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April 1973

WARS UHF FINAL REPORT

GTE Sylvania, Incorporated

Rome Air Development Center
Air Force Systems Command
Griffiss Air Force Base, New York

WARS UHF FINAL REPORT

R. Goodwin

GTE Sylvania, Incorporated

FOREWORD

This final report was prepared by GTE Sylvania, Incorporated, Electronic Systems Group - Western Division, P.O. Box 188, Mountain View, California, under contract F30602-69-C-0268, Project WARS, Job Order Number 681E0502, for Rome Air Development Center, Griffiss Air Force Base, New York.

The work described in this report covers Change E of the contract and was performed during the period June 1972 through February 1973. The Sylvania Project Engineer was R. Lucas, and the Technical Monitor for RADC was Mr. Samuel J. Militello (OCDS).

This technical report has been reviewed and is approved.

Approved: SAMUEL J. MILITELLO
Project Engineer

Approved: FRED I. DIAMOND, Technical Director
Communications and Navigation Division

FOR THE COMMANDER:

CARLO P. CROCETTI
Chief, Plans Office

ABSTRACT

This document is the final report summarizing the work performed under contract F30602-69-C-0268, Change E, under which one developmental model of the Wide Area Remote Surveillance (WARS) system was produced for use in employment and deployment studies and tests by RADC. Included in this report are: description of the WARS concept, equipment design and development, equipment test program, measured system performance, summary of reports and visits, and recommendations for future activity.

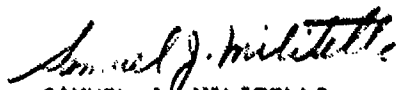
EVALUATION

This development program relates to RADC Technology Plan TPO-7, Tactical Surveillance and evolved from Advanced Development Program ADP 681E. The Wide Area Remote Surveillance (WARS) equipment was initially developed to meet a SEA requirement to negate rocket and mortar attacks against USAF bases by providing early warning of enemy activity preparing for such attacks. Versatility of the equipment is such that it is equally adaptable and presently of interest to both the Army for its Remote Battlefield Surveillance System (REMBASS) and to ESD for the tri-service Base and Installation Security Systems (BISS) program.

The delivered model is completely self-contained from the sensor(s) through the data printout and as such could serve as a scaled down REMBASS or BISS system. In addition, it could directly interface with all elements of a larger BISS system. Interfacing with present REMBASS equipment would require compatibility of message formats. Among the many equipment features is very low circuit current drain enabling long life battery operation (6 months or more).

The WARS equipment consists of 15 sensor/transmitter devices and one receiver/data processor station. This equipment can be deployed to monitor activity along three distinct paths and automatically printout intruder information regarding speed, direction, numbers, type and accuracy of data.

The equipment will be deployed at an RADC test site for additional field/operational evaluation in order to establish optimum bounds of sensor gain settings and spacing, sensor array and RF link configurations and processor parameters for a variety of scenarios. Demonstrations are planned for both the Army and various elements of the Air Force - primarily ESD BISS program office - during this evaluation phase.



SAMUEL J. MILITELLO
RADC Project Engineer

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Section 1

INTRODUCTION

The conflict in SEA presented the United States and its allies with a difficult problem: the allied bases were in close proximity to enemy ground forces and could be attacked at any time or place of enemy choosing due to the ill defined order of battle.

The enemy selected targets which provided the greatest potential payoff for the expenditure and risk incurred. The weapons employed were those which lent themselves to guerrilla tactics and were typically the mortar and rocket class. These provided sufficient standoff capability to minimize retaliatory capability since the direction of attack, and range was not immediately available for counterfire.

A study of this problem was conducted, and the results indicated that a Wide Area Remote Surveillance system would be of significant assistance in locating intruders and predicting their line of travel and launch sites. Additional studies further refined the threat model into one of base perimeter defense, and a set of system requirements was established by the Air Force for a seismic sensor system which employed an array of sensors, a UHF data link, and a processor to extract high priority seismic data for use in the Central Security Control Processor and Display (CSCPD). The concept of base perimeter defense has application world wide rather than in the special SEA applications, and the WARS system has been designed for interface with other field sensors as auxiliary inputs.

The basic contract was originally for two VHF systems with a Preprocessor. This was later modified to delivery of one UHF system complete with Preprocessor and Digital Converter/Printer Output equipment. The development equipment was completed and delivered on 9 February for Air Force employment and deployment studies and tests at RADC.

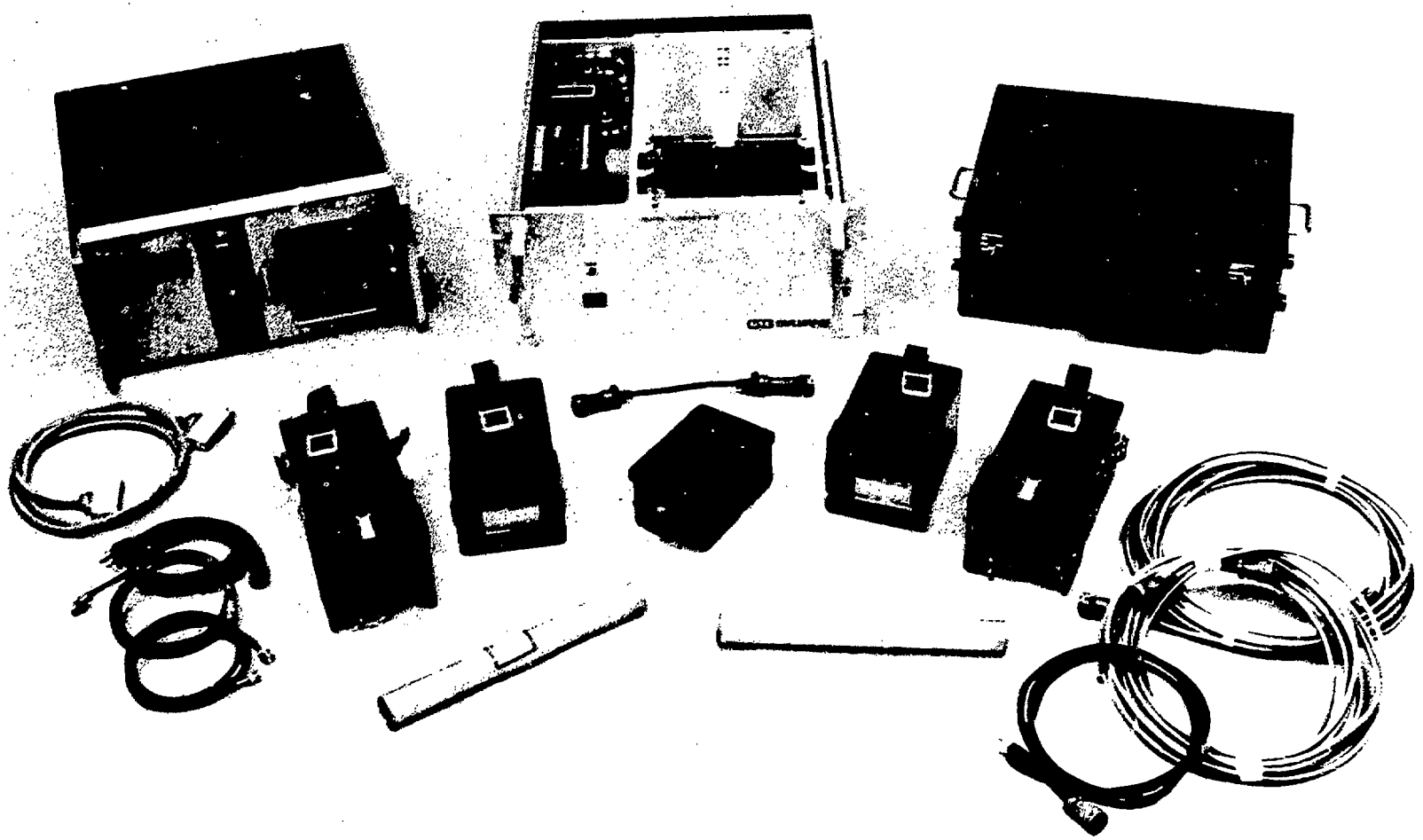


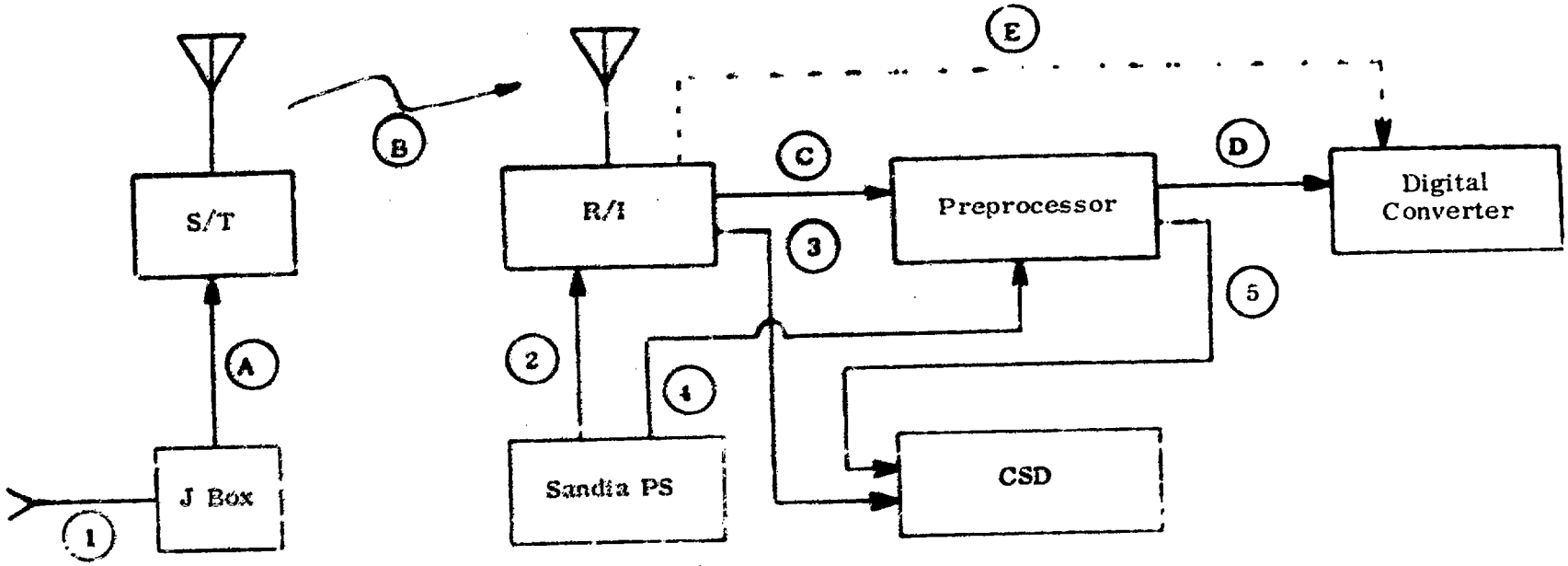
Figure 1-1. WARS Components

Section 2

WARS CONCEPT

The concept which governed the development of the WARS system was the generation of a highly flexible sensor system which could collect seismic data from an enemy intrusion into a monitored area, and relay that intrusion data via RF link to a central processing and display center where appropriate tactical decisions could be made. The system was conceived as a means of remotely monitoring trails, fence lines, roads, assembly areas or any other tactically significant application. The sensors employed in the WARS system are seismic geophones which respond to Rayleigh wave motion in the propagation medium, converting the medium displacement into a voltage which can be analyzed for the specific spectral characteristics of the threat. The WARS system is designed for maximum detection probability for personnel intrusion, but will also detect vehicles with a lesser probability. The system is configured as shown in Figure 2-1. Each geophone is housed within an individual Sensor/Transmitter (S/T) unit. These units are deployed in arrays or strings with from five to eight units comprising each array. All arrays in one area report by RF link to the Receiver/Interface (R/I) unit on a time shared basis. The data received by the R/I unit is forwarded to either the WARS Processor, or is sent directly to the Central Processing Center by land line. If the data is routed to the WARS processor, it is analyzed for array alarm rate and pattern. When preset criteria on array alarm rate have been reached, the Processor begins to compute the direction of travel, velocity and length of column for readout at a one/minute rate for high priority tactical use. A Digital Converter and Printer Unit are provided for real-time presentation of this data.

Each area occupied by a WARS system is assigned a specific number which is coded into the S/T units assigned that area, and the R/I unit to which they report. Therefore, transmissions from adjacent areas will not be decoded by the R/I and data will not be intermixed. There are 16 possible area codes



Numbered Interfaces are To/From Non-Sylvania Equipments

Lettered Interfaces are To/From Sylvania-Only Equipments

Figure 2-1. WAPS System Interfaces

available, eight possible array codes, and eight possible sensor identification numbers. In addition, it is possible for each area to operate on a different frequency with channel spacings of 25 kHz available over the full 407 MHz to 470 MHz band. The processor is designed to operate with only one area being processed at a time, and can therefore handle eight sensors per array and eight arrays per area for a total of 64 primary sensors. Once in operation and processing the data from the first array qualifying, the processor locks out the other arrays and passes their data through without further analysis.

The data format employed in the WARS system makes the concept directly adaptable to the Sensor Communications and Display System SCDS (TAC) system format and the drivers are incorporated which will feed the WARS digital outputs directly to the inputs of these systems over land line, or to modulators for additional RF transmission.

The deployment of the system will depend on the tactical situation and type of information desired. The sensors are designed with two gain settings which will detect a single man at ranges of up to 10 or 30 meters in normal soil. The distance between sensors is optional, but should be at multiples or submultiples of 25 meters if the Processor is to be employed.

Two RF power output settings are available, 2 watts minimum, and 200 milliwatts minimum. The selection of power output will depend on propagation loss over the link selected, power conservation considerations, and detectability.

The units are designed to be of low observability. Their profiles are minimal with an almost invisible monopole antenna. In addition, the units can be completely buried with the antenna ground planes resting on the earth if deployment in a sparsely vegetated area is necessary.

Figures 2-2 and 2-3 show two possible array configurations. Figure 2-2 is a trail array where the intruders will pass on a line parallel to the sensor string. This is the optimum array for use with the Processor since the processed

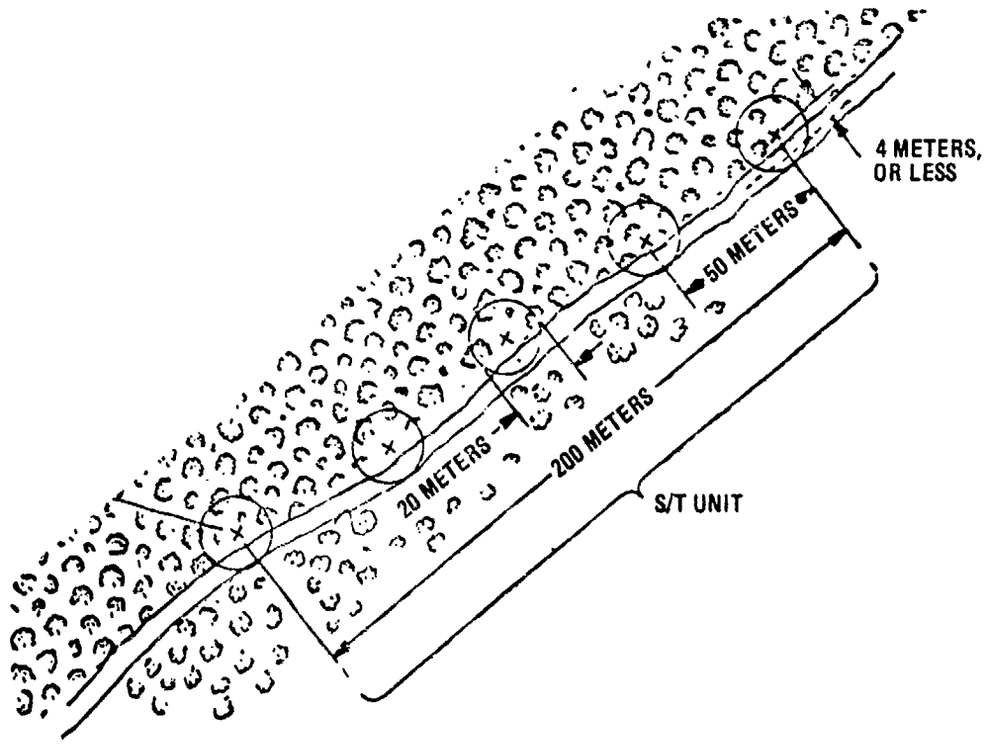


Figure 2-2. Trail Array

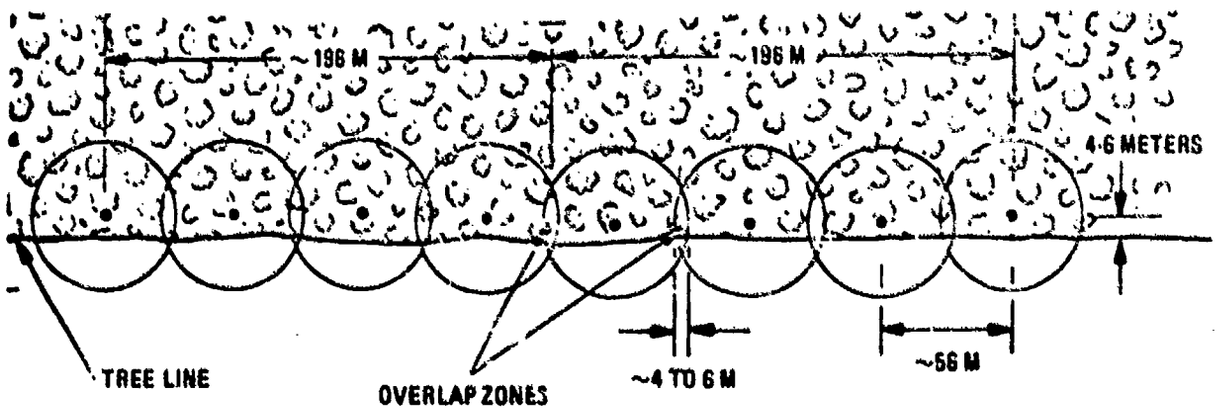


Figure 2-3. Fence Array

data will indicate direction of travel, velocity of column head, location of the column head within the array, and general makeup of the column. Figure 2-3 indicates a fence array configuration where penetration of a perimeter is of interest. Note that the sensors of this configuration have overlapping coverage to avoid uncovered passages through the perimeter. This type of coverage is not necessary in the trail array since the path of the intruder is predictable and his progress along the array is of importance.

The WARS system has been developed to give the Air Force a gap-filling capability with enough flexibility to allow its incorporation into future base defense and area defense systems. Even the RF data links are designed for field replaceability to VHF if desired.

Section 3

SYSTEM DESCRIPTION

3.1 GENERAL

The WARS system as delivered under the present contract consists of 15 S/T units, one R/I unit, one Processor, one Digital Converter and one Printer unit. The S/T and R/I units consist of an Antenna, Battery Pack and the S/T or R/I assemblies. In addition, two "J-boxes" were delivered which provide the input interface for auxiliary sensors to the S/T unit. Each type of component which comprises the WARS system is shown in Figure 3-1. The S/T unit with the "J-box" connected is shown in the lower right. Note that the antenna has weights on the end of the ground plane wires to assist in keeping the ground plane close to earth for minimum VSWR. The Battery Pack has been attached to the rear of the S/T housing by means of two latches, one of which is shown.

The R/I unit is shown at the lower left of the picture with 25 feet of cable used to feed the decoded digital data to the WARS Processor. The output of the Processor feeds the Digital Converter unit which is mounted directly below the Printer.

All units except the Digital Converter and Printer have been designed for field use and are made watertight through the use of "O-ring" gasketing. These gaskets are located at each housing interface and are held in compression by the latches. In order to reduce the effects of high energy electromagnetic fields, the gasketing around the Battery Pack front panel and the S/T and R/I front panels is of the RFI sealing type, and the cable connecting the "J-box" to the S/T unit has been RFI shielded. The interconnecting cables between the R/I and Processor and between the Processor and Digital Converter are also RFI shielded through the use of individually twisted shielded pairs of wires within the cables.

All field units are equipped with handles for ease of transport and are painted with two layers of epoxy paint for extended protection.

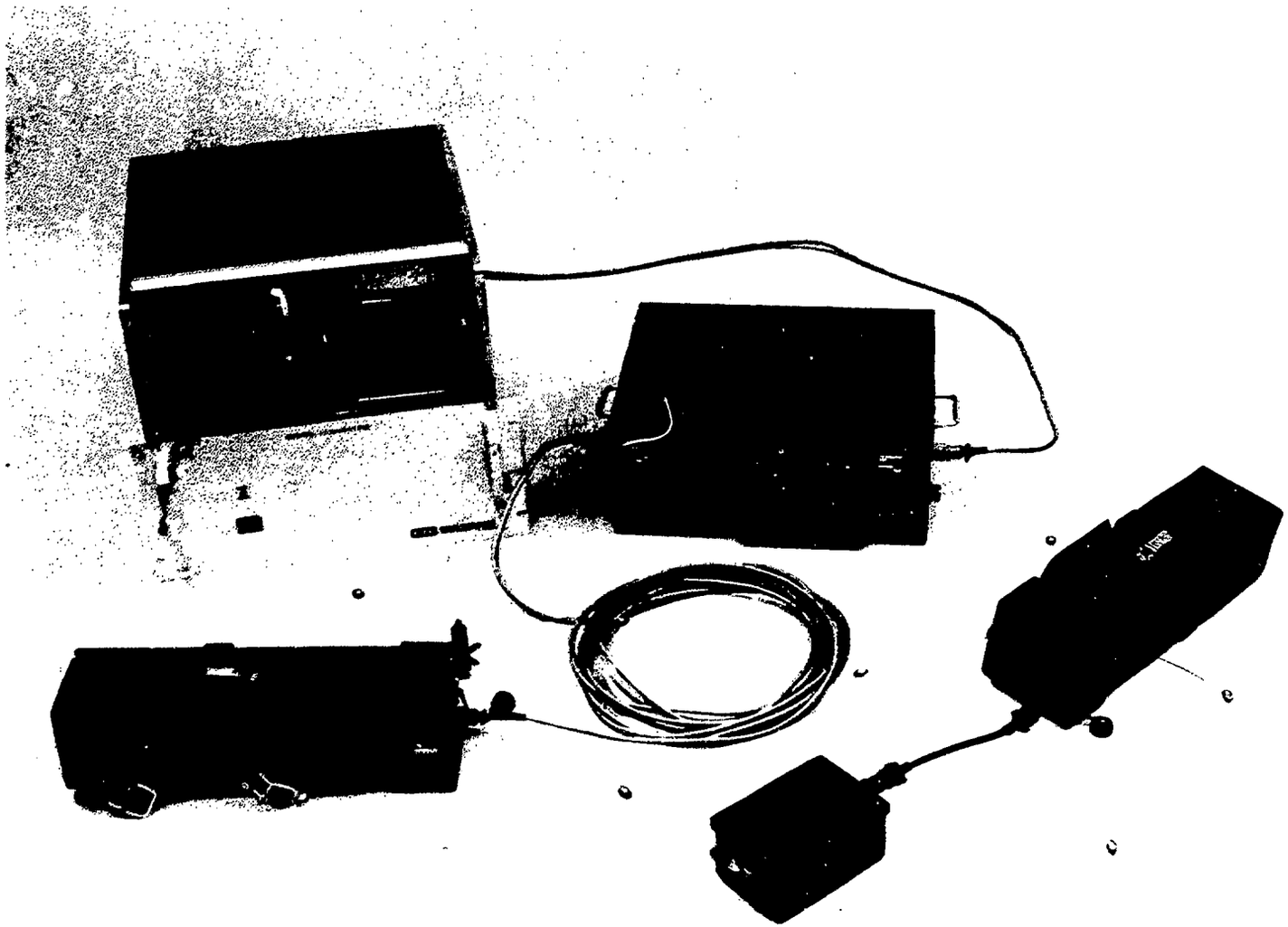


Figure 3-1. WARS System

3.2 SYSTEM SPECIFICATIONS

The complete listing of system specifications can be found in the Prime Item Development Specification and Interface Specification documents listed in Section 6 of this report. A listing of the most significant parameters of the delivered system are as follows:

Sensor/Transmitter Unit

Frequency	407.375 MHz ± 5 PPM
Power Output	2 W minimum into 50 ohm load
Modulation	Digital FSK
Deviation	± 5.5 kHz PEAK
Bit Rate	1200 bits/second
Spurious Output	50 dB reference unmodulated carrier
Message Format	Figure 3-2
Temperature Range	-20°C to + 71°C
Low Power	10 ± 3 dB less than high power
Low Gain	Approximately 10 meters
High Gain	Approximately 30 meters
Auxiliary Input Capability	Four (classification types - Vehicles or Personnel)
Battery Type	"D" alkaline (MN 1300) cells 18 cells/pack
External Power	25 ± 3 VDC
Turn on	Less than 1 millisecond
Antenna	Quarter Wave Monopole (Collapsible) 50 ohms with S/T case properly implanted Vertically polarized 406-426 MHz range

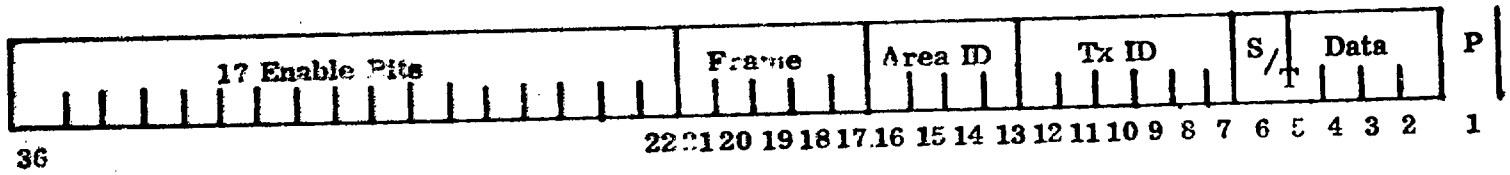


Figure 3-2. Message Format

3.2 (Continued)

Self-Test	Once per three hours if no valid alarms have been sent
Self-Disable	16 to 17.5 volts 3/4 amp, Picofuse (located in battery pack)
Volume w/Battery	5-1/4" x 5-1/4" x 15-3/4"
Weight w/Battery and Antenna	20 pounds

Receiver/Interface Unit

Frequency	407.375 MHz
Sensitivity	-105 dBm
Error Rate	$\leq 2 \times 10^{-3}$
IF Bandwidth	27 kHz at 3 dB points
Dynamic Range	60 dB spurious free from -105 dBm, and proper operation at -30 dBm input
Squelch	Squelch circuitry controls power turn-on for decode and encode functions
Address Comparison	Encode and relay shall occur only when area code, Barker code and parity are correct
Data Output Format	16 bits identical to S/T bits 1 through 16
Output Signals	Message Gate Data Clock Chassis Ground
Compatibility	Output compatible with CSC/PD drive Output compatible with SCDS drive Output compatible with Processor drive
Battery Pack	Same as for S/T

3.2 (Continued)

Antenna	Same as for S/T
Temperature Range	Same as for S/T
External Power	Same as for S/T

Processor

Data Handling	Up to 64 S/T inputs
Array Processing Capability	One array at a time
Data Readout	Processed data at a one per minute rate Unprocessed data passed through with minimum delay
Qualification for Processing	3 alarms from one array within 30 seconds
Return to Unprocessed Mode	2 minutes after array activity ceases
Data Output	Figures 3-3 and 3-4
Compatibility	CSC/PD SCDS (TAC) HP5050 Printer (modified)
Temperature	0°C to 50°C
External Power	Same as for S/T

Digital Converter/Printer

Data Readout	150 ms minimum
Priority Assessment	Processed message word (Highest) Unprocessed message (Second) Self-test message (Lowest)
Printer Unit	HP5050B with M14 and option 55 clock
Data Printout Format	Figure 3-5
Power Input	115 V AC, 60 Hz

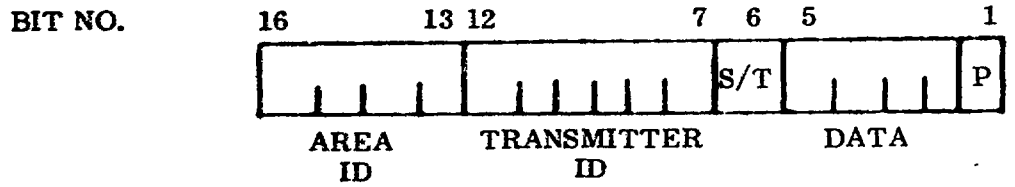
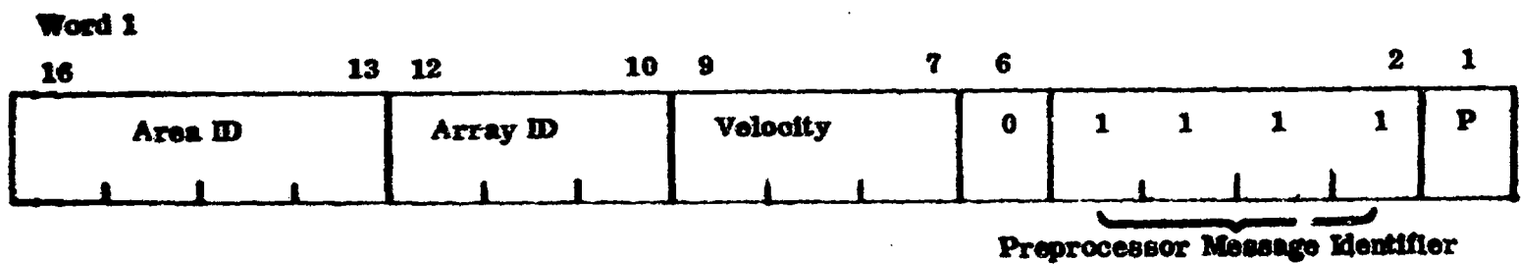


Figure 3-3. Unprocessed Message Format



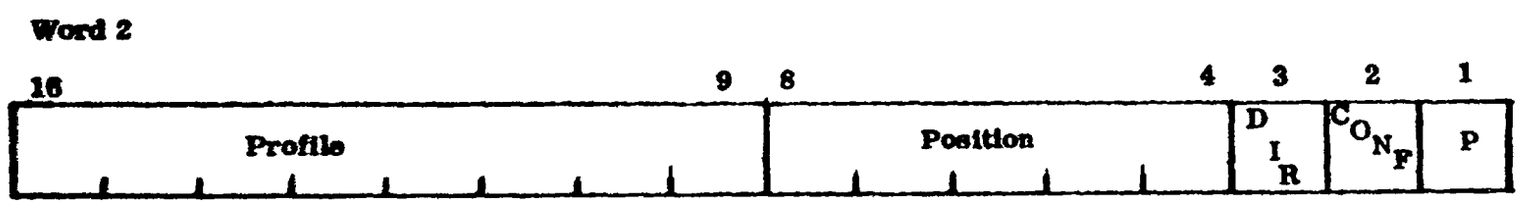


Figure 3-4. Processed Message Format

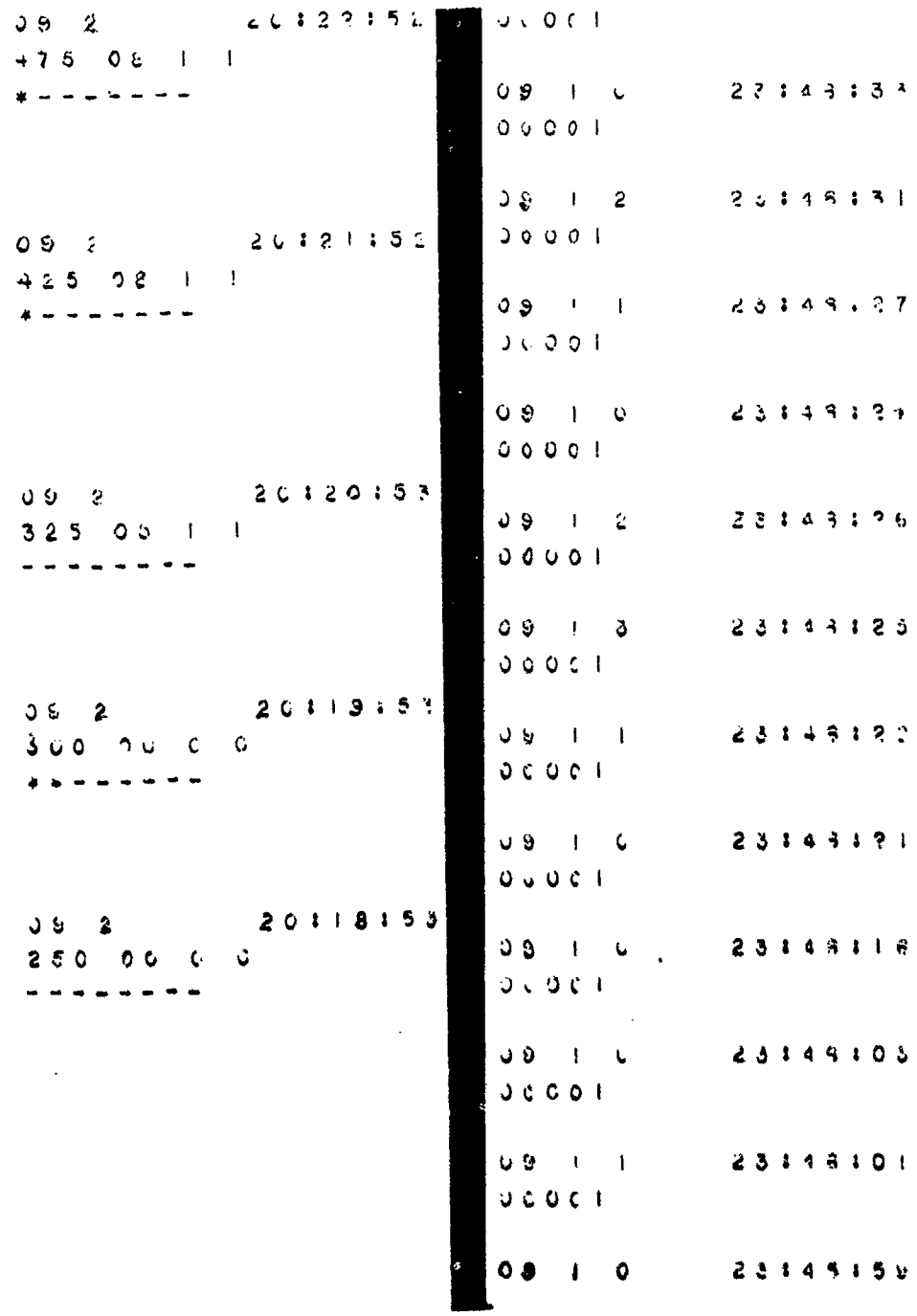


Figure 3-5. Data Printout Format

3.3 SENSOR/TRANSMITTER UNIT

The Sensor/Transmitter unit (S/T) is shown in Figure 3-6 in a partially disassembled state. The major components of this unit are the front panel, the housing, the amplifier, processor, alarm pulse generator and encoder boards, and the transmitter assembly. The antenna and battery pack will be discussed separately.

A fully disassembled view of the unit is shown in Figure 3-7. This unit is the data collection and relay component of the WARS system and is designed to operate in either a buried or surface deployment condition.

The front panel contains the geophone, the motherboard, the code plug, the antenna connector and the "J-box" input connector. This panel is used to interconnect all electrical functions within the S/T unit and is equipped with "O-ring" seals around the code plug access hatch and the housing interface.

The code plug seen in Figure 3-6 contains rocker switches which are field settable and allow assignment of area code, array code, S/T unit number, detection range, transmitter power output level, and processor spectral weighting. The code plug is a reusable device and can be reset for any change in application by changing switch positions as desired.

The geophone is an HSJ-1 which has been wrapped in two layers of μ-metal tape to minimize induction effects during S/T transmission. This geophone output drives the amplifier board shown second from the left in Figure 3-7. The amplifier filters and gain sets the seismically derived signal and passes it on to the processor board (far left in Figure 3-7) where the signal is analyzed for amplitude variance and is thresholded for alarm generation. An additional gain control switch is mounted on the amplifier board to give a total of four possible gain settings. The processor output is fed to the alarm pulse generator board where alarm signal is applied to a matrix with the four other auxiliary inputs from the "J-box." The APG circuitry then commutates the five alarm signals out to the encoder board along with the 1200 bit/sec clock. The APG board also picks up the battery pack power by means of the two pin connector

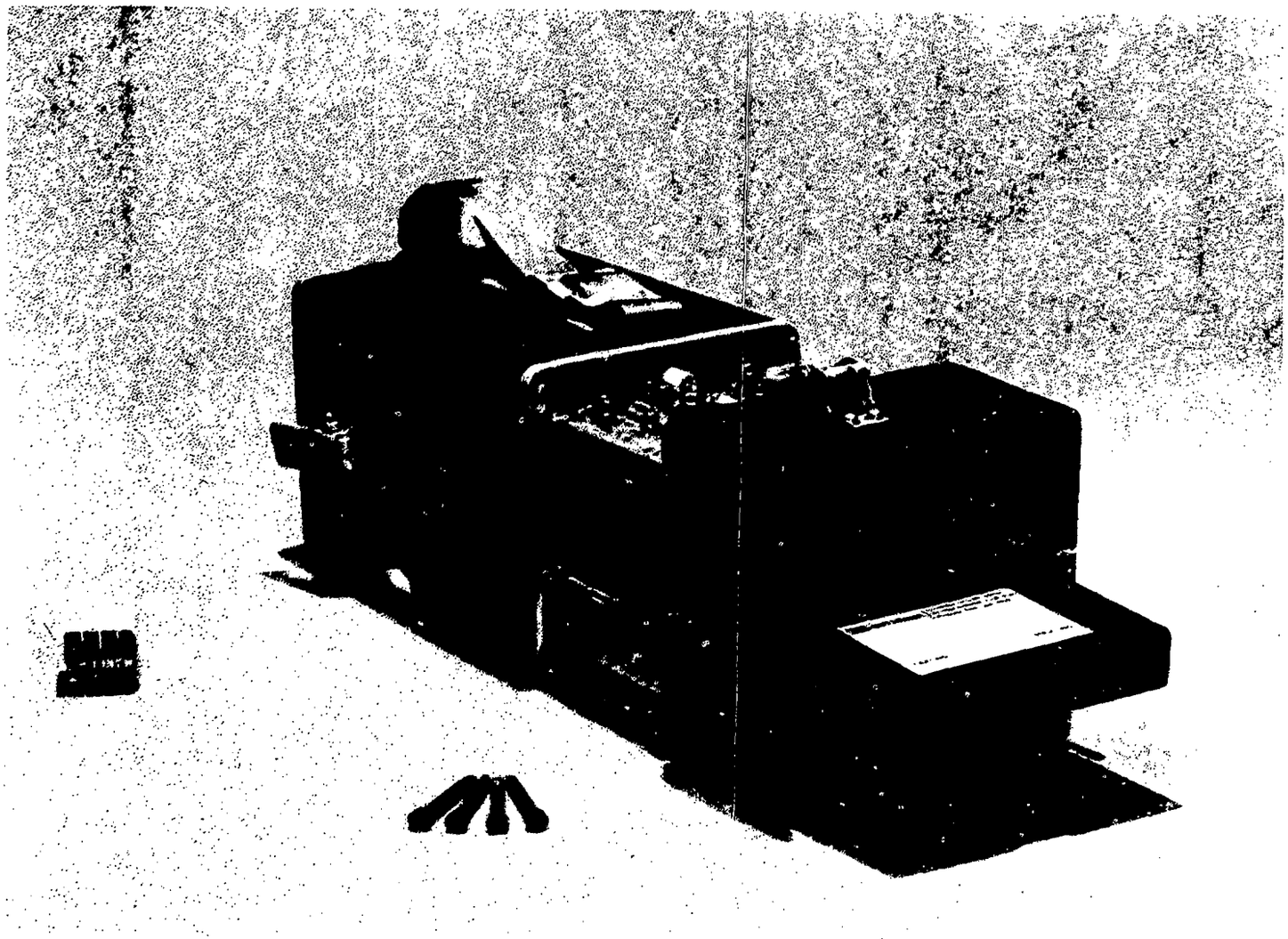


Figure 3-6. S/T Unit Configuration

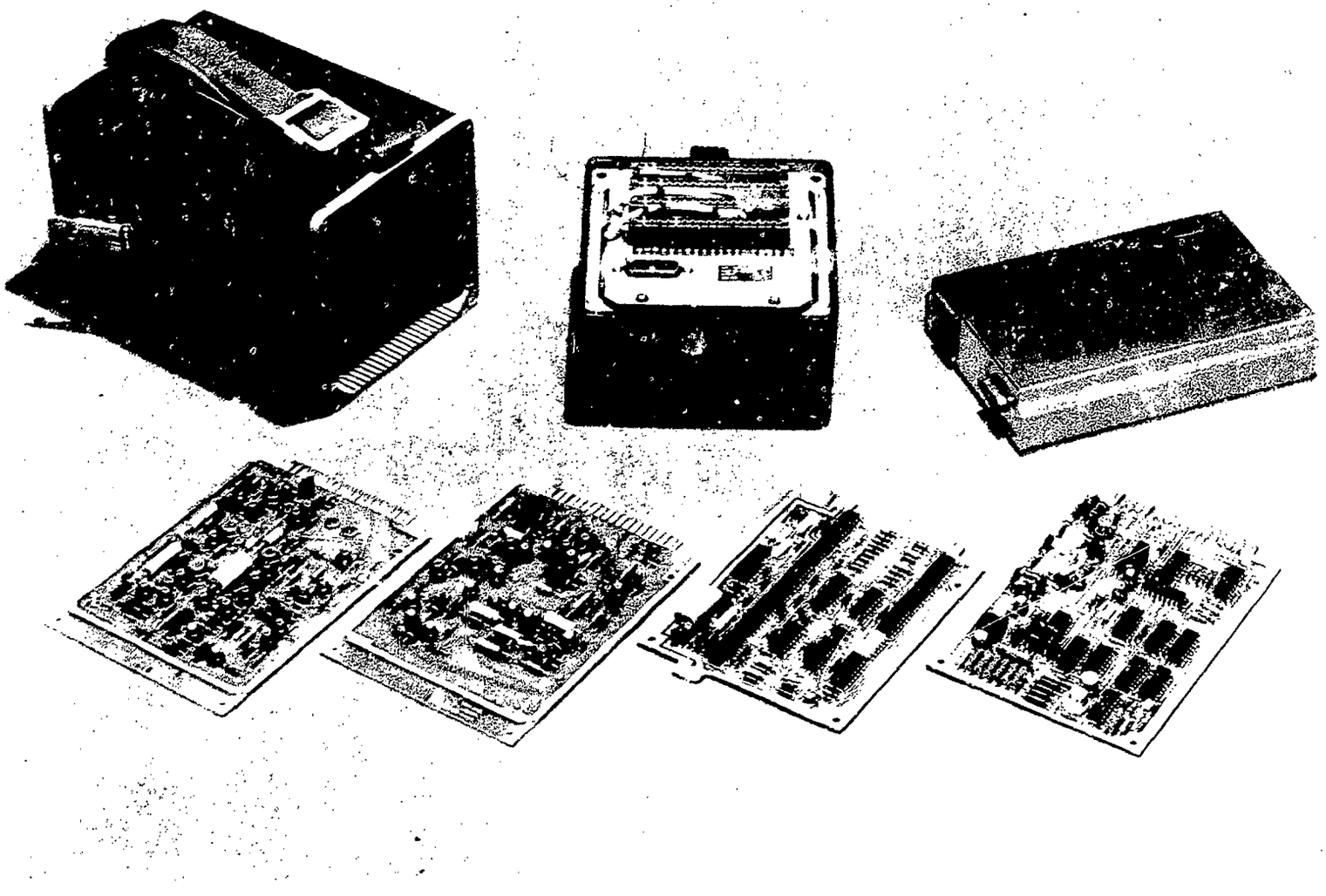


Figure 3-7. S/T Components

3.3 (Continued)

on the top of the board, and routes this power to the motherboard for distribution. In addition, the self test message is generated on this board.

The S/T encoder board (on the far right of Figure 3-7) is used to assemble and sequence the message to the transmitter. This message consists of the data bits as shown in **Figure 3-2.** The encoder board also contains the power disable circuitry which blows the main power fuze when the voltage drops below a preset level between 16 and 18 volts. The transmitter assembly contains two printed circuit boards. One board has the modulation circuitry, crystal oscillator and frequency multiplier circuits. The second board contains the power amplifier chain. The transmitter is designed with Class C power stages to minimize battery drain, and is also designed for frequency change by crystal replacement.

Each transmitter assembly is capable of covering one of three frequency bands: 406-426 MHz, 426-447 MHz or 447-470 MHz. Frequency change within any one band is accomplished by crystal change and realignment of the tuned circuits. Frequency change between major bands is accomplished by assembly change **(See Figure 3-7, top right shielded assembly.**

The RF output of the transmitter is fed to the output connector on the front panel by means of the coaxial fitting on the motherboard connector interface.

All boards used in the S/T units are interchangeable with like boards on other units.

3.4 RECEIVER/INTERFACE UNIT

The Receiver/Interface unit (R/I) is shown in Figure 3-8. It is nearly identical with the S/T unit from external view except that the housing is one inch longer, and a second MS connector is mounted on the front panel. The front panel MS connectors provide outputs to the WARS Processor/Digital Converter units, or to the **SCDS receiver input.** The RF connector is the antenna input connector. The code plug only has four switches on it for assignment of the area code. No additional data bits are selectable externally, however, the frame marker code may be selected by jumpers on the power control board.

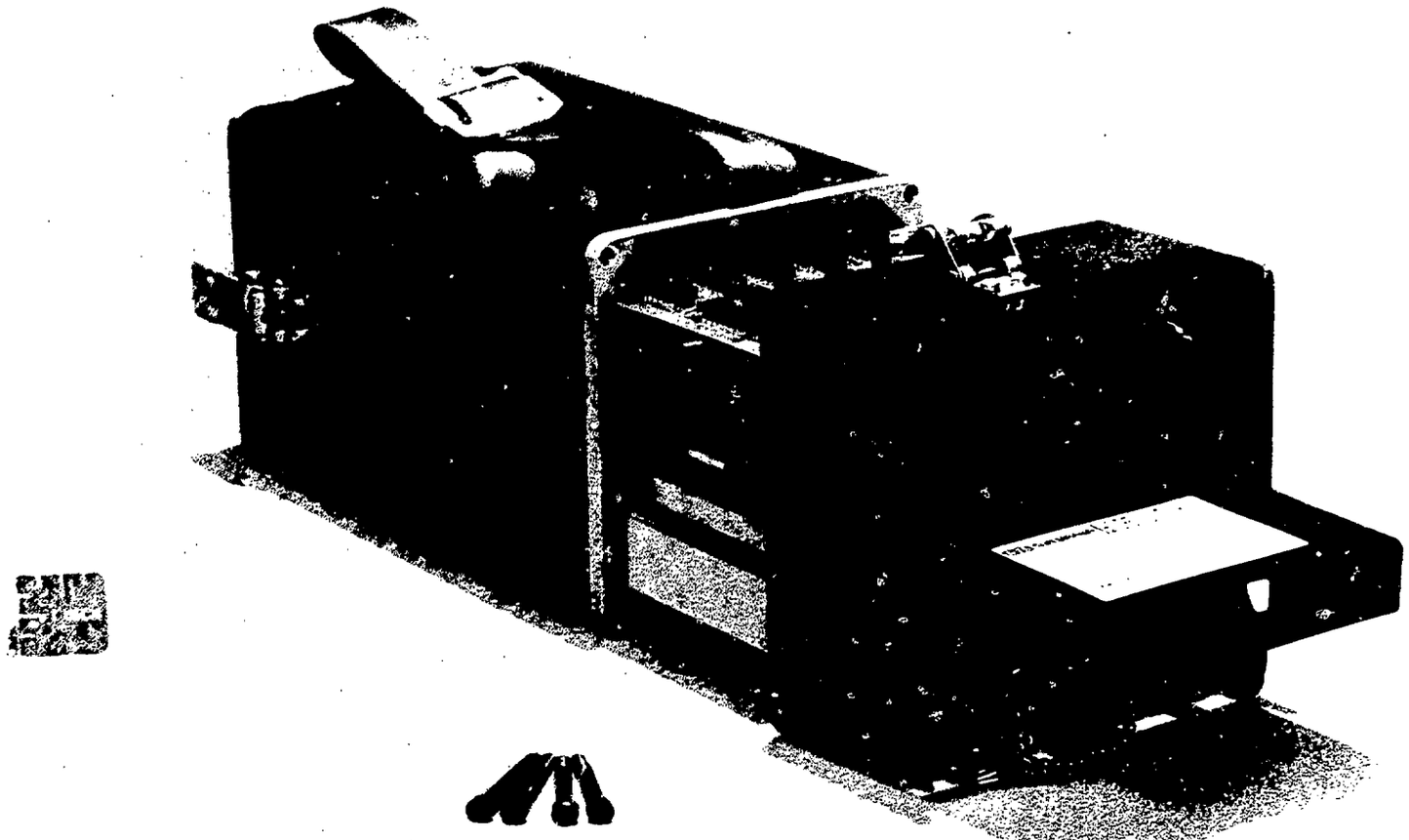


Figure 3-8. R/I Unit Configuration

3.4 (Continued)

The individual components of the R/I unit are shown in Figure 3-9. The receiver assembly is tuned to operate with the S/T arrays in the field, by selection of crystal and tuning components on the boards. The signals received from the S/T units generate a squelch signal which is used to activate address comparison and encode circuitry.

The IF output signal from the receiver assembly is sent to the decoder boards where the biphase data is converted to NRZ data, the clock reference is established, and the Barker and parity codes are checked. If the Barker code received matches the code preset into the R/I and the parity checks correctly, the power control board switches power to the encoder board where the demodulated code is checked against the R/I code plug setting. If this correlates, then the decoded message is encoded and forwarded to the desired processing and display subsystems by means of line driver circuitry on the encoder board. If the data is to be sent to the SCDS system, , then external power is required for the R/I unit to provide sufficient power for the high level TTL line drivers. If the data is to be sent to the WARS processor or digital converter, then the low level line driver output connector is employed and internal power is sufficient.

There is also a power disable function in the R/I similar to that in the S/T. The circuitry for this function is contained on the power control board.

The R/I output signals consist of the Message Gate, Data, Clock, Status and Chassis Ground signals required for proper operation of the SCDS or WARS Processor/Digital Converter units.

3.5 BATTERY PACK

The battery assembly is shown in Figure 3-10. This unit is housed in the same type of extrusion as the S/T and R/I units, but is fitted with a plastic insert to insulate the battery cases from the extrusion wall. The battery is composed of 18 alkaline "D" cells rated at 9 ampere hours apiece. This results in a pack with a 28 volt initial battery charge running to an 18 volt end life in four to six months of normal service. The individual "D" cells are connected in series as

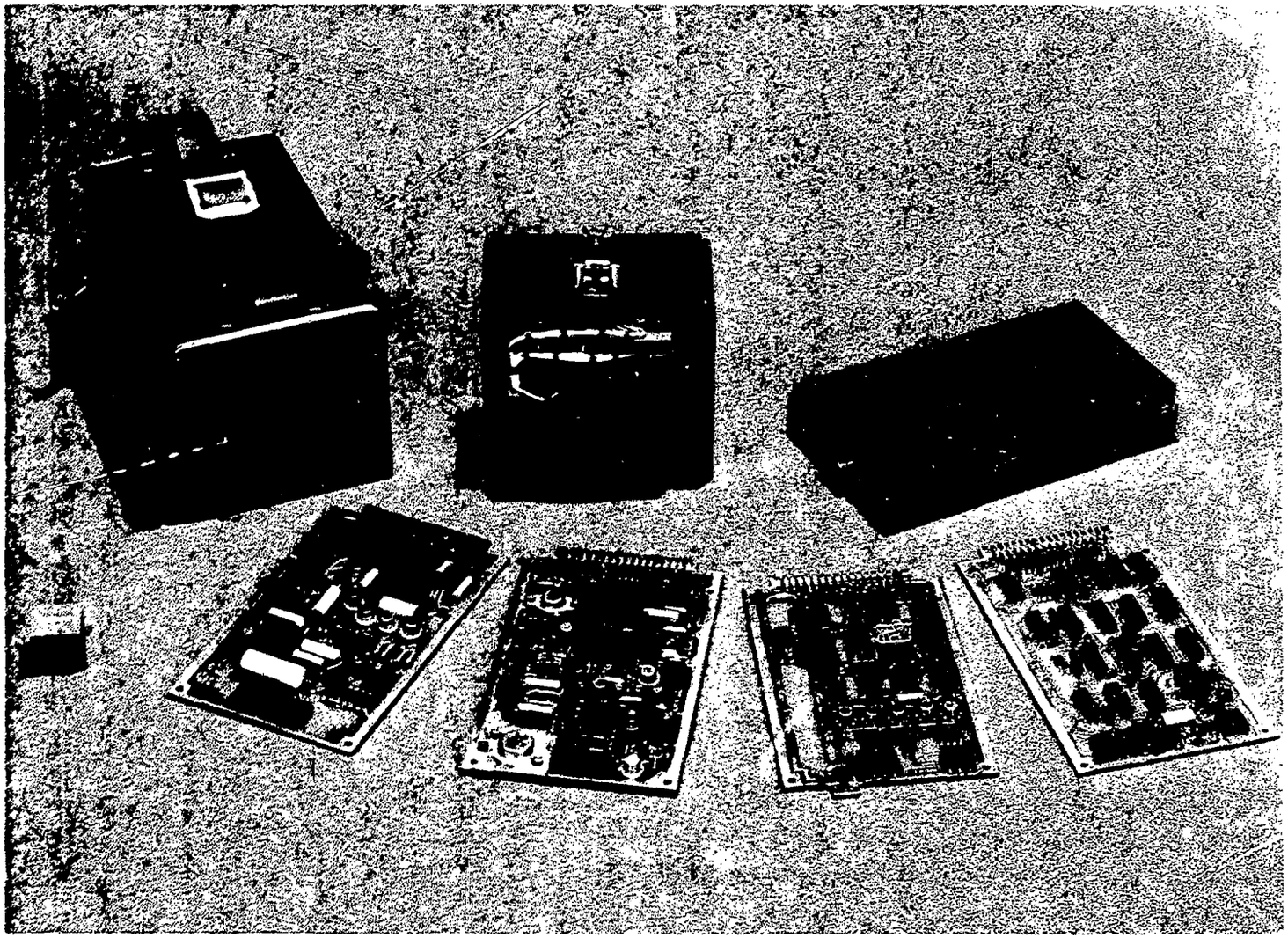


Figure 3-9. R/I Unit Components

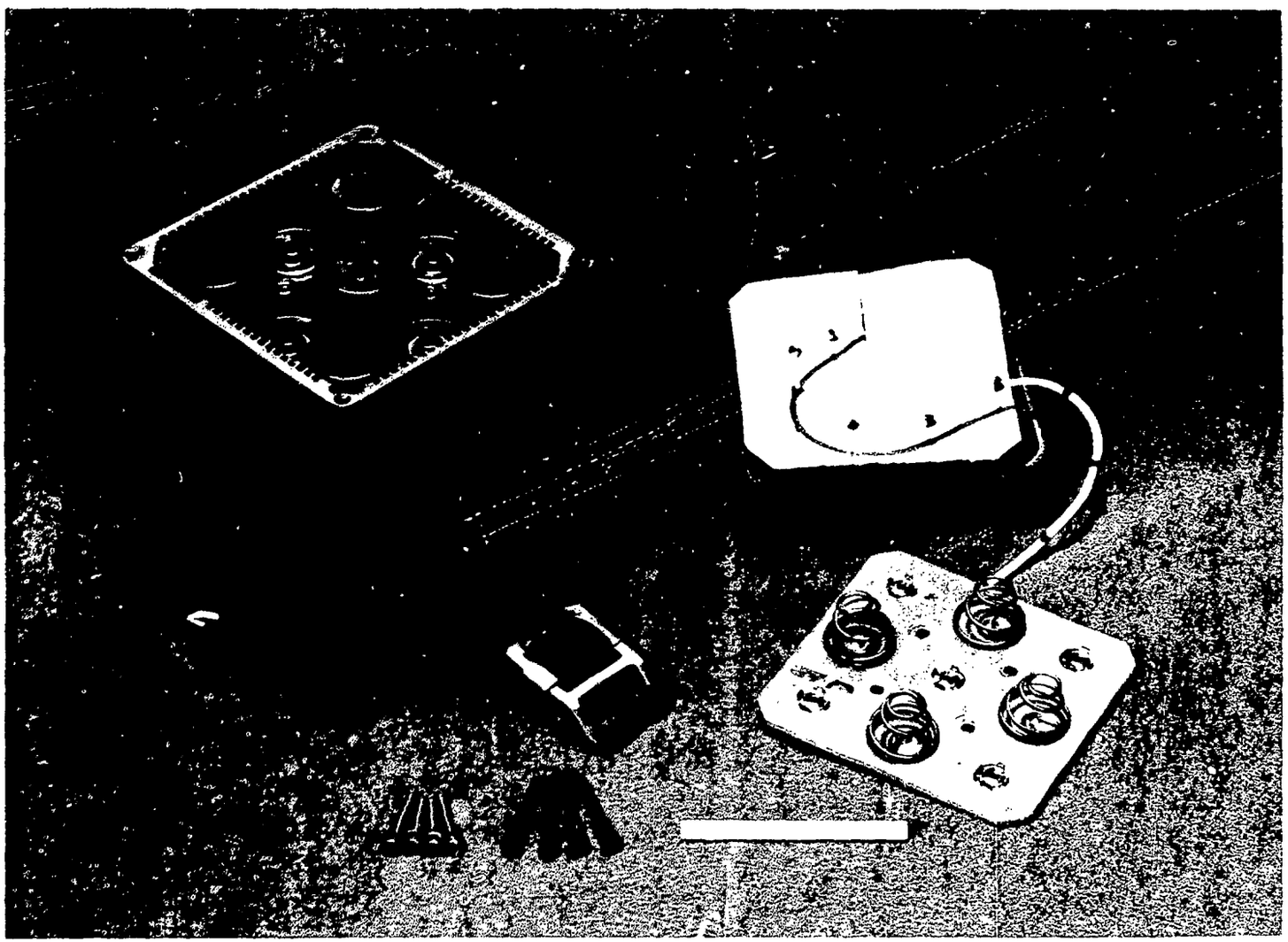


Figure 3-10. Battery Assembly

3.5 (Continued)

shown in the figure. The series connection between cell stacks is accomplished through the interconnect boards with the springs mounted on them. There is one board at the top of the pack, and another on the bottom. Plastic covered dowels are used to separate and hold the battery stacks firmly in place, and one dowel is used to carry the battery +12 volt tap from the bottom board to the top board.

The battery connections are made through berilium copper pressure interfaces. The positive terminals of the batteries are designed to fit into the copper springs which place a 90 pound pressure load on the upper board when the pack is assembled. Measurements indicate that the interconnect resistance of the batteries is comparable to the internal resistance of the units so that the maximum voltage drop under a 600 ma load is only 2 volts.

The +28 volt output of the pack is fused with a 3/4 amp Picofuse mounted on the upper battery board and accessible by removal of the case lid. This is the fuse which is blown by the disable circuitry when the battery pack voltage falls to a level between 16 and 18 volts.

The case lid is sealed by means of an RFI "O-ring" gasket when the four Allen Head Cap Screws are tightened.

Power is fed to the interfacing unit, either the R/I, S/T or Processor, through a connector mounted on the case lid. This connector is also "O-ring" sealed.

3.6 ANTENNA

The WARS antenna is a collapsible monopole shown in Figure 3-11. This unit is choke fed at the base exhibiting a nominal input impedance of 50 ohms. The pattern is omnidirectional in azimuth with an elevation pattern shown in Figure 3-12. The polarization is vertical and the VSWR remains below 3:1 over the full 406-470 MHz frequency range as long as the ground plane remains within a few inches of the earth. For this reason, lead weights have been added to the tips of the ground plane wires to keep the plane on or near the earth.

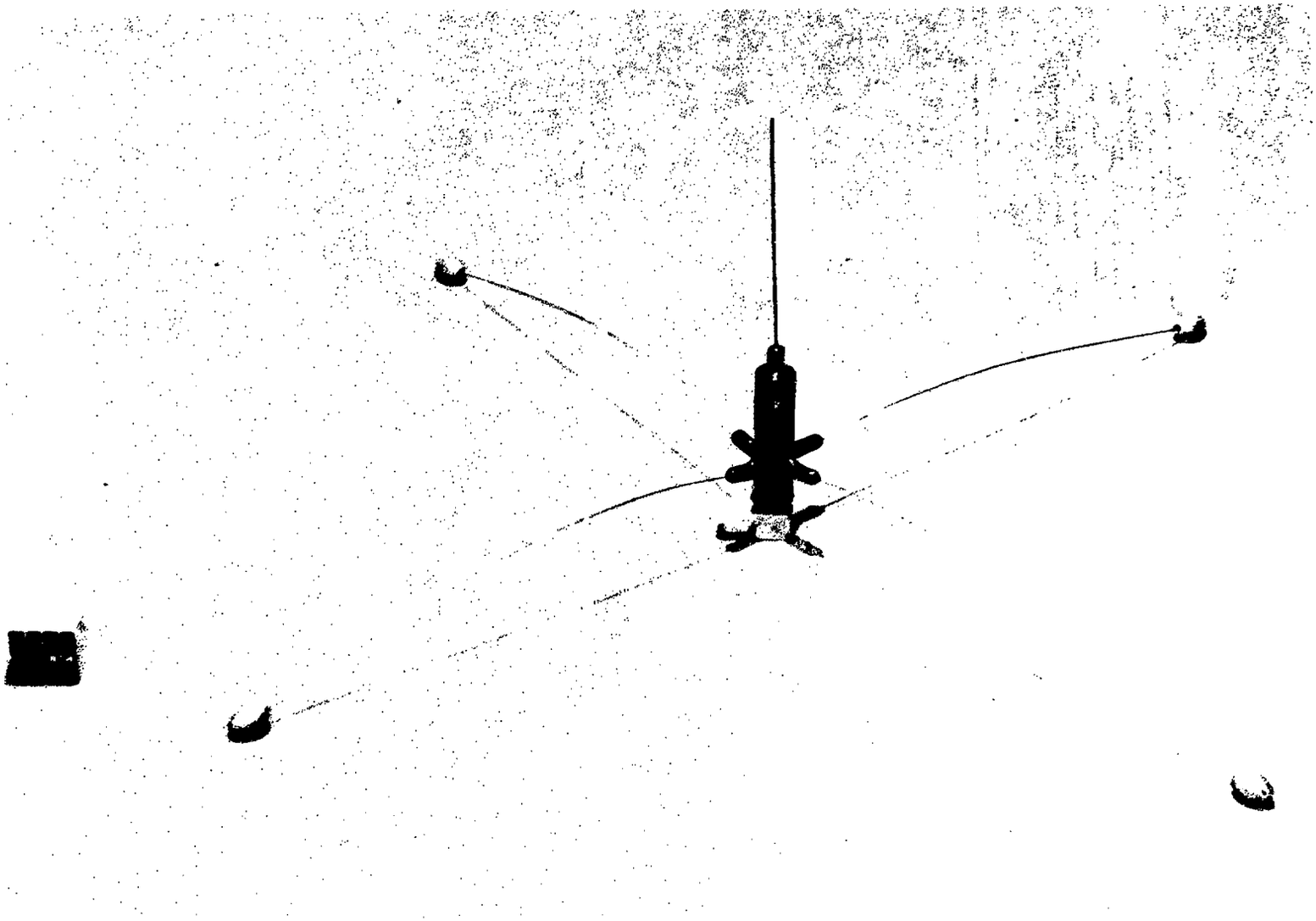


Figure 3-11. WARS Antenna

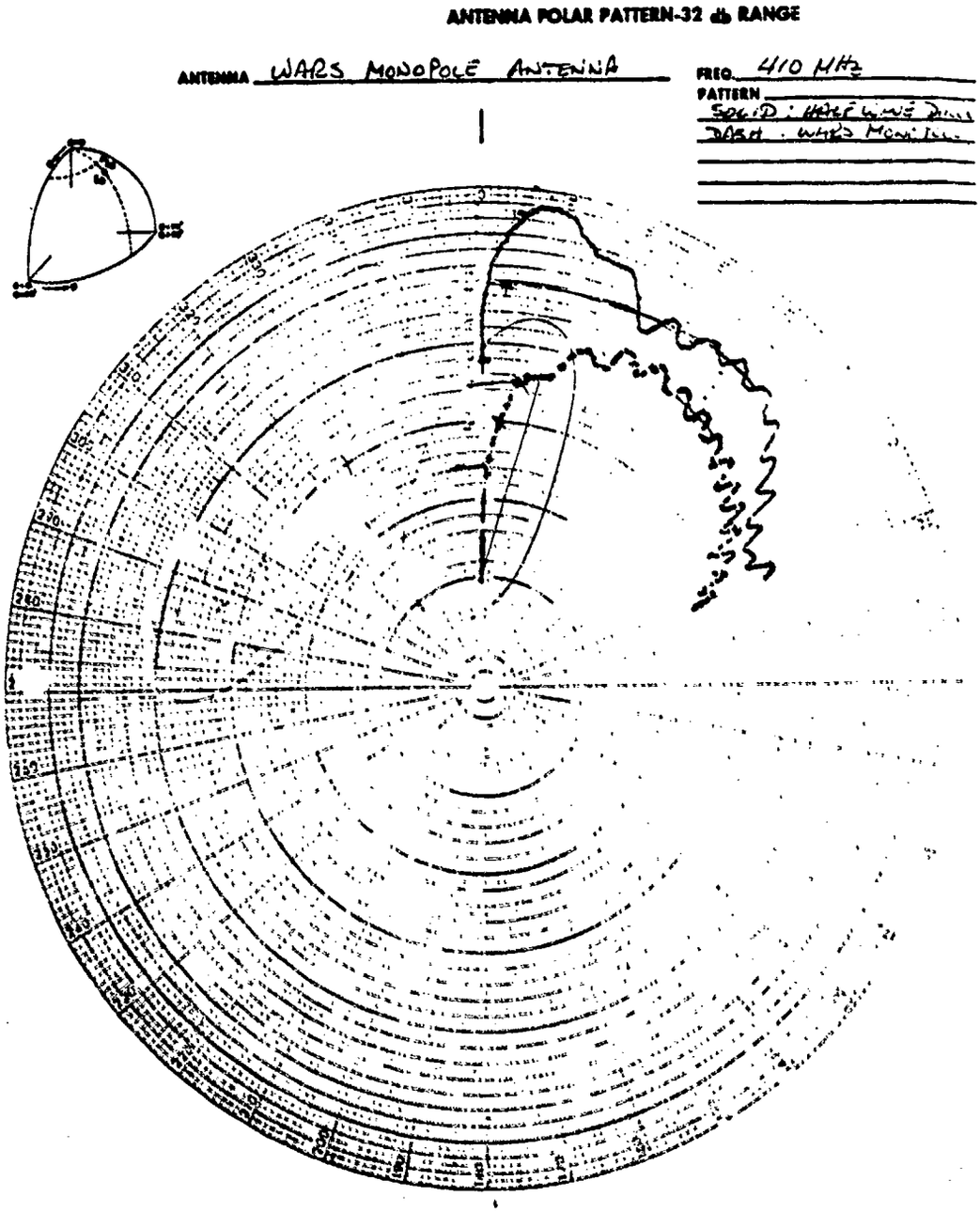


Figure 3-12. WARS Antenna Pattern

3.6 (Continued)

The antenna is designed to be buried up to the feed point where the ground plane separates from the silicone rubber feed assembly.

The antenna is used on both the S/T and R/I units, and can be folded to fit into a carrying tube 1-1/2" in diameter and 12 inches long.

3.7 PROCESSOR

The WARS Processor is the development model of the Sylvania WILTRAK processing unit. It is housed within a field case as shown in Figure 3-13 with its own battery pack power supply. The circuitry is carried on six double wirewrap boards designated as: I/O (Input/Output), Control Logic, ALU (Arithmetic Logic Unit), RAM (Random Access Memory), ROM (Read Only Memory) and Timing and Power Control.

The WILTRAK processor is designed to operate within the overall WARS configuration. The intruder detection information originating at the Sensor/Transmitter units is transmitted to a Receiver/Interface unit. Each Receiver/Interface unit is the collection point of alarm transmission from up to 64 Sensor/Transmitter units - identified as a WARS area. As such, each WARS area may contain up to eight arrays each of which may contain as many as eight Sensor/Transmitter units.

The Receiver/Interface unit interfaces with the processor via three twisted pair with shield. All R/I unit output messages are relayed to the processor which selects primary messages for activity processing, and relays and outputs all other types. Whenever the processor is in the processing mode, all primary alarms not originating in the array being processed are also relayed.

The processor output is identical to that of the Receiver/Interface unit - three twisted pair with shield. The output messages can be either relayed R/I messages or processed data messages originating in the processor. The processor output also may be transmitted to a central data collection point, a higher level processor or computer or direct readout via the Digital Converter and Printer.

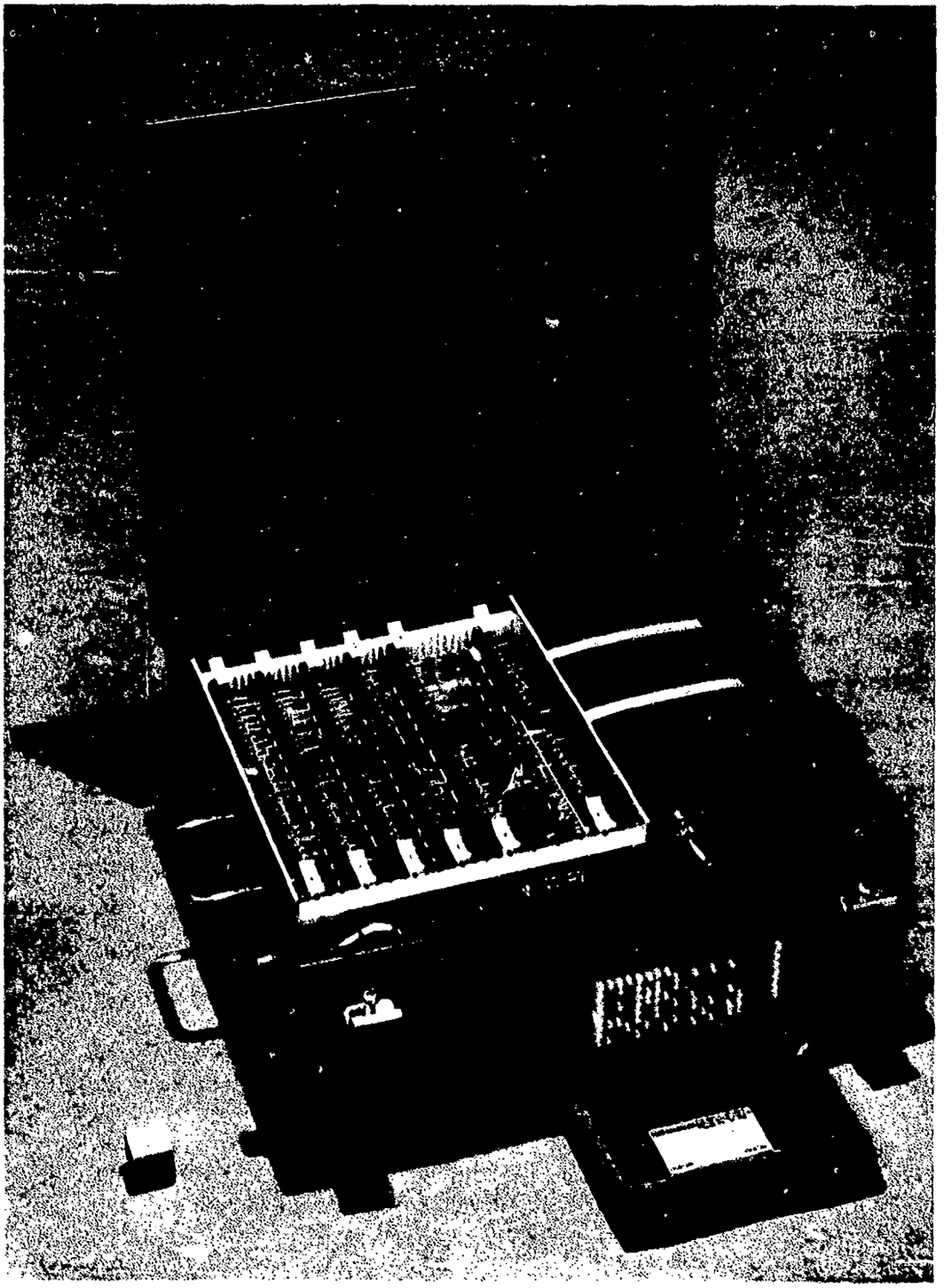


Figure 3-13. WILTRAK Processor

3.7 (Continued)

The Digital Converter and Printer are designed to realize a more meaningful interpretation of processed data. The binary coded data representing velocity, position, and direction are translated into numeric values representing true velocities and position in meters/second and meters respectively.

The processor is programmed with a unique data processing algorithm derived from work performed by GTE Sylvania. This program is contained in read-only-memories such that the processor is self-contained and does not require continuing software and programming support.

The processor operation is based on knowing the relative location of the sensors within an array. Consequently, the sensor position data is programmed into the processor with a pinboard matrix. The programming of the sensor positions sets into the processor the distance between each sensor in an array. The pinboard positions are numbered from 0 to 15 where each position represents a distance of 25 meters. The maximum length of deployment of a sensor array is 400 meters. Each possible sensor location (16) is therefore assigned a unique cell position in memory. Pins (up to 8) are inserted into this field of 16 pinboard locations to relate the specific position of the sensors to the processor. Sensors in an array are deployed and therefore numbered, sequentially, where sensor number 1 is always the first sensor in the trail array leading to the area to be protected. In trail arrays parallel to the protected area, sensor number 1 is the first sensor at the left end of the array. Since the first sensor is the reference for determining the relative distance between sensors, it is always located in the first position (0 meters) in the 16 position pinboard matrix.

As an example, if there are five sensors in an array spaced 75 meters apart, the pinboard would be programmed as follows:

Sensor No. 1	Pinboard Position 0
Sensor No. 2	Pinboard Position 3
Sensor No. 3	Pinboard Position 6

3.7 (Continued)

Sensor No. 4	Pinboard Position 9
Sensor No. 5	Pinboard Position 12

A diagram of the above example is shown in Figure 3-14.

Alarm messages received from sensors within an area by way of a WARS Receiver/Interface unit are processed to extract intruder information. These messages are decoded to determine the identity of the sensor and the nature of the alarm, i.e., a primary or auxiliary alarm - only primary alarms are to be processed. A primary alarm is one generated by the Sensor/Transmitter unit internal sensor and processor, and identified by the SCDS data code 0001.

The operation of the processor is divided into two modes: Array Detection mode and Array Processing mode. When in the Array Detection mode, the processor monitors the level of activity of up to eight different arrays (each of which contains five to eight sensors). Should one array indicate increasing alarm activity, the processor switches to the Processing Mode and locks onto that array. Alarm information from all other arrays is ignored when in the Array Processing mode.

When the processor is in the Detection mode, all non-primary messages (auxiliary, self test, etc.) are retransmitted without modification or processing. In the Processing mode, the processor retransmits all messages except those originating in the array which the processor is locked onto. When in this mode, the processor enters into a data scanning routine every 60 seconds which results in output words containing velocity, direction, position, profile and confidence information. Whenever the intrusion alarm activity subsides for the array being processed, the processor switches back to the detection mode to again monitor the activity of all arrays.

3.8 DIGITAL CONVERTER

The Digital Converter (Figure 3-15) accepts messages from either the WARS R/I unit or the processor and converts the data into a form suitable to drive a specially modified Hewlett Packard 5050B digital printer. The Digital Converter

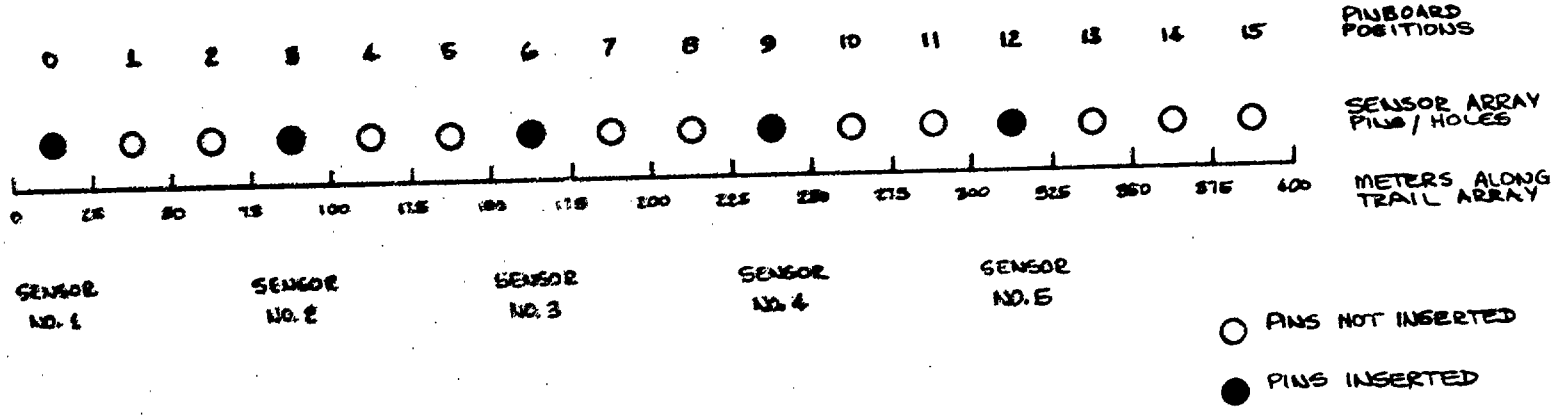


Figure 3-14. Sensor Array Pinboard Programming Example for an Array Deployed to Monitor Personnel

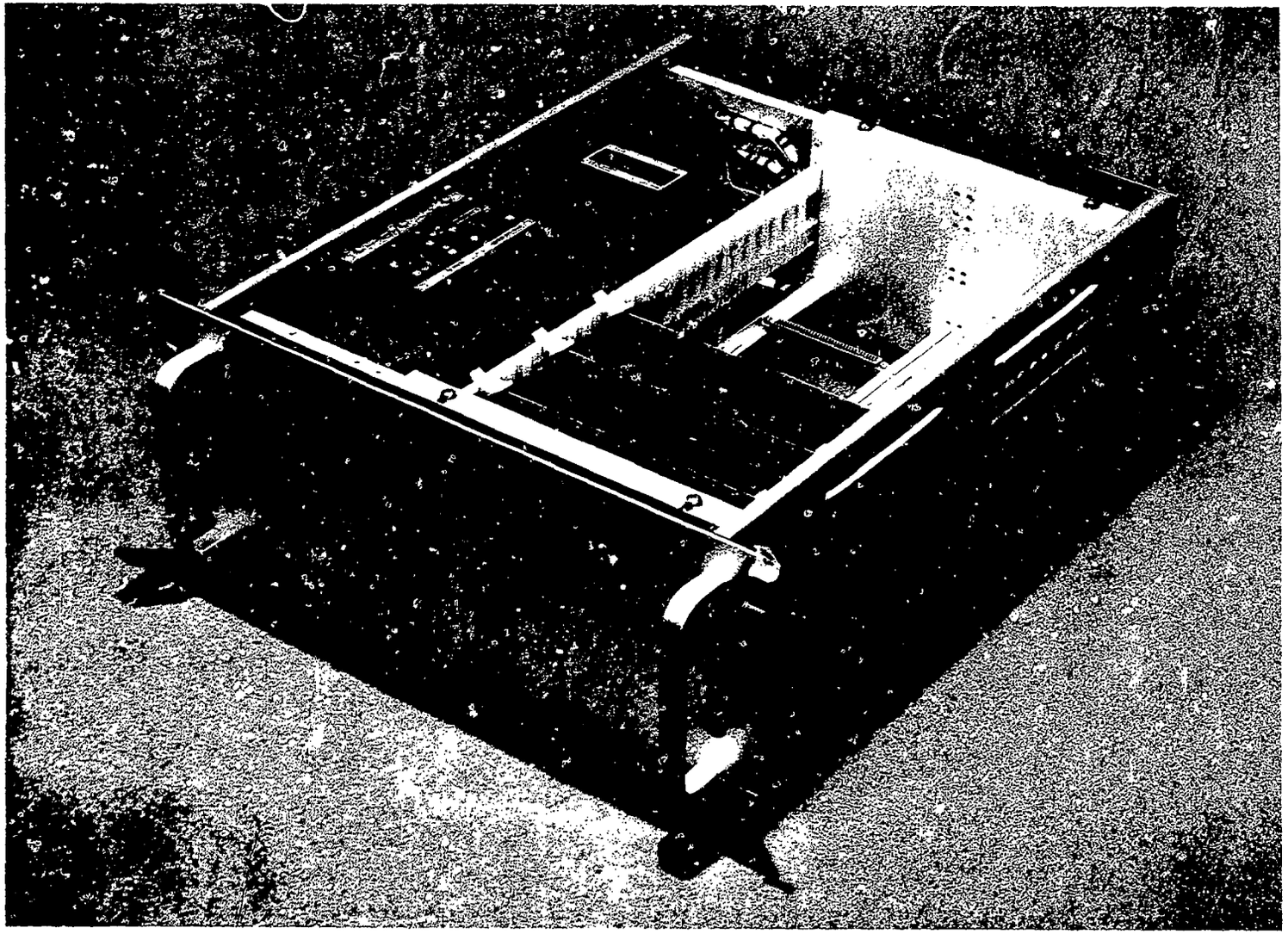


Figure 3-15. Digital Converter

3.8 (Continued)

also generates the various command and control signals required by the printer. The digital printer displays the data in the format of Figure 3-16a if the message is processed, or in the format of Figure 3-16b if the message is not processed. Since the display rate is limited by the speed of the printer, a priority network is implemented in the Digital Converter to prevent the loss of processed data at the expense of a possible loss of some unprocessed data, particularly self test messages. No data will be lost, however, if the messages are separated by 150 milliseconds or more.

There are four input signals. In addition to the serial data, clock, and message gate from the processor or the R/I unit, a hold-off signal is required from the printer which tells the Digital Converter when a print cycle is in progress. The Digital Converter outputs consist of parallel data for nine binary coded decimal (BCD) digits, reference voltages to tell the printer what is a logic "1" and "0", and print and paper advance commands.

The primary purpose of the Digital Converter and printer is to display data from the processor. The function of displaying unprocessed data is secondary and will be performed only when it does not interfere with the displaying of processed data. Processed messages are separated by at least 60 seconds, so it is impossible for a processed message to be lost due to the printing of other processed messages. Priorities are assigned to the message types as follows: a processed message is highest priority, an unprocessed alarm message is second priority, and a self test message is lowest priority.

The Digital Converter was constructed using 7400 series TTL. The choice of TTL was based on the fact that it is inexpensive, readily available, and offers a wide variety of complex function MSI devices. Power consumption is not a problem since the Digital Converter operates from AC line power. All of the circuitry is contained on three circuit boards, and the total number of integrated circuits is approximately 80.

The digital printer is a Hewlett Packard model 5050B with modification specification M14. Also included with the basic printer is an option 55 digital clock.

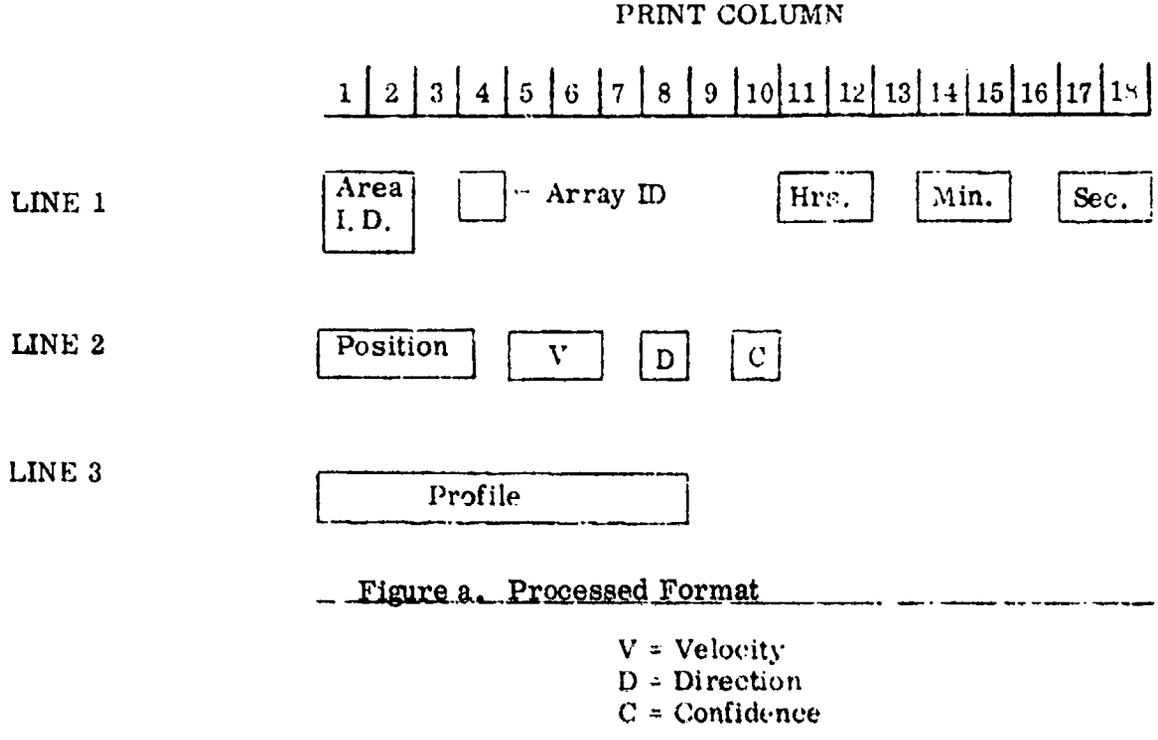


Figure a. Processed Format

V = Velocity
D = Direction
C = Confidence

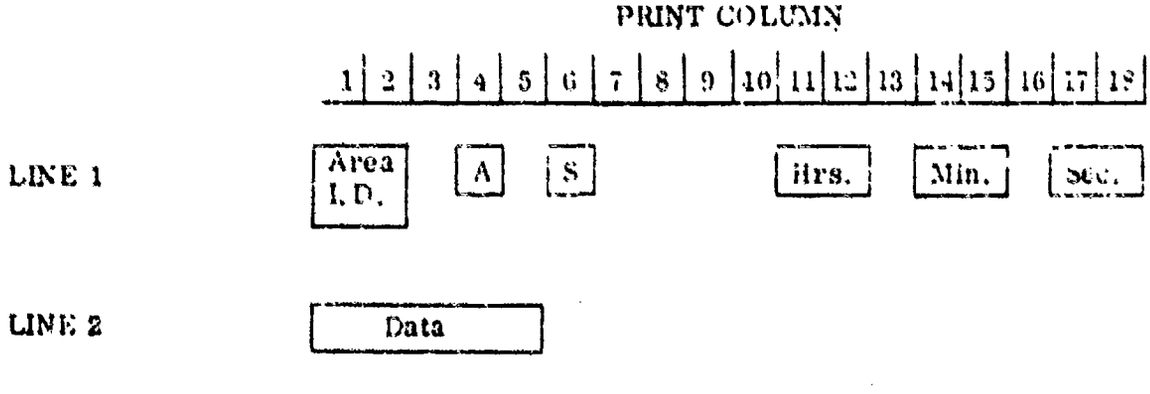


Figure b. Unprocessed Format

A = Array ID
S = Sensor ID
} Transmitter ID

Figure 3-16. Printer Output Formats

3.8 (Continued)

The modifications to the printer are in two areas. First, time from the digital clock will be printed in the eight columns nearest the right hand side of the paper only when a time enable pulse preceeds the print command. Colons will always be printed between the hours and minutes and between the minutes and seconds. No data or controls are required by the printer to print time other than the time enable and print command pulses. The necessary connections needed to print colons between the hours, minutes, and seconds are hardwired into a code plug which is attached to the input connector A1J2 on the back of the printer. The second modification to the printer is provision to advance the paper at the command of an external pulse. An input connector is added to the rear panel of the instrument to receive the paper advance signal.

Section 4

DEVELOPMENT PROGRAM

4.1 DESIGN PHASE

Change E to the WARS contract was received on 2 June 1972, and the design phase of the contract for a UHF digital FSK system was initiated.

The primary goal of this phase was to define the UHF system and establish a set of design goals which were to be incorporated into the Prime Item Development Specification. Of major concern during this phase was the addition of the circuitry and interface details for inputting four auxiliary alarm signals to the S/T unit, changing the data readout rate from one primary alarm every four seconds to one primary alarm every five seconds with a maximum S/T alarm rate of one per second when all five alarms present (the primary plus four auxiliaries), converting the transmitter, receiver and antennas to the UHF band, and changing the data format for SCDS compatibility.

The design effort required to accomplish these changes occupied the period from June 1972 through October 1972. The extent of the redesign was nearly total in terms of circuit board layout. The only boards which remained basically unchanged were the amplifier and processor boards in the S/T unit, but new layouts of these were required to pick up some last minute design improvements.

The effect of shifting to a 5 second data rate was much more severe than anticipated in the effectiveness of the algorithm employed in the processor. The loss in data due to the low sample rate per sensor (20% loss) manifested itself as drastically reduced confidence levels in the processed message, and erratic velocity data. A major change had to be made in the processor design in order to change the basic flag rate and peripheral functions to the five second rate.

The design effort undertaken during this five month period included the paper design of the circuitry and system interfaces, the breadboarding of the circuits and testing of the breadboards for board level and system level operation.

4.2 PACKAGING PHASE

The packaging design for the WARS system makes use of common housing design in the S/T, R/I and battery pack. This commonality required the use of only one set of extrusion tooling for all units. An extrusion was selected on the basis of mechanical integrity for units which would be receiving considerable personnel handling and would be subjected to the environment of a buried system. The only interfaces that would be subject to leakage would be the end plates and the covers rather than a multi-seam box with a cover. The units have been designed for maximum accessibility to the individual cards by placing all boards, including the RF subassemblies, on a motherboard by means of connectors. This arrangement allows complete removal of the electronics by simply removing four Cap Screws and sliding the entire assembly out of the housing. Once this has been done, each board can be individually removed without soldering iron or cutters. The only tools required for complete assembly are an Allen Head wrench and a combination Blade/Phillips Head screwdriver.

The extrusions employed are of a universal type in which many grooves are available for card guides. To insure that incorrect board insertion does not occur, the proper guides have been opened and present a flanged input as seen in Figure 3-6.

Consideration of field settability resulted in the use of single pole single throw switches on the code plug for assignment and change of code settings. This allows resuse of the code plugs and field change of code by simply altering the switch positions. The code plugs are shown in Figure 4-1, and are field accessible through a hatch which is latch secured and "O-ring" sealed.

All board tongues are keyed so that only S/T boards can be inserted in the S/T motherboards, and then, only in their proper connectors. The same is true for the R/I boards. The processor boards and the Digital Converter boards are identified by name and their positions in the chassis are marked on the chassis.

The hand-carried assemblies such as the R/I, S/T,battery packs and processor are equipped with handles or straps for ease of carrying.

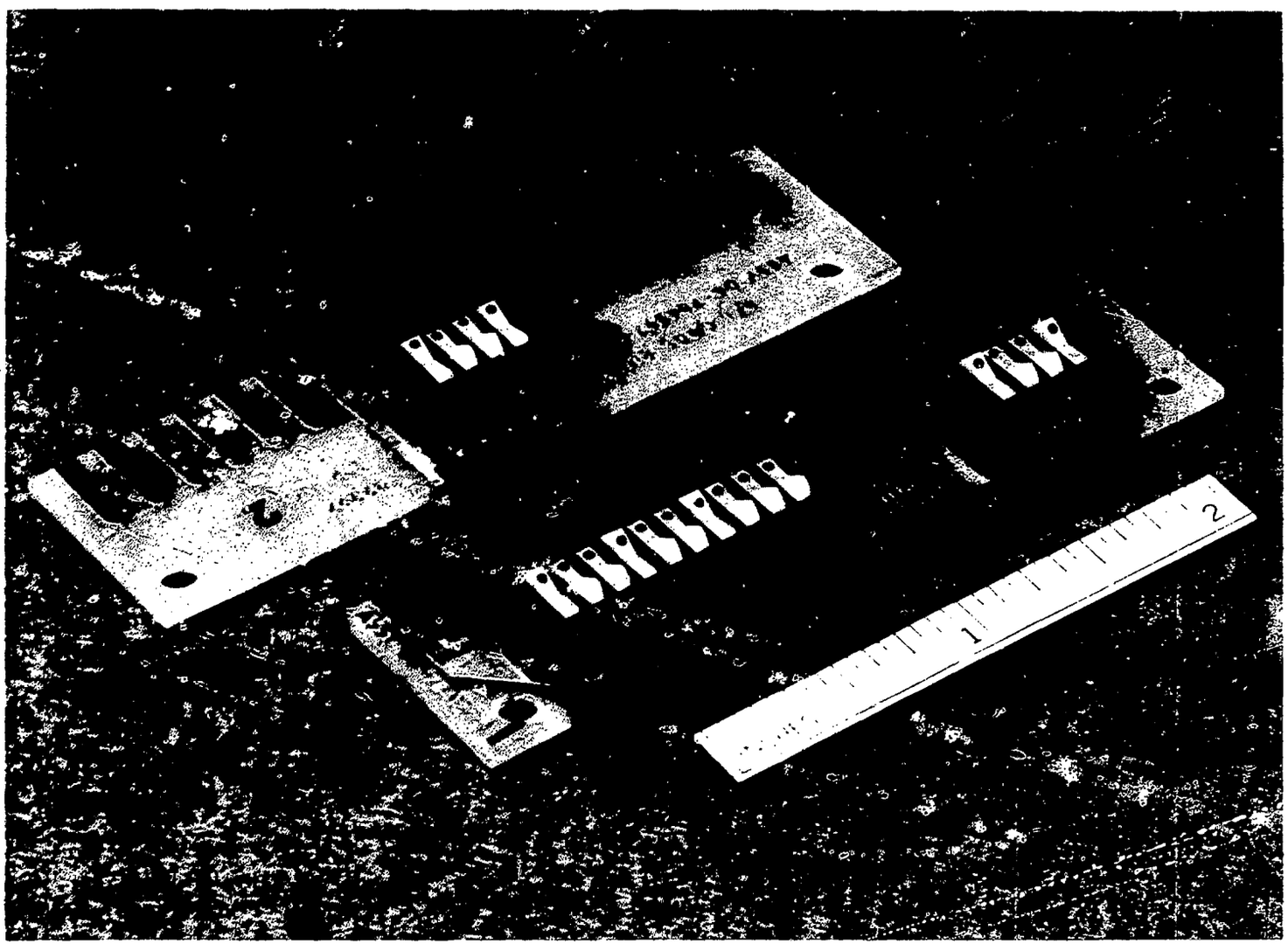


Figure 4-1. Code Plugs

4.2 (Continued)

The Digital Converter and Printer units are designed for rack mounting and are equipped with mounting hardware.

All field units are water sealed by gasketing, and painted olive drab.

4.3 ENGINEERING TESTS

Engineering tests continued throughout the breadboard phase of the program. Each prototype board and assembly was subjected to electrical performance and interface evaluations to assess compliance with the end item specifications. After each board was checked for operation at room temperature and over the -20°C to + 71°C temperature range, it was incorporated into a prototype front panel for subsystem integration. Prototype integration was followed by system testing of the R/I and S/T prototypes. This evaluation included digital interfacing to verify the function of the encoder and decoder boards by directly coupling the S/T encoder output to the R/I decoder and address comparison functions and checking the R/I encoder output format against the S/T encoder output format. RF link tests were made to verify transmitter/receiver frequency tolerance buildup and modulation interfaces.

Interface tests were also performed using the processor and digital converter to verify R/I operation into those units.

Testing of the processor was conducted using a Nova 800 computer to simulate the sensor field and apply array inputs which would exercise all of the processor operations. Temperature testing from 0°C to + 52°C followed electrical tests. A word generator breadboard was fabricated and used to test the digital converter functions including the priority assessment and data handling functions of the unit.

A watertight integrity test was performed on an S/T battery pack assembly to determine the effectiveness of the "O-ring" seals and tension adjustment of the latches. The assembly was heated to + 150°F and then submerged in three feet of water at approximately 50°F.

4.4 DEVELOPMENTAL MODEL

Following successful completion of the testing on each assembly prototype, final engineering release was made for fabrication of the developmental model. This model consists of 15 S/T units, one R/I unit, 17 battery packs, 16 antennas, one processor, one digital converter, one printer and the cabling necessary to interface the system.

In addition to the above assemblies, two J-boxes for auxiliary sensor inputs to the S/T units were provided. Figure 1-1 of this report pictures all of the units of the developmental model delivered. There are only one S/T, two battery packs, two antennas, and one J-box shown since all other units are identical. The fabrication of the developmental model took place during the months of November 1972, December 1972, and January 1973. All units were subjected to workmanship inspection and preliminary electrical checkout prior to the commencement of formal Acceptance Testing.

Section 5

ACCEPTANCE TESTS

5.1 TEST CRITERIA

The Acceptance Test criteria for the WARS UHF developmental model were established in the contract Statement of Work, PR No. C-2-2463 of Contract F30602-69-C-0268, Modification P00013. The essential requirements for the WARS system are as follows:

a. Sensor/Transmitter Unit. - The S/T unit shall be comprised of the following subassemblies: (1) Primary Detector, (2) Alarm Pulse Generator, (3) Encoder and Power Control, (4) Transmitter, (5) Antenna, and (6) Battery Pack. An alarm signal generated by the primary detector shall initiate power turn-on on the encoder and transmitter. The encoder and power control shall enable the transmitter, generate the message to be transmitted, and determine the duration of transmission. The message shall be a digital word consisting of 21 bits plus 17 external bits. The encoder shall be provided with an external means of selecting the Area ID and the Transmitter ID. The transmitter shall be a high stability UHF unit operating at a single crystal controlled frequency in either the 406-426 MHz, 426-447 MHz, or 447-470 MHz frequency bands. Bands may be changed by replacement of the transmitter printed wiring assembly. The antenna shall be approximately a quarter-wave monopole. The battery pack shall provide 27 volts, to an end point voltage of 18 volts. Self-test circuitry shall be included to verify system performance during extended periods of inactivity. The self-test circuitry shall be inhibited during periods of intrusion alarm activity. There shall be provision for self-disable circuitry.

b. Receiver/Interface Unit. - The R/I unit shall be capable of receiving signals sent by the S/T unit and transferring the received message over

5.1 (Continued)

a wire line to either the processor or the CSC/PD. The R/I unit shall be comprised of the following subassemblies: (1) Receiver, (2) Decoder, (3) Address Comparator/Encoder (AC/E), (4)Power Control-Line Driver, (5) Antenna, and (6) Battery. The receiver shall be crystal-controlled and set to a frequency in any one of three bands, 406-426, 426-447, or 447-470 MHz. Received messages from the S/T shall be demodulated, decoded and checked for WARS address. If the address is correct, the message shall be reencoded and sent to the CSC/PD, or the preprocessor. The antenna shall be approximately a quarter-wave monopole. There shall be provision for self-disable circuitry.

c. Preprocessor Equipment. - The equipment shall be comprised of the following:

Preprocessor Unit. The preprocessor unit shall be designed suitable for field deployment interfacing with the WARS R/I unit and SCDS (TAC) receiver terminal unit. The unit shall contain all the necessary memory, registor, control, logic, decoder and encoder circuits to process input alarm data. The unit shall be self-contained with its own battery pack which, ideally, shall be the same as used for the S/T and R/I units.

Digital Converter Unit. The digital converter shall provide the necessary interface between the preprocessor unit and the clock printer unit. The converter shall contain all the necessary buffers, decoding registers and control circuits required for converting the output of the preprocessor unit into an acceptable and meaningful format(s) for display (printout) by the printer unit.

Clock Printer Unit. This shall be a suitable, standard, commercially available unit such as the HP 5050B with Option 55 (Digital Clock) modified as required for direct interfacing with the digital converter unit.

The equipment shall be designed to interface, via interconnecting cable, directly with the R/I unit. Basically, the function of the equipment shall

5.1 (Continued)

be to automatically extract and print out intrusion information, e.g., position, direction, velocity and profile based upon correlation of internally established logic and inputted alarm messages originating from array-deployed S/T units. An array is defined as a group of from five to eight S/T units arranged in a trail configuration, up to 400 meters in length. The processor equipment shall be capable of monitoring "array activity" from at least eight arrays. However, the equipment will not be required to simultaneously process and print out data from two or more simultaneously intruded arrays.

The test program was to be conducted in three phases: Unit Level Tests, System Level Tests and Field Demonstration. The Unit and System Level tests were classified as Preliminary Acceptance Tests while the Final Acceptance Test was the Field Demonstration.

5.2 TEST PLAN

An Acceptance Test Plan was submitted for approval on 10 November 1972 which delineated the test requirements, test procedures, and acceptance criteria to be used during the acceptance test phase of the program. This phase was conducted during the period 19 January through 9 February 1973 at the contractor's plant in Mountain View, California.

The test plan called out all of the critical parameters and functions for evaluation that were specified in the contract Statement of Work, and also called out many of the detailed unit parameters for measurement that were deemed critical to the overall system performance.

The Unit Level tests evaluated the following parameters for compliance to the Prime Item Development Specification submitted on 21 August 1972 and those elements cited in Section 5.1 of this report:

S/T Unit Tests

Primary Detection	Sensitivity and Gain setting provision.

5.2 (Continued)

Alarm Pulse Generator	Auxiliary inputs, alarm rate, switched power control for encoder and transmitter.
Encoder Message Format	Code plug operation, message format, clock rate, message length.
Transmitter	Frequency, high and low power output level and control, spurious output levels, modulation deviation, input voltage level effects.
Power Consumption	Transmit and quiescent current consumption.
Configuration	Form factor and environmental features.
Antenna	Collapsible monopole.
Battery Pack	Voltage range, current capability, external power provision.
Environment	Proper operation over -20°C to +71°C with a frequency stability of 5 ppm from initial room temperature setting.
R/I Unit Tests	Sensitivity, IF bandwidth, spurious free dynamic range, strong signal operation, frequency.
Squelch Control	Control of Decode and Address Comparison/ Encode functions.
Error Rate	Bit error rate for input of -105 dBm.
Message Verification	Frame sync word effect on message Decode/ Encode function.
Configuration	Form factor and environmental features.
Antenna	Collapsible monopole.
Battery Pack	Voltage, range, current capability and external power input provision.
Power Consumption	Quiescent and encode current consumption.

5.2 (Continued)

Environment	Proper operation over -20°C to + 71°C with a frequency stability of 5 ppm from initial room temperature setting.
Output Format	Message format, drive circuitry, compatibility with CSC/PD and digital converter, data line content.
Processor Unit Tests	
Detection Mode Tests	Detection level, auxiliary alarm message handling, primary alarm message handling, self test message handling.
Array Processing Mode	Qualification criteria, output format, return to detection mode criteria, and algorithm tests for direction, velocity, image, confidence and position data.
Digital Converter Unit Tests	
Message Handling	All combinations of valid processed and non-processed message inputs, parity error indication.
Priority Routine	All combinations of processed, un-processed and self test alarm data inputs.

The System Level Tests were performed in the laboratory using the battery packs as prime power sources for the R/I, S/T and Processor units. These tests were designed to check all of the interface functions using an RF link, and verify the self test and system error rate specifications. During this series of tests, the entire system was hooked up as it would be in the field and tested for all major system functions.

The Field Demonstration tests were conducted to verify that the system would perform in a field environment as designed. These tests checked the field setability of the code plugs, the seismic detection function of the primary sensors, the RF data link operation through the monopole antennas, the processor operation when working on R/I decoded primary sensor alarms qualifying for array processing, and false alarm operation in a very high seismic background level.

5.2 (Continued)

In addition to these required tests, additional tests were performed at the COTR's request. These tests evaluated adjacent channel interference effects in the receiver, and looked at the ground-to-ground range capability of the RF link in the local area.

5.3 TEST RESULTS

The results of the testing indicated that the system met or exceeded all of the requirements of the contract Statement of Work for electrical performance both in the laboratory and the field. The detailed data sheets for each test performed are presented in Appendix A of this report.

The measurement of ground-to-ground range of RF data communications showed that the unit operated successfully at ranges of between 1.5 and 2 miles. The intervening terrain included several freeway overpasses and embankments which produced non-line-of-sight conditions.

The adjacent channel interference test was performed in a simulated manner using two signal generators coupling energy into the receiver. Measured adjacent channel selectivity was approximately 40 db at a 25 kHZ offset.

Section 6

REPORTS AND VISITS

6.1 REPORTS SUBMITTED

The following reports were submitted under Change E of the subject contract:

Data Item A001	R&D Status Report for 1 June through 14 July 1972 - 17 July 1972
	R&D Status Report for 14 July through 14 August 1972 - 29 August 1972
	R&D Status Report for 14 August through 8 September 1972 - 11 September 1972
	R&D Status Report for 8 September through 10 October 1972 - 10 October 1972
	R&D Status Report for 10 October through 10 November 1972 - 10 November 1972
	R&D Status Report for 10 November through 11 December 1972 - 13 December 1972
	R&D Status Report for 11 December 1972 through 11 January 1973 - 11 January 1973
	R&D Status Report for 12 January through 12 February 1973 - 14 February 1973
Data Item A002	Design Plan (update) S/T and R/I units - 30 August 1972
Data Item A003	WARS UHF Acceptance Test Plan - 10 November 1972
Data Item A004	WARS UHF Final Report - March 1973
Data Item A005	Recommended Spare Parts List - 28 September 1972
Data Item A006	Engineering Data - 1 March 1973

6.1 (Continued)

Data Item A007	Instruction Manual for WARS - March 1973
Data Item A008	Contract Funds Status Report - 11 September 1972
Data Item A009	Configuration Item Development Specification - 30 August 1972
Data Item A010	WILTRAK Preprocessor Design Plan - 23 October 1972 WARS Interface Specification - 18 July 1972 WARS Design Review Minutes - 30 August 1972

6.2 CONFERENCES AND VISITS

The following visits were made during the period of performance under Change E of the subject contract:

S. Militello, R. King, H. Power of RADC; D. Eno and T. Sutton of Sandia; T. Midura and J. O'Neill of ESD attended a WARS Interface meeting at ESG-WD, Mountain View, California on 13 July 1972.

S. Militello and H. Power of RADC attended a WARS Design Review at ESG-WD, Mountain View, California on 23-24 August 1972.

R. Lucas visited RADC on 3 October 1972 for technical discussions on WARS.

W. Wolber, S. Militello, R. King and H. Power of RADC; T. Midura of ESD; W. Gosset of Sandia attended a WARS Design Review held at ESG-WD, Mountain View, California on 25-26 October 1972.

S. Militello, R. King and D. Reed of RADC visited ESG-WD for technical discussions and witness of Acceptance Tests during the period 5-9 February 1973.

Section 7

CONCLUSIONS AND RECOMMENDATIONS

The successful development of the WARS UHF system, the performance data obtained in testing, and the capabilities demonstrated in the limited field test show that the WARS system presents a viable approach to both intermediate and long range Air Force seismic detection and data link requirements. The equipment meets all of the specifications imposed on the development hardware, and the processor represents a basic and powerful tool in data analysis and target presentation with sufficient flexibility to allow integration with a wide variety of sensor concepts.

The hardware has been developed to the specifications of a basic intrusion detection concept. The actual employment and deployment of the system components and effective use of the processor is to be studied by RADC. Sensor gain settings, sensor spacing, array configurations, processor parameter measurement bounds, and RF link configurations are areas which must be further refined and defined in actual field testing.

Some of the areas which should be specifically addressed are:

1. Design, develop and install a VHF data link to replace or supplement the present UHF link.
2. Enter into a second phase study for the next generation WILTRAK processor to refine the velocity measurement capability, expand the memory, improve data handling to more than one array at a time, and generally improve the algorithm while improving the hardware. **(See Figure 3-12).**
3. Replace the present monopole antenna with an end fed or sleeve dipole for better low angle coverage and lower VSWR.
4. Evaluate the environmental capability of the present design through empirical tests.

7.0 (Continued)

5. Redesign for full temperature range of -40°C to + 71°C.
6. Upgrade the mechanical design as required for full MIL capability.
7. Design, develop and fabricate a board to replace the transmitter assembly in the S/T unit with a hardwire driver circuit.
8. Provide EMI and surge protection for the R/I to CSCPD output circuits. Two-hundred ohm resistors have been added in each line for some protection, but surge arrestors and decoupling should be applied.
9. Mechanical redesign of the battery pack for attachment of the PC board to the lid.
10. Install a fuse in the 12 volt battery output line.

Appendix A

DATA

SYSTEM 1
Amplifier Unit # 1

DATA SHEET I

PRIMARY DETECTOR PERFORMANCE TEST

Pulse Test

Ref: 2.8 V P-P

Amplifier Gain	Spec Level	Measured Level	Comments
High	56.5 mV P-P	96 dB	
Low	336 mV P-P	84 dB	

Tape Test

Amplifier Gain	Signal Source	Alarm Spec	Alarms Incurred
High	1 Man	2 min.	16
High	6 Men	4 min.	23
High	Heavy Rain	1 max.	0
High	Helicopter Hover	1 max.	0
High	Flyover 200'	0	0
High	Flyover 500'	0	0
High	Flyover 1000'	0	0

Conducted by: [signature]

Witnessed by: [signature]

Date: 1/[illegible]/[illegible]

APG # 1 SYSTEM 1

DATA SHEET II

ALARM PULSE GENERATOR PERFORMANCE TEST

Sensor Input	Alarm	Switched 12 v	Alarm Rate	Comments
Primary	yes	yes	5.5 sec	
Aux 1 Personnel	yes	"	"	
Aux 1 Vehicle	"	"	"	
Aux 2 Personnel	"	"	"	
Aux 2 Vehicle	"	"		
Aux 3 Personnel	"	"	"	
Aux 3 Vehicle	"	"	"	
Aux 4 Personnel	"	"		
Aux 4 Vehicle	"	"		
Primary, Aux1-4	ok	ok	1/sec	

Conducted by: T. Tokoyo

Witnessed by: [illegible]

Date: 1/25/73

ENCODER #1 SYSTEM 1

DATA SHEET II (CONTINUED)

MESSAGE FORMAT PERFORMANCE TEST

Parameter	Specification	Measurement	Comment
Clock Rate	1200 pps ± 3%	1210Hz	
Message Length	32 ms ± 3%	31.25MS	
Bits 38-22	All "0's"	17	
Bits 21-17	11101	11101	
Bits 16-7	Selectable	ok	
Bit 6	0	0	
Bits 5-2 Primary	00001	00001	
Bits 5-2 Aux 1 P	00010	00010	
Bits 5-2 Aux 1 V	01010	01010	
Bits 5-2 Aux 2 P	00011	00011	
Bits 5-2 Aux 2 V	01011	01011	
Bits 5-2 Aux 3 P	00100	00100	
Bits 5-2 Aux 3 V	01100	01100	
Bits 5-2 Aux 4 P	00101	00101	
Bits 5-2 Aux 4 V	01101	01101	
Bit 1	1	UNIT 4 OK	

DISPLAY 16.8 V

Conducted by: T. Takaya

Witnessed by: QA

Date: 1/28/72

Transmitter #1 SYSTEM 1

DATA SHEET III

TRANSMITTER PERFORMANCE TESTS

Parameter	Specification	Measured	Comment
Power output (high)	@ 18V 2 watts min	3.6 w	
Power output (low)	@ 27V 10 ± 3 dB below high power level	HIGH 5.4 v LOW .73 w 18V 27V	
Spurious output	Greater than 50 dB below unmodulated output	High 54dB Low 52dB	53dB 51dB
Modulation	± 5.5 kHz ± 10% FSK		407.38027 407.36926 10.99 KHz
Frequency	One frequency in 406-470 MHz band (407.375)		407.374,76

Conducted by: T. Takagi 0930

Witnessed by: _____

Date: 1/22/73

ANTENNA EXAMINATION

Collapsible Quarterwave Monopole	(Yes)	(No)

Examined by: R Gonlu QA 0930

Witnessed by: _____

Date: 1/31/73

PHYSICAL CONFIGURATION

Conforms to Specification	(Yes)	(No)

Examined by: R. Gonlu QA 0930

Witnessed by: _____

Date: 1/31/73

SYSTEM NO. 1

UNIT NO. 1

DATA SHEET IV

S/T BATTERY PACK

Parameter	Specification	Measured	Comment
Voltage	27 volt dc to 18 v dc	27.8 ✓	
Disable	18 volts dc max	6.8	
External input	(Yes)	yes	
Battery Current	Mon. Mode 400 μa nominal	370μA	
	Xmt Mode 550 ma nominal	550 MA	@ 27 ✓

Duty Cycle: .02%

Conducted by: T. Takagi

Witnessed by: QA 093

Date 1/22/73

6 Mos. = 4380 Hrs.

Amp. Hrs. Cont. = 370μa x 4380 = 1.6 AHR

Xmt. Mode = 550 ma x .02% = 4.8 AHR

6 Mos. TOTAL DRAIN = 6.4 AHR

Battery Capability = 9 AHRs @ 25°C

S/T ENVIRONMENTAL TEST

Parameter	Specification	Measured				
		-20°	0°	+30°	+50°	+71°
Power Output	2 watt min					
Spurious Level	>50 dB down					
Frequency	± 5 ppm from $f_{30°C}$					
Message Length	32 ms ± 3%					
Threshold	56.5 uv high 226 uv low					

Conducted by: T. Takagi

Witnessed by: QA 093

Date: 1/22/73

SYSTEM NO. 2

UNIT NO. 2

DATA SHEET I

PRIMARY DETECTOR PERFORMANCE TEST

Pulse Test 2.8V P-P Ref

Amplifier Gain	Spec Level	Measured Level	Comments
High	56.5μV	96dB	
Low	226μV	84dB	

Tape Test

Amplifier Gain	Signal Source	Alarm Spec	Alarms Incurred
High	1 Man	2 min.	12
High	6 Men	4 min.	23
High	Heavy Rain	1 max.	0
High	Helicopter Hover	1 max.	1
High	Flyover 200'	0	0
High	Flyover 500'	0	0
High	Flyover 1000'	0	0

Conducted by: T. Lahaye

Witnessed by: _____ QA 093

Date: 1/23/73

SYSTEM NO. 2

UNIT NO. 2

DATA SHEET II

ALARM PULSE GENERATOR PERFORMANCE TEST

Sensor Input	Alarm	Switched 12 v	Alarm Rate	Comments
Primary	yes	yes	5 sec	
Aux 1 Personnel	"	"	"	
Aux 1 Vehicle	"	"	"	
Aux 2 Personnel	"	"	"	
Aux 2 Vehicle	"	"	"	
Aux 3 Personnel	"	"	"	
Aux 3 Vehicle	"	"	"	
Aux 4 Personnel	"	"	"	
Aux 4 Vehicle	"	"	"	
Primary, Aux1-4	"	"	1/sec	

Conducted by: T. Lahaye

Witnessed by: _____ QA

Date: 1/23/73

SYSTEM NO. 2

UNIT NO. 2

DATA SHEET II (CONTINUED)

MESSAGE FORMAT PERFORMANCE TEST

Parameter	Specification	Measurement	Comment
Clock Rate	1200 pps ± 3%	1204 HZ	
Message Length	32 ms ± 3%	31.50 MS	
Bits 38-22	All "0's"	17	
Bits 21-17	11101	11101	
Bits 16-7	Selectable	ok.	
Bit 6	0	0	
Bits 5-2 Primary	00001	00001	
Bits 5-2 Aux 1 P	00010	00010	
Bits 5-2 Aux 1 V	01010	01010	
Bits 5-2 Aux 2 P	00011	00011	
Bits 5-2 Aux 2 V	01011	01011	
Bits 5-2 Aux 3 P	00100	00100	
Bits 5-2 Aux 3 V	01100	01100	
Bits 5-2 Aux 4 P	00101	00101	
Bits 5-2 Aux 4 V	01101	01101	
Bit 1	1	Parity ok	

Conducted by: T. Lakaye

Witnessed by: _____

Date: 4/23/73

SYSTEM NO. 2

UNIT NO. 2

DATA SHEET III

TRANSMITTER PERFORMANCE TESTS

Parameter	Specification	Measured	Comment
Power output (high)	@18V 2 watts min	3.5W	
Power output (low)	@27V 10 ± 3 dB below high power level	HIGH 5.4W LOW .7W	
Spurious output	Greater than 50 dB below unmodulated output	High 27V 56dB Low 52dB	18V 56dB 52dB
Modulation	± 5.5 kHz ± 10% FSK		407.38108 407.36988
Frequency	One frequency in 406-470 MHz band (407.375)		11.20KHz 407.37548 MHz

Conducted by: T. Sabrey

Witnessed by: [illegible] 093

Date: 1/23/73

ANTENNA EXAMINATION

Collapsible Quarterwave Monopole	(Yes)	(No)

Examined by: R. Goodwin

Witnessed by: [illegible] 09

Date: 1/31/73

PHYSICAL CONFIGURATION

Conforms to Specification	(Yes)	(No)

Examined by: R. Goodwin

Witnessed by: [illegible]

Date: 1/31/73

SYSTEM NO. 2

UNIT NO. 2

DATA SHEET IV

S/T BATTERY PACK

Parameter	Specification	Measured	Comment
Voltage	27 volt dc to 18 v dc	27.8V	
Disable	18 volts dc max	16.5V	
External input	(Yes)	yes	
Battery Current	Mon. Mode 400 μa nominal	425 μA	
	Xmt Mode 550 ma nominal	470MA	@ 27V

Conducted by: T. Lahaye QA 095

Witnessed by: _____

Date 1/23/73

S/T ENVIRONMENTAL TEST

Parameter	Specification	Measured				
		-20°	0°	+30°	+50°	+71°
Power Output	2 watt min					
Spurious Level	>50 dB down					
Frequency	± 5 ppm from $f_{30°C}$					
Message Length	32 ms ± 3%					
Threshold	56.5 uv high 226 uv low					

Conducted by: _____

Witnessed by: _____

Date: _____

SYSTEM NO. 3

UNIT NO. 3

DATA SHEET I

PRIMARY DETECTOR PERFORMANCE TEST

Pulse Test — 1VRMS Ref

Amplifier Gain	Spec Level	Measured Level	Comments
High	56.5μV P-P	96dB	
Low	226μV P-P	84dB	

Tape Test

Amplifier Gain	Signal Source	Alarm Spec	Alarms Incurred
High	1 Man	2 min.	12
High	6 Men	4 min.	23
High	Heavy Rain	1 max.	0
High	Helicopter Hover	1 max.	0
High	Flyover 200'	0	0
High	Flyover 500'	0	0
High	Flyover 1000'	0	0

Conducted by: T Sakaye

Witnessed by: GA

Date: 1/23/73

SYSTEM NO. 3

DATA SHEET II

UNIT NO. 3

ALARM PULSE GENERATOR PERFORMANCE TEST

Sensor Input	Alarm	Switched 12 v	Alarm Rate	Comments
Primary	yes	yes	4.8 sec	
Aux 1 Personnel	4	4	1	
Aux 1 Vehicle	1	1	1	
Aux 2 Personnel	1	1	1	
Aux 2 Vehicle	1	1	1	
Aux 3 Personnel	1	1	1	
Aux 3 Vehicle	1	1	1	
Aux 4 Personnel	1	1	1	
Aux 4 Vehicle	1	1	1	
Primary, Auxl-4	1	1	1/sec	

Conducted by: T. Lehay

Witnessed by: QA 099

Date: 1/24/73

SYSTEM NO. 3

UNIT NO. 3

DATA SHEET II (CONTINUED)

MESSAGE FORMAT PERFORMANCE TEST

Parameter	Specification	Measurement	Comment
Clock Rate	1200 pps ± 3%	1200 HZ	
Message Length	32 ms ± 3%	31.61 MS	
Bits 38-22	All "0's"	17	
Bits 21-17	11101	11101	
Bits 16-7	Selectable	ok	
Bit 6	0	0	
Bits 5-2 Primary	00001	00001	
Bits 5-2 Aux 1 P	00010	00010	
Bits 5-2 Aux 1 V	01010	01010	
Bits 5-2 Aux 2 P	00011	00011	
Bits 5-2 Aux 2 V	01011	01011	
Bits 5-2 Aux 3 P	00100	00100	
Bits 5-2 Aux 3 V	01100	01100	
Bits 5-2 Aux 4 P	00101	00101	
Bits 5-2 Aux 4 V	01101	01101	
Bit 1	1	Parity ok	

Conducted by: T. Takagi QA

Witnessed by: _____ QC

Date: 1/24/75

SYSTEM NO. 3

UNIT NO. 3

DATA SHEET III

TRANSMITTER PERFORMANCE TESTS

Parameter	Specification	Measured	Comment
Power output (high)	@ 18V 2 watts min	3.4W	
Power output (low)	@ 27V 10 ± 3 dB below high power level	High 5.2W Low .7W	
Spurious output	Greater than 50 dB below unmodulated output	18V High 54dB Low 51dB	27V 50dB 51dB
Modulation	± 5.5 kHz ± 10% FSK		407.38045 407.36917
Frequency	One frequency in 406-470 MHz band (407.375)		11.28KW 407.37481

Conducted by: T. Takagi

Witnessed by: ~~QA~~ QC

Date: 1/23/73

ANTENNA EXAMINATION

Collapsible Quarterwave Monopole	(Yes)	(No)

Examined by: R. Goodin

Witnessed by: _____

Date: 1/31/73

PHYSICAL CONFIGURATION

Conforms to Specification	(Yes)	(No)

Examined by: R. Goodin

Witnessed by: _____

Date: 1/31/73

SYSTEM NO. 3

UNIT NO. 3

DATA SHEET IV

S/T BATTERY PACK

Parameter	Specification	Measured	Comment
Voltage	27 volt dc to 18 v dc	27.8 V	
Disable	18 volts dc max	16.78V	
External input	(Yes)	yes	
Battery Current	Mon. Mode 400 μa nominal	370μA	
	Xmt Mode 550 ma nominal	550 MA	@27V

Conducted by: T. Sakaye

Witnessed by: QA

Date 1/25/73

S/T ENVIRONMENTAL TEST

Parameter	Specification	Measured				
		-20°	0°	+30°	+50°	+71°
Power Output	2 watt min					
Spurious Level	>50 dB down					
Frequency	± 5 ppm from $f_{30°C}$					
Message Length	32 ms ± 3%					
Threshold	56.5 uv high 226 uv low					

Conducted by: _____

Witnessed by: _____

Date: _____

SYSTEM NO. 4

UNIT NO. 4

DATA SHEET I

PRIMARY DETECTOR PERFORMANCE TEST

Pulse Test 2.8V P-P Ref.

Amplifier Gain	Spec Level	Measured Level	Comments
High	56.5 μV P-P	95 dB	
Low	236 μV P-P	84 dB	

Tape Test

Amplifier Gain	Signal Source	Alarm Spec	Alarms Incurred
High	1 Man	2 min.	11
High	6 Men	4 min.	23
High	Heavy Rain	1 max.	0
High	Helicopter Hover	1 max.	1
High	Flyover 200'	0	0
High	Flyover 500'	0	0
High	Flyover 1000'	0	0

Conducted by: T. Talley

Witnessed by: _____ QA

Date: 1/23/72

SYSTEM NO. 4

UNIT NO. 4

DATA SHEET II

ALARM PULSE GENERATOR PERFORMANCE TEST

Sensor Input	Alarm	Switched 12 v	Alarm Rate	Comments
Primary	yes	yes	1.8 sec	
Aux 1 Personnel	4	4	4	
Aux 1 Vehicle	4	4	4	
Aux 2 Personnel	4	4	4	
Aux 2 Vehicle	4	4	4	
Aux 3 Personnel	4	4	4	
Aux 3 Vehicle	4	4	4	
Aux 4 Personnel	4	4	4	
Aux 4 Vehicle	4	4	4	
Primary, Auxl-4	4	4	1/sec	

Conducted by: T. Lokay

Witnessed by: QA

Date: 1/29/75

SYSTEM NO. 4

UNIT NO. 4

DATA SHEET II (CONTINUED)

MESSAGE FORMAT PERFORMANCE TEST

Parameter	Specification	Measurement	Comment
Clock Rate	1200 pps ± 3%	1205HZ	
Message Length	32 ms ± 3%	31.62MS	
Bits 38-22	All "0's"	17	
Bits 21-17	11101	11101	
Bits 16-7	Selectable	ok	
Bit 6	0	0	
Bits 5-2 Primary	00001	00001	
Bits 5-2 Aux 1 P	00010	00010	
Bits 5-2 Aux 1 V	01010	01010	
Bits 5-2 Aux 2 P	00011	00011	
Bits 5-2 Aux 2 V	01011	01011	
Bits 5-2 Aux 3 P	00100	00100	
Bits 5-2 Aux 3 V	01100	01100	
Bits 5-2 Aux 4 P	00101	00101	
Bits 5-2 Aux 4 V	01101	01101	
Bit 1	1	PARITY OK	

Conducted by: T Tobey v.J3

Witnessed by: _____

Date: 1/23/73

SYSTEM NO. 4

UNIT NO. 4

DATA SHEET III

TRANSMITTER PERFORMANCE TESTS

Parameter	Specification	Measured	Comment
Power output (high)	2 watts min @ 18V	3.5W	
Power output (low)	10 ± 3 dB below high power level @ 27V	HIGH 5.8W Low .65W	
Spurious output	Greater than 50 dB below unmodulated output	18V High -56dB Low 52dB	27V 57dB 52dB
Modulation	± 5.5 kHz ± 10% FSK		407.38090 407.36964
Frequency	One frequency in 406-470 MHz band (407.375)		1.26KHz 407.37527MHz

Conducted by: T. Tokoph QA 093

Witnessed by: _____

Date: 1/23/73

ANTENNA EXAMINATION

Collapsible Quarterwave Monopole	(Yes)	(No)

Examined by: R Jordan

Witnessed by: _____

Date: 1/31/73

PHYSICAL CONFIGURATION

Conforms to Specification	(Yes)	(No)

Examined by: R. Jordan

Witnessed by: _____

Date: 1/31/73

SYSTEM NO. 4

UNIT NO. 4

DATA SHEET IV

S/T BATTERY PACK

Parameter	Specification	Measured	Comment
Voltage	27 volt dc to 18 v dc	27.8 v	
Disable	18 volts dc max	16.65	
External input	(Yes)	yes	
Battery Current	Mon. Mode 400 μa nominal	406 μA	
	Xmt Mode 550 ma nominal	~~[illegible]~~ 660 MA	@ 27V

Conducted by: I Lebaye (QA)

Witnessed by: _____ 093

Date 1/23/73

S/T ENVIRONMENTAL TEST

Parameter	Specification	Measured				
		-20°	0°	+30°	+50°	+71°
Power Output @ 18V	2 watt min	2.4	3.35	3.2	3.3	3.15
Spurious Level 2.1	>50 dB down	-54	-56	-60	-58	-58
Frequency	± 5 ppm from $f_{30°C}$	407. 37437	407. 37685	407. 37497	407. 37353	407. 37265
Message Length	32 ms ± 3%	31.57	31.58	31.71	31.68	31.74
Threshold @ 1V RMS Ref	56.5 uv high	95db	96db	96db	96db	95db
	226 uv low	83db	84db	84db	83db	83db

Conducted by: J T Lee (QA)

Witnessed by: _____ 093

Date: 2/2/73

SYSTEM NO. 5

UNIT NO. #5

DATA SHEET I

PRIMARY DETECTOR PERFORMANCE TEST

Pulse Test — 28 V P-P Ref.

Amplifier Gain	Spec Level	Measured Level	Comments
High		96 dB	GAIN SWITCH NOT MARKED CORRECTLY
Low		94 dB	SWITCH REPAIRED 1/24/73 T.L.

Tape Test

Amplifier Gain	Signal Source	Alarm Spec	Alarms Incurred
High	1 Man	2 min.	11
High	6 Men	4 min.	22
High	Heavy Rain	1 max.	0
High	Helicopter Hover	1 max.	1
High	Flyover 200'	0	0
High	Flyover 500'	0	0
High	Flyover 1000'	0	0

Conducted by: T. Tekoyc

Witnessed by: _____

Date: 1/23/73

SYSTEM NO. 5

UNIT NO. 5

DATA SHEET II (CONTINUED)

MESSAGE FORMAT PERFORMANCE TEST

Parameter	Specification	Measurement	Comment
Clock Rate	1200 pps ± 3%	1206Hz	
Message Length	32 ms ± 3%	31.4 ok	
Bits 38-22	All "0's"	17	
Bits 21-17	11101	11101	
Bits 16-7	Selectable	o/k.	
Bit 6	0	0	
Bits 5-2 Primary	00001	00001	
Bits 5-2 Aux 1 P	00010	00010	
Bits 5-2 Aux 1 V	01010	01010	
Bits 5-2 Aux 2 P	00011	00011	
Bits 5-2 Aux 2 V	01011	01011	
Bits 5-2 Aux 3 P	00100	00100	
Bits 5-2 Aux 3 V	01100	01100	
Bits 5-2 Aux 4 P	00101	00101	
Bits 5-2 Aux 4 V	01101	01101	
Bit 1	1	Parity ok	

double @ 16.81

Conducted by: T. Lukey

Witnessed by: _____ Date

Date: 4/25/73

SYSTEM NO. 5

UNIT NO. 5

DATA SHEET II

ALARM PULSE GENERATOR PERFORMANCE TEST

Sensor Input	Alarm	Switched 12 v	Alarm Rate	Comments
Primary	yes	yes	5.2 sec	
Aux 1 Personnel	"	"	"	
Aux 1 Vehicle	"	"	"	
Aux 2 Personnel	"	"	"	
Aux 2 Vehicle	"	"	"	
Aux 3 Personnel	"	"	"	
Aux 3 Vehicle	"	"	"	
Aux 4 Personnel	"	"	"	
Aux 4 Vehicle	"	"	"	
Primary, Aux1-4	"	"	1.1/sec	

Conducted by: T. Lahaye

Witnessed by: Qr 093

Date: 4/23/73

SYSTEM NO. 5

UNIT NO. 5

DATA SHEET III

TRANSMITTER PERFORMANCE TESTS

Parameter	Specification	Measured	Comment
Power output (high)	@ 18V 2 watts min	3.5W	
Power output (low)	@ 27V 10 ± 3 dB below high power level	HIGH 5.6W LOW .62W	
Spurious output	Greater than 50 dB below unmodulated output	High 18V 56dB Low 50dB	27V 56dB 50dB
Modulation	± 5.5 kHz ± 10% FSK		407.58050 407.36926
Frequency	One frequency in 406-470 MHz band (407.375)		10 24 KH 407.37488

Conducted by: T. Lahaye

Witnessed by: QA QC

Date: 1/23/73

Xmtr I @ 27V = 560 ma

ANTENNA EXAMINATION

Collapsible Quarterwave Monopole	(Yes)	(No)

Examined by: R. Goodin

Witnessed by: _____

Date: 1/31/73

PHYSICAL CONFIGURATION

Conforms to Specification	(Yes)	(No)

Examined by: R. Goodin

Witnessed by: _____

Date: 1/31/73

SYSTEM NO. 5

UNIT NO. 5

DATA SHEET IV

S/T BATTERY PACK

Parameter	Specification	Measured	Comment
Voltage	27 volt dc to 18 v dc	27.8 V	
Disable	18 volts dc max	16.8V	
External input	(Yes)	yes	
Battery Current	Mon. Mode 400 μa nominal	380μA	
	Xmt Mode 550 ma nominal	560MA	@27V

Conducted by: T. Lahey

Witnessed by: QA 293

Date 4/23/73

S/T ENVIRONMENTAL TEST

Parameter	Specification	Measured				
		-20°	0°	+30°	+50°	+71°
Power Output	2 watt min					
Spurious Level	>50 dB down					
Frequency	± 5 ppm from $f_{30°C}$					
Message Length	32 ms ± 3%					
Threshold	56.5 uv high 226 uv low					

Conducted by: _____

Witnessed by: _____

Date: _____

SYSTEM NO. 6

UNIT NO. 16

DATA SHEET I

PRIMARY DETECTOR PERFORMANCE TEST

Pulse Test

1VRMS Ref

Amplifier Gain	Spec Level	Measured Level	Comments
High	56.5μV P-P	96dB	
Low	226μV P-P	84dB	

Tape Test

Amplifier Gain	Signal Source	Alarm Spec	Alarms Incurred
High	1 Man	2 min.	12
High	6 Men	4 min.	52
High	Heavy Rain	1 max.	0
High	Helicopter Hover	1 max.	0
High	Flyover 200'	0	0
High	Flyover 500'	0	0
High	Flyover 1000'	0	0

Conducted by: T. Sulay

Witnessed by: QA 023

Date: 1/25/75

SYSTEM NO. 6

UNIT NO. 16

DATA SHEET II

ALARM PULSE GENERATOR PERFORMANCE TEST

Sensor Input	Alarm	Switched 12 v	Alarm Rate	Comments
Primary	yes	yes	5 sec	
Aux 1 Personnel	"	"	"	
Aux 1 Vehicle	"	"	"	
Aux 2 Personnel	"	"	"	
Aux 2 Vehicle	"	"	"	
Aux 3 Personnel	"	"	"	
Aux 3 Vehicle	"	"	"	
Aux 4 Personnel	"	"	"	
Aux 4 Vehicle	"	"	"	
Primary, Aux1-4	"	"	1/sec	

Conducted by: T Takagi

Witnessed by: QA 093

Date: 1/25/73

SYSTEM NO. 6

UNIT NO. 16

DATA SHEET II (CONTINUED)

MESSAGE FORMAT PERFORMANCE TEST

Parameter	Specification	Measurement	Comment
Clock Rate	1200 pps ± 3%	1205 Hz	
Message Length	32 ms ± 3%	31.46 MS	
Bits 38-22	All "0's"	17	
Bits 21-17	11101	11101	
Bits 16-7	Selectable	ok	
Bit 6	0	0	
Bits 5-2 Primary	00001	00001	
Bits 5-2 Aux 1 P	00010	00010	
Bits 5-2 Aux 1 V	01010	01010	
Bits 5-2 Aux 2 P	00011	00011	
Bits 5-2 Aux 2 V	01011	01011	
Bits 5-2 Aux 3 P	00100	00100	
Bits 5-2 Aux 3 V	01100	01100	
Bits 5-2 Aux 4 P	00101	00101	
Bits 5-2 Aux 4 V	01101	01101	
Bit 1	1	PARITY OK	

Conducted by: T. Sakaye

Witnessed by: _____

Date: 1/25/73

SYSTEM NO. 6

UNIT NO. 6

DATA SHEET III

TRANSMITTER PERFORMANCE TESTS

Parameter	Specification	Measured	Comment
Power output (high)	2 watts min @18V	3.6 W	
Power output (low)	10 ± 3 dB below high power level @27V	HIGH 5.8 W LOW .83	
Spurious output	Greater than 50 dB below unmodulated output	High 55dB @18V Low 54dB	53dB @27V 55dB
Modulation	± 5.5 kHz ± 10% FSK		407.38022 407.36922
Frequency	One frequency in 406-470 MHz band (407.375)		11.0 KHz 407.37474

Conducted by: T. Lackaye QA/093

Witnessed by: _____

Date: 1/25/73

ANTENNA EXAMINATION

Collapsible Quarterwave Monopole	(Yes)	(No)

Examined by: R. Jacobs QA/093

Witnessed by: _____

Date: 1/31/73

PHYSICAL CONFIGURATION

Conforms to Specification	(Yes)	(No)

Examined by: R. Jacobs QA/093

Witnessed by: _____

Date: 1/31/73

SYSTEM NO. 6

UNIT NO. 16

DATA SHEET IV

S/T BATTERY PACK

Parameter	Specification	Measured	Comment
Voltage	27 volt dc to 18 v dc	27.8 V	
Disable	18 volts dc max	16.9V	
External input	(Yes)	yes	
Battery Current	Mon. Mode 400 μa nominal	390μA	
	Xmt Mode 550 ma nominal	560 MA	@27V

Conducted by: T. Lahaye

Witnessed by: _____

Date 4/25/73

S/T ENVIRONMENTAL TEST

Parameter	Specification	Measured				
		-20°	0°	+30°	+50°	+71°
Power Output	2 watt min					
Spurious Level	>50 dB down					
Frequency	± 5 ppm from $f_{30°C}$					
Message Length	32 ms ± 3%					
Threshold	56.5 uv high 226 uv low					

Conducted by: _____

Witnessed by: _____

Date: _____

SYSTEM NO. 7

UNIT NO. 7

DATA SHEET I

PRIMARY DETECTOR PERFORMANCE TEST

Pulse Test 2.8V P-P Ref.

Amplifier Gain	Spec Level	Measured Level	Comments
High	56.5μV P-P	96 dB	
Low	226μV P-P	94 dB	

Tape Test

Amplifier Gain	Signal Source	Alarm Spec	Alarms Incurred
High	1 Man	2 min.	11
High	6 Men	4 min.	20
High	Heavy Rain	1 max.	0
High	Helicopter Hover	1 max.	1
High	Flyover 200'	0	0
High	Flyover 500'	0	0
High	Flyover 1000'	0	0

Conducted by: T. Tuhay

Witnessed by: IA

Date: 1/23/75

SYSTEM NO. 7

UNIT NO. 7

DATA SHEET II

ALARM PULSE GENERATOR PERFORMANCE TEST

Sensor Input	Alarm	Switched 12 v	Alarm Rate	Comments
Primary	yes	yes	5.4 sec	
Aux 1 Personnel	"	"	"	
Aux 1 Vehicle	"	"	"	
Aux 2 Personnel	"	"	"	
Aux 2 Vehicle	"	"	"	
Aux 3 Personnel	"	"	"	
Aux 3 Vehicle	"	"	"	
Aux 4 Personnel	"	"	"	
Aux 4 Vehicle	"	"	"	
Primary, Aux1-4	"	"	1.1/sec	

Conducted by: T. Lahaye

Witnessed by: _____ (QA)

Date: 1/23/72

SYSTEM NO. 7

UNIT NO. 1

DATA SHEET II (CONTINUED)

MESSAGE FORMAT PERFORMANCE TEST

Parameter	Specification	Measurement	Comment
Clock Rate	1200 pps ± 3%	1210 Hz	
Message Length	32 ms ± 3%	31.27 MS	
Bits 38-22	All "0's"	17	
Bits 21-17	11101	11101	
Bits 16-7	Selectable	ok	
Bit 6	0	0	
Bits 5-2 Primary	00001	00001	
Bits 5-2 Aux 1 P	00010	00010	
Bits 5-2 Aux 1 V	01010	01010	
Bits 5-2 Aux 2 P	00011	00011	
Bits 5-2 Aux 2 V	01011	01011	
Bits 5-2 Aux 3 P	00100	00100	
Bits 5-2 Aux 3 V	01100	01100	
Bits 5-2 Aux 4 P	00101	00101	
Bits 5-2 Aux 4 V	01101	01101	
Bit 1	1	Parity OK	

Conducted by: T. Lahey

Witnessed by: _____

Date: 1/23/72

SYSTEM NO. 7

UNIT NO. 7

DATA SHEET III

TRANSMITTER PERFORMANCE TESTS

Parameter	Specification	Measured	Comment
Power output (high)	@ 18V 2 watts min	3.5 W	
Power output (low)	@ 27V 10 ± 3 dB below high power level	HIGH 5.8W Low 1.7W	
Spurious output	Greater than 50 dB below unmodulated output	@ 18V High 53dB Low 54dB	@ 27V 52dB 52dB
Modulation	± 5.5 kHz ± 10% FSK		407.38050 407.36920
Frequency	One frequency in 406-470 MHz band (407.375)		11.10 KHz. 407.374.75

Conducted by: E. Schaye

Witnessed by: _____ QA

Date: 1/23/73

ANTENNA EXAMINATION

Collapsible Quarterwave Monopole	(Yes)	(No)

Examined by: R. Goode

Witnessed by: _____ QA

Date: 1/31/73

PHYSICAL CONFIGURATION

Conforms to Specification	(Yes)	(No)

Examined by: R. Goode

Witnessed by: _____ QA

Date: 1/31/73

SYSTEM NO. 7

UNIT NO. 7

DATA SHEET IV

S/T BATTERY PACK

Parameter	Specification	Measured	Comment
Voltage	27 volt dc to 18 v dc	27.9 V	
Disable	18 volts dc max	16.72 V	
External input	(Yes)	yes	
Battery Current	Mon. Mode 400 μa nominal	380 μA	
	Xmt Mode 550 ma nominal	640 MA	@ 27 V

Conducted by: T. Takagi

Witnessed by: _____

Date 1/23/73

S/T ENVIRONMENTAL TEST

Parameter	Specification	Measured				
		-20°	0°	+30°	+50°	+71°
Power Output	2 watt min					
Spurious Level	>50 dB down					
Frequency	± 5 ppm from $f_{30°C}$					
Message Length	32 ms ± 3%					
Threshold	56.5 uv high 226 uv low					

Conducted by: _____

Witnessed by: _____

Date: _____

SYSTEM NO. 9

UNIT NO. 9

DATA SHEET I

PRIMARY DETECTOR PERFORMANCE TEST

Pulse Test 5V P-P ref.

Amplifier Gain	Spec Level	Measured Level	Comments
High	56.5V P-P	96dB	
Low	220V P-P	84dB	

Tape Test

Amplifier Gain	Signal Source	Alarm Spec	Alarms Incurred
High	1 Man	2 min.	12
High	6 Men	4 min.	24
High	Heavy Rain	1 max.	0
High	Helicopter Hover	1 max.	1
High	Flyover 200'	0	0
High	Flyover 500'	0	0
High	Flyover 1000'	0	2

Conducted by: [signature]

Witnessed by: [signature] CA 003

Date: 1/24/73

SYSTEM NO. 9

UNIT NO. 9

DATA SHEET II

ALARM PULSE GENERATOR PERFORMANCE TEST

Sensor Input	Alarm	Switched 12 v	Alarm Rate	Comments
Primary	yes	yes	5.1 sec	
Aux 1 Personnel	"	"	"	
Aux 1 Vehicle	"	"	"	
Aux 2 Personnel	"	"	"	
Aux 2 Vehicle	"	"	"	
Aux 3 Personnel	"	"	"	
Aux 3 Vehicle	"	"	"	
Aux 4 Personnel	"	"	"	
Aux 4 Vehicle	"	"	"	
Primary, Aux1-4	"	"	1/sec	

Conducted by: T. Lehnert

Witnessed by: [illegible]

Date: 1/24/73

SYSTEM NO. 9

UNIT NO. 9

DATA SHEET II (CONTINUED)

MESSAGE FORMAT PERFORMANCE TEST

Parameter	Specification	Measurement	Comment
Clock Rate	1200 pps ± 3%	1201Hz	
Message Length	32 ms ± 3%	31.59MS	
Bits 38-22	All "0's"	17	
Bits 21-17	11101	11101	
Bits 16-7	Selectable	ok	
Bit 6	0	ø	
Bits 5-2 Primary	00001	00001	
Bits 5-2 Aux 1 P	00010	00010	
Bits 5-2 Aux 1 V	01010	01010	
Bits 5-2 Aux 2 P	00011	00011	
Bits 5-2 Aux 2 V	01011	01011	
Bits 5-2 Aux 3 P	00100	00100	
Bits 5-2 Aux 3 V	01100	01100	
Bits 5-2 Aux 4 P	00101	00101	
Bits 5-2 Aux 4 V	01101	01101	
Bit 1	1	Parity OK	

Conducted by: T. Lahaye

Witnessed by: _____

Date: 1/24/73

SYSTEM NO. 9

UNIT NO. 9

DATA SHEET III

TRANSMITTER PERFORMANCE TESTS

Parameter	Specification	Measured	Comment
Power output (high)	@18V 2 watts min	3.5W	
Power output (low)	@27V 10 ± 3 dB below high power level	HIGH 5.9W LOW .7W	
Spurious output	Greater than 50 dB below unmodulated output	High @18V 55dB Low 56dB	@27V 55dB 56dB
Modulation	± 5.5 kHz ± 10% FSK		407.37996 407.36905
Frequency	One frequency in 406-470 MHz band (407.375)		10.91 KHZ 407.374,50

Conducted by: T. Lalaye (CS)

Witnessed by: _____

Date: 1/24/73

ANTENNA EXAMINATION

Collapsible Quarterwave Monopole	(Yes)	(No)

Examined by: R. Goodin

Witnessed by: _____ (CS)

Date: 1/31/73

PHYSICAL CONFIGURATION

Conforms to Specification	(Yes)	(No)

Examined by: R. Goodin

Witnessed by: _____ (CS)

Date: 1/31/73

SYSTEM NO. 9

UNIT NO. 9

DATA SHEET IV

S/T BATTERY PACK

Parameter	Specification	Measured	Comment
Voltage	27 volt dc to 18 v dc	27.8 V	
Disable	18 volts dc max	16.95V	
External input	(Yes)	YES	
Battery Current	Mon. Mode 400 μa nominal	400μA	
	Xmt Mode 550 ma nominal	580MA	@ 27V

Conducted by: T. Takagi

Witnessed by: _____

Date 1/29/73

S/T ENVIRONMENTAL TEST

Parameter	Specification	Measured				
		-20°	0°	+30°	+50°	+71°
Power Output	2 watt min					
Spurious Level	>50 dB down					
Frequency	± 5 ppm from $f_{30°C}$					
Message Length	32 ms ± 3%					
Threshold	56.5 uv high 226 uv low					

Conducted by: _____

Witnessed by: _____

Date: _____

SYSTEM NO. 10

UNIT NO. 10

DATA SHEET I

PRIMARY DETECTOR PERFORMANCE TEST

Pulse Test — IRIMS Ref.

Amplifier Gain	Spec Level	Measured Level	Comments
High	56.5MV P-P	96dB	
Low	226MV P-P	84dB	

Tape Test

Amplifier Gain	Signal Source	Alarm Spec	Alarms Incurred
High	1 Man	2 min.	12
High	6 Men	4 min.	24
High	Heavy Rain	1 max.	0
High	Helicopter Hover	1 max.	0
High	Flyover 200'	0	0
High	Flyover 500'	0	0
High	Flyover 1000'	0	0

Conducted by: T. Lekays CA 093

Witnessed by: _____

Date: 1/24/73

SYSTEM NO. 10

UNIT NO. 10

DATA SHEET II

ALARM PULSE GENERATOR PERFORMANCE TEST

Sensor Input	Alarm	Switched 12 v	Alarm Rate	Comments
Primary	yes	yes	5 sec	
Aux 1 Personnel	"	"	"	
Aux 1 Vehicle	"	"	"	
Aux 2 Personnel	"	"	"	
Aux 2 Vehicle	"	"	"	
Aux 3 Personnel	"	"	"	
Aux 3 Vehicle	"	"	"	
Aux 4 Personnel	"	"	"	
Aux 4 Vehicle	"	"	"	
Primary, Aux1-4	"	"	1/sec	

Conducted by: T. Sakaye

Witnessed by: _____

Date: 4/24/73

SYSTEM NO. 10

UNIT NO. 10

DATA SHEET II (CONTINUED)

MESSAGE FORMAT PERFORMANCE TEST

Parameter	Specification	Measurement	Comment
Clock Rate	1200 pps ± 3%	1205 Hz	
Message Length	32 ms ± 3%	31.41	
Bits 38-22	All "0's"	17	
Bits 21-17	11101	11101	
Bits 16-7	Selectable	ok	
Bit 6	0	0	
Bits 5-2 Primary	00001	00001	
Bits 5-2 Aux 1 P	00010	00010	
Bits 5-2 Aux 1 V	01010	01010	
Bits 5-2 Aux 2 P	00011	00011	
Bits 5-2 Aux 2 V	01011	01011	
Bits 5-2 Aux 3 P	00100	00100	
Bits 5-2 Aux 3 V	01100	01100	
Bits 5-2 Aux 4 P	00101	00101	
Bits 5-2 Aux 4 V	01101	01101	
Bit 1	1	PARITY OK	

Conducted by: T. Schaye

Witnessed by: _____

Date: 1/24/73

SYSTEM NO. 10

UNIT NO. 10

DATA SHEET III

TRANSMITTER PERFORMANCE TESTS

Parameter	Specification	Measured	Comment
Power output (high)	@ 18V 2 watts min	3.6W	
Power output (low)	@ 27V 10 ± 3 dB below high power level	HIGH 6.0W Low 1.8W	
Spurious output	Greater than 50 dB below unmodulated output	@18 High 54dB Low 53dB	@27 55 dB 54dB
Modulation	± 5.5 kHz ± 10% FSK		407.38034 407.36921
Frequency	One frequency in 406-470 MHz band (407.375)		11.18 KHz 407.37480

Conducted by: T. Sakaye

Witnessed by: 093

Date: 1/24/73

ANTENNA EXAMINATION

Collapsible Quarterwave Monopole	(Yes)	(No)

Examined by: R. Goodman

Witnessed by: QA 093

Date: 1/31/73

PHYSICAL CONFIGURATION

Conforms to Specification	(Yes)	(No)

Examined by: R. Goodman

Witnessed by: C. 093

Date: 1/31/73

SYSTEM NO.

UNIT NO. 10

DATA SHEET IV

S/T BATTERY PACK

Parameter	Specification	Measured	Comment
Voltage	27 volt dc to 18 v dc	27.8 V	
Disable	18 volts dc max	16.7V	
External input	(Yes)	yes	
Battery Current	Mon. Mode 400 μa nominal	380μA	
	Xmt Mode 550 ma nominal	600 MA	@ 27V

Conducted by: T. Sakaye

Witnessed by: _____

Date 1/24/72

S/T ENVIRONMENTAL TEST

Parameter	Specification	Measured				
		-20°	0°	+30°	+50°	+71°
Power Output	2 watt min					
Spurious Level	>50 dB down					
Frequency	± 5 ppm from $f_{30°C}$					
Message Length	32 ms ± 3%					
Threshold	56.5 uv high 226 uv low					

Conducted by: _____

Witnessed by: _____

Date: _____

SYSTEM NO. 11

UNIT NO. 11

DATA SHEET I

PRIMARY DETECTOR PERFORMANCE TEST

Pulse Test — 1VRMS Ref.

Amplifier Gain	Spec Level	Measured Level	Comments
High	56.5 μV P-P	96 dB	
Low	226 μV P-P	84 dB	

Tape Test

Amplifier Gain	Signal Source	Alarm Spec	Alarms Incurred
High	1 Man	2 min.	12
High	6 Men	4 min.	92
High	Heavy Rain	1 max.	0
High	Helicopter Hover	1 max.	0
High	Flyover 200'	0	0
High	Flyover 500'	0	0
High	Flyover 1000'	0	0

Conducted by: T. Lakaye QA USA

Witnessed by: _____

Date: 1/24/73

SYSTEM NO. //

UNIT NO. //

DATA SHEET II

ALARM PULSE GENERATOR PERFORMANCE TEST

Sensor Input	Alarm	Switched 12 v	Alarm Rate	Comments
Primary	yes	yes	5.3 sec	
Aux 1 Personnel	"	"	"	
Aux 1 Vehicle	"	"	"	
Aux 2 Personnel	"	"	"	
Aux 2 Vehicle	"	"	"	
Aux 3 Personnel	"	"	"	
Aux 3 Vehicle	"	"	"	
Aux 4 Personnel	"	"	"	
Aux 4 Vehicle	"	"	"	
Primary, Aux1-4	"	"	1/sec	

Conducted by: T. Schaap QA

Witnessed by: _____

Date: 1/24/73

SYSTEM NO. 11

UNIT NO. 11

DATA SHEET II (CONTINUED)

MESSAGE FORMAT PERFORMANCE TEST

Parameter	Specification	Measurement	Comment
Clock Rate	1200 pps ± 3%	1198 Hz	
Message Length	32 ms ± 3%	31.66 MS	
Bits 38-22	All "0's"	17	
Bits 21-17	11101	11101	
Bits 16-7	Selectable	ok	
Bit 6	0	0	
Bits 5-2 Primary	00001	00001	
Bits 5-2 Aux 1 P	00010	00010	
Bits 5-2 Aux 1 V	01010	01010	
Bits 5-2 Aux 2 P	00011	00011	
Bits 5-2 Aux 2 V	01011	01011	
Bits 5-2 Aux 3 P	00100	00100	
Bits 5-2 Aux 3 V	01100	01100	
Bits 5-2 Aux 4 P	00101	00101	
Bits 5-2 Aux 4 V	01101	01101	
Bit 1	1	parity ok	

Conducted by: T. Takagi

Witnessed by: C

Date: 1/24/72

SYSTEM NO. 11

UNIT NO. 17

DATA SHEET III

TRANSMITTER PERFORMANCE TESTS

Parameter	Specification	Measured	Comment
Power output (high)	@18V 2 watts min	3.5 W	
Power output (low)	@27V 10 ± 3 dB below high power level	HIGH 5.9W LOW .73W	
Spurious output	Greater than 50 dB below unmodulated output	High 18V 55dB Low 50dB	27V 54dB 50dB
Modulation	± 5.5 kHz ± 10% FSK		407.380,46 407.36928
Frequency	One frequency in 406-470 MHz band (407.375)		1.1.18 KHZ 407.37467

Conducted by: T. Lakaye QA

Witnessed by: _____

Date: 1/24/72

ANTENNA EXAMINATION

Collapsible Quarterwave Monopole	(Yes)	(No)

Examined by: R. Goerlen QA

Witnessed by: _____

Date: 1/31/73

PHYSICAL CONFIGURATION

Conforms to Specification	(Yes)	(No)

Examined by: R. Goerlen QA

Witnessed by: _____

Date: 1/31/73

SYSTEM NO. 11

UNIT NO. 11

DATA SHEET IV

S/T BATTERY PACK

Parameter	Specification	Measured	Comment
Voltage	27 volt dc to 18 v dc	27.9 V	
Disable	18 volts dc max	16.8 V	
External input	(Yes)	yes	
Battery Current	Mon. Mode 400 μa nominal	400 μA	
	Xmt Mode 550 ma nominal	600 MA	@27V

Conducted by: T. LeBlanc

Witnessed by: _____

Date 1/24/73

S/T ENVIRONMENTAL TEST

Parameter	Specification	Measured				
		-20°	0°	+30°	+50°	+71°
Power Output	2 watt min					
Spurious Level	>50 dB down					
Frequency	± 5 ppm from $f_{30°C}$					
Message Length	32 ms ± 3%					
Threshold	56.5 uv high 226 uv low					

Conducted by: _____

Witnessed by: _____

Date: _____

SYSTEM NO. 12

UNIT NO. 2

DATA SHEET I

PRIMARY DETECTOR PERFORMANCE TEST

Pulse Test — 1V RMS Ref

Amplifier Gain	Spec Level	Measured Level	Comments
High	56.5 μV P-P	96dB	
Low	226 μV P-P	84dB	

Tape Test

Amplifier Gain	Signal Source	Alarm Spec	Alarms Incurred
High	1 Man	2 min.	12
High	6 Men	4 min.	25
High	Heavy Rain	1 max.	0
High	Helicopter Hover	1 max.	1
High	Flyover 200'	0	0
High	Flyover 500'	0	0
High	Flyover 1000'	0	0

Conducted by: F. Lukey

Witnessed by: QA 093

Date: 1-24-73

SYSTEM NO. 12

UNIT NO. 12

DATA SHEET II

ALARM PULSE GENERATOR PERFORMANCE TEST

Sensor Input	Alarm	Switched 12 v	Alarm Rate	Comments
Primary	yes	yes	5.3 sec	
Aux 1 Personnel	"	"	"	
Aux 1 Vehicle	"	"	"	
Aux 2 Personnel	"	"	"	
Aux 2 Vehicle	"	"	"	
Aux 3 Personnel	"	"	"	
Aux 3 Vehicle	"	"	"	
Aux 4 Personnel	"	"	"	
Aux 4 Vehicle	"	"	"	
Primary, Aux1-4	"	"	1/sec	

Conducted by: T. Lakeys

Witnessed by: [illegible]

Date: 1/24/73

SYSTEM NO. 12

UNIT NO. 12

DATA SHEET II (CONTINUED)

MESSAGE FORMAT PERFORMANCE TEST

Parameter	Specification	Measurement	Comment
Clock Rate	1200 pps ± 3%	1205 Hz	
Message Length	32 ms ± 3%	31.4 MS	
Bits 38-22	All "0's"	17	
Bits 21-17	11101	11101	
Bits 16-7	Selectable	ok	
Bit 6	0	0	
Bits 5-2 Primary	00001	00001	
Bits 5-2 Aux 1 P	00010	00010	
Bits 5-2 Aux 1 V	01010	01010	
Bits 5-2 Aux 2 P	00011	00011	
Bits 5-2 Aux 2 V	01011	01011	
Bits 5-2 Aux 3 P	00100	00100	
Bits 5-2 Aux 3 V	01100	01100	
Bits 5-2 Aux 4 P	00101	00101	
Bits 5-2 Aux 4 V	01101	01101	
Bit 1	1	Parity ok	

Conducted by: T. Hukaye QA

Witnessed by: _____

Date: 1/24/73

SYSTEM NO. 12

UNIT NO. 12

DATA SHEET III

TRANSMITTER PERFORMANCE TESTS

Parameter	Specification	Measured	Comment
Power output (high)	@ 18V 2 watts min	3.5W	
Power output (low)	@ 27V 10 ± 3 dB below high power level	HIGH 5.6W Low .74W	
Spurious output	Greater than 50 dB below unmodulated output	High 55dB Low 53dB	18V 55dB 27V 53dB
Modulation	± 5.5 kHz ± 10% FSK		407.38033 407.36918 11.15 KHZ
Frequency	One frequency in 406-470 MHz band (407.375)		407.37475

Conducted by: T. Lakaye

Witnessed by: C.A 093

Date: 1/24/73

ANTENNA EXAMINATION

Collapsible Quarterwave Monopole	(Yes)	(No)

Examined by: R. Jacobs

Witnessed by: C.A 093

Date: 1/31/73

PHYSICAL CONFIGURATION

Conforms to Specification	(Yes)	(No)

Examined by: R. Jacobs

Witnessed by: C.A 093

Date: 1/31/73

SYSTEM NO. 12

UNIT NO. 12

DATA SHEET IV

S/T BATTERY PACK

Parameter	Specification	Measured	Comment
Voltage	27 volt dc to 18 v dc	27.9V	
Disable	18 volts dc max	16.8V	
External input	(Yes)	yes	
Battery Current	Mon. Mode 400 μa nominal	450μA	
	Xmt Mode 550 ma nominal	660MA	@27V

Conducted by: T. Takagi QA

Witnessed by: _____

Date 1/24/73

S/T ENVIRONMENTAL TEST

Parameter	Specification	Measured				
		-20°	0°	+30°	+50°	+71°
Power Output	2 watt min					
Spurious Level	>50 dB down					
Frequency	± 5 ppm from $f_{30°C}$					
Message Length	32 ms ± 3%					
Threshold	56.5 uv high 226 uv low					

Conducted by: _____

Witnessed by: _____

Date: _____

SYSTEM NO. 13

UNIT NO. 36

DATA SHEET I

PRIMARY DETECTOR PERFORMANCE TEST

Pulse Test — IVEMS Ref.

Amplifier Gain	Spec Level	Measured Level	Comments
High	36.5μV P-P	96 dB	
Low	226μV P-P	84 dB	

Tape Test

Amplifier Gain	Signal Source	Alarm Spec	Alarms Incurred
High	1 Man	2 min.	11
High	6 Men	4 min.	32
High	Heavy Rain	1 max.	0
High	Helicopter Hover	1 max.	0
High	Flyover 200'	0	1
High	Flyover 500'	0	1
High	Flyover 1000'	0	1

Conducted by: T. Takagi

Witnessed by: USA 093

Date: 1/24/73

SYSTEM NO. /3

UNIT NO. /6

DATA SHEET II

ALARM PULSE GENERATOR PERFORMANCE TEST

Sensor Input	Alarm	Switched 12 v	Alarm Rate	Comments
Primary	yes	yes	5.3 sec	
Aux 1 Personnel	4	4	4	
Aux 1 Vehicle	1	1	1	
Aux 2 Personnel	1	1	1	
Aux 2 Vehicle	1	1	1	
Aux 3 Personnel	1	1	1	
Aux 3 Vehicle	1	1	1	
Aux 4 Personnel	1	1	1	
Aux 4 Vehicle	1	1	1	
Primary, Aux1-4	1	1	1/min	

Conducted by: T Lackey

Witnessed by: O.A [illegible]

Date: 4/24/73

SYSTEM NO. 13

UNIT NO. 6

DATA SHEET II (CONTINUED)

MESSAGE FORMAT PERFORMANCE TEST

Parameter	Specification	Measurement	Comment
Clock Rate	1200 pps ± 3%	1202Hz	
Message Length	32 ms ± 3%	31.57	
Bits 38-22	All "0's"	17	
Bits 21-17	11101	11101	
Bits 16-7	Selectable	ok	
Bit 6	0	0	
Bits 5-2 Primary	00001	00001	
Bits 5-2 Aux 1 P	00010	00010	
Bits 5-2 Aux 1 V	01010	01010	
Bits 5-2 Aux 2 P	00011	00011	
Bits 5-2 Aux 2 V	01011	01011	
Bits 5-2 Aux 3 P	00100	00100	
Bits 5-2 Aux 3 V	01100	01100	
Bits 5-2 Aux 4 P	00101	00101	
Bits 5-2 Aux 4 V	01101	01101	
Bit 1	1	PARITY OK	

Conducted by: T. Sekaya

Witnessed by: 04 CO3

Date: 1/24/72

SYSTEM NO. 13

UNIT NO. 13

DATA SHEET III

TRANSMITTER PERFORMANCE TESTS

Parameter	Specification	Measured	Comment
Power output (high)	@18V 2 watts min	3.7W	
Power output (low)	@27V 10 ± 3 dB below high power level	High 6.3W Low .75W	
Spurious output	Greater than 50 dB below unmodulated output	18V High 55dB Low 54dB	27V 53dB 54dB
Modulation	± 5.5 kHz ± 10% FSK		407.37997 407.36882
Frequency	One frequency in 406-470 MHz band (407.375)		11.15 KHz 407.37439

Conducted by: T. Lakaye

Witnessed by: _____

Date: 1/24/73

ANTENNA EXAMINATION

Collapsible Quarterwave Monopole	(Yes)	(No)

Examined by: R. Goodin

Witnessed by: GA 093

Date: 1/31/73

PHYSICAL CONFIGURATION

Conforms to Specification	(Yes)	(No)

Examined by: R. Goodin

Witnessed by: GA 093

Date: 1/31/73

SYSTEM NO.

UNIT NO. 13

DATA SHEET IV

S/T BATTERY PACK

Parameter	Specification	Measured	Comment
Voltage	27 volt dc to 18 v dc	27.7 V	
Disable	18 volts dc max	16.8V	
External input	(Yes)	yes	
Battery Current	Mon. Mode 400 μa nominal	440μA	
	Xmt Mode 550 ma nominal	630MA	@ 27V

Conducted by: I Schaye

Witnessed by: _____

Date 1/24/73

S/T ENVIRONMENTAL TEST

Parameter	Specification	Measured				
		-20°	0°	+30°	+50°	+71°
Power Output	2 watt min					
Spurious Level	>50 dB down					
Frequency	± 5 ppm from $f_{30°C}$					
Message Length	32 ms ± 3%					
Threshold	56.5 uv high 226 uv low					

Conducted by: _____

Witnessed by: _____

Date: _____

SYSTEM NO. 14

UNIT NO. 14

DATA SHEET I

PRIMARY DETECTOR PERFORMANCE TEST

Pulse Test 1V RMS Ref.

Amplifier Gain	Spec Level	Measured Level	Comments
High	56.5μV P-P	96dB	
Low	226μV P-P	84dB	

Tape Test

Amplifier Gain	Signal Source	Alarm Spec	Alarms Incurred
High	1 Man	2 min.	11
High	6 Men	4 min.	22
High	Heavy Rain	1 max.	0
High	Helicopter Hover	1 max.	0
High	Flyover 200'	0	0
High	Flyover 500'	0	0
High	Flyover 1000'	0	0

Conducted by: T Takaye 193

Witnessed by: _____

Date: 1/24/73

SYSTEM NO. 14

UNIT NO. 14

DATA SHEET II

ALARM PULSE GENERATOR PERFORMANCE TEST

Sensor Input	Alarm	Switched 12 v	Alarm Rate	Comments
Primary	yes	yes	1.8 sec	
Aux 1 Personnel	"	"	"	
Aux 1 Vehicle	"	"	"	
Aux 2 Personnel	"	"	"	
Aux 2 Vehicle	"	"	"	
Aux 3 Personnel	"	"	"	
Aux 3 Vehicle	"	"	"	
Aux 4 Personnel	"	"	"	
Aux 4 Vehicle	"	"	"	
Primary, Aux1-4	"	"	1 sec	

Conducted by: T Takaya 093

Witnessed by: _____

Date: 1/24/73

SYSTEM NO. 14

UNIT NO. 14

DATA SHEET II (CONTINUED)

MESSAGE FORMAT PERFORMANCE TEST

Parameter	Specification	Measurement	Comment
Clock Rate	1200 pps ± 3%	1204Hz	
Message Length	32 ms ± 3%	31.54	
Bits 38-22	All "0's"	17	
Bits 21-17	11101	11101	
Bits 16-7	Selectable	ok	
Bit 6	0	0	
Bits 5-2 Primary	00001	00001	
Bits 5-2 Aux 1 P	00010	00010	
Bits 5-2 Aux 1 V	01010	01010	
Bits 5-2 Aux 2 P	00011	00011	
Bits 5-2 Aux 2 V	01011	01011	
Bits 5-2 Aux 3 P	00100	00100	
Bits 5-2 Aux 3 V	01100	01100	
Bits 5-2 Aux 4 P	00101	00101	
Bits 5-2 Aux 4 V	01101	01101	
Bit 1	1	Parity OK	

Conducted by: T. Lahaye

Witnessed by: 093

Date: 1/24/73

SYSTEM NO. 14

UNIT NO. 14

DATA SHEET III

TRANSMITTER PERFORMANCE TESTS

Parameter	Specification	Measured	Comment
Power output (high)	@ 18V 2 watts min	3.3 w	
Power output (low)	@ 27V 10 ± 3 dB below high power level	HIGH 5.4W LOW .7	
Spurious output	Greater than 50 dB below unmodulated output	18V High 56dB Low 53dB	27V 55dB 52dB
Modulation	± 5.5 kHz ± 10% FSK		407.37999 407.36903
Frequency	One frequency in 406-470 MHz band (407.375)		1.096 KHz 407.37451

Conducted by: T. Sakaye

Witnessed by: _____ 097

Date: 1/24/73

ANTENNA EXAMINATION

Collapsible Quarterwave Monopole	(Yes)	(No)

Examined by: R. Gordon

Witnessed by: _____ 097

Date: 1/31/73

PHYSICAL CONFIGURATION

Conforms to Specification	(Yes)	(No)

Examined by: R. Gordon

Witnessed by: _____ 093

Date: 1/31/73

SYSTEM NO. 14

UNIT NO. 14

DATA SHEET IV

S/T BATTERY PACK

Parameter	Specification	Measured	Comment
Voltage	27 volt dc to 18 v dc	27.9V	
Disable	18 volts dc max	16.7	
External input	(Yes)	Yes	
Battery Current	Mon. Mode 400 μa nominal	390 μA	
	Xmt Mode 550 ma nominal	570 MA	@ 27V

Conducted by: T Lahaye

Witnessed by: 093

Date 1/24/73

S/T ENVIRONMENTAL TEST

Parameter	Specification	Measured				
		-20°	0°	+30°	+50°	+71°
Power Output	2 watt min					
Spurious Level	>50 dB down					
Frequency	± 5 ppm from $f_{30°C}$					
Message Length	32 ms ± 3%					
Threshold	56.5 uv high 226 uv low					

Conducted by: _____

Witnessed by: _____

Date: _____

SYSTEM NO. 15

UNIT NO. 15

DATA SHEET I

PRIMARY DETECTOR PERFORMANCE TEST

Pulse Test — 1V RMS Ref

Amplifier Gain	Spec Level	Measured Level	Comments
High	56.5μV P-P	96dB	
Low	226μV P-P	84dB	

Tape Test

Amplifier Gain	Signal Source	Alarm Spec	Alarms Incurred
High	1 Man	2 min.	12
High	6 Men	4 min.	23
High	Heavy Rain	1 max.	0
High	Helicopter Hover	1 max.	0
High	Flyover 200'	0	0
High	Flyover 500'	0	0
High	Flyover 1000'	0	0

Conducted by: T. Tokoyo

Witnessed by: [illegible]

Date: 1/24/73

SYSTEM NO. 15

UNIT NO. 15

DATA SHEET II

ALARM PULSE GENERATOR PERFORMANCE TEST

Sensor Input	Alarm	Switched 12 v	Alarm Rate	Comments
Primary	yes	yes	4.9 sec	
Aux 1 Personnel	"	"	"	
Aux 1 Vehicle	"	"	"	
Aux 2 Personnel	"	"	"	
Aux 2 Vehicle	"	"	"	
Aux 3 Personnel	"	"	"	
Aux 3 Vehicle	"	"	"	
Aux 4 Personnel	"	"	"	
Aux 4 Vehicle	"	"	"	
Primary, Auxl-4	"	"	1/sec	

Conducted by: T. Lahaye

Witnessed by: 093

Date: 1/24/73

SYSTEM NO. 15

UNIT NO. 15

DATA SHEET II (CONTINUED)

MESSAGE FORMAT PERFORMANCE TEST

Parameter	Specification	Measurement	Comment
Clock Rate	1200 pps ± 3%	1202 Hz	
Message Length	32 ms ± 3%	31.54	
Bits 38-22	All "0's"	17	
Bits 21-17	11101	11101	
Bits 16-7	Selectable	C	
Bit 6	0	0	
Bits 5-2 Primary	00001	00001	
Bits 5-2 Aux 1 P	00010	00010	
Bits 5-2 Aux 1 V	01010	01010	
Bits 5-2 Aux 2 P	00011	00011	
Bits 5-2 Aux 2 V	01011	01011	
Bits 5-2 Aux 3 P	00100	00100	
Bits 5-2 Aux 3 V	01100	01100	
Bits 5-2 Aux 4 P	00101	00101	
Bits 5-2 Aux 4 V	01101	01101	
Bit 1	1	Parity OK	

Conducted by: T. Lackey

Witnessed by: [illegible]

Date: 1/24/73

SYSTEM NO. 15

UNIT NO. 15

DATA SHEET III

TRANSMITTER PERFORMANCE TESTS

Parameter	Specification	Measured	Comment
Power output (high)	@180 2 watts min	3.4W	
Power output (low)	@270 10 ± 3 dB below high power level	HIGH 5.6W LOW .71W	
Spurious output	Greater than 50 dB below unmodulated output	180 High 54dB Low 52dB	270 52dB 50dB
Modulation	± 5.5 kHz ± 10% FSK		407.38019 407.36906 11.13 KHz
Frequency	One frequency in 406-470 MHz band (407.375)		407.37462

Conducted by: T. Lahaye

Witnessed by: ________

Date: 1/24/73

ANTENNA EXAMINATION

Collapsible Quarterwave Monopole	(Yes) ✓	(No)

Examined by: R. Goodl

Witnessed by: ________

Date: 1/31/73

PHYSICAL CONFIGURATION

Conforms to Specification	(Yes) ✓	(No)

Examined by: R. Goodl

Witnessed by: ________

Date: 1/31/73

SYSTEM NO. 15

UNIT NO. 15

DATA SHEET IV

S/T BATTERY PACK

Parameter	Specification	Measured	Comment
Voltage	27 volt dc to 18 v dc	27.9V	
Disable	18 volts dc max	16.8V	
External input	(Yes)	yes	
Battery Current	Mon. Mode 400 μa nominal	370μA	
	Xmt Mode 550 ma nominal	550MA	@27V

Conducted by: T Lekaye

Witnessed by: _____

Date 1/25/73

S/T ENVIRONMENTAL TEST

Parameter	Specification	Measured				
		-20°	0°	+30°	+50°	+71°
Power Output	2 watt min					
Spurious Level	>50 dB down					
Frequency	± 5 ppm from $f_{30°C}$					
Message Length	32 ms ± 3%					
Threshold	56.5 uv high 226 uv low					

Conducted by: _____

Witnessed by: _____

Date: _____

SYSTEM NO. 116

UNIT NO. 8

DATA SHEET I

PRIMARY DETECTOR PERFORMANCE TEST

Pulse Test 2.8V P-P Ref

Amplifier Gain	Spec Level	Measured Level	Comments
High	56.5μV P-P	96dB	
Low	226μV P-P	84dB	

Tape Test

Amplifier Gain	Signal Source	Alarm Spec	Alarms Incurred
High	1 Man	2 min.	12
High	6 Men	4 min.	24
High	Heavy Rain	1 max.	0
High	Helicopter Hover	1 max.	0
High	Flyover 200'	0	0
High	Flyover 500'	0	0
High	Flyover 1000'	0	0

Conducted by: T. Lahaye

Witnessed by: 093

Date: 1/23/72

SYSTEM NO. #16

UNIT NO. 8

DATA SHEET II

ALARM PULSE GENERATOR PERFORMANCE TEST

Sensor Input	Alarm	Switched 12 v	Alarm Rate	Comments
Primary	yes	yes	5 sec	
Aux 1 Personnel	"	"	"	
Aux 1 Vehicle	"	"	"	
Aux 2 Personnel	"	"	"	
Aux 2 Vehicle	"	"	"	
Aux 3 Personnel	"	"	"	
Aux 3 Vehicle	"	"	"	
Aux 4 Personnel	"	"	"	
Aux 4 Vehicle	"	"	"	
Primary, Auxl-4	"	"	1/sec	

Conducted by: T. Lakoye

Witnessed by: 093

Date: 1/23/73

SYSTEM NO. 16

UNIT NO. 8

DATA SHEET II (CONTINUED)

MESSAGE FORMAT PERFORMANCE TEST

Parameter	Specification	Measurement	Comment
Clock Rate	1200 pps ± 3%	1202 Hz	
Message Length	32 ms ± 3%	31.50	
Bits 38-22	All "0's"	17	
Bits 21-17	11101	11101	
Bits 16-7	Selectable	ok	
Bit 6	0	0	
Bits 5-2 Primary	00001	00001	
Bits 5-2 Aux 1 P	00010	00010	
Bits 5-2 Aux 1 V	01010	01010	
Bits 5-2 Aux 2 P	00011	00011	
Bits 5-2 Aux 2 V	01011	01011	
Bits 5-2 Aux 3 P	00100	00100	
Bits 5-2 Aux 3 V	01100	01100	
Bits 5-2 Aux 4 P	00101	00101	
Bits 5-2 Aux 4 V	01101	01101	
Bit 1	1	parity ok	

Conducted by: T. Tokoyo

Witnessed by: _____

Date: 1/23/73

SYSTEM NO. F16

UNIT NO. 8

DATA SHEET III

TRANSMITTER PERFORMANCE TESTS

Parameter	Specification	Measured	Comment
Power output (high)	2 watts min @ 18V	3.5W	
Power output (low)	10 ± 3 dB below high power level @ 27V	HIGH 3.4W LOW .62	
Spurious output	Greater than 50 dB below unmodulated output	High 54dB @18V Low 58dB	@27V 51dB 58dB
Modulation	± 5.5 kHz ± 10% FSK		407.38030 407.36920
Frequency	One frequency in 406-470 MHz band (407.375)		11.10 KHZ 407.37475

Conducted by: T. Takaye

Witnessed by: _____

Date: 1/24/73

ANTENNA EXAMINATION

Collapsible Quarterwave Monopole	(Yes)	(No)

Examined by: R. Goodeen

Witnessed by: _____

Date: 1/31/73

PHYSICAL CONFIGURATION

Conforms to Specification	(Yes)	(No)

Examined by: R. Goodeen

Witnessed by: _____

Date: 1/31/73

SYSTEM NO. 16

UNIT NO. 8

DATA SHEET IV

S/T BATTERY PACK

Parameter	Specification	Measured	Comment
Voltage	27 volt dc to 18 v dc	27.9V	
Disable	18 volts dc max	16.7V	
External input	(Yes)	yes	
Battery Current	Mon. Mode 400 μa nominal	430μA	
	Xmt Mode 550 ma nominal	580 MA	@27V

Conducted by: T Salaye

Witnessed by: _____

Date 1/23/73

S/T ENVIRONMENTAL TEST

Parameter	Specification	Measured				
		-20°	0°	+30°	+50°	+71°
Power Output	2 watt min					
Spurious Level	>50 dB down					
Frequency	± 5 ppm from $f_{30°C}$					
Message Length	32 ms ± 3%					
Threshold	56.5 uv high 226 uv low					

Conducted by: _____

Witnessed by: _____

Date: _____

SYSTEM NO.

DATA SHEET V

SENSITIVITY AND BIT ERROR RATE TEST

Input Signal Strength = -105 dBm

Error #	Message Input	Error Message Printed
1		NO INCORRECT MESSAGES PRINTED
2		
3		
4		
5		
6	MISSING MESSAGES	(217 MESSAGES SENT)
7		
8		

Conducted by: T. Lahaye

Witnessed by: J. J. Millette

Date: 2/9/73

SPURIOUS FREE DYNAMIC RANGE TEST

Input Signal Strength for Proper Decoding = -110 dBm

Input Signal Strength for Spurious Response Test = -50 dBm

Input Frequency MHz	Spurious Response Exceeding Spec.	Input Signal Strength dBm
135MHz - 470MHz	NO SPURIOUS RESPONSE EXCEEDING SPEC.	

Conducted by: T. Lahaye

Witnessed by: J. J. Millette

Date: 2/9/73

SYSTEM NO. /

DATA SHEET VI

STRONG SIGNAL HANDLING TEST

Input Signal Level	Signal Output	
	Satisfactory	Unsatisfactory
-105 dBm Signal	yes	
-30 dBm Signal	yes.	

Conducted by: T. Lukaye

Witnessed by: L. J. Militello

Date: 2/9/73

RECEIVER IF SELECTIVITY TEST

Bandwidth	Low Frequency	High Frequency	Difference
3 dB Bandwidth	407.359,374	407.391,659	32.1 KHz
60 dB Bandwidth	407.335,095	407.409,353	74.25KHz

Conducted by: T. Lukaye

Witnessed by: L. J. Militello

Date: 2/5/73

RECEIVER FREQUENCY BAND

RF Input Frequency = 407.375 MHz

Conducted by: T. Lukaye

Witnessed by: L. J. Militello

Date: 2/5/73

DATA SHEET VII SYSTEM NO. /

SQUELCH CONTROL TEST

Squelch Control Operating:	Yes X	No ___

Conducted by: T. Lukaya

Witnessed by: A. J. Militello

Date: 2/9/72

ADDRESS COMPARISON TEST

Barker Code Input	Decode Operation	
	Yes	No
11101	X	
(11111) modified barker code		X

Conducted by: T. Lukaya

Witnessed by: A. J. Militello

Date: 2/9/72

POWER CONSUMPTION AND VOLTAGE RANGE TEST

Voltage Input	Correct Operation	Incorrect Operation
27	yes	
18	yes	

WITH CONVERTER CONNECTED

Operating Mode	Current Drain	Duty Factor	Peak Drain	Spec
Standby	680 μA	100%	680 μA	[redacted]
.1% Duty Cycle Decode/Relay	30 MA	50%	60 MA	[redacted]

Conducted by: T. Lukaya

Witnessed by: A. J. Militello

Date: 2/9/72

6 MO = 4380 HRS

AMP HRS CONTINUOUS = 680 μA x 8760 HRS = 2.97 AH

AMP HRS. PULSE = 60 MA x 4380 HRS x .1% DC = .260 AMP HRS.

AMP HRS TOTAL FOR 6 MO = 3.23 AMP HRS

BATTERY 9.0 AMP HRS @ 25°C

SYSTEM NO. /

DATA SHEET VIII

R/I PHYSICAL CONFIGURATION

Conforms to Specification	(Yes)	(No)

Conducted by: R. Goodlin

Witnessed by: L. J. Millette

Date: 2/9/73

R/I ANTENNA EXAMINATION

Collapsible Quarterwave Monopole	(Yes)	(No)

Conducted by: R. Goodlin

Witnessed by: L. J. Millette

Date: 2/9/73

R/I ENVIRONMENTAL TEST

Parameter	Spec	Measured				
		-20°C	0°C	30°C	50°C	71°C
Frequency	± 5 ppm from 30°C	407.37 84	407.37 612	407.35 53	407.373 05	407.374 79
Sensitivity	-105 dBm	-110	-110	-109	-109	-106
Message Out	Same as msg in	yes	yes	yes	yes	yes

Conducted by: T. Lahaye

Witnessed by: L. J. Millette

Date: 2/5/73

SYSTEM NO. /

DATA SHEET IX

OUTPUT FORMAT TO CSD

	Correct	Incorrect
Data Signal Format	yes	
Message Gate	yes	
Clock	yes	
Status Line	yes	

Conducted by: T. Lakaye

Witnessed by: L J Mellott

Date: 2/10/73

R/I to Digital Converter Output

	Correct	Incorrect
Data Signal Format	ok	
Message Gate	ok	
Clock	ok	
Status Line	NOT USED	
Logic Level (0 - +12v)	0-+12 VOLTS DURING DATA TRANSMISSION	

Conducted by: T. Lakaye

Witnessed by: L J Mellott

Date: 2/9/73

DATA SHEET X

TEST	SATISFACTORY	UNSATISFACTORY	COMMENT
Detection Level Tests	✓		
Auxiliary Alarm Messages	✓		See attached Printout
Qualification Level Tests	✓		See attached Printout
Processed Output Message	✓		"
Processor Algorithm Tests	✓		"
Detection Mode Return	✓		
Self Test Message	✓		

Conducted by: A.O. Schwager
QA 093

Witnessed by: _____

Date: 5 FEB 73

DATA SHEET XI

Valid Non-Processed Message Check

Message #	Correct	Incorrect
1	✓	
2	✓	
3	✓	
4	✓	
5	✓	
6	✓	
7	✓	
8	✓	
9	✓	
10	✓	
11	✓	
12	✓	
13	✓	
14	✓	
15	✓	
16	✓	
17	✓	
18	✓	
19	✓	
20	✓	
21	✓	
22	✓	
23	✓	
24	✓	
25	✓	
26	✓	
27	✓	
28	✓	
29	✓	
30	✓	
31	✓	
32	✓	

Message #	Correct	Incorrect
33	✓	
34	✓	
35	✓	
36	✓	
37	✓	
38	✓	
39	✓	
40	✓	
41	✓	
42	✓	
43	✓	
44	✓	
45	✓	
46	✓	
47	✓	
48	✓	
49	✓	
50	✓	
51	✓	
52	✓	
53	✓	
54	✓	
55	✓	
56	✓	
57	✓	
58	✓	
59	✓	
60	✓	
61	✓	
62	✓	
63	✓	
64	✓	

Conducted by: R. H. Bell Witnessed by: £60 093 QA Date: 1/31/73

DATA SHEET XII

Valid Processed Message Check

Message #	Correct	Incorrect	Comment
1	✓		
2	✓		
3	✓		
4	✓		
5	✓		
6	✓		
7	✓		
8	✓		
9	✓		
10	✓		
11	✓		
12	✓		
13	✓		
14	✓		
15	✓		
16	✓		
17	✓		
18	✓		
19	✓		
20	✓		
21	✓		
22	✓		
23	✓		
24	✓		
25	✓		
26	✓		
27	✓		
28	✓		
29	✓		
30	✓		
31	✓		
32	✓		

Conducted by: R. H. Bell Witnessed by: 093 Date: 1/31/73

DATA SHEET XIII

Invalid Message Check

Word Inputed	Parity Error Light (Yes/No)	Printer Output (Yes/No)
Even Parity	Yes	No

Conducted by: R. H. Bell

Witnessed by: [illegible]

Date: 1/31/73

Message Priority Check

Input Sequence	Required Printer Output	Actual Printer Output
$S_1 - S_2$	S_1	S_1
A-S	A	A
P-S	P	P
S-A	S (line 1) then A	S (line 1) then A
A_1-A_2	A_1	A_1
P-A	P then A	P then A
S-P	S (line 1) then P	S (line 1) then P
A-P	A then P	A then P

Conducted by: R. H. Bell

Witnessed by: [illegible]

Date: 1/31/73

SYSTEM NO. 1

DATA SHEET XVII

SYSTEM DEPLOYMENT DEMONSTRATION

Unit #	Field Setting	Operation Checked
S/T - 1	09 1 0	09 1 0
2	09 1 1	09 1 1
3	09 1 2	09 1 2
4	09 1 3	09 1 3
5	09 1 4	09 1 4
6	09 1 5	09 1 5
7	09 1 6	09 1 6
8	09 2 0	09 2 0
9	09 2 1	09 2 1
10	09 2 2	09 2 2
11	09 2 3	09 2 3
12	09 2 4	09 2 4
13	09 2 5	09 2 5
14	09 2 6	09 2 6
15	09 1 7	09 1 7
R/I	09	09
Preprocessor	—	yes
Digital Converter	—	yes

Conducted By: T. Lakoye

Witnessed By: L. J. Militello

Date: 2/8/73

SYSTEM NO. 1

DATA SHEET XVIII

OPERATIONAL DEMONSTRATION

Baseline Data	Printer Output
Array #1	Array # 1
Direction 1	Direction 1
Speed ≈ 1/2 ms	Speed 0.5 m/sec
# in Column 3	Image ** -------
Test #2	
Array #1	Array # 1
Direction 0	Direction 0
Speed ≈ 1 m/s	Speed 1.2 m/sec
# in Column 2	Image *-------
Test #3	
Array #2	Array # 2
Direction 1	Direction 1
Speed ≈ 1/2 ms	Speed 0.8 m/sec
# in Column 3	Image *-------
Test #4	
Array #2	Array # 2
Direction 0	Direction 0
Speed ≈ 1 m/s	Speed 0.8 - 1.2 m/sec
# in Column 3	Image ** -------

Conducted by: A. Llamas

Witnessed by: L. J. Mitchell

Date: 7 Feb 03

SYSTEM NO. 1

DATA SHEET XIX

FALSE ALARM DEMONSTRATION

Date Begun 2/7/73 Date Terminated 2/8/73

Time Begun 21:24:12 Time Terminated 08:[illegible]:58

False Alarm #	Date	Time	Comment
1	2/8/73	02:55:34	Activity near or in corporation yard. Not directly observed.
2	2/8/73	06:30:58	Same as #1. Personnel or vehicle motion probably not [illegible].

Conducted by: [illegible signature]

Witnessed by: [illegible signature]

Date: 8 Feb 73

DATA SHEET XIV
System RF Link Test

S/T #	Transmission	Printout
1	9 11	9 11
2	9 12	912
3	9 13	913
4	914	914
5	915	915
6	916	916
7	917	917
8	920	920
9	921	921
10	922	922
11	923	923
12	924	924
13	925	925
14	926	926
15	927	927

Conducted by: T. Lalaya Witnessed by: L. Whittle Date: 2/7/73

Self Test Check

S/T #	Self Test Readout
1	9 11 11000
2	9 12 11000
3	9 13 11000
4	9 14 11000
5	9 15 11000
6	916 11000
7	917 11000
8	920 11000
9	921 11000
10	922 11000
11	923 11000
12	924 11000
13	925 11000
14	926 11000
15	927 11000

Conducted by: T. Lalaya Witnessed by: L. Whittle Date: 2/8/73

DATA SHEET XV

MULTIPLE SIGNAL HANDLING

S/T No.	Digital Converter Printout
1	yes
2	yes
3	yes
4	yes
5	yes
6	yes
7	yes
8	yes
9	yes
10	yes
11	yes
12	yes
13	yes
14	yes
15	yes

Conducted By: R Jordan Witnessed By: J. Militello Date 2/6/23

SYSTEM ERROR RATE

Error	MSG Programmed	MSG Received
1		
2		
3	No errors	
4		
5		
6		
7		
8		

Conducted By: R Jordan Witnessed By: J Militello Date: 2/6/23

UNCLASSIFIED

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

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WARS UHF FINAL REPORT

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)

Final Report June 1972 - February 1973

5. AUTHOR(S) (First name, middle initial, last name)

R. Goodwin

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F30602-69-C-0268 Job Order No. 681E0502	None
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10. DISTRIBUTION STATEMENT

Distribution limited to US Gov't agencies only; April 1973; test and evaluation. Other requests for this document must be referred to RADC (OCDS), GAFB, NY 13441.

11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
None	Rome Air Development Center (OCDS) Griffiss Air Force Base, New York 13441

13. ABSTRACT

This final report summarites the work performed under Change E of the Wide Area Remote Surveillance (WARS) contract F30602-69-C-0268. This phase of the contract was primarily concerned with re-design of the RF link portion of the WARS equipment for UHF operation, incorporation of sensor data processor/print out equipment, design compatibility with other Air Force systems and fabrication/delivery of one WARS equipment model system for further studies and tests by RADC. Included in this report are: description of the WARS concept, equipment design and development, equipment test program, measured system performance, summary of reports and visits, and recommendations for future activity. Previous phases of the contract are described in the following interim reports: (1) "Wide Area Remote Surveillance"(U), RADC-TR-69-328, dated February 1970, Secret; and (2) Addendum #1, dated December 1970, Secret.

DD FORM 1 NOV 1473

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Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Base Defense						
Intrusion Detection						
Ground Sensors						
Seismic Detection						
Sensor Arrays						
Sensor Data Processing						
Sensor Data Communications						

RAC--Griffiss AFB NY