 miles full scale, (b) Terminal: 1-2 miles full scale and (c) Approach: 500-3000 feet full scale. Choice of presentation (distance/degrees) and scales are (TBD-1).

## Signal Characteristics

RANGE: 0 to + 150  $\mu$ a  
 RESOLUTION: 3  $\mu$ a  
 ACCURACY: +10  $\mu$ a  
 INDEX REFERENCE: Selected course  
 POSITIVE DIRECTION SENSE: Fly right (+)  
 SCALE FACTOR: 75  $\mu$ a/dot on the indicator.  
 Distance/angular displacement scale factor (TBD-1).

## Electrical Characteristics

LOAD: Flight Director Computer, CPU-76/A, 1000 Ohms  $\pm$ 3%  
 SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Pair  
 Wire Size: No. 22 AWG

A/C: F-111F  
 REF: MIL-I-27848  
 MIL-C-83013  
 1F-111F-2-18-1  
 ARINC Characteristic 582-5

| DATE  | ISSUE | REVISION | DESCRIPTION |
|-------|-------|----------|-------------|
| A     |       |          | ICD-GPS-015 |
| SCALE | REV   | DATE     | 10-13       |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME               | TYPE     | I/O | FROM | TO                       |
|---------------------------|----------|-----|------|--------------------------|
| Horizontal Deviation Flag | Discrete | 0   | UE   | Flight Director Computer |

## Functional Description

Provides a discrete signal to operate the deviation warning flag or circuit when the deviation data is unreliable or a malfunction has occurred in the course deviation circuitry.

## Signal Characteristics

RANGE: Deviation signal valid: 245-500 mv.  
Deviation signal invalid: <180 mv.

## Electrical Characteristics

LOAD: Flight Director Computer, CPU-76/A, 1000 Ohms,  $\pm 3\%$

SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Pair  
Wire Size: No. 22 AWG

A/C: F-111F  
REF: MIL-I-27848  
MIL-C-83013  
1F-111F-2-18-1

|       |             |              |
|-------|-------------|--------------|
| DATE  | APPROVED BY | REVISION NO. |
| A     |             | ICD-GPS-015  |
| SCALE | REV         | DATE 10-14   |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME        | TYPE   | I/O | FROM | TO                       |
|--------------------|--------|-----|------|--------------------------|
| Vertical Deviation | Analog | 0   | UE   | Flight Director Computer |

## Functional Description

Provides a variable d.c. signal that indicates the displacement of the aircraft above or below a desired flight path. The displacement represented by the indicating device will be controlled by UE software and will be dependent upon aircraft flight phase. Deflection of the indicating device may represent angular displacement (e.g., 0.5° for ILS) or distance. For an area navigation system, the Area Navigation Subcommittee of the Air Transport Association's Air Traffic Control Committee has recommended the following ranges for the flight modes indicated: (a) Enroute: 200 to 2000 feet full scale, (b) Terminal: 60-200 feet full scale and (c) Approach: 40-100 feet full scale. Choice of presentation (distance/degrees) and scales are (TBD-1).

## Signal Characteristics

RANGE: 0 to +150  $\mu$ a  
 RESOLUTION: 3  $\mu$ a  
 ACCURACY: +10  $\mu$ a  
 INDEX REFERENCE: Desired flight path  
 POSITIVE DIRECTION SENSE: Fly down (+)  
 SCALE FACTOR: 75  $\mu$ a/dot on the indicator.  
 Distance/angular displacement scale factor (TBD-1).

## Electrical Characteristics

LOAD: Flight Director Computer, CPU-76/A, 1000 Ohms  $\pm$ 3%  
 SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Pair  
 Wire Size: No. 22 AWG

A/C: F-111F  
 REF: MIL-C-83013  
 1F-111F-2-17-1  
 ARINC Characteristic 582-5

|       |           |             |
|-------|-----------|-------------|
| DATE  | ISSUED BY | APPROVED BY |
| A     |           |             |
| SCALE | REV       | SHEET 10-15 |

ICD-GPS-015

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME             | TYPE     | I/O | FROM | TO                       |
|-------------------------|----------|-----|------|--------------------------|
| Vertical Deviation Flag | Discrete | 0   | UE   | Flight Director Computer |

## Functional Description

Provides a discrete signal to the Flight Director Computer when the UE vertical deviation signal is unreliable. This signal is similar to glideslope flag signal.

## Signal Characteristics

RANGE: Deviation signal valid: 245-500 mv.  
Deviation signal invalid: <180 mv.

## Electrical Characteristics

LOAD: Flight Director Computer, CPU-76/A, 1000 Ohms  $\pm$  3%

SOURCE: (TBD-1)

## Interconnection Data

Wire Type & No.: Twisted Pair  
Wire Size: No. 22 AWG

A/C: F-111F  
REF: MIL-C-83013  
1F-111F-2-17-1

|      |          |             |
|------|----------|-------------|
| DATE | REVISION | DESCRIPTION |
| A    |          | 1CD-GPS-015 |
| DATE | REV      | DATE 10-16  |

# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME         | TYPE    | I/O | FROM | TO                         |
|---------------------|---------|-----|------|----------------------------|
| Digital Output Data | Digital | 0   | UE   | IBNS Converter-Multiplexer |

## Functional Description

Provides the following digital data to update the INS and to aid in navigation and bombing solutions:

- |                       |                                 |
|-----------------------|---------------------------------|
| 1) Latitude           | 4) Direction Cosines (xx,yy,zz) |
| 2) Longitude          | 5) Time                         |
| 3) Velocities (x,y,z) | 6) Display data                 |

## Signal Characteristics

Serial digital data (see Appendix III)

## Electrical Characteristics

Voltage levels: Logic 1 = +3.25  $\pm$ 0.75 volts  
Logic 0 = -0.3  $\pm$ 0.7 volts

Current levels: Output drivers shall have a 20 ma current sink capability at logic 0 level and source 20 ma at logic 1 level

## Interconnection Data

Wire Type & No.: 5 conductors; one shielded pair and one shielded triad  
Wire Size: No. 22 AWG

A/C: F-111F  
REF: 1F-111F-2-5-1  
1F-111F-2-22  
FZE-12-6073

|          |             |
|----------|-------------|
| <b>A</b> | ICD-GPS-015 |
| REV      | 10-17       |



# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME        | TYPE    | I/O | FROM                       | TO |
|--------------------|---------|-----|----------------------------|----|
| Digital Input Data | Digital | I   | IBNS Converter-Multiplexer | UE |

## Functional Description

Provides the UE with the following digital data to aid in acquiring satellites and improving AJ capabilities:

- |                                    |                           |
|------------------------------------|---------------------------|
| 1) Latitude                        | 6) True Heading           |
| 2) Longitude                       | 7) True Airspeed          |
| 3) Velocities (N/S, E/W, Vertical) | 8) Barometric altitude    |
| 4) Direction Cosines (xx,yy,zz)    | 9) Attitude (pitch, roll) |
| 5) Magnetic Heading                | 10) Control data          |

## Signal Characteristics

Serial digital data (see Appendix III)

## Electrical Characteristics

Voltage levels: Logic 1 = +3.25 +0.75 volts  
 Logic 0 = -0.3 -0.7 volts  
 Current levels: Output drivers shall have a 20 ma current sink capability at logic 0 level and source 20 ma at logic 1 level

## Interconnection Data

Wire Type & No.: 5 conductors; one shielded pair and one shielded triad  
 Wire Size: No. 22 AWG

A/C: F-111F  
 REF: 1F-111F-2-5-1  
 1F-111F-2-22  
 FZE-12-6073

|   |             |     |       |
|---|-------------|-----|-------|
| A | DATE        | REV | 10-16 |
|   | ICD-GPS-015 |     |       |

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# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME     | TYPE  | I/O | FROM                 | TO |
|-----------------|-------|-----|----------------------|----|
| Blanking Pulses | Pulse | I   | Interference Blanker | UE |

## Functional Description

The interference blanker provides blanking pulses to prevent interference between systems operating in the same frequency spectrum.

## Signal Characteristics

(See pages 10-20 and 10-21.)

## Electrical Characteristics

SOURCE: Interference Blanker, MX-8103/A

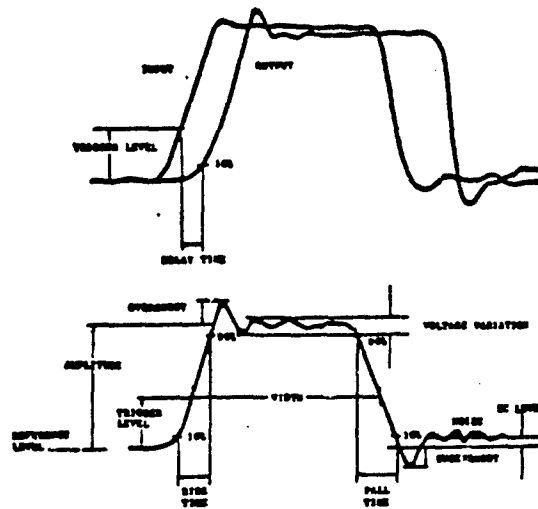
LOAD: (TBD-1)

## Interconnection Data

Wire Type & No.: Coaxial Cable, RG-58 C/U

A/C: F-111F  
REF: T.O. 12P3-4-22-12  
T.O. 1F-111F-2-22

|       |      |      |       |             |
|-------|------|------|-------|-------------|
| DATE  | CODE | REV  | ISS   | ISSUED BY   |
| A     |      |      |       | ICD-GPS-015 |
| SCALE | REV  | DATE | 10-19 |             |



- AMPLITUDE** - AVERAGE DC-LEVEL OF THE PULSE TOP, OVERSHOOT EXCLUDED.
- RISE TIME** - TIME INTERVAL BETWEEN THE 10% AMPLITUDE LEVEL AND THE 90% AMPLITUDE LEVEL ON THE LEADING EDGE OF THE PULSE.
- FALL TIME** - TIME INTERVAL BETWEEN THE 90% AMPLITUDE LEVEL AND THE 10% AMPLITUDE LEVEL ON THE TRAILING EDGE OF THE PULSE.
- WIDTH** - TIME INTERVAL BETWEEN THE POINT WHERE THE PULSE CROSSES THE NOMINAL TRIGGER LEVEL ON THE LEADING EDGE OF THE PULSE AND THE POINT WHERE THE PULSE CROSSES THE NOMINAL TRIGGER LEVEL ON THE TRAILING EDGE OF THE PULSE.
- VOLTAGE VARIATION** - PEAK VALUE OF THE CHANGE IN VOLTAGE, GREATER OR LESS THAN THE AMPLITUDE LEVEL, THAT OCCURS ON THE DC COMPONENT PULSE.
- OVERSHOOT** - MAXIMUM POSITIVE VOLTAGE ATTAINED BY THE LEADING EDGE OF THE PULSE ABOVE THE AMPLITUDE LEVEL.
- UNDERSHOOT** - MAXIMUM NEGATIVE VOLTAGE ATTAINED BY THE TRAILING EDGE OF THE PULSE AS SEPARATED FROM THE ZERO LINE.
- NOISE** - ALL DEVIATIONS IN VOLTAGE FROM THE DIRECT RESIDUAL LEVEL THAT OCCUR BETWEEN THE 10% LEVEL OF THE TRAILING EDGE OF ONE PULSE AND THE 10% LEVEL OF THE LEADING EDGE OF THE FOLLOWING PULSE. WITH THE EXCEPTION OF THE OVERSHOOT AND THE LEADING AND TRAILING EDGES, SHALL BE CONSIDERED NOISE. P-N NOISE PEAK-TO-PEAK SHALL NOT BE LESS THAN 20 MARCH/COV. AND THE FALL TIME SHALL NOT BE LESS THAN 40 MARCH/COV.
- TRIGGER** - THAT INPUT VOLTAGE BELOW WHICH THE OUTPUT OF A CHANNEL IS 0 AND ABOVE WHICH THE OUTPUT OF THE CHANNEL IS THE SPECIFIED VOLTAGE.
- DELAY** - TIME INTERVAL BETWEEN THE NOMINAL TRIGGER LEVEL OF THE INPUT PULSE TO THE 10% LEVEL ON THE RESULTING OUTPUT PULSE LEADING EDGE.

# Blanking Pulse Characteristics (continued)

| REV         | DATE | BY   | CHKD  | APP'D |
|-------------|------|------|-------|-------|
| A           |      |      |       |       |
| ICD-GPS-015 |      |      |       |       |
| REV         | REV  | DATE | 10-20 |       |

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# INTERFACE SIGNAL CHARACTERISTICS

| SIGNAL NAME | TYPE    | I/O | FROM | TO |
|-------------|---------|-----|------|----|
| Course Set  | Synchro | I   | HSI  | UE |

## Functional Description

Provides an electrical reference signal of the course manually selected by the Course Set control on the HSI. This signal will be used by the UE as a reference for positioning the course deviation and To-From indicators on the HSI.

## Signal Characteristics

RANGE: 0° to 360°  
 ACCURACY:  $\pm 0.5^\circ$   
 RESOLUTION: 1.0°  
 INDEX REFERENCE: Magnetic North  
 POSITIVE DIRECTION SENSE: Right Hand Increments  
 SCALE FACTOR: 1° = 1

## Electrical Characteristics (Continued on next page)

SOURCE: HSI (AQU-4/A), Course Resolver, Kearfott Type  
 CR40931018 or equal  
 LOAD: (TBD-1)

## Interconnection Data

Wire Type & No.: Seven single conductors (twisted)  
 Wire Size: No. 24 /WG

A/C: F-111D  
 REF: 1F-111D-2-18-1  
 MIL-I-27848  
 SFB-16-4-3

|       |          |             |
|-------|----------|-------------|
| DATE  | REVISION | DESCRIPTION |
| A     |          | ICD-GPS-015 |
| SCALE | REV      | SHEET 10-22 |

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# ELECTRICAL CHARACTERISTICS

| SOURCE                                                              |                   |
|---------------------------------------------------------------------|-------------------|
| HSI, AQU-4/A, Course Resolver,<br>Kearfott Type CR40931018 or equal |                   |
| Primary Winding                                                     | Rotor             |
| Input Voltage                                                       | 26 Vac            |
| Frequency                                                           | 400 Hz            |
| Input Current                                                       | 20 ma             |
| Input Power                                                         | 150 mW            |
| Input Impedance                                                     | 1680 / 78.5° ohms |
| Output Impedance                                                    | 1400 / 78° ohms   |
| DC Resistance (rotor)                                               | 190 ohms          |
| DC Resistance (stator)                                              | 170 ohms          |
| Output Voltage                                                      | 22 Vac            |
| Sensitivity                                                         | 384 mv/deg        |
| Maximum null Voltage                                                | 46 mv             |
| Maximum error from<br>electrical zero                               | 10 minutes        |
| Transformation ratio                                                | .846              |

|      |      |      |             |
|------|------|------|-------------|
| REV  | DATE | BY   | 1CD-GPS-015 |
| A    |      |      |             |
| DATE | REV  | DATE | 10-23       |

### 30. F-111F DIGITAL CHARACTERISTICS

The following section provides a brief description of the digital signal characteristics of the F-111F IBNS.

**30.1 Word/Frame Structure.** The serial digital data input and output of the converter set are in the form of a bit-serial, word-serial pulse train over data channels consisting of five lines each. One pair of lines transmits data in true (DATA) and in one's complement (DATA) form. The second pair of lines transmits synchronizing signals in true (SYNC) and in one's complement (SYNC) form. The fifth line serves as a signal return. Data words contain 26 bits on a non-return-to-zero (NRZ) basis. Synchronizing signals are pulse groups, each group containing 26 pulses which are concurrent with the data word, but are in a return-to-zero (RZ) format.

Each channel is capable of handling a maximum of 64 data words. Both the data word and the synchronizing pulse groups (SYNC) are separated by gaps that are equal to six pulses (60 microseconds). The sync pulses synchronize data bits and the pulse gap synchronizes data words. The data word content of each channel is processed cyclically, one word after another until all words are processed.

The waveform of an input or output serial digital word sync pulse group and the waveform and bit construction for an input or output serial digital word is shown in Figure III-1.

**30.2 Information Identifier.** Each word contains a 6 bit address field which identifies each word as one of 64 in each serial channel.

**30.3 Timing Tolerances.** The data transmission rate is 100 kilobits per second. The lead or delay of a serial data signal with respect to its data complement signal shall not exceed 0.250  $\mu$ sec. The lead or delay is to be measured at the 50% amplitude of the rise and fall transitions of each signal. The lead or delay of a serial data clock synchronization signal with respect to its complement shall not exceed 0.250  $\mu$ sec when measured at the 50% amplitude points.

**30.4 Data Standards.** Data standards for the F-111F are summarized in Table III-1.

|             |     |     |     |     |      |
|-------------|-----|-----|-----|-----|------|
| REV         | CDL | REV | CDL | REV | CDL  |
| A           |     |     |     |     |      |
| ICD-6PS-015 |     |     |     |     |      |
| CDL         | REV | CDL | REV | CDL | REV  |
|             |     |     |     |     | 30-2 |

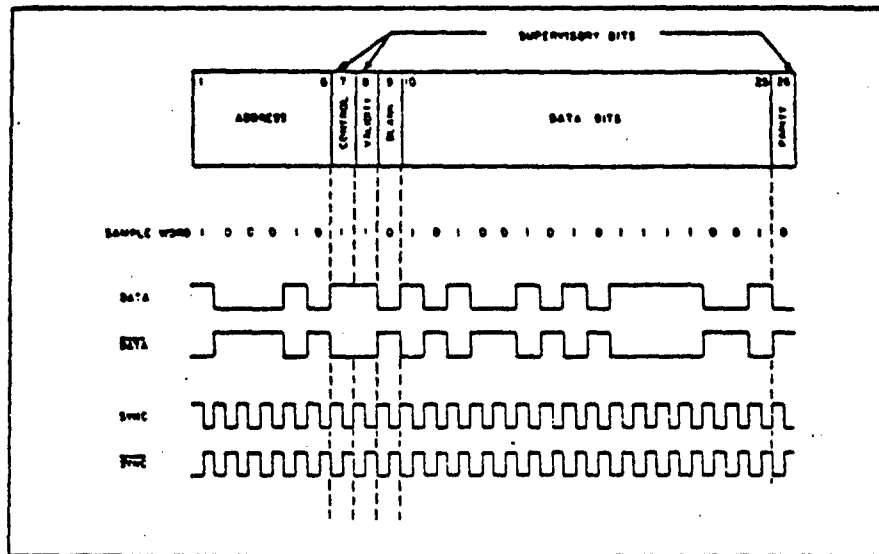


Figure III-1. Serial Digital Input or Output Data Word Channel Structure

|       |      |             |
|-------|------|-------------|
| REV   | DATE | DESCRIPTION |
| A     |      | ICD-6PS-015 |
| ISSUE | REV  | SHEET 30-3  |



TABLE III-1. DIGITAL DATA STANDARDS

| Signal Name      | Units                              | Range      | Resolution | Significant Bits |
|------------------|------------------------------------|------------|------------|------------------|
| Latitude         | (Calculated from other parameters) |            |            |                  |
| Longitude        | Semicircle                         | $\pm 1$    | 1/1048576  | 22               |
| V <sub>x</sub>   | ft/sec                             | $\pm 2048$ | 1/512      | 22               |
| V <sub>y</sub>   | ft/sec                             | $\pm 2048$ | 1/512      | 22               |
| V <sub>z</sub>   | ft/sec                             | $\pm 2048$ | 1/512      | 22               |
| C <sub>xx</sub>  | Semicircle                         | $\pm 1$    | 1/1048576  | 22               |
| C <sub>xy</sub>  | Semicircle                         | $\pm 1$    | 1/1048576  | 22               |
| Time             | (TBD-1)                            | (TBD-1)    | (TBD-1)    | (TBD-1)          |
| Magnetic Heading | Degrees                            | 0-360      | 360/4096   | 13               |
| True Heading     | Degrees                            | 0-360      | 360/4096   | 13               |
| True Airspeed    | ft/sec                             | (TBD-2)    | (TBD-2)    | 12               |
| Baro Altitude    | feet                               | (TBD-2)    | (TBD-2)    | 12               |
| Pitch Angle      | Degrees                            | $\pm 90$   | 360/2048   | 12               |
| Roll Angle       | Degrees                            | $\pm 180$  | 360/2048   | 12               |
| Control Data     | (TBD-1)                            | (TBD-1)    | (TBD-1)    | (TBD-1)          |
| Display Data     | (TBD-1)                            | (TBD-1)    | (TBD-1)    | (TBD-1)          |

Source: FZE-12-6073

|     |      |    |             |
|-----|------|----|-------------|
| REV | DATE | BY | 1CD-GPS-016 |
| A   |      |    |             |
| REV | DATE | BY | 30-4        |

## 9. FUTURE MODIFICATIONS

Table 9-1 lists the avionics suite expected to be installed in each of the F-111-family aircraft by 1985. This chart is useful for comparing the members of the F-111 family. Figures 9-1 and 9-2 show current and planned equipment bay space allocations for the F-111F. Planned system additions for the F-111F include the ARC-164 UHF communications system, the ALQ-137, and the ALR-62 CMRS. Also planned for inclusion are GPS, PAVE TACK, Video Tape Recorder, PAL, and the KY-28 Secure Voice System.

The AN/ARC-164, scheduled to replace the ARC-109 in most aircraft by 1985, operates in the 225 MHz to 399.75 MHz military band. It provides a 7,000 channel tuneable UHF receiver, a 243 MHz (nominal) auxiliary guard receiver, and a 7,000-channel, 10-watt carrier transmitter for voice communications. The AN/ARC-164 Radio Set has two basic configurations -- the console mount and the remote mount.

The function of the ALQ-137 is to detect hostile CW and pulsed signals and automatically respond with programmed jamming against the following:

- Fire control radars of anti-aircraft artillery (AAA)
- Surface to air missiles (SAM)
- Airborne Interceptors (AI)
- Command Guidance missiles

The AN/ALQ-137 provides deception response in the E through J bands with four subsystems covering the low band, middle band, forward high band, and aft high band. Each of the four subsystems consists of a receiver and amplifier. Forward and aft antennas are used to provide proper protection. Additional threat information is received from the ALR-62 Radar Warning Receiver.

The ALR-62 is a countermeasures receiver set designed to intercept, detect, and analyze RF threat signals. Threat signals displayed show type of threat, direction, and lethality. The system uses a dual-channel receiver, a multichannel receiver, a digital processor, a control indicator unit, and an antenna switching unit.

The Global Positioning System will physically and functionally replace the ARN-84(V) TACAN System, and the ARA-50 UHF ADF System. The GPS receiver and mount will be installed in the forward equipment bay (RH), under door 1202, in the space presently occupied by the TACAN. The antenna will be installed above the equipment bay (Figure 9-1).

| Table 9-1. PRINCIPAL AVIONICS TO BE INSTALLED IN THE F-111 FAMILY BY 1985 |                                  |                           |                                          |                           |                                  |
|---------------------------------------------------------------------------|----------------------------------|---------------------------|------------------------------------------|---------------------------|----------------------------------|
| Equipment                                                                 | F-111A                           | F-111D                    | F-111E                                   | F-111F                    | F-111A                           |
| UHF                                                                       | ARC-109 → ARC-164                | ARC-109 → ARC-164         | ARC-109 → ARC-164                        | ARC-109 → ARC-164         | ARC-109 → ARC-164                |
| HF                                                                        | ARC-112/123                      | ARC-123                   | ARC-123                                  | ARC-123                   | ARC-112                          |
| Intercom                                                                  | AIC-25                           | AIC-25                    | AIC-25                                   | AIC-25                    | AIC-25                           |
| INS                                                                       | AJQ-20 Digital Bomb Navigational | AJN-16                    | AJQ-20 (Maybe Digital Bomb Navigational) | AJN-16                    | AJQ-20 Digital Bomb Navigational |
| TACAN                                                                     | ARN-118 (Maybe GPS)              | ARN-52/118 (Maybe GPS)    | ARN-52/118 (Maybe GPS)                   | ARN-84 (Maybe GPS)        | ARN-118 (Maybe GPS)              |
| ILS                                                                       | ARN-58 (Maybe CAT II MLS)        | ARN-58 (Maybe CAT II MLS) | ARN-58                                   | ARN-58 (Maybe CAT II MLS) | ARN-58 (Maybe CAT II MLS)        |
| UHF-D/F                                                                   | ARA-50 (Maybe GPS)               | ARA-50 (Maybe GPS)        | ARA-50 (Maybe GPS)                       | ARA-50 (Maybe GPS)        | ARA-50 (Maybe GPS)               |
| Radar Altimeter                                                           | APN-167                          | APN-167                   | APN-167                                  | APN-167                   | APN-167                          |
| TFR                                                                       | APQ-110                          | APQ-128                   | APQ-110                                  | APQ-146/128/114           | APQ-110                          |
| Attack Radar                                                              | APQ-113                          | APQ-130                   | APQ-113                                  | APQ-144/114               | Demodify to Naval Radar          |
| Lead Computer Sight                                                       | ASG-23                           | --                        | ASG-23                                   | ASG-27/25                 | Demodify                         |
| Auto Gun                                                                  | M61-A1                           | M61-A1                    | M61-A1                                   | M61-A1                    | Demodify                         |
| IFF A/G                                                                   | APX-64                           | APX-64                    | APX-64                                   | APX-64                    | APX-64                           |
| IFF Crypto                                                                | KIT-1A                           | KIT-1A                    | KIT-1A                                   | KIT-1A                    | KIT-1A                           |
| HSI                                                                       | AQU-4/A                          | AQU-4/A                   | AQU-4/A                                  | AQU-4/A                   | AQU-4/A                          |
| CADC                                                                      | 1903633-4                        | 1903634-3                 | 1903633-4                                | 1903634-3                 | 1903633-4                        |
| Flight Director System                                                    | CPU-76                           | --                        | CPU-76A                                  | CPU-76A                   | CPU-76, ARU-11                   |
| Auxiliary Flight Reference System                                         | A24G-26A                         | A24G-26A                  | A24G-26A                                 | A24G-26A                  | A24G-26A                         |
| RHAW                                                                      | APS-109                          | APS-109                   | APS-109                                  | APS-109                   | ALR-62 (TTWS)                    |
| ECM Receivers                                                             | ALR-23                           | ALR-23                    | --                                       | ALR-23                    | ALR-23 (TTWS)                    |
|                                                                           | AAR-34                           | AAR-34                    | AAR-34                                   | AAR-34                    | ALQ-137 (SPS)                    |
| Jamming Transmitters                                                      | ALQ-94, 41                       | ALQ-94                    | ALQ-94, 119                              | ALQ-94                    | ALQ-99E (JBS)                    |
| Interference Blanker                                                      | MX-6770                          | MX-8106                   | MX-6770A                                 | MX-8103                   | MX-9879/A                        |
| Dispenser                                                                 | ALP-28                           | ALP-28                    | ALP-28                                   | ALP-28                    | ALP-28                           |
| Strike Camera                                                             | KB-18A                           | KB-18A                    | KB-18A                                   | KB-18A                    | Demodify                         |
| Flight Control System                                                     | FC-11                            | FC-11                     | FC-11                                    | FC-11                     | FC-11                            |

(continued)

Table 9-1. (continued)

| Equipment                    | F-111A                  | F-111D                  | F-111E                  | F-111F                         | EP-111A            |
|------------------------------|-------------------------|-------------------------|-------------------------|--------------------------------|--------------------|
| Fuel and Trim Assembly       | 12C1154-879             | 12C1154-867             | 12C1154-879             | 12C1154-875                    | 12C1154-879        |
| Doppler                      | --                      | APN-189 (Maybe OPS)     | --                      | --                             | --                 |
| Nav Data Entry Panel         | --                      | ID-1764/AYK             | --                      | --                             | --                 |
| Nav Data Display Panel       | --                      | ID-1622/AYK             | --                      | ID-1768/AYK                    | --                 |
| General Purpose Computer     | --                      | AYK-6 (2)               | --                      | AYK-6 (2)                      | --                 |
| Weapons Bay Gun System       | --                      | ?                       | ?                       | --                             | Demodify           |
| Multiplex Converter Unit     | --                      | CV-2492/A               | --                      | CV-2497/A                      | --                 |
| Horizontal Situation Display | --                      | AYN-3                   | --                      | --                             | --                 |
| Integrated Display Set       | --                      | AVA-9                   | --                      | --                             | --                 |
| IFF Interrogator             | --                      | APR-76                  | --                      | --                             | --                 |
| Computer Control Unit        | --                      | --                      | --                      | C-8584/AYK                     | --                 |
| UHF Crypto                   | --                      | --                      | --                      | --                             | PY-28              |
| Nav Radar                    | --                      | --                      | --                      | --                             | APQ-160 (Demodify) |
| Modifications                |                         |                         |                         |                                |                    |
| P2824                        | Terrain Follow Radar    | --                      | Terrain Follow Radar    | --                             | --                 |
| P2930                        | ALQ-119 ECM (Some A/C)  | ALQ-119 ECM (Some A/C)  | ALQ-119 ECM             | --                             | --                 |
| T13315A                      | SIS (Some A/C)          | SIS (Some A/C)          | SIS                     | SIS (Some A/C)                 | --                 |
| T17305A                      | APN-167 LARA (Some A/C) | APN-167 LARA (Some A/C) | APN-167 LARA (Some A/C) | APN-167 LARA (Some A/C)        | --                 |
| T17310A                      | LARA Override System    | LARA Override System    | LARA Override System    | LARA Override System           | --                 |
| T37063A                      | APQ-113 TFR (Some)      | APQ-130 TFR             | APQ-113 TFR             | APQ-144 TFR                    | --                 |
| P2957                        | ALR-62 RWR (Some)       | ALR-62 RWR              | ALR-62 RWR              | ALR-62 RWR                     | --                 |
| P0000                        | Jam System (Some A/C)   | --                      | --                      | --                             | --                 |
| F15312B                      | --                      | AVA-9 I/Os              | --                      | --                             | --                 |
| T37236B                      | --                      | --                      | --                      | Multiplex Converter (Some A/C) | --                 |
| Planned Avionics             |                         |                         |                         |                                |                    |
| Video Tape Recorder          | --                      | CVTR                    | CVTR                    | CVTR                           | --                 |

## 10. DATA SOURCES

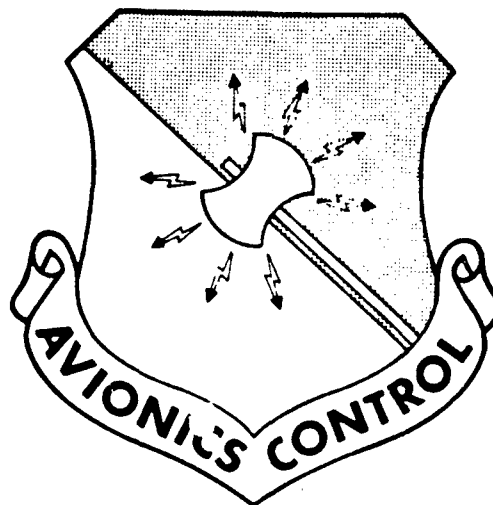
The following sources of data were used in preparing this summary:

- Aircraft and avionics configuration data assembled by ARINC Research, principally in the form of copies of applicable sections, tables, and figures from the aircraft technical orders, as well as for equipment technical orders listed at the end of this section.
- Avionics Planning Baseline Document -- October 1978
- GPS Phase II User Equipment Interface Requirements for the F-111F Aircraft; 1 September 1977

### LIST OF TECHNICAL ORDERS

| <u>T.O. Number</u> | <u>Title</u>                              | <u>Change</u> | <u>Date</u> |
|--------------------|-------------------------------------------|---------------|-------------|
| 1F-111F-01         | List of Publications.                     |               | 4/21/72     |
| 1F-111F-1-1        | Flight Manual                             | Basic         | 10/20/78    |
| 1F-111F-2-1        | General Information                       | 25            | 4/16/77     |
| 1F-111F-2-5-1      | Fire Power Control System                 | Basic         | 5/27/77     |
| 1F-111F-2-6-1      | Air Data Computer System                  | 12            | 1/5/77      |
| 1F-111F-2-12-1     | Instrument Systems                        | 22            | 8/19/77     |
| 1F-111F-2-15-1     | Environmental Sciences                    | 20            | 8/19/77     |
| 1F-111F-2-17-1     | Comm. and Instrument<br>Landing Systems   | 12            | 8/19/77     |
| 1F-111F-2-18-1     | UHF/ADF, TACAN, IFF<br>Systems            | 14            | 8/19/77     |
| 1F-111F-2-22       | Systems Integration                       | 18            | 11/11/77    |
| 12P2-2APQ114-2     | Attack Radar Set                          | 10            | 1/28/77     |
| 12P2-2APQ128-2     | Terrain Following Radar                   |               |             |
| 12P3-2ALE28-2      | Countermeasures Dispenser                 |               |             |
| 12P4-2APX64-2      | Radio Receiver-Transmitter<br>Transmitter | 18            | 5/5/78      |
| 12P5-2APN167-12    | Electronic Altimeter                      | 12            | 5/3/78      |
| 12R1-2ARA50-2      | Direction Finder Group                    | 2             | 2/1/72      |
| 12E2-2AIC25-2      | Intercom Set                              | 10            | 12/1/76     |
| 12R2-2ARC109-2     | Radio Set                                 | 1             | 4/26/77     |
| 12R2-2ARC109-4     | IPB Radio Set                             |               | 8/1/76      |
| 12R2-2ARC109-42    | Radio Receiver                            | 2             | 6/1/77      |
| 12R2-2ARC123-2     | Radio Set                                 |               | 4/7/77      |
| 12R2-2ARC164-2     | Radio Set                                 |               | 5/23/77     |
| 12R5-2ARN58-2      | ILS                                       | 6             | 5/13/77     |
| 12R5-2ARN118-1     | TACAN                                     |               | 10/15/76    |

**AVIONICS INTERFACE DATA SUMMARY  
FOR  
RF-4C**



**October 1979**

**Issued by  
The Deputy for Avionics Control  
ASD/AX  
A Joint AFSC/AFLC Organization**

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## FOREWORD

This document is one of a series of reports that describe Avionics interfaces for various USAF aircraft. It was prepared for the Deputy for Avionics Control, Aeronautical Systems Division (ASD/AX), Wright-Patterson AFB, Ohio by ARINC Research Corporation, Annapolis, Maryland under Contract F33657-79-C-0567.

| Record of Changes |         |              |          |
|-------------------|---------|--------------|----------|
| Change            | Subject | Date Entered | Initials |
|                   |         |              |          |



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## 1. INTRODUCTION

This document contains configuration data relating to the integration of additional avionics into the RF-4C aircraft.

This document will be revised periodically as additional modifications are planned and incorporated into the aircraft. Queries regarding information contained herein should be addressed to:

The Deputy for Avionics Control  
Code: ASD/AXP  
Wright-Patterson AFB, Ohio

This document was compiled from Air Force source materials by ARINC Research Corporation under Contract F33657-79-C-0567.

The applicable Technical Orders are included in the references listed in Section 10.

## 2. COCKPIT SPACE

Figures 2-1 through 2-4 shows the front and rear cockpit panels and consoles. There are several locations currently unoccupied. On the forward cockpit left console (Figure 2-2) there are two blank panels. One is 3.4" x 5.75" (item 10) the other is irregular in shape but larger than a 5.75" x 5.75" panel (item 8). On the right console there are two more blank panels. The blank panel farthest back is 5.4 x 5.75 (item 23). The other blank panel is 2.6 x 5.75" (item 21).

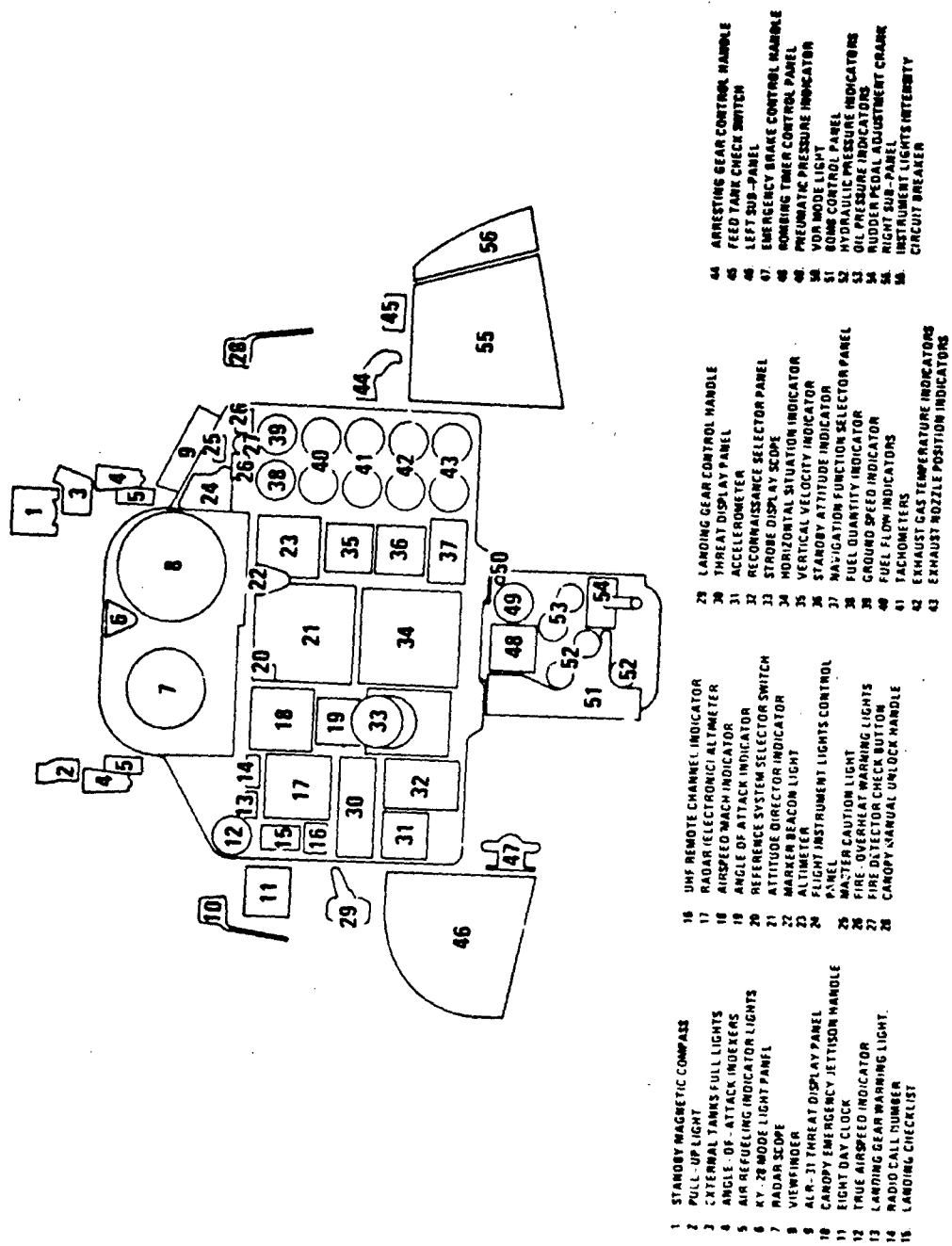


Figure 2-1. FORWARD COCKPIT MAIN PANEL AREA, RF-4C

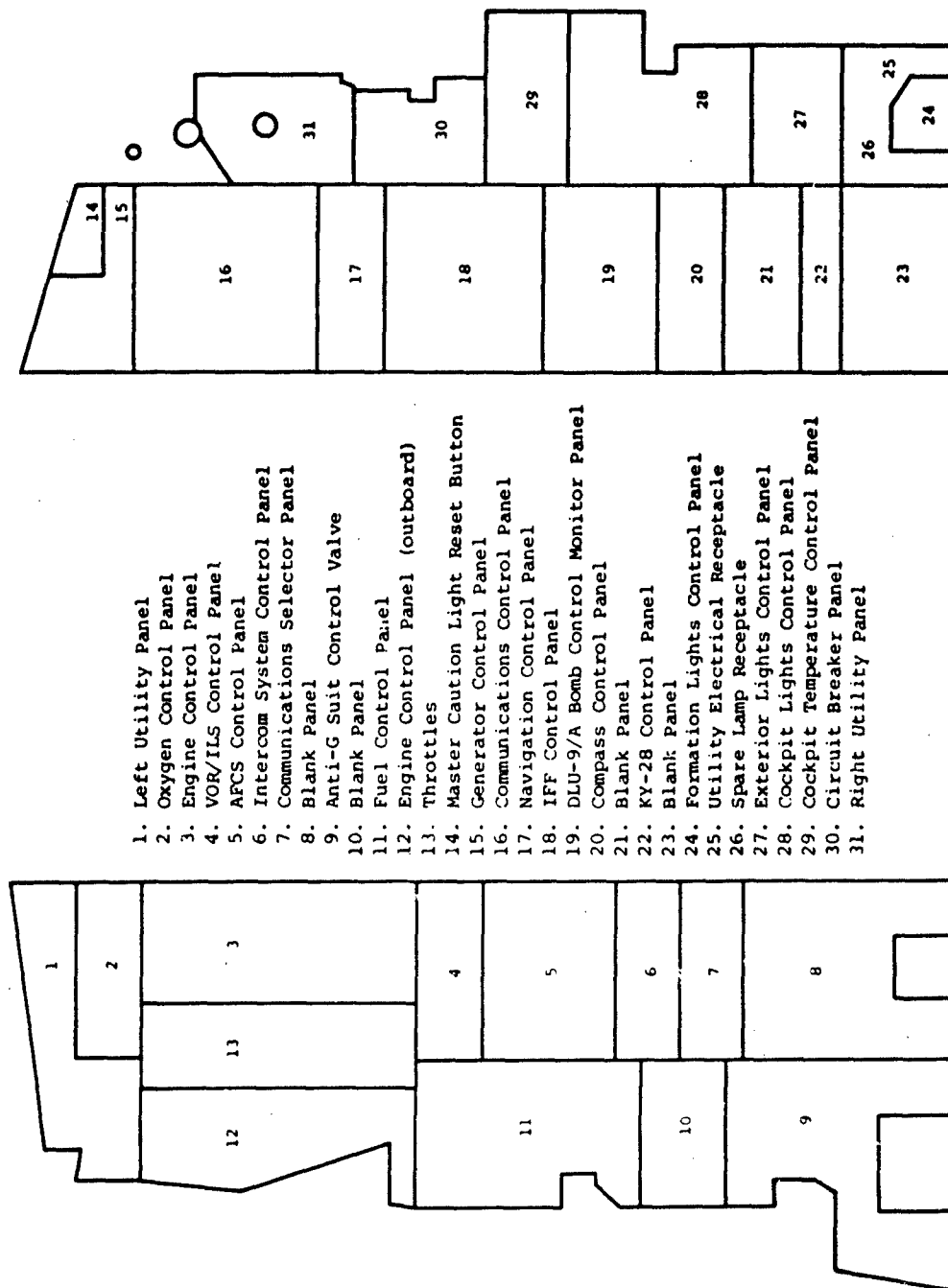
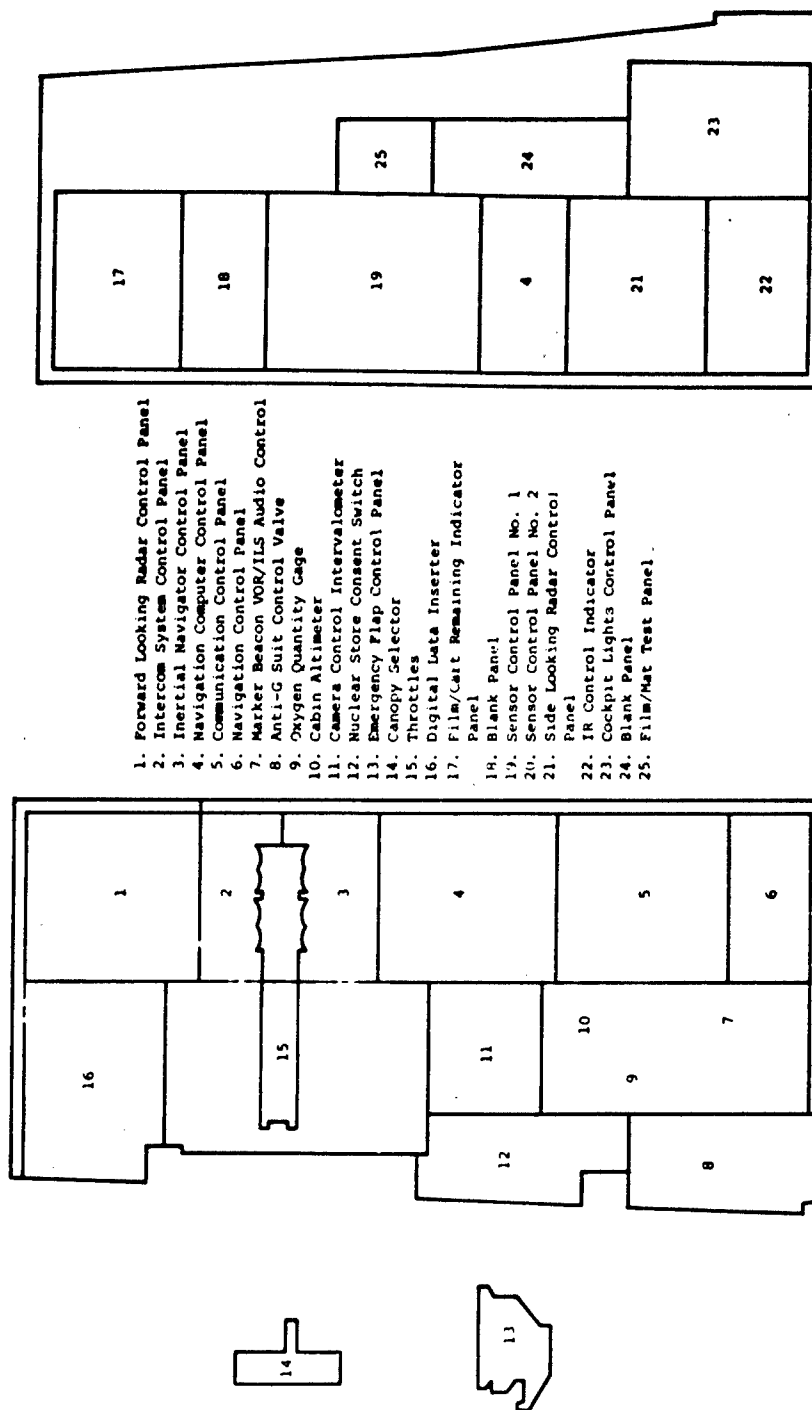


Figure 2-2. RF-4C FORWARD COCKPIT CONSOLE LAYOUT







1. Forward Looking Radar Control Panel
2. Intercom System Control Panel
3. Inertial Navigator Control Panel
4. Navigation Computer Control Panel
5. Communication Control Panel
6. Navigation Control Panel
7. Marker Beacon VOR/ILS Audio Control
8. Anti-G Suit Control Valve
9. Oxygen Quantity Gage
10. Cabin Altimeter
11. Camera Control Intervalometer
12. Nuclear Store Consent Switch
13. Emergency Flap Control Panel
14. Canopy Selector
15. Throttles
16. Digital Data Insertor
17. Film/Clut Remaining Indicator Panel
18. Blank Panel
19. Sensor Control Panel No. 1
20. Sensor Control Panel No. 2
21. Side Looking Radar Control Panel
22. IR Control Indicator
23. Cockpit Lights Control Panel
24. Blank Panel
25. Film/Mat Test Panel

Figure 2-4. RF-4C AFT COCKPIT CONSOLE LAYOUT

### 3. AVIONICS SPACE

Some of the alternatives for providing space in the RF-4C are compiled in the Form, Fit, and Environmental (F<sup>2</sup>E) Summary Table 3-1. Figure 3-1 shows the approximate locations of these spaces and is keyed to the Table 3-1. The temperature-altitude-vibration environmental data relative to the identified locations are presented in Table 3-2.

The following basic points should be made with respect to the data contained in the tables:

- A large space (A and B in Figure 3-1) with cooling and power will become available in most QSR aircraft with the APQ-102 Side Looking Radar (SLR) demod. However, TERC and UPD-4 (APD-10) SLR equipped aircraft use the space already and would continue to occupy that space.
- A large space (C) apparently is available in the tail, but the severe temperature must be overcome and power must be provided. The amount of power and cooling required for candidate avionics be determined more precisely to determine the attractiveness of this space.
- Some space could become available in Area B through reduction in equipment size.
- The temperature data represent *uncontrolled* environmental conditions. Equipment installed in any area must be cooled to the extent necessary to meet Class 2 requirements.
- All space locations shown, excluding the tail area, have forced air cooling available. The tail area is not cooled currently and has a most severe temperature environment.
- The vibration data represent compartment conditions existing for any equipment mounted therein. The necessity for shock mounting can be determined from these data. Of the applicable regions examined, the lower forward fuselage has the most vibration in the 10-15 Hz band while, of the three regions examined, the upper avionics bay has the most severe vibration in the 2-23 Hz band.

| Table 3-1. F <sup>2</sup> E SUMMARY - RF-4C                                                                                                                                               |                                                                                                     |                                                                                                         |                                                                                                                                                                   |                                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| F <sup>2</sup> E Criteria                                                                                                                                                                 | Potential Space Available                                                                           |                                                                                                         |                                                                                                                                                                   |                                                          |
|                                                                                                                                                                                           | A<br>Behind High Alt<br>Camera Station<br>Access Doors 506 R/L,<br>507 R/L<br>Remove APO-102<br>C/R | B<br>Upper Avionics<br>Bay<br>Access Door 19<br>Remove Two APO-102<br>LRUs: SIG GEN<br>Recorder Control | B<br>Upper Avionics Bay<br>Door 19<br>Replacement of Amp-<br>Power Supply-Aux<br>Rcvr AM-2349/<br>ASQ                                                             | C<br>Tail Area Behind<br>Access Door 61L                 |
| Rectangular Size*<br>(H, W, D)<br>Volume                                                                                                                                                  | TBD<br>19.3 ft <sup>3</sup><br>(Unconfirmed)                                                        | TBD                                                                                                     | 8.5" 6.4" 23.2"<br>0.7 ft <sup>3</sup><br>Current Unit Size                                                                                                       | 16" 18" 22"<br>16" 8" 22"<br>Total - 5.3 ft <sup>3</sup> |
| Type Cooling<br>Available                                                                                                                                                                 | Forced Air Conditioning<br>(Cooling Flow Rate<br>of APO-102 Units is<br>TBD)                        | Forced Air Conditioning<br>(Cooling Flow Rate<br>of APO-102 Units is<br>(TBD)                           | Forced Air Conditioning<br>(Unit Cooling Air Flow<br>TBD) Total CNI Elec.<br>Central System Req<br>Requires 3.2 Lb/Min.)                                          | Currently Convection<br>Only                             |
| McDonnell Report 8738*<br>Temperature-Altitude<br>Vibration**                                                                                                                             | C<br>Conditions IV and VIII<br>Region XIV                                                           | Condition VIII<br>Region XIII                                                                           | Condition VIII<br>Region XIII                                                                                                                                     | Condition II<br>Region I                                 |
| Possible Candidates<br>for the Space                                                                                                                                                      | TEREC A/C and APD-10<br>(UPD-4) A/C Utilize this<br>Space                                           | ILS ARN-127<br>NAV ARN-101                                                                              | Smaller Amp-Pwr<br>Rcvr Unit                                                                                                                                      | None Known                                               |
| Remarks                                                                                                                                                                                   | Removal of SLR System Components is On-Going.<br>Group A Wiring Remains.                            |                                                                                                         | Requirement Reduced<br>with ARN-118 and<br>ARC-164 Installed.<br>Only needed for<br>- Intercom<br>- IFF Xponder<br>- Aux UHF Rcvr<br>Perhaps Gain Half of<br>Vol. | Spaces Separated<br>by Rib<br>No Power<br>Available      |
| *Where LRU is currently installed, the dimensions given represent dimensions of LRU; when no LRU is installed, the dimensions given are those of the available space.<br>**See Table 3-2. |                                                                                                     |                                                                                                         |                                                                                                                                                                   |                                                          |

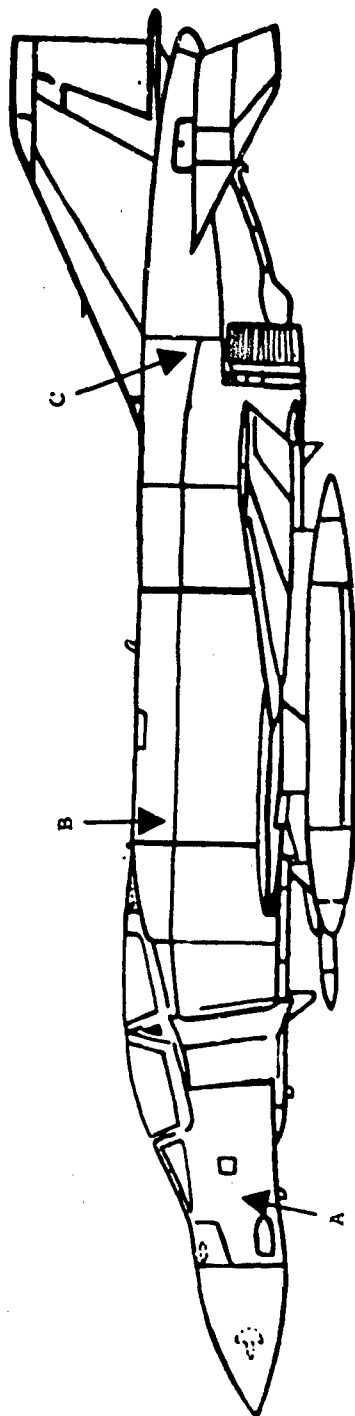


Figure 3-1. F-4E/RF-4C SPACE LOCATIONS

| Table 3-2. RF-4C RAW ENVIRONMENTAL DATA SYNOPSIS |                                                          |                   |                                                                                          |                                                          |  |  |
|--------------------------------------------------|----------------------------------------------------------|-------------------|------------------------------------------------------------------------------------------|----------------------------------------------------------|--|--|
| Temperature Data                                 |                                                          |                   |                                                                                          |                                                          |  |  |
| Temperature-Altitude Conditions                  | Condition                                                |                   |                                                                                          |                                                          |  |  |
|                                                  | I                                                        | IV                | VII                                                                                      | VIII                                                     |  |  |
| Continuous                                       | -54° C to +71° C, Sea level<br>-54° C to +24° C, 60,000' | No Data in Report | -54° C to +29° C<br>Sea level to 60,000'                                                 | -54° C to +71° C, Sea level<br>-54° C to +24° C, 60,000' |  |  |
| 30 Minutes                                       | to +95° C, Sea level<br>to +100° C, 60,000'              |                   | to +53° C, Sea level<br>to +63° C, 60,000'                                               | to +95° C, Sea level<br>to +55° C, 60,000'               |  |  |
| 10 Minutes                                       | to +109° C, Sea level<br>to +170° C, 50,000'             |                   | to +58° C, Sea level<br>to +77° C, 50,000' (5 minutes)<br>to +54° C, 70,000' (5 minutes) | to +75° C, 50,000'<br>to +60° C, 50,000'                 |  |  |
| Vibration Data                                   |                                                          |                   |                                                                                          |                                                          |  |  |
| Equipment Performance (double amplitude)         | Region                                                   |                   |                                                                                          |                                                          |  |  |
|                                                  | I                                                        | XIII              | XIV                                                                                      |                                                          |  |  |
| 5-10 Hz                                          | 0.060 inches                                             | 0.060 inches      | 0.060 inches                                                                             |                                                          |  |  |
| 10-15 Hz                                         | 0.063 inches                                             | 0.064 inches      | 0.110 inches                                                                             |                                                          |  |  |
| 15-20 Hz                                         | 0.036 inches                                             | 0.036 inches      | 0.036 inches                                                                             |                                                          |  |  |
| 20-23 Hz                                         | 0.036 inches                                             | 0.050 inches      | 0.045 inches                                                                             |                                                          |  |  |
| 23-50 Hz                                         | 0.036 inches                                             | 0.036 inches      | 0.036 inches                                                                             |                                                          |  |  |
| >50 Hz                                           | ±5g                                                      | ±5g               | ±5g                                                                                      |                                                          |  |  |

#### 4. ELECTRICAL POWER

##### 4.1 Main Power Supply System

The RF-4C is powered by a 60 kVA power supply system. This power is generated by two 30 kVA generators in parallel. Each generator system consists of a 30 kVA 200/115 volt, 3 phase, 400 Hz generator, a constant speed drive, a generator control panel, and, on serial numbers 71-244 and up, an underfrequency protector. An ac power control box and a frequency and load control box are also utilized.

##### 4.2 Power and Distribution System

The power conversion and distribution system is required to perform three operations: converting 115 Vac to 28 Vac; converting 115 Vac, 3 phase to 28 Vdc; and distributing this power to the appropriate systems. The power distribution system consists of the left, right, and an essential 115 Vac, 400 Hz, 3 phase bus system, and low voltage ac and dc bus systems. Under normal use the left and right 3 phase 115 Vac systems are in parallel. Two transformer/rectifier units supply 28 Vdc to the left, right, and essential dc buses.

##### 4.3 Emergency Power System

The emergency power system is available if the main power system fails. Electrical power is developed by a 3kVA, 200/115 Vac, 400 Hz, 3 phase generator. This generator is run by a ram air turbine. The emergency ac generator powers only the essential loads.

## 5. ENVIRONMENTAL CONTROL SYSTEM

### 5.1 General

The aircraft air conditioning system is divided into two major systems, one for the cabin areas and one for reconnaissance and electronic equipment cooling. Both systems use high-temperature, high-pressure, seventeenth-stage engine compressor bleed air from either or both engines.

### 5.2 Cabin Air Conditioning

The Cabin Air Conditioning System (CACS) on the right side of the fuselage two air-to-air heat exchangers and other associated equipment. The CACS affords a selection of cabin conditioning temperatures, vent air temperatures, defogging, rain removal, and ram air operations.

### 5.3 Equipment Air Conditioning

The equipment air conditioning system on the left side of the fuselage supplies cooling air to the reconnaissance and electronic equipment. The equipment air conditioner uses a cooling turbine and a compressor mounted on opposite ends of a common shaft and an air-to-air heat exchanger. Control of the system is entirely automatic; the temperature in the equipment cooling air circuit is controlled at approximately 84°F from sea level to 25,000 feet and at 39°F from 25,000 feet and up. The temperature in the camera compartment cooling circuit is controlled to maintain a compartment discharge temperature of 95°F. The compartment discharge temperature of the infrared reconnaissance sensor cooling circuit is maintained at 75°F.

### 5.4 Equipment Auxiliary Air System

The equipment air conditioning system also supplies partially cooled air to the Equipment Auxiliary Air System (EAAS). The EAAS distributes partially cooled air from the air-to-air heat exchanger to the following systems:

- Anti-G system
- Canopy seal system
- Air data computer
- Radar transmitter
- Radar wave guide
- Radio receiver-transmitters
- SLR amplifier modulator
- SLR wave guide
- SLR wave guide antenna
- Fuel System pressurization
- Pneumatic system air compressor

## 6. CURRENT AVIONICS

Tables 6-1 through 6-22 contains LRU data relating to the RF-4C avionics systems that make up the current or near-term configuration. Where no entries are shown, the data were not available for this report. Data pertaining to future avionics modifications are presented in Section 9.



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| Table 6-1. RF-4C AVIONICS CONFIGURATION DATA: INTEGRATED ELECTRONIC CENTRAL (IEC) AN/ASQ-88( ) OR AN/ASQ-108* |                                                              |                                |                     |           |      |                       |                 |                                                                |                 |                  |                                                   |          |
|---------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------|---------------------|-----------|------|-----------------------|-----------------|----------------------------------------------------------------|-----------------|------------------|---------------------------------------------------|----------|
| Name                                                                                                          | Nomenclature                                                 | Location                       | Dimensions (Inches) |           |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power                                                 |                 | Heat Dissipation | Cooling Method                                    | Mounting |
|                                                                                                               |                                                              |                                | H                   | W         | D    |                       |                 | AC                                                             | DC              |                  |                                                   |          |
| Amplifier Power Supply-Auxiliary Receiver                                                                     | AM-2349( ) / ASQ-19<br>MSN: 5895-00-755-4528                 | Door 19                        | 8.5                 | 6.4       | 23.2 | 1262                  | 36.0            | 115 V<br>400 Hz<br>3 0<br>TBS VA<br>(Powers entire IEC system) | 27.5 V<br>TBS W |                  | Forced Air<br>3.2 lb/min.<br>Required for System. |          |
| Intercom Subsystem                                                                                            |                                                              |                                |                     |           |      |                       |                 |                                                                |                 |                  |                                                   |          |
| Stations (2)                                                                                                  | LS-460A<br>MSN: TBD                                          | Both Cockpits Left Console     | 2.25                | 5.75      | 8.2  |                       |                 |                                                                |                 |                  |                                                   |          |
| Microphone Switch                                                                                             |                                                              |                                |                     |           |      |                       |                 |                                                                |                 |                  |                                                   |          |
| UHF Communication and ADF Subsystem                                                                           |                                                              | Aft Cockpit Left Console       |                     |           |      |                       | 7.0             |                                                                |                 |                  |                                                   |          |
| Central Radio Control (One Each Cockpit)                                                                      | C-6718/ASQ-88<br>MSN: 5895-00-017-8936<br>(or)<br>C-6684/ASQ | Pod Cockpit Right Console      | 6.4                 | 5.75      | 5.2  | 184                   | 6.0             |                                                                |                 |                  |                                                   |          |
| Receiver-Transmitter                                                                                          | RT-7931( ) / ASQ-19<br>MSN: 5895-00-919-2121                 | Aft Cockpit Under Left Console | 7.5                 | 11.85     | 16.3 | 1449                  | 38.0            |                                                                |                 |                  | Internal Blower                                   |          |
| ADF Antenna                                                                                                   | AS-909A/ANA-48<br>MSN: 5826-00-849-0055                      | Towers 502 and 503             | 3.5                 | 11.4      | 12.4 | 495                   | 9.0             |                                                                |                 |                  |                                                   |          |
| UHF Filter                                                                                                    |                                                              | Aft Cockpit Behind Seat        | 1.0                 | 2.1       | 4.0  | 8.4                   | 0.6             |                                                                |                 |                  |                                                   |          |
| Antenna Selector Switch                                                                                       |                                                              |                                |                     |           |      |                       |                 |                                                                |                 |                  |                                                   |          |
| Coax Relay                                                                                                    |                                                              | Aft Cockpit Behind Seat        | 1.5                 | 1.6       | 5.0  |                       |                 |                                                                |                 |                  |                                                   |          |
| UHF Antennas (2)                                                                                              |                                                              |                                |                     |           |      |                       |                 |                                                                |                 |                  |                                                   |          |
| Lower                                                                                                         |                                                              | Nose Gear Pod Door             |                     | 9.5 Blade |      |                       | 1.4             |                                                                |                 |                  |                                                   |          |
| Upper**                                                                                                       |                                                              | Fin Cap-Door 68                | 1.5                 | 2.0       | 5.0  | 15                    | 0.8             |                                                                |                 |                  |                                                   |          |
| *AN/ASQ-88B and AN/ASQ-108 have secure speech capability.                                                     |                                                              |                                |                     |           |      |                       |                 |                                                                |                 |                  |                                                   |          |
| **Some upper UHF antennas on Door 48.                                                                         |                                                              |                                |                     |           |      |                       |                 |                                                                |                 |                  |                                                   |          |

| Table 6-1. (continued)                                                        |                                                                                    |                                      |                     |      |      |                       |                 |                |    |                  |                |          |
|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------|--------------------------------------|---------------------|------|------|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                          | Nomenclature                                                                       | Location                             | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                               |                                                                                    |                                      | H                   | W    | D    |                       |                 | AC             | DC |                  |                |          |
| Frequency Channel Indicators (2)                                              | ID-808/ASQ<br>NSM: 5895-00-825-7334<br>(or)<br>ID-1311/ASQ                         | Cockpit Instr. Panels                | 1.3                 | 1.6  | 5.9  | 12                    | 3.0             |                |    |                  |                |          |
| <u>TACAM Subsystem</u>                                                        |                                                                                    |                                      |                     |      |      |                       |                 |                |    |                  |                |          |
| Controls (Pair in Each Cockpit)                                               | C-6684/ASQ<br>NSM: 5890-00-919-0400<br>(or)<br>C-6685/ASQ<br>NSM: 5895-00-919-0410 | Alt Cockpit<br><br>Left Console      | 2.3                 | 5.8  | 6.3  | 234                   | 6.0             |                |    |                  |                |          |
| Receiver-Transmitter                                                          | RT-716/ASQ-88<br>NSM: 5895-00-017-8935                                             | Pod Cockpit Right Console<br>Door 19 | 2.3                 | 5.8  | 3.3  | 44                    | 1.8             |                |    |                  |                |          |
| Pulse Decoder                                                                 | KY-531/ASQ-88<br>NSM: 5895-00-919-0412                                             | Door 19                              | 10.5                | 6.5  | 22.5 | 1536                  | 35.0            |                |    |                  |                |          |
| Antennas (2)*                                                                 |                                                                                    | Door 135 and Aft Nose Gear Door      |                     |      |      |                       |                 |                |    |                  |                |          |
| Ccax Switch                                                                   |                                                                                    | Door 19                              |                     |      |      |                       |                 |                |    |                  |                |          |
| Antenna Selector                                                              |                                                                                    | Door 19                              |                     |      |      |                       |                 |                |    |                  |                |          |
| <u>Identification Subsystem</u>                                               |                                                                                    |                                      |                     |      |      |                       |                 |                |    |                  |                |          |
| Coder-Receiver-Transmitter                                                    | KY-532( )/ASQ<br>NSM: 5895-00-017-8933                                             | Door 19                              | 8.6                 | 6.4  | 22.5 | 1238                  | 26.0            |                |    |                  |                |          |
| Transponder Control                                                           | C-6280A(P)APX<br>NSM: 5895-00-089-4403                                             | Pod Cockpit Right Console            | 5.25                | 5.75 | 3.1  | 94                    | 2.6             |                |    |                  |                |          |
| Antenna Computer                                                              | KIT-1A/TSDC<br>NSM: TBD                                                            | Door 19<br>Doors 502 and 503         | (8.25 diameter)     |      | 1.7  | 90<br>244             | 0.75<br>11.0    |                |    |                  |                |          |
| *On some aircraft the upper antenna is located on the top of the nose radome. |                                                                                    |                                      |                     |      |      |                       |                 |                |    |                  |                |          |

| Table 6-2. RF-4C AVIONICS CONFIGURATION DATA: HF RADIO SET, AM/ARC-105 NSM: 5821-00-124-4517                              |              |                                                        |                     |      |      |                       |                 |                                                                |    |                  |                |          |
|---------------------------------------------------------------------------------------------------------------------------|--------------|--------------------------------------------------------|---------------------|------|------|-----------------------|-----------------|----------------------------------------------------------------|----|------------------|----------------|----------|
| Name                                                                                                                      | Nomenclature | Location                                               | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power                                                 |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                                                           |              |                                                        | H                   | W    | D    |                       |                 | AC                                                             | DC |                  |                |          |
| Radio Set Control                                                                                                         | C-4958       | Aft Cockpit Right Console*                             | 2.65                | 5.75 | 4.9  | 75                    | 1.8             | 115 V<br>3.5<br>400 Hz<br>1039 W<br>max.<br>Total System Power |    |                  | Convection     | Console  |
| Receiver-Transmitter                                                                                                      | RT-712       | Door 511R                                              | 22.9                | 10.3 | 11.5 | 2712                  | 65.0            |                                                                |    |                  | Forced Air     | Hard     |
| HF Comm. Panel                                                                                                            |              | Pod Cockpit Left Console                               |                     |      |      |                       |                 |                                                                |    |                  | Convection     | Console  |
| HF-UHF Selector Switch                                                                                                    |              | Aft Cockpit Instr. Panel                               |                     |      |      |                       |                 |                                                                |    |                  | Convection     | Panel    |
| Vacuum Dielectric Variable Capacitors (2)                                                                                 | MX-6066      | Doors 513L/R                                           | 4.1                 | 5.9  | 8.0  | 194                   | 6.5 (each)      |                                                                |    |                  | Convection     | Hard     |
| Antenna Coupler                                                                                                           | CU-1239      | Photoflash Ejector Well Inboard Door                   | 8.6                 | 8.6  | 14.4 | 1065                  | 18.0            |                                                                |    |                  | Convection     | Hard     |
| Antenna Coupler Control                                                                                                   | C-4959       | Door 511L                                              | 3.7                 | 7.7  | 14.5 | 1528                  | 9.0             |                                                                |    |                  | Forced Air     | Hard     |
| Antenna                                                                                                                   |              | Edge of Vertical Stabilizer Feed Point Behind Door 512 |                     |      |      |                       |                 |                                                                |    |                  |                |          |
| HF Comm/Loran D Panel**                                                                                                   |              | Aft Cockpit Instr. Panel                               |                     |      |      |                       | 10              |                                                                |    |                  |                | Panel    |
| *located in the forward cockpit right console on a limited number of aircraft.<br>**only on a limited number of aircraft. |              |                                                        |                     |      |      |                       |                 |                                                                |    |                  |                |          |

\*Located in the forward cockpit right console on a limited number of aircraft.  
 \*\*Only on a limited number of aircraft.

| Table 6-3. RF-4C AVIONICS CONFIGURATION DATA: SECURE COMMUNICATIONS SET, KY-28 |                                     |          |                     |      |     |                       |                 |                |      |                  |                |          |
|--------------------------------------------------------------------------------|-------------------------------------|----------|---------------------|------|-----|-----------------------|-----------------|----------------|------|------------------|----------------|----------|
| Name                                                                           | Nomenclature                        | Location | Dimensions (Inches) |      |     | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |      | Heat Dissipation | Cooling Method | Mounting |
|                                                                                |                                     |          | H                   | W    | D   |                       |                 | AC             | DC   |                  |                |          |
| Control Unit                                                                   | C-8057/ABC<br>NSN: 5921-00-017-1504 |          | 2.6                 | 5.75 | 2.3 | 34                    | 1.0             |                | 28 V |                  | Convection     | Console  |
| Remote Unit                                                                    | TSEC/KY-28<br>NSN: TBD              |          | 7.8                 | 5.0  | 9.1 | 335                   | 15.0            |                | 28 V |                  |                |          |

| Table 6-1. RF-4C AVIONICS CONFIGURATION DATA: FLIGHT DIRECTOR GROUP |                       |                                |                     |      |      |                       |                 |                |    |                  |                |          |
|---------------------------------------------------------------------|-----------------------|--------------------------------|---------------------|------|------|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                | Nomenclature          | Location                       | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                     |                       |                                | H                   | W    | D    |                       |                 | AC             | DC |                  |                |          |
| Flight Director Computer                                            | CPU-82A<br>NSN: TBD   | Aft Cockpit Right              | 7.8                 | 6.25 | 9.6  | 468                   | 11.0            |                |    |                  |                |          |
| Mode Selector Control                                               | C-8108/A<br>NSN: TBD  | FWL Cockpit Main Instr. Panel  | 3.25                | 2.0  | 5.0  | 31                    | 1.0             |                |    |                  |                |          |
| Horizontal Situation Indicator                                      | AF/A24J-1<br>NSN: TBD | FWL Cockpit Main Instr. Panel  | 5.3                 | 5.0  | 7.6  | 201                   | 8.0             |                |    |                  |                |          |
| NSI Amplifier                                                       |                       | FWL Cockpit Above Left Console | 3.5                 | 7.0  | 5.0  | 123                   | 4.0             |                |    |                  |                |          |
| Bearing Distance Measuring Indicator                                | ID-613A/U<br>NSN: TBD | Aft Cockpit Main Instr. Panel  | 3.25                | 3.25 | 7.75 | 82                    | 3.0             |                |    |                  |                |          |
| AWOL Mode Select Switch                                             |                       | Aft Cockpit Main Instr. Panel  | 1.3                 | 0.6  | 2.3  | 1.8                   | 0.1             |                |    |                  |                |          |

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| Table 6-5. RF-4C AVIONICS CONFIGURATION DATA: ELECTRONIC ALTIMETER SET, AM/APN-159 NSM: 5841-00-411-1662 |              |                       |                     |      |      |                       |                 |                                                                           |               |                |
|----------------------------------------------------------------------------------------------------------|--------------|-----------------------|---------------------|------|------|-----------------------|-----------------|---------------------------------------------------------------------------|---------------|----------------|
| Name                                                                                                     | Nomenclature | Location              | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power                                                            |               | Cooling Method |
|                                                                                                          |              |                       | H                   | W    | D    |                       |                 | AC                                                                        | DC            |                |
| Receiver-Transmitter                                                                                     | RT-708( )    | Door 510L             | 6.3                 | 7.5  | 24.0 | 1134                  | 21.0            |                                                                           |               |                |
| Weight Indicators (2)                                                                                    | WD-1162      | Cockpit Instr. Panels | 3.25                | 3.25 | 4.4  | 46                    | 4.0 (each)      |                                                                           |               |                |
| Power Supply                                                                                             | PP-1889      | Door 510L             | 8.0                 | 4.1  | 4.2  | 138                   | 4.0             | 400 Hz<br>115 V<br>0.8 A<br>28 V<br>1.0 A<br>14/28 V<br>0.4 A<br>5 V, 3 A | 28 V<br>1.0 A |                |
| Transmitter Antenna                                                                                      | AS-1521( )   | Door 27R              | 2.4                 | 7.5  | 10.3 | 185                   | 2.7             |                                                                           |               |                |
| Receiver Antenna                                                                                         | AS-1522( )   | Door 27L              | 2.4                 | 7.5  | 10.3 | 185                   | 2.7             |                                                                           |               |                |

| Table 6-6. RF-4C AVIONICS CONFIGURATION DATA: FLIGHT CONTROL GROUP, AN/ASA-32J |                                          |                                |                     |      |      |                       |                 |                |    |                  |                |          |
|--------------------------------------------------------------------------------|------------------------------------------|--------------------------------|---------------------|------|------|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                           | Nomenclature                             | Location                       | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                |                                          |                                | H                   | W    | D    |                       |                 | AC             | DC |                  |                |          |
| Control Amplifier                                                              | C-6563(1)/ASA-32H<br>NSN: TBD            | Aft Cockpit Under Left Console | 8.25                | 10.0 | 11.8 | 975                   | 27.0            |                |    |                  | Convection     | Shock    |
| Engage Controller                                                              | C-6564/ASA-32H<br>NSN: 6615-00-907-0197  | Pwd Cockpit Left Console       | 4.5                 | 5.75 | 4.5  | 116                   | 2.0             |                |    |                  | Convection     | Console  |
| Rate Gyros Pitch                                                               | CR-560/ASA-32<br>NSN: TBD                | Door 89L                       | 2.6                 | 2.9  | 5.4  | 40                    | 1.0             |                |    |                  | Convection     | Hard     |
| Roll                                                                           | CR-558/ASA-32<br>NSN: TBD                | Aft Cockpit Bulkhead Right     | 2.6                 | 2.9  | 5.4  |                       | 1.0             |                |    |                  | Convection     | Hard     |
| Yaw                                                                            | CR-559/ASA-32<br>NSN: TBD                | Door 89R                       | 2.6                 | 2.9  | 5.4  |                       | 1.0             |                |    |                  | Convection     | Hard     |
| F-Limiting Accelerometer                                                       | MX-3423/ASA-32D<br>NSN: 6615-00-600-1007 | Pwd Camera Compartment         | 3.5                 | 3.5  | 4.4  | 54                    | 1.0             |                |    |                  | Convection     | Hard     |
| Lateral Accelerometer                                                          | MX-3421/ASA-32D<br>NSN: 6615-00-600-0969 | Under Aft Seat                 | 3.5                 | 3.5  | 4.4  | 54                    | 1.0             |                |    |                  | Convection     | Hard     |
| Motional Pickup Transducer                                                     | CR-175/ASA-32D<br>NSN: 6615-00-590-5172  | Pwd Cockpit Control Stick      | 8.0                 | 1.9  | 3.7  | 56                    | 5.0             |                |    |                  | Convection     | Hard     |

| Table 6-7. RF-4C AVIONICS CONFIGURATION DATA: AIR DATA COMPUTER SET NSN: TBD |                                                         |                                     |                     |                |       |    |                       |                 |                |  |                  |                |          |
|------------------------------------------------------------------------------|---------------------------------------------------------|-------------------------------------|---------------------|----------------|-------|----|-----------------------|-----------------|----------------|--|------------------|----------------|----------|
| Name                                                                         | Nomenclature                                            | Location                            | Dimensions (Inches) |                |       |    | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |  | Heat Dissipation | Cooling Method | Mounting |
|                                                                              |                                                         |                                     | H                   | W              | D     | AC |                       |                 | DC             |  |                  |                |          |
| Computer                                                                     | CPU-114/A or<br>CPK-86/A24G-30<br>or CPK-69/<br>A24G-24 | Aft Cockpit<br>Left Side            | 7.5                 | 12.0           | 16.75 |    | 1508                  | 43.0            |                |  |                  | Convection     | Rack     |
| Altitude<br>Encoder Unit                                                     | CVK-99A/A24G<br>or<br>CVK-99B/A24G                      | Door 502<br>Camera Bay<br>Equipment | 3.3                 | 6.4            | 5.5   |    | 116                   | 4.0             |                |  |                  | Forced Air     |          |
| Angle of Attack<br>Transmitter                                               | TRK-58/A24G-16                                          | Mounted on<br>Door JR               | (4.9 diameter)      |                | 7.1   |    | 128                   | 2.0             |                |  |                  | Convection     | Hard     |
| Electrical<br>Resistance<br>Temperature<br>Transmitter                       | TRK-64/A24G-19                                          | Mounted on<br>fwd nose gear<br>door | 5.0                 | 3.6            | 2.5   |    | 45                    |                 |                |  |                  | Convection     | Hard     |
| Indicators                                                                   |                                                         | Cockpit<br>Instr. Panels            |                     |                |       |    |                       |                 |                |  |                  | Convection     | Panel    |
| True Airspeed<br>Indicator                                                   | AVK-14/A24G-8                                           |                                     |                     | (2.0 diameter) | 6.9   |    | 22                    | 1.0             |                |  |                  | Convection     | Panel    |
| Angle of<br>Attack<br>Indicator                                              | ARK-10A/A24G-8                                          |                                     |                     | (2.4 diameter) | 6.5   |    | 29                    | 1.8             |                |  |                  | Convection     | Panel    |
| Vertical<br>Velocity<br>Indicator                                            | RCS601LO                                                |                                     |                     |                |       |    |                       |                 |                |  |                  | Convection     | Panel    |
| Servowind<br>Altimeter                                                       | AAU-191 1/A                                             |                                     |                     | (3.3 diameter) | 8.8   |    | 75                    | 4.5             |                |  |                  | Convection     | Panel    |
| Airspeed and<br>Mach Number<br>Indicator                                     | MS851L                                                  |                                     |                     |                |       |    |                       |                 |                |  |                  | Convection     | Hard     |
| Stall Warning<br>Vibrator                                                    | PM-15A520                                               | Left Rudder<br>Panel                |                     |                |       |    |                       |                 |                |  |                  | Convection     | Hard     |
| Aural Tone<br>Generator                                                      | O-1551/APN                                              | Under Fwd<br>Cockpit<br>Pedestal    | 3.5                 | 3.1            | 8.5   |    | 92                    | 2.8             |                |  |                  | Convection     | Hard     |
| Pitot-Static<br>Tube                                                         | 855S-2                                                  | Nose Radome                         |                     |                |       |    |                       |                 |                |  |                  | Convection     | Hard     |

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| Name                                                                   | Nomenclature | Location                         | Dimensions (Inches) <sup>a</sup> |   |    | Volume (Cubic Inches) <sup>a</sup> | Weight (Pounds) | Aircraft Power                                                         |                       | Heat Dissipation | Cooling Method | Mounting        |
|------------------------------------------------------------------------|--------------|----------------------------------|----------------------------------|---|----|------------------------------------|-----------------|------------------------------------------------------------------------|-----------------------|------------------|----------------|-----------------|
|                                                                        |              |                                  | H                                | W | D  |                                    |                 | AC                                                                     | DC                    |                  |                |                 |
| Computer-Control Amplifier Computer<br><br>Ground Speed Indicators (2) | CP-7238      | Aft Cockpit Left Console         | 7                                | 7 | 11 | 5.9                                | 12.0            |                                                                        |                       |                  | Convection     | Console Mounted |
|                                                                        | AM-3734      | Aft Cockpit Floor Left           | 9                                | 9 | 11 | 89.1                               | 17.0            |                                                                        |                       |                  | Convection     | Hard            |
|                                                                        | ID-1126      | Cockpit Main Instr. Panels Right | 3                                | 3 | 7  | 6.3                                | 2.0 (each)      | **<br>26 V<br>400 Hz<br>1.2<br>25 VA                                   | **<br>24-25 V<br>45 W |                  | Convection     | Panel Mounted   |
|                                                                        |              |                                  |                                  |   |    |                                    | **<br>34.0      | 115 V<br>400 Hz<br>1.2<br>125 VA<br>0-28 V<br>Lighting Separate Source |                       |                  |                |                 |

<sup>a</sup>Crated dimensions.
<sup>\*\*</sup>Total system weight and power.

| Name                          | Nomenclature                                        | Location                           | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power*                                           |      | Heat Dissipation | Cooling Method                          | Mounting         |
|-------------------------------|-----------------------------------------------------|------------------------------------|---------------------|------|------|-----------------------|-----------------|-----------------------------------------------------------|------|------------------|-----------------------------------------|------------------|
|                               |                                                     |                                    | H                   | W    | D    |                       |                 | AC                                                        | DC   |                  |                                         |                  |
| Navigation Computer (Heading) | CP-779/ASN-56<br>NSN: 6605-00-999-2278              | Aft Cockpit<br>On Gyro Platform    | 6.4                 | 15.0 | 7.9  | 758                   | 17.0            | 115 V<br>400 Hz<br>3 $\phi$<br>28 V<br>400 Hz<br>1 $\phi$ | 28 V |                  | Internal Blower w/Cabin Air Cond.       | On Gyro Platform |
| Navigation Computer           | CP-733/ASN<br>NSN: 6605-00-050-7768                 | Aft Cockpit<br>Under Right Console | 7.3                 | 9.8  | 26.1 | 1867                  | 45.0            |                                                           |      |                  | Solenoid Operated Intake/Exhaust System | Shock            |
| Navigation Set Control        | C-4779/ASN<br>NSN: 6605-00-987-6166                 | Aft Cockpit<br>Left Console        | 2.2                 | 5.7  | 4.3  | 53.9                  | 1.5             |                                                           |      |                  | Convection                              | Console          |
| Attitude Computer             | CP-780/ASN-56<br>NSN: 6605-00-915-9319              | Aft Cockpit<br>Under Right Console | 14.4                | 6.2  | 23.9 | 2114                  | 26.0            |                                                           |      |                  | Convection                              | Shock            |
| Gyro Stabilized Platform      | MX-4839 ( )/ASN<br>or<br>MX-7299/ASN-74<br>NSN: TBD | Aft Cockpit<br>Right Side          | 11.3                | 14.9 | 10.0 | 1684                  | 31.0            |                                                           |      |                  | Convection                              | Hard             |

\*System power requirements.

C

Table 6-10. RF-4C AVIONICS CONFIGURATION DATA: ILS/VOR SYSTEM, AN-ARN-127

| Name                     | Nomenclature                        | Location                    | Dimensions<br>(Inches) |     |      | Volume<br>(Cubic<br>Inches) | Weight<br>(Pounds) | Aircraft<br>Power     |                       | Heat<br>Dissipation | Cooling<br>Method | Mounting |
|--------------------------|-------------------------------------|-----------------------------|------------------------|-----|------|-----------------------------|--------------------|-----------------------|-----------------------|---------------------|-------------------|----------|
|                          |                                     |                             | H                      | W   | D    |                             |                    | AC                    | DC                    |                     |                   |          |
| Control Panel            | C-10124<br>NSN: 594-00-<br>917-4951 | Fwd Cockpit<br>Left Console | 5.75                   | 2.6 | 4.5  | 68                          | 2.2                |                       | 27.5 V                |                     | Convection        | Console  |
| Course<br>Indicator      | ID-351B/ARN<br>NSN: TBD             | Aft Cockpit<br>Instr. Panel |                        |     |      |                             |                    |                       |                       |                     |                   | Panel    |
| OS VOR/ILS<br>Antenna    |                                     | Radome                      |                        |     |      |                             |                    |                       |                       |                     |                   | Hard     |
| Marker Beacon<br>Antenna |                                     | Door 508                    |                        |     |      |                             |                    |                       |                       |                     |                   | Hard     |
| VOR/ILS<br>Receiver      | R-2032<br>NSN: 5950-00-<br>415-4369 | Door 19                     | 5.1                    | 7.2 | 12.6 | 463                         | 10.0               | 26 V<br>400 Hz<br>1 A | 27.5 V<br>2 A<br>max. |                     | Convection        |          |

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| Table 6-11. RF-4C AVIONICS CONFIGURATION DATA: LORAN NAVIGATION SET, AN/ARN-92* MSN: 5826-00-498-3319**                                                                    |                  |                           |                     |       |      |                       |                 |                                                                                               |               |                  |                          |          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------------|---------------------|-------|------|-----------------------|-----------------|-----------------------------------------------------------------------------------------------|---------------|------------------|--------------------------|----------|
| Name                                                                                                                                                                       | Nomenclature     | Location                  | Dimensions (Inches) |       |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power                                                                                |               | Heat Dissipation | Cooling Method           | Mounting |
|                                                                                                                                                                            |                  |                           | H                   | W     | D    |                       |                 | AC                                                                                            | DC            |                  |                          |          |
| Navigation Computer                                                                                                                                                        | CP-898( )        | Doors 507L and 508        | 7.8                 | 10.75 | 24.0 | 2012                  | 44.0            | 115 V<br>3 $\phi$<br>400 Hz<br>28 V<br>400 Hz<br>1 $\phi$<br>TBD VA<br>(Powers entire system) | 28 V<br>TBD W |                  | Internal Blower in Mount | Shock    |
| Receiver                                                                                                                                                                   | R-1503( )        | Door 507R                 | 7.6                 | 7.5   | 19.1 | 1089                  | 29.0            |                                                                                               |               |                  | Internal Blower in Mount | Shock    |
| M/Notch Filter                                                                                                                                                             | F-1265 or F-1266 |                           | 3.5                 | 4.4   | 6.9  | 106                   | 2.0             |                                                                                               |               |                  | Convection               | Hard     |
| Control Indicator                                                                                                                                                          | C-7417           | Aft Cockpit Right Console | 6.6                 | 5.75  | 5.0  | 342                   | 12.0            |                                                                                               |               |                  | Convection               | Console  |
| Antenna Coupler                                                                                                                                                            | CU-1721          | Door 40                   | 1.7                 | 3.7   | 5.3  | 33                    | 18.0            |                                                                                               |               |                  | Convection               | Hard     |
| Signal Conditioner                                                                                                                                                         |                  | Door 50R                  | 5.5                 | 7.7   | 9.0  | 381                   | 11.0            |                                                                                               |               |                  | Convection               | Hard     |
| Antenna                                                                                                                                                                    |                  | Upper Center Fuselage     |                     |       |      |                       |                 |                                                                                               |               |                  | Convection               | Hard     |
| *Effectivity: Aircraft 68-594 through 69-350. These aircraft are not expected to be JTIDS candidates.<br>**ALMO MSN: 5826-00-883-5755; for AN-92V3, MSN: 5826-00-134-7054. |                  |                           |                     |       |      |                       |                 |                                                                                               |               |                  |                          |          |

| Table 6-12. RF-4C AVIONICS CONFIGURATION DATA: ATTITUDE HEADING REFERENCE SYSTEM, AM/ASN-55 |                                                         |                          |                     |     |     |                       |                 |                |    |                  |                |          |
|---------------------------------------------------------------------------------------------|---------------------------------------------------------|--------------------------|---------------------|-----|-----|-----------------------|-----------------|----------------|----|------------------|----------------|----------|
| Name                                                                                        | Nomenclature                                            | Location                 | Dimensions (Inches) |     |     | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                                             |                                                         |                          | H                   | W   | D   |                       |                 | AC             | DC |                  |                |          |
| Indicator                                                                                   | ARU-11/A or ARU-31/A<br>MSN: 6610-00-424-8740           | Pwd Cockpit Instr. Panel | 5.1                 | 5.0 | 9.8 | 250                   | 9.0             |                |    |                  | Convection     | Panel    |
| Remote Indicator                                                                            | ARU-11A<br>MSN: 6610-00-883-1034                        | Aft Cockpit Instr. Panel | 3.3                 | 3.3 | 9.8 | 107                   | 3.7             |                |    |                  |                |          |
| Compass Transmitter                                                                         | ML-1<br>MSN: TBD                                        | Door 95                  | 2.3                 | 3.5 | 4.9 | 39                    | 1.5             |                |    |                  | Convection     | Hard     |
| Compass Adapter-Compensator                                                                 | ADK-1821 1/<br>A24G-1A<br>MSN: 6615-00-9535             | Aft Cockpit Left         | 4.1                 | 5.1 | 9.6 | 201                   | 7.0             |                |    |                  | Convection     |          |
| Compass Controller                                                                          | C-6448<br>MSN: 6615-00-759-1435                         | Pwd Cockpit Instr. Panel | 2.6                 | 5.8 | 4.4 | 66                    | 1.3             |                |    |                  | Convection     | Panel    |
| Rate Gyro Transmitter                                                                       | T-751/AJB-3A or<br>T-970/AJB-7<br>MSN: 6613-00-759-1367 | Aft Cockpit Left         | 2.8                 | 2.7 | 5.4 | 41                    | 2.5             |                |    |                  | Convection     | Hard     |
| Switching Rate Gyro                                                                         | CN-1050<br>MSN: 6615-00-759-1367                        | Aft Cockpit Left         | 2.7                 | 1.8 | 4.8 | 23                    | 1.1             |                |    |                  | Convection     |          |
| Directional Displacement Gyro                                                               | DN-990<br>MSN: 6615-00-567-7949                         | Door 504R                | 8.1                 | 4.9 | 4.9 | 194                   | 7.5             |                |    |                  | Convection     |          |
| Power Supply Amplifier                                                                      | AM-4080<br>MSN: 6615-00-759-1434                        | Radiometer               | 1.3                 | 4.6 | 4.6 | 91                    | 4.0             |                |    |                  | Forced Air     |          |
| Roll and Pitch Displacement Gyro                                                            | MD-1<br>MSN: 6615-00-074-4036                           | Doors 502 and 503        | 4.7                 | 4.9 | 9.6 | 221                   | 9.0             |                |    |                  | Convection     |          |

| Table 1. N-4 AVIONICS CONFIGURATION DATA: INTERFERENCE BLANKET UNIT NSN: YTD |              |                                                     |                     |     |      |                       |                 |                             |    |                  |                |          |
|------------------------------------------------------------------------------|--------------|-----------------------------------------------------|---------------------|-----|------|-----------------------|-----------------|-----------------------------|----|------------------|----------------|----------|
| Name                                                                         | Nomenclature | Location                                            | Dimensions (Inches) |     |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power              |    | Heat Dissipation | Cooling Method | Mounting |
|                                                                              |              |                                                     | H                   | W   | D    |                       |                 | AC                          | DC |                  |                |          |
| Interference Blanka                                                          | 53-87570     | Bottom of Fuselage Behind Nose Wheelwell, Door 5108 | 5.75                | 4.0 | 10.5 | 241                   | 10.0            | 115 V<br>1 $\phi$<br>400 Hz |    |                  | Convection     |          |

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| Table 6-16. RF-4C AVIONICS CONFIGURATION DATA: RADAR MAPPING SET, AM/APD-10* |                                  |                           |                     |      |      |                       |                 |                           |               |                  |                |          |
|------------------------------------------------------------------------------|----------------------------------|---------------------------|---------------------|------|------|-----------------------|-----------------|---------------------------|---------------|------------------|----------------|----------|
| Name                                                                         | Nomenclature                     | Location                  | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power            |               | Heat Dissipation | Cooling Method | Mounting |
|                                                                              |                                  |                           | H                   | W    | D    |                       |                 | AC                        | DC            |                  |                |          |
| Antennas                                                                     | AS-2609<br>NSN: TBD              | Door 506L                 | 6.5                 | 1.0  | 50.0 | 325                   | 8.0             | 115 V<br>1 φ              | 28 V<br>160 W |                  | Convection     | Hard     |
|                                                                              | AS-2608                          | Door 506R                 | 6.5                 | 1.0  | 50.0 | 325                   | 8.0             | 400<br>1440 W<br>(system) |               |                  | Convection     |          |
| Antenna Control Groups                                                       | OE-107<br>NSN: TBD               | Door 506L                 | 10.1                | 9.0  | 13.0 | 1182                  | 27.0            |                           |               |                  | Convection     |          |
| Antenna Controls                                                             | OE-108<br>NSN: TBD               | Door 506R                 | 10.1                | 9.0  | 13.0 | 1182                  | 24.0            |                           |               |                  | Convection     |          |
|                                                                              | C-8721<br>NSN: TBD               | Door 506L                 | 5.0                 | 9.7  | 10.6 | 514                   | 10.0            |                           |               |                  | Convection     |          |
| Amplifier Modulator                                                          | C-8722<br>NSN: TBD               | Door 506R                 | 5.0                 | 9.7  | 10.6 | 514                   | 10.0            |                           |               |                  | Convection     |          |
|                                                                              | AM-6401<br>NSN: 5841-00-186-2487 | Door 507R                 | 12.7                | 10.0 | 23.3 | 2959                  | 97.0            |                           |               |                  | Forced Air     |          |
| Frequency Converter Transmitter                                              | CV-2831<br>NSN: TBD              | Door 507R                 | 12.4                | 8.9  | 23.0 | 2538                  | 70.0            |                           |               |                  | Forced Air     |          |
| Signal Data Generator Computer                                               | CP-1060<br>NSN: TBD              | Door 19                   | 13.0                | 8.5  | 20.5 | 2265                  | 47.0            |                           |               |                  | Forced Air     |          |
| Distribution Box                                                             | J-2986<br>NSN: TBD               | Door 19                   | 10.2                | 16.8 | 8.5  | 1457                  | 35.0            |                           |               |                  | Convection     |          |
| Recorder                                                                     | RD-399<br>NSN: TBD               | Doors 502, 503, 504L      | 18.0                | 28.3 | 20.9 | 10446                 | 229.0           |                           |               |                  | Forced Air     |          |
| Recorder Magazine                                                            | LA-446A<br>NSN: TBD              | Within Recorder           | 9.5                 | 12.3 | 6.4  | 748                   | 14.0 (loaded)   |                           |               |                  |                |          |
| Radar Control Fault Locator                                                  | C-8720<br>NSN: TBD               | Aft Cockpit Right Console | 6.4                 | 5.7  | 4.1  | 150                   | 4.0             |                           |               |                  | Convection     | Console  |
|                                                                              | TS-3061<br>NSN: 5841-00-371-8199 | Door 507L                 | 17.1                | 7.0  | 11.3 | 1353                  | 29.0            |                           |               |                  | Convection     | Hard     |
| *Effectivity: Aircraft 49-360 through 49-375.                                |                                  |                           |                     |      |      |                       |                 |                           |               |                  |                |          |

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| Name                                | Nomenclature                          | Location               | Dimensions (Inches) |            |              | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power                                 |               | Heat Dissipation | Cooling Method           | Mounting |
|-------------------------------------|---------------------------------------|------------------------|---------------------|------------|--------------|-----------------------|-----------------|------------------------------------------------|---------------|------------------|--------------------------|----------|
|                                     |                                       |                        | H                   | W          | D            |                       |                 | AC                                             | DC            |                  |                          |          |
| Antennas                            | AS-1586                               | Door 506L              | 6.5                 | 5.0        | 0.1          | 125                   | 11.0            | 115/200 V<br>400 Hz<br>3 φ<br>2300 VA (system) | 28 V<br>100 W |                  | Convection               | Hard     |
| Antenna Controls                    | C-6067<br>C-6068                      | Door 506L<br>Door 506R | 5.0<br>5.0          | 9.7<br>9.7 | 10.6<br>10.6 | 516<br>516            | 10.0<br>10.0    |                                                |               |                  | Convection<br>Convection |          |
| Antenna Control Group               | CA-6413<br>CA-6414                    | Door 506L<br>Door 506R | 10.1<br>10.1        | 9.0<br>9.0 | 11.0<br>11.0 | 1187<br>1182          | 25.0<br>25.0    |                                                |               |                  | Convection<br>Convection |          |
| Recorder Control                    | C-6068                                | Door 19                | 21.5                | 10.2       | 8.5          | 1464                  | 32.0            |                                                |               |                  | Forced Air               |          |
| Radar Mapping Recorder              | MO-249 or<br>MO-276                   | Doors 507L<br>508      | 14.0                | 9.5        | 39.0         | 5187                  | 107.0<br>110.0  |                                                |               |                  | Forced Air               |          |
| Computer-Reference Signal Generator | CP-758                                | Door 19                | 21.5                | 11.0       | 4.5          | 2176                  | 42.0            |                                                |               |                  | Forced Air               |          |
| Frequency Converter-Transmitter     | CV-1678                               | Door 507R              | 13.25               | 9.8        | 24.0         | 3116                  | 57.0            |                                                |               |                  | Forced Air               |          |
| Amplifier-Modulator                 | AM-1950                               | Door 507R              | 13.7                | 10.0       | 21.25        | 3185                  | 95.0            |                                                |               |                  | Forced Air               |          |
| Film Magazine                       | MA-12/APQ-103<br>or<br>MA-14/APQ-102A | Contained in Recorder  |                     |            |              |                       | 6.0<br>8.0      |                                                |               |                  |                          |          |

\*Effectivity: All aircraft except those with APQ-10.  
\*\*This MSN for APQ-102(A).

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| Name                      | Nomenclature | Location                 | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power                                                 |               | Heat Dissipation | Cooling Method | Mounting |
|---------------------------|--------------|--------------------------|---------------------|------|------|-----------------------|-----------------|----------------------------------------------------------------|---------------|------------------|----------------|----------|
|                           |              |                          | H                   | W    | D    |                       |                 | AC                                                             | DC            |                  |                |          |
| Antenna-Receiver          | AS-1451      | Door 501                 | 19.6                | 20.0 | 24.2 | 9486                  | 41.0            | 115 V<br>3 $\phi$<br>400 Hz<br>1350 VA<br>(Total System Power) | 28 V<br>200 W |                  |                | Shock*   |
| Transmitter               | T-920        | Door 501                 | 6.8                 | 16.6 | 10.1 | 1163                  | 35.0            |                                                                |               |                  |                | Shock    |
| Power Supply-Programmer   | PP-3814      | Door 501                 | 12.2                | 21.4 | 5.3  | 1394                  | 37.0            |                                                                |               |                  |                | Shock    |
| Command Computer          | CP-731       | Door 501                 | 2.8                 | 10.2 | 7.5  | 214                   | 7.0             |                                                                |               |                  |                | Shock    |
| Altitude Range Indicators |              |                          |                     |      |      |                       |                 |                                                                |               |                  |                |          |
| Pod                       | IP-710       | Above Instr. Panels      | 6.5                 | 9.3  | 20.5 | 1239                  | 26.0            |                                                                |               |                  | Convection     | Panel    |
| Aft                       | IP-711       |                          | 8.8                 | 7.5  | 22.5 | 1485                  | 31.0            |                                                                |               |                  |                |          |
| Radar Control             | C-4751       | Aft Cockpit Left Console | 5.9                 | 5.8  | 4.4  | 151                   | 4.0             |                                                                |               |                  | Convection     | Console  |

\*On Forward Mounting Assembly MT-1027 (30 lbs., 17.5" x 24.3" x 7.2").

| Name                      | Nomenclature     | Location | Dimensions (Inches) |            |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power                        |      | Heat Dissipation | Cooling Method | Mounting |
|---------------------------|------------------|----------|---------------------|------------|------|-----------------------|-----------------|---------------------------------------|------|------------------|----------------|----------|
|                           |                  |          | H                   | W          | D    |                       |                 | AC                                    | DC   |                  |                |          |
| Signal Processor          | CH-442 ( )       |          | 7.6                 | 5.0        | 14.6 | 555                   | 25.0            | 115 V<br>400 Hz<br>2.5 A              |      |                  |                |          |
| Counter-Measures Receiver | R-1854 ( )       |          | 4.0                 | 6.0        | 10.8 | 259                   | 8.2             | 1 $\phi$<br>115 V<br>400 Hz<br>0.25 A |      |                  |                |          |
| Amplifier Detectors (4)   | AM-6639          |          | 6.7                 | 1.7        | 7.6  | 87                    | 3.6 (each)      |                                       | 12 V |                  | Convection     |          |
| Indicator Controls (2)    | ID-1902          |          | 5.1                 | 1.8        | 4.25 | 39                    | 2.0 (each)      |                                       |      |                  |                |          |
| Altitude Indicators (2)   | ID-957/APR-36(V) |          | 3.25                | 3.25       | 10.8 | 114                   | 3.0 (each)      |                                       |      |                  |                |          |
| Antennas (4)              |                  |          | 5.5                 | 2.6 (each) | 4.0  |                       | 1.0 (each)      |                                       |      |                  |                |          |



| Table 6-19. RF-4C AVIONICS CONFIGURATION DATA: CHAFF DISPENSING CAPABILITY NSN: 5865-00-144-1858** |              |                             |                        |   |   |                             |                                                      |                   |    |                     |                   |          |
|----------------------------------------------------------------------------------------------------|--------------|-----------------------------|------------------------|---|---|-----------------------------|------------------------------------------------------|-------------------|----|---------------------|-------------------|----------|
| Name                                                                                               | Nomenclature | Location                    | Dimensions<br>(Inches) |   |   | Volume<br>(Cubic<br>Inches) | Weight<br>(Pounds)                                   | Aircraft<br>Power |    | Heat<br>Dissipation | Cooling<br>Method | Mounting |
|                                                                                                    |              |                             | H                      | W | D |                             |                                                      | AC                | DC |                     |                   |          |
| Chaff Dispenser<br>External Store<br><br>Chaff<br>Cartridges*<br>(not part of<br>ALE-38)           | AN/ALF-38    | Wing Station:<br>2 and 4    |                        |   |   |                             | 470 (Full)<br>+214<br>Mounting<br>Hardware<br>(each) |                   |    |                     |                   |          |
|                                                                                                    | RR-1368/A/E  | Photo Flash<br>Ejector Door |                        |   |   |                             |                                                      |                   |    |                     |                   |          |
| *Loaded into and ejected by Photoflash Unit.<br>**NSN for ALE-38.                                  |              |                             |                        |   |   |                             |                                                      |                   |    |                     |                   |          |

| Table 1-1. NI-DC AUTOMICS CONFIGURATION DATA: SAVING RELATIVE SET, AN ANA NEW: TBD |               |                          |                     |     |      |                       |                 |                          |               |                  |                                |          |
|------------------------------------------------------------------------------------|---------------|--------------------------|---------------------|-----|------|-----------------------|-----------------|--------------------------|---------------|------------------|--------------------------------|----------|
| Name                                                                               | Nomenclature  | Location                 | Dimensions (Inches) |     |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power           |               | Heat Dissipation | Cooling Method                 | Mounting |
|                                                                                    |               |                          | H                   | W   | D    |                       |                 | AC                       | DC            |                  |                                |          |
| Recorder                                                                           | RU-254(1)/ASQ | Aft Cockpit Under Seat   | 4.75                | 3.0 | 6.25 | 1.5                   | 6.0             | 115 V<br>61 mA<br>400 Hz | 28 V<br>30 mA |                  | Convection (Cabin Environment) | Hard     |
| Recorder Switch and Sensor Control                                                 |               | Aft Cockpit Instr. Panel |                     |     |      |                       |                 |                          |               |                  | Convection                     | Panel    |

| Name                           | Nomenclature                                                              | Location                                                                                                                           | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power              |    | Cooling Method | Mounting |
|--------------------------------|---------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|---------------------|------|------|-----------------------|-----------------|-----------------------------|----|----------------|----------|
|                                |                                                                           |                                                                                                                                    | H                   | W    | D    |                       |                 | AC                          | DC |                |          |
| Digital Data Insertor          | C-6383/ASQ-90                                                             | Aft Cockpit Left Console                                                                                                           | 3.25                | 3.25 | 3.4  | 3.0                   | 2.0             | 115 V<br>5 A<br>28 V<br>0 C |    |                |          |
| Signal Data Converter          | CV-2656/ASQ-908 or<br>CV-2694/ASQ-134                                     | Aft Cockpit Behind Left Console                                                                                                    | 8.75                | 9.0  | 20.0 | 1575                  | 60.0            |                             |    |                |          |
| Digital Display Indicators (7) | IP-764/ASQ-90<br>IP-765<br>IP-766<br>IP-767<br>IP-783<br>IP-763<br>IP-770 | Door 502 (KS-72 Camera)<br>Aft Cockpit Instr. Panel<br>Door 504L/R<br>Door 509<br>Door 503<br>Door 507L<br>Door 502 (KS-87 Camera) | (1.25 diameter)     |      | 4.5  | 5.6                   | 1.0             |                             |    |                |          |

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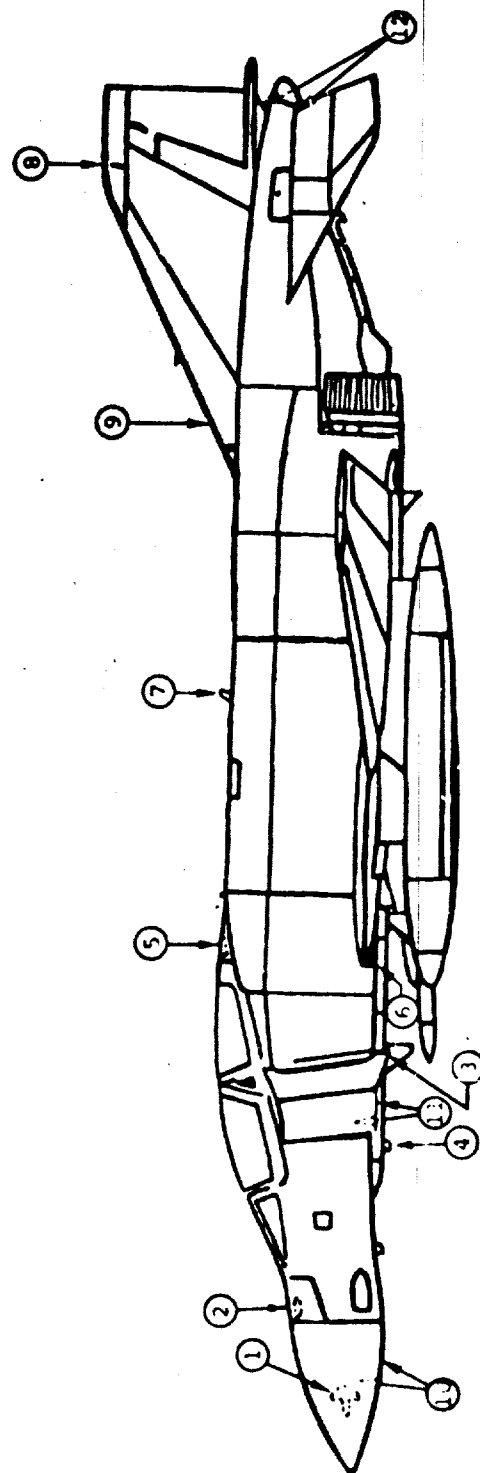
| Name                                   | Nomenclature                                | Location                           | Dimensions (Inches) |                |       | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power                       |              | Heat Dissipation | Cooling Method | Mounting |
|----------------------------------------|---------------------------------------------|------------------------------------|---------------------|----------------|-------|-----------------------|-----------------|--------------------------------------|--------------|------------------|----------------|----------|
|                                        |                                             |                                    | H                   | W              | D     |                       |                 | AC                                   | DC           |                  |                |          |
| Aircraft Camera Parameter Control      | LA-311 ( )<br>NSN: 6625-00-448-0457         | Door 503                           | 7.0                 | 7.5            | 14.5  | 761                   | 19.0            | 115 V<br>400 Hz<br>1 $\phi$<br>50 VA | 28 V<br>20 W |                  |                |          |
| Photo Control Junction Box             | 53-79511                                    | Door 503                           |                     |                |       |                       |                 |                                      |              |                  |                |          |
| Camera Control Photoflash Detector     | LA-285A<br>NSN: 6760-00-056-5874            | Door 510L                          |                     | (2.0 diameter) | 6.5   | 20                    | 1.7             |                                      |              |                  |                |          |
| Aerial Mapping and Recon. Phot. Finder | LA-313A<br>NSN: 6760-00-880-0842            | Doors 504R and 515 and Pwd Cockpit | 6.4                 | 5.0            | 27.0  | 864                   | 75.0            |                                      |              |                  |                |          |
| Sensor Control Panels (2)              |                                             | Aft Cockpit Instr. Panel           |                     |                |       |                       | 5.0             |                                      |              |                  |                |          |
| Pilot Recon. Selector Panel            |                                             | Pwd Cockpit Instr. Panel           |                     |                |       |                       |                 |                                      |              |                  |                |          |
| Film Remaining Panel                   |                                             | Aft Cockpit Instr. Panel           |                     |                |       |                       |                 |                                      |              |                  |                |          |
| Intervalometer Panel                   |                                             | Aft Cockpit Instr. Panel           |                     |                |       |                       |                 |                                      |              |                  |                |          |
| Photographic Equipment                 |                                             |                                    |                     |                |       |                       |                 |                                      |              |                  |                |          |
| Low Altimeter Pan Camera               | KA-56E<br>NSN: 6720-00-499-4467             | Door 503                           | 8.6                 | 23.7           | 18.8  | 3832                  | 58.0            | 115 V<br>400 Hz<br>1 $\phi$          | 28 V         |                  |                |          |
| Framing Camera                         | KS-872<br>NSN: TBD                          | Door 502                           | 10.3                | 16.0           | 23.0  | 140                   | 78.0            | 115 V<br>400 Hz<br>3 $\phi$          | 28 V         |                  |                |          |
| High Altimeter Pan Camera              | LA-918                                      | Door 504L/R                        | 18.0                | 28.0           | 24.0  | 12096                 | 168.0           | 115 V<br>400 Hz<br>3 $\phi$          | 28 V         |                  |                |          |
| Cartridge Ejectors 4 Each              | LA-307A or LA-308A<br>NSN: 6625-00-064-5124 | Aft Center Fuselage                | 13.0                | 7.0            | 16.75 | 1524                  | 49.0            | 115 V<br>400 Hz<br>14/28 V           | 28 V         |                  |                |          |

## 7. ANTENNA LOCATIONS

Figure 7-1 shows the approximate locations of the antennas on the RF-4C. Antenna nomenclature from current technical orders is as follows:

| <u>Antenna</u>                   | <u>Nomenclature or<br/>Part Number</u>                      |
|----------------------------------|-------------------------------------------------------------|
| 1. Forward Looking Radar         | AS-1451/APQ-99                                              |
| 2. UHF/ADF                       | AS-909A/ARA-48 or<br>AS-1059/ASQ-19                         |
| 3. TACAN/RHAW                    | TBD                                                         |
| 4. Lower UHF                     | DM67-8                                                      |
| 5. IFF                           | 2285-1                                                      |
| 6. Electronic Altimeter          | Receiver: AS-1522A/APN-159<br>Transmitter: AS-1521A/APN-159 |
| 7. TACAN                         | DMNI-29                                                     |
| 8. Upper UHF                     | 6583-2                                                      |
| 9. HF                            | TBD                                                         |
| 10. Radar Homing and Warning (2) | TBD                                                         |
| 11. Side Looking Radar (2)       | Right Side: AS-1587/APQ-102<br>Left Side: AS-1586/APQ-102   |
| 12. Radar Homing and Warning (2) | TBD                                                         |





- |                                  |                                     |
|----------------------------------|-------------------------------------|
| 1. Forward Looking Radar Antenna | 7. TACAN Antenna                    |
| 2. UHF/ADF Antenna               | 8. Upper UHF Antenna                |
| 3. TACAN/RHAW Antenna            | 9. HF Antenna                       |
| 4. Lower UHF Antenna             | 10. RHAW Antennas (2)               |
| 5. IFF Antenna                   | 11. Side Looking Radar Antennas (2) |
| 6. Electronic Altimeter Antenna  | 12. RHAW Antennas (2)               |

Figure 7-1. RF-4C ANTENNA LOCATIONS

**8. INTERFACE DATA**

Data were not available for this section.

## 9. FUTURE MODIFICATIONS

Table 9-1 lists the known on-going or near-term RF-4C modifications. Table 9-2 presents some of the planned or tentative Class V modifications. The classified details of some modifications limit the content of this section.

Tables 9-3 through 9-5 contain pertinent LRU data for the ARC-164, ARN-118, and ARN-101 systems.

Table 9-1. \* -GOING AND NEAR-TERM MODIFICATIONS

| Terminology/Nomenclature              | Remarks                                                                                                                                          |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Medium Altitude Camera/<br>KA-91      | Provides capability to select remotely the scan angle of the KA-91 camera from the rear cockpit.                                                 |
| ECM Chaff Capability                  | Provides individual cartridge ejection capability during normal operation of the photoflash ejection system.                                     |
| Rivet BAT II/ALR-46                   | Provides improved radar warning system that alerts crew to radar/SAM tracking.                                                                   |
| IR System/AAD-5                       | Provides improved IR reconnaissance system and replaces the AAS-18.                                                                              |
| Laser Demod/AVD-2                     | Removes AVD-2 Laser Reconnaissance Set installed by Mod 2122 and returns aircraft to standard configuration (small number of aircraft involved). |
| Digital Navigation System/<br>ARN-101 | Provides an all-altitude bombing system, an improved visual and blind weapon delivery, and LORAN grid targeting capability.                      |
| PAVE TACK/AVQ-26                      | Provides ARN-101-equipped aircraft with the capability to acquire targets and employ terminally guided direct attack weapons.                    |
| UHF Radio/ARC-164                     | Replaces appropriate UHF portion of ASQ-88 ( )                                                                                                   |
| TACAN/ARN-118                         | Replaces appropriate TACAN portion of ASQ-88 ( ).                                                                                                |
| VOR/ILS/ARN-127                       | Provides a VHF Omni Range Navigation System and an Instrument Landing System.                                                                    |
| ECM Jamming Pod/ALQ-131               | Replacement for ALQ-119 Pod Jammer. The system will be modularized to provide mission-tailored ECM jamming capability.                           |
| UHF Radio/ARC-164                     | Replaces appropriate UHF portion of ASQ-88 ( ) (Near completion.)                                                                                |
| TACAN/ARN-118                         | Replaces appropriate TACAN portion of ASQ-88 ( ). (Near completion)                                                                              |

**Table 9-2. PLANNED AND TENTATIVE MODIFICATIONS**

| Terminology/Nomenclature                 | Remarks                                                                                                                                                                                                                                                                              |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Global Positioning System                | Space-based radio navigation system that provides worldwide, continuous, precise, three-dimensional location information.                                                                                                                                                            |
| TEREC/ALQ-125                            | Provides capability to detect, identify, locate, and record information from ground-based emitters.                                                                                                                                                                                  |
| Quick Strike Reconnaissance (QSR) System | Advanced real-time reconnaissance system integrating existing sensors and adding many new equipments within the RF-4C. Among some of the major additions are the ALQ-131 Microwave Data Link, the Digital Scan Converter Group Display and a video tape recorder and control system. |
| COMPASS TIE (ALR-69)                     | Planning funds only.                                                                                                                                                                                                                                                                 |

| Table 9-1. RF-4C AVIONICS CONFIGURATION DATA: UNF RADIO SET LEUS AN/ARC-164 (TWO COMPLETE SYSTEMS MAY BE INSTALLED)                                       |                       |          |                     |      |      |                       |                 |                               |                                            |                  |                |                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|----------|---------------------|------|------|-----------------------|-----------------|-------------------------------|--------------------------------------------|------------------|----------------|------------------|
| Name                                                                                                                                                      | Nomenclature          | Location | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power                |                                            | Heat Dissipation | Cooling Method | Mounting         |
|                                                                                                                                                           |                       |          | H                   | W    | D    |                       |                 | AC                            | DC                                         |                  |                |                  |
| Receiver-Transmitter (Remote)                                                                                                                             | RT-1145               | †        | 4.7                 | 5.0  | 8.25 | 194                   | 8.1             | 400Ma<br>5Vac<br>Panel Lights | 27.5V<br>105W<br>TX Mode<br>30W<br>RX Mode |                  | Forced Air     |                  |
| Main* Receiver                                                                                                                                            | R-1977                |          |                     |      |      |                       |                 |                               |                                            |                  |                |                  |
| Guard* Receiver                                                                                                                                           | R-1976                |          |                     |      |      |                       |                 |                               |                                            |                  |                |                  |
| Transmitter*                                                                                                                                              | T-1307                |          |                     |      |      |                       |                 |                               |                                            |                  |                |                  |
| Signal Data Converter*                                                                                                                                    | CV-3297               |          |                     |      |      |                       |                 |                               |                                            |                  |                |                  |
| Radio Control Panel                                                                                                                                       | C-9533** or C-10116   | TBD      | 4.9                 | 5.75 | 5.3  | 149                   | 4.3             |                               | 17.5V<br>10W                               |                  | Convection     | Console          |
| Frequency/Channel Indicator                                                                                                                               | ID-1961** or ID-1994A | TBD      | 2.25                | 2.4  | 5.9  | 32                    |                 |                               |                                            |                  | Convection     | Console of Panel |
| ADF Amplifier/Replay Assembly                                                                                                                             | AM-3624/ARA-50        |          |                     |      |      |                       |                 |                               |                                            |                  |                |                  |
| *Included in RT-1145 DATA.<br>**Configuration not yet decided.<br>†Participate likely installation in spaces vacated by Intersected Electronic Component. |                       |          |                     |      |      |                       |                 |                               |                                            |                  |                |                  |

\*Included in RT-1145 DATA.

\*\*Configuration not yet decided.

†Installation in spaces vacated by Integrated Electronic Control (IEC) communications equipment. See Table 8.

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| Table 9-4. RT-4C AVIONICS CONFIGURATION DATA: TACAM LRUs AM/AM-118                                      |              |          |                     |      |      |                       |                 |                     |                |                  |                 |                     |
|---------------------------------------------------------------------------------------------------------|--------------|----------|---------------------|------|------|-----------------------|-----------------|---------------------|----------------|------------------|-----------------|---------------------|
| Name                                                                                                    | Nomenclature | Location | Dimensions (Inches) |      |      | Volume (Cubic Inches) | Weight (Pounds) | Aircraft Power      |                | Heat Dissipation | Cooling Method  | Mounting            |
|                                                                                                         |              |          | H                   | W    | D    |                       |                 | AC                  | DC             |                  |                 |                     |
| Transceiver                                                                                             | RT-1159/A    | **       | 6.8                 | 7.5  | 14.6 | 745                   | 26.5            | 115V<br>400Hz<br>1ø |                |                  | Internal Blower | Transceiver Mounted |
| Digital-to-Analog Adapter                                                                               | MX-9577/A    | **       | 6.8                 | 1.7  | 13.1 | 151                   | 6.0             | 250VAC<br>60Hz      |                |                  | Convection      | Adapter Mount       |
| Transceiver Mount                                                                                       | MT-4926/A    | **       | 2.1                 | 11.7 | 20.5 | 504                   |                 |                     |                |                  | Convection      | Shock               |
| Control Unit                                                                                            | C-10062/A    | TBD      | 2.25                | 5.75 | 5.4  | 70                    | 2.0             |                     | 28VDC<br>28VAC |                  | Convection      | Console             |
| Adapter Mount                                                                                           | MT-4927/A    | **       |                     |      |      |                       |                 |                     |                |                  |                 | Shock               |
| *For Analog Indicators<br>**Installed in space vacated by Integrated Electronic Central TACAM equipment |              |          |                     |      |      |                       |                 |                     |                |                  |                 |                     |

Table 9-5. RF-4C AVIONICS CONFIGURATION DATA: AM/ARM-101 COMPONENTS

| Name                                           | Nomenclature | Location                         | Dimensions<br>(Inches.) |       |      | Volume<br>(Cubic<br>Inches) | Weight<br>(pounds) | Aircraft<br>Power |    | Heat<br>Dissipation | Cooling<br>Method | Mounting |
|------------------------------------------------|--------------|----------------------------------|-------------------------|-------|------|-----------------------------|--------------------|-------------------|----|---------------------|-------------------|----------|
|                                                |              |                                  | H                       | W     | D    |                             |                    | AC                | DC |                     |                   |          |
| Signal Data Converter, Unit 301                | CV-3467/A    | After Cockpit RH Console         | 9.34                    | 7.61  | 9.25 | 635                         | 16.9               | 118W              |    |                     |                   |          |
| Computer, Navigation, Unit 302                 | CP-1314/A    | After Cockpit RH Console         | 11.88                   | 11.02 | 7.60 | 966                         | 38.7               | 320W              |    |                     |                   |          |
| Inertial Measurement Unit Buffer Unit 304      | MQ-9697/A    | After Cockpit RH Console         | 6.58                    | 9.31  | 6.08 | 372                         | 12.0               | 83W               |    |                     |                   |          |
| Power Supply, Unit 305                         | PP-7428/A    | After Cockpit LH Console         | 7.53                    | 7.52  | 6.76 | 383                         | 17.2               | 110W              |    |                     |                   |          |
| Keyer Control, Unit 306                        | C-9474/A     | After Cockpit RH Console         | 6.50                    | 5.75  | 7.87 | 256                         | 7.9                | 77W               |    |                     |                   |          |
| Control, Navigation Computer, Unit 307         | C-9472/A     | After Cockpit LH Console         | 4.50                    | 5.75  | 3.00 | 68                          | 2.2                | 16W               |    |                     |                   |          |
| Indicator, Digital Display, Unit 308           | ID-1942/A    | After Cockpit Instrument Panel   | 5.75                    | 5.75  | 3.00 | 86                          | 2.8                | 45W               |    |                     |                   |          |
| Indicator, Auxiliary Digital Display, Unit 309 | ID-1943/A    | Forward Cockpit Instrument Panel | 6.00                    | 2.38  | 2.38 | 34                          | 1.1                | 9W                |    |                     |                   |          |
| Receiver, Loran, Unit 310                      | R-2086A      | Upper Equipment Bay Shelf        | 12.86                   | 3.76  | 7.63 | 369                         | 12.2               | 105W              |    |                     |                   |          |
| Antenna Coupler, Unit 311                      | CU-2150/A    | Upper Equipment Bay              | 7.52                    | 2.91  | 2.53 | 55                          | 1.8                | 3W                |    |                     |                   |          |
| Course Select Panel, Unit 312                  |              | Forward Cockpit Instrument Panel | 1.87                    | 6.52  | 1.85 | 22.6                        | 2.0                | 5W                |    |                     |                   |          |
| Relay Assembly* Unit 313                       | RE-1118/A    | Upper Equipment Bay Door 19      | 8.25                    | 4.72  | 4.37 | 155                         | 6.0                | 75W               |    |                     |                   |          |
| Antenna, Loran, X-Y Axis, Unit 314             | AS-4010/A    | Center Fuselage Door 48          | 19.3                    | 9.02  | 1.90 | 220                         | 10.0               | N/A               |    |                     |                   |          |
| Antenna, Loran, Z Axis, Unit 315               | AS-4011/A    | After Fuselage Vertical Tail Fin | 6.19                    | 1.75  | 9.19 | 71                          | 4.0                | N/A               |    |                     |                   |          |
| Target Insert Panel, Unit 316                  |              | After Cockpit LH Console         | 2.90                    | 5.75  | 1.12 | 18.7                        | 1.5                | 8W                |    |                     |                   |          |
| Data Transfer Module, Unit 317                 |              | Data TBD                         |                         |       |      |                             |                    |                   |    |                     |                   |          |

\*Also referred to as Relay Box Unit (RBU)



## 10. DATA SOURCES

The following sources of data were used in preparing this summary:

- Information contained in the JTIDS Aircraft Configuration Data Summary - RF-4C. Published for ASD/XRE by ARINC Research Corporation, June 1978.
- Avionics Planning Baseline Document - October, 1978.
- McDonnell Report 8738. "Environmental Design Requirements and Test Procedures, Aircraft Electronic Equipment" 5 April 1962, Revised 15 July 1964.
- Proceedings of the Society of Photo-Optical Instrumentation Engineers (held 18-21 April), Volume 101, "Airborne Reconnaissance".
- ARINC Research Informal Report - Technical Report Preliminary JTIDS Configuration Data Analyses, May 1978

### Inventory of Technical Orders

| <u>T. O. Number</u> | <u>Title</u>           | <u>Change<br/>Order</u> | <u>Date</u> |
|---------------------|------------------------|-------------------------|-------------|
| 1F-4(R) C-1         | Flight Manual          | 10                      | 9/15/78     |
| 1F-4(R) C-2-1       | General Information    | 15                      | 4/15/79     |
| 1F-4(R) C-2-4       | Flight Control Systems | 20                      | 12/15/77    |
| 1F-4(R) C-2-10      | Fuel System            | 20                      | 12/15/77    |
| 1F-4(R) C-2-11      | Instrument Systems     | 20                      | 12/15/77    |
| 1F-4(R) C-2-12      | Air Data Set           | 18                      | 12/15/77    |
| 1F-4(R) C-2-15      | Navigation Systems     | 15                      | 5/15/77     |
| 1F-4(R) C-2-16      | Auto Flight Control    | 20                      | 12/15/77    |
| 1F-4(R) C-2-18      | Armament System        | 7                       | 9/15/77     |
| 1F-4(R) C-2-22      | System Integration     | 13                      | 12/1/77     |
| 1F-4(R) C-2-25      | Forward Looking Radar  | 14                      | 9/15/77     |
| 1F-4(R) C-2-26      | Radar Mapping          | 6                       | 9/1/76      |
| 1F-4(R) C-2-29      | I.R. and Laser Sets    | 12                      | 3/15/76     |
| 1F-4(R) C-2-35      | Radar Mapping          | 5                       | 1/15/78     |
| 12R5-2ARN127-2      | Radio Receiving        | Basic                   | 1/15/77     |
| 12P3-2ALR46-42      | Signal Processor       | 4                       | 12/31/77    |
| 12P3-2AAS18-42      | Infrared Detecting Set | 19                      | 8/1/77      |
| 12P5-2APN159-2      | Altimeter Set          | 10                      | 7/1/77      |