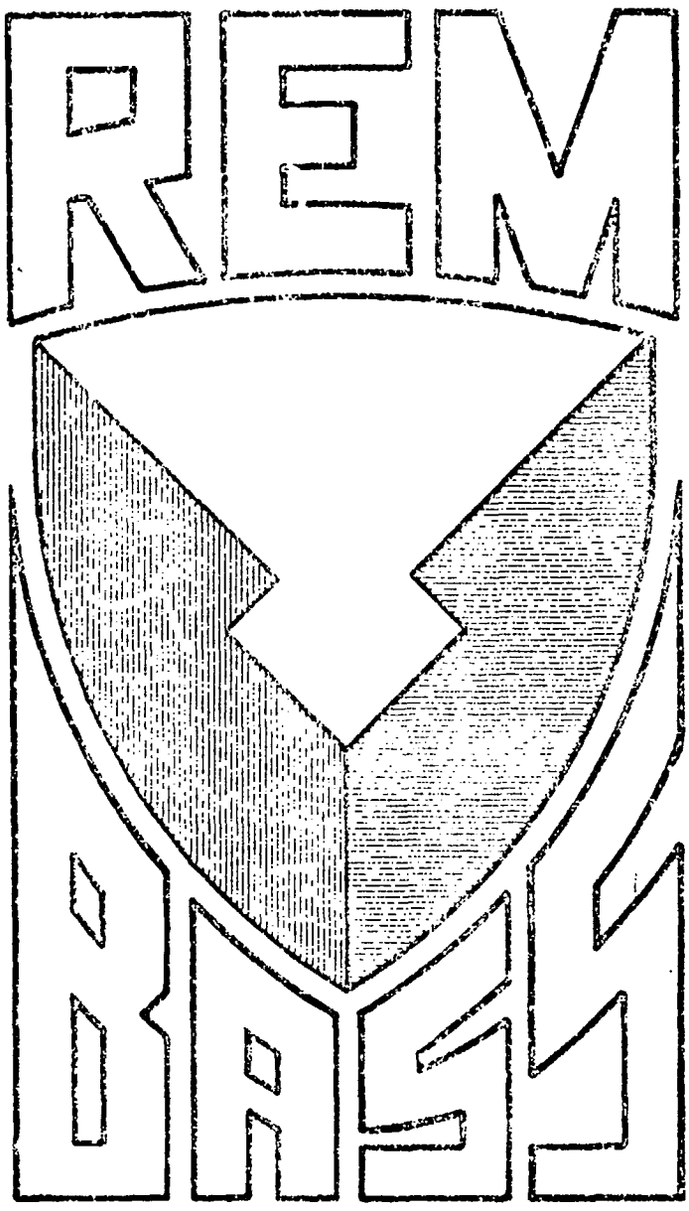
REMBASS PRELIMINARY SYSTEM DESCRIPTION

Office of the Project Manager REMBASS
Fort Monmouth, New Jersey

1 October 1973



PRELIMINARY SYSTEM DESCRIPTION

1 OCTOBER 1973

TABLE OF CONTENTS

Chapter 1 INTRODUCTION

Chapter 2 REQUIREMENTS

Chapter 3 SYSTEM FUNCTION
- 3-1 Introduction
- 3-2 Sensor Subsystem
- 3-3 Data Transmission Subsystem
- 3-4 Sensor Reporting Unit Subsystem
- 3-5 Delivery Subsystem
- 3-6 Location Subsystem
- 3-7 Power Subsystem

Chapter 4 SENSORS
- 4-1 Introduction
- 4-2 Seismic Transducer
- 4-3 Magnetic Transducer
- 4-4 Electromagnetic Transducer
- 4-5 Acoustic Transducer
- 4-6 Seismic-Magnetic-Acoustic Transducer
- 4-7 Infrared Transducer
- 4-8 Imaging Transducer
- 4-9 Seismic-Acoustic Transducer
- 4-10 Variable Resistance Transducer
- 4-11 Magnetic-Strain Transducer
- 4-12 Strain Transducer
- 4-13 Encoder
- 4-14 Transmitter
- 4-15 Antenna (Non-Commandable)
- 4-16 Chassis Electronics
- 4-17 Case
- 4-18 Battery
- 4-19 Wire Link
- 4-20 Classifier
- 4-21 Receiver
- 4-22 Decoder
- 4-23 Antenna
- 4-24 Diplexer
- 4-25 Hand-Emplaced Low Power Non-Commandable Seismic Sensor (HE LP NC SS)
- 4-26 Hand-Emplaced Low Power Non-Commandable Magnetic Sensor (HE LP NC MS)
- 4-27 Hand-Emplaced Low Power Non-Commandable Electromagnetic Sensor (HE LP NC ES)
- 4-28 Hand-Emplaced Low Power Non-Commandable Acoustic Sensor (HE LP NC AS)
- 4-29 Hand-Emplaced High Power Non-Commandable Seismic Sensor (HE HP NC SS)
- 4-30 Hand-Emplaced High Power Non-Commandable Magnetic Sensor (HE HP NC MS)
- 4-31 Hand-Emplaced High Power Non-Commandable Seismic-Magnetic-Acoustic Sensor (HE HP NC S-M-AS)
- 4-32 Hand-Emplaced High Power Commandable Acoustic Sensor (HE HP C AS)

4-33 Hand-Emplaced High Power Commandable Seismic-Magnetic-Acoustic Sensor (HE HP C S-M-AS)
4-34 Hand-Emplaced High Power Commandable Infrared Sensor (HE HP C IRS)
4-35 Hand-Emplaced High Power Commandable Imaging Sensor (HE HP C IS)
4-36 Air-Emplaced High Power Non-Commandable Seismic Sensor (AE HP NC SS)
4-37 Air-Emplaced High Power Non-Commandable Seismic-Acoustic Sensor (AE HP NC S-AS)
4-38 Air-Emplaced High Power Commandable Acoustic Sensor (AE HP C AS)
4-39 Ballistic-Emplaced High Power Non-Commandable Seismic Sensor (BE HP NC SS)
4-40 Variable Resistance Line Sensor (VRLS)
4-41 Magnetic-Strain Line Sensor (M-S LS)
4-42 Strain Line Sensor (SLS)

Chapter 5 DATA TRANSMISSION
5-1 Introduction
5-2 Data Transmission Parameters
5-3 Sensor Control Module
5-4 Radio Relays
5-5 Hand-Emplaced Digital Single Channel Radio Relay (HE D SC RR)
5-6 Hand-Emplaced, Digital Multiple Channel Relay (HE D MC RR)
5-7 Hand-Emplaced Digital-Analog Single Channel Radio Relay (HE D-A SC RR)
5-8 Air-Emplaced Digital Signal Channel Radio Relay (AE D SC RR)
5-9 Ballistic-Emplaced Digital Single Channel Radio Relay (BE D SC RR)
5-10 Universal Control Receiver (UCR)
5-11 Universal Control Transmitter (UCR/T)

Chapter 6 SENSOR REPORTING UNIT (SRU)
6-1 Introduction
6-2 Long Range Reconnaissance Patrol (LRRP) SRU
6-3 Armored Cavalry Squadron (ACS) SRU
6-4 Battalion (BN) SRU
6-5 Artillery Battalion (ARTY BN) SRU
6-6 Brigade (BDE) SRU
6-7 Division (DIV) SRU
6-8 Interface Box
6-9 Central Processing Unit (CPU)
6-10 Recorder
6-11 Spectral Display
6-12 Map Situation Display
6-13 Page Printer
6-14 Image Display

Chapter 7 DELIVERY

Chapter 8 LOCATION

Chapter 9 POWER

APPENDIX A REFERENCES

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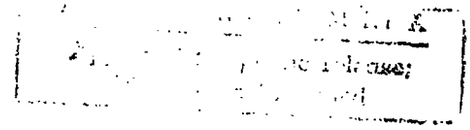

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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

Establishes an initial system definition based on discussions of SAGE, TOD, TOA and experience with DSPG Phase III and SEAOPSS.

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SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

CHAPTER 1 (U)

INTRODUCTION (U)

1-1 (U) This preliminary Remotely Monitored Battlefield Sensor System (REMBASS) System Description establishes an initial system definition. The techniques and hardware components selected are based on the discussions of the REMBASS Systems Advisory Group-Engineering (SAGE) and the results of the Trade-Off Determination (TOD), the Trade-Off Analysis (TOA), and the Best Technical Approach (BTA). In addition, information provided by REMBASS (and other) research and development tasks, and the experience with the Defense Special Projects Group (DSPG) Phase III sensor system and US Army Southeast Asia Operational Sensor System (SEAOPSS) were considered in the selection of the initial system definition.

1-2 (U) The system definition will be refined, based on the results of on-going research and development tasks, continuing systems engineering efforts, and other analyses — such as the Cost and Operational Effectiveness Analysis (COEA).

1-3 (U) Chapter 2 of this description discusses the system requirements. Chapter 3 describes the overall system functional operation. Chapters 4 through 9 describe subsystem components.

1-4 (U) Comments or queries on this publication should be forwarded to Project Manager REMBASS, ATTN: AMCPM-RBS-T, Ft. Monmouth, NJ 07703.

CHAPTER 2 (U)

REQUIREMENTS (U)

To be provided at a later date.

(Refer to REMBASS Materiel Need.)

CHAPTER 3 (U)

SYSTEM FUNCTION (U)

3-1 (U) Introduction

The REMBASS will be composed of equipment that will fulfill the requirements and characteristics stated above. The equipments will be organized into generic subsystems to describe the major functions of REMBASS. The six subsystems required for REMBASS are illustrated in Figure 3-1. Each one of the subsystems will be composed of components which are specific end item equipments. For example, the sensor subsystems will have components such as: seismic sensors, acoustic sensors, and magnetic sensors. Each one of the components will be composed of functional elements which can be considered as the building blocks of specific components. For example, a seismic sensor will be composed of functional elements that include a geophone, a seismic logic, an encoder, a code plug, and a radio transmitter. The REMBASS system will have generic functional subsystems required to perform the system mission; these subsystems will contain specific end items composed of functional elements which will do specific jobs for the system.

3-2 (U) Sensor Subsystem

The function of the sensor subsystem is to report the presence of a target and/or to determine the class of targets that is being detected. Sensors are devices which use phenomena of a target to determine if a target is within the zone of influence of the sensor. Some sensors will determine the class of target being detected. Sensors will detect the presence of targets and convey this information to the sensor reporting unit where information can be assembled to fulfill the system surveillance, target acquisition, and alerting functions. Sensors will use a variety of technologies to determine if targets are present, and the information conveyed by a particular sensor will be identified with respect to that sensor. Sensors will have a detection range of 100 meters against men with weapons and 500 meters against tanks. Since there is no one sensor which is capable of performing all of the required functions of REMBASS, the REMBASS will be composed of a group of sensors. These sensors will utilize different technologies and can be applied to different circumstances in particular applications.

3-3 (U) Data Transmission Subsystem

The function of the data transmission subsystem is to carry data from the sensor to the Sensor Reporting Unit (SRU). The data transmission subsystem will include both digital and analog messages which can be transmitted via radio or wire.

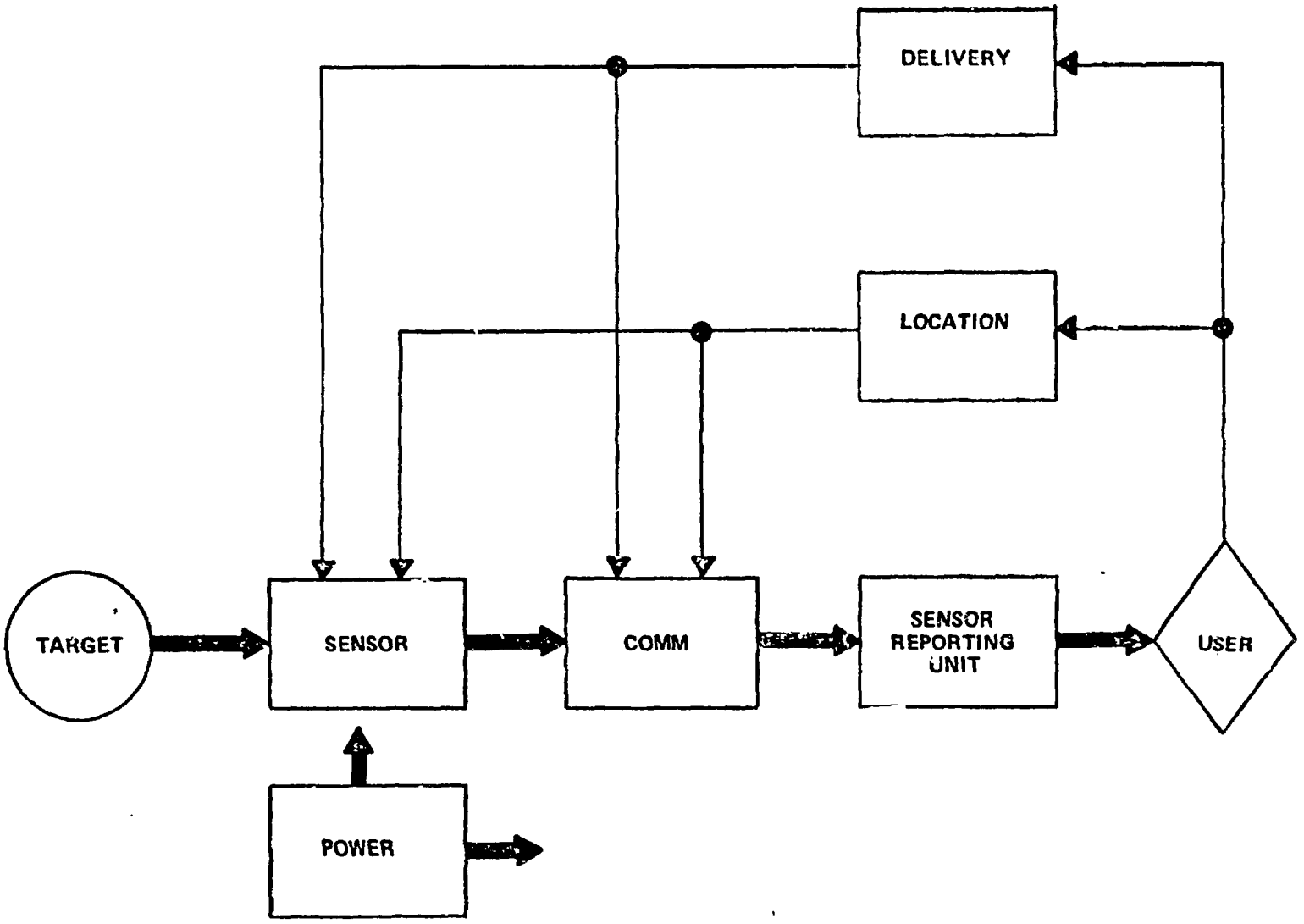


Figure 3-1 (U) Rembass Functions

3-4 (U) Sensor Reporting Unit Subsystem

The function of the Sensor Reporting Unit (SRU) subsystem is to display sensor information to the user in visual, audio, and hard copy formats. In addition to the reporting/display function, data processing for the REMBASS will be performed in the SRU. The SRU equipment complement will vary depending upon the using echelon. Since the REMBASS will be configured for each user echelon in a different manner, the SRU will be constructed in a modular manner such that common pieces of equipment may be added or deleted based on the user's requirements for a particular application. Each SRU component will be designed to be interchangeable between using echelons and/or within using echelons. The basic SRU will contain a recorder and a digital display. More sophisticated SRU configurations will contain a central processing unit to automatically monitor several hundred sensors, to perform routine "housekeeping" operations, and to perform the data processing of the REMBASS system.

3-5 (U) Delivery Subsystem

The function of the delivery subsystem is to deliver REMBASS equipment by one of the following three means:

A. hand emplacement,
B. aircraft emplacement, and
C. artillery emplacement.

3-6 (U) Location Subsystem

The function of the location subsystem is to locate sensors and targets with respect to UTM coordinates.

3-7 (U) Power Subsystem

The function of the power subsystem is to provide power to the REMBASS component end items.

CHAPTER 4 (U)

SENSORS (U)

4-1 (U) Introduction

The REMBASS sensor subsystem consists of a number of hand, air, and ballistic delivered sensors using various sensing techniques; the techniques include seismic, magnetic, electromagnetic, acoustic, infra-red, and imaging, as well as combinations of these techniques. In addition to the sensor transducer and associated electronics, a number of common (or similar) circuit elements are included. These elements include the encoder, transmitter, antenna, chassis electronics, case, battery, wire link, and classifier for non-commandable sensors; the decoder, receiver, and diplexer are added for commandable sensors. Paragraphs 4-2 through 4-12 describe the sensor transducers and electronics elements; paragraphs 4-13 through 4-20 describe the common/similar elements included in non-commandable sensors; and paragraphs 4-21 through 4-24 describe the additional common/similar elements added to commandable sensors. Paragraphs 4-25 through 4-42 describe individual sensors.

4-2 (U) Seismic Transducer

A. Function:

Moving personnel and vehicles impart seismic disturbances to the earth, which are transmitted by wave motion through the soil medium to an appropriate transducer. The seismic transducer consists of a geophone, an amplifier to bring the electrical signals to a usable level, and a signal processor to determine if preestablished detection criteria are met. In addition to seismic disturbance transmitted through the ground to the transducer, acoustic energy (sound pressure) is converted to seismic disturbances through air/ground coupling.

B. Characteristics:

Seismic point transducers generally offer reliable detection, relatively long ranges, low cost, easy deployment, ruggedness, etc. Due to variation of the transmission medium, however, site-to-site variations may occur. Typical false alarm sources for these transducers are rain, wind and root noise, explosions, thunderstorms, large animals, urban environment, and natural seismic disturbances, although the recommended processing techniques effectively eliminate most of these.

(1) Transducer:

Type - Geophone
Resonant Frequence - 14 Hz ± 1 Hz
Sensitivity - 1.75 ± .17 V/IN/SEC above resonance
Coil Impedance - 4000 ohms ± 400 ohms

(2) Amplifier:

Bandwidth - 8 - 150 Hz
Gain - 100 db
AGC - 40 db
Noise - 17V peak/peak reference to input

4-3 (U) Magnetic Transducer

A. Function:

The transducer detects magnetic disturbances caused by ferromagnetic material passing through the earth's field. The signal generated is amplified, filtered, and processed as required.

B. Characteristics:

(1) Transducer:

Type - Magnetometer
Frequency - 0.08 - 0.8 Hz 3 db points
Roll-Off - 18 - 24 db low frequency
Sensitivity - 0.68 γ zero to peak

(2) Amplifier:

Bandwidth - 0 - 2 Hz
Gain - 1000 db
AGC - 40 db, slow
Noise - 1 u volt peak/peak maximum reference input

4-4 (U) Electromagnetic Transducer

A. Function:

The transducer (antenna) detects minute changes of electromagnetic energy reflected by a target onto the antenna. The electronics processes the signal as required.

B. Characteristics:

Electromagnetic sensors are not susceptible to false alarms caused by aircraft overflights, artillery and bomb explosions, nearby noise-producing sources such as power units, etc. They are most valuable in areas of high seismic noise, such as in built-up areas or in an active battlefield, or where the intruders make no seismic noise, such as boat traffic. The false alarm rate for electromagnetic sensors is presently less than that of seismics and, therefore, very little processing at the receiver or display is necessary to discern between real and false signals.

4-5 (U) Acoustic Transducer

A. Function:

The acoustic transducer consists of a diaphragm connected to a device which converts mechanical movement (caused by the sound energy) into an electrical signal whose amplitude is proportional to the sound pressure. This signal is amplified and processed in the logic before being sent out as an alarm.

B. Characteristics:

Acoustic transducers are easily emplaced and require no special tools. They have relatively long range and moderate unit cost. Because of its relatively long range, and the fact that there is very low distortion in acoustic propagation, compared to seismic, the acoustic transducer is an excellent candidate to collect acoustic energy emanating from vehicles and aircraft. Its ability to collect energy emanating from personnel, however, is poor.

(1) Microphone:

Type - Ceramic
Frequency Response - 20 - 2 KHz $\pm$ 5 db
Sensitivity - -80 db reference .0002 dynes/$_{Cm^2}$ Min.
Directivity - Omnidirectional

(2) Amplifier:

Bandwidth - 10 - 2000 Hz
Gain - 100 db
AGC - 40 db
Noise - 1 u volt peak/peak maximum reference input

4-6 (U) Seismic-Magnetic-Acoustic Transducer

A. Function:

The three-technology transducers detect their respective energy sources which are amplified, filtered, and processed according to the individual signal source requirements.

B. Characteristics:

The acoustic sensor has most of the capability of the seismic sensor; in addition, it can be used to transmit the sounds from the vicinity of the sensor. However, it will not sense and detect humans at ranges greater than a few meters, and it has a high false alarm rate.

The short detection range of the magnetic type sensor restricts its use for the REMBASS. On the other hand, its extremely low false alarm rate (FAR) leads users of this type sensor to have very high confidence in its decisions that a target is present. The short detection range is an asset in one respect: the location of the target is accurately known with respect to the sensor position.

(1) Transducer (Seismic):
Resonant Frequency - 14 Hz ± 1 Hz
Sensitivity - 1/75 ± .17 V/IN/SEC above resonance
Coil Impedance - 4000 ohms ± 400 ohms

(2) Transducer (Acoustic):
Type - Ceramic Microphone
Frequency Response - 20 - 2 KHz ± 5 db
Sensitivity - -80 db reference .0002 dynes/$_{Cm^2}$ Min.
Directivity - Omnidirectional

(3) Transducer (Magnetic):
Type - Magnetometer
Frequency - 0.08 - 0.8 Hz 3 db points
Roll-Off - 18 - 24 db low frequency
Sensitivity - 0.68 γ zero to peak

(4) Amplifier (Magnetic):
Bandwidth - 0 - 2 Hz
Gain - 100 db
AGC - 40 db, 5 low
Noise - 1 u volt peak/peak maximum reference input

(5) Amplifier (Acoustic):
Bandwidth - 10 - 2000 Hz
Gain - 100 db
AGC - 40 db
Noise - 1 u volt peak/peak maximum reference input

(6) Amplifier (Seismic):
Bandwidth - 8 - 150 Hz
Gain - 100 db
AGC - 40 db
Noise - 1 u volt peak/peak maximum reference input

4-7 (U) Infrared Transducer

A. Function:

The transducer detects changes in target temperatures and converts them to electrical signals which are amplified and processed before indicating an activation.

B. Characteristics:

(1) Transducer:

Type - thermopile
Responsivity - 5 volts/watt
Beam Width - 5 milliradians horizontal X 50 milliradians vertical
Time Constant - 5 - 10 ms.

(2) Amplifier:

Gain - 120 db
Bandwidth - .5 to 200 Hz
Noise - 0.1 u volt ref. input
AGC - Low frequency - .05 Hz

4-8 (U) Imaging Transducer

A. Function:

Imaging sensors may use visible or infrared radiation. The sensed image can be displayed at the Sensor Reporting Unit (SRU) where it will provide a picture of the field of view seen by the sensing optics. The characteristics of this operation will restrict its use to special applications that require visual identification of target type.

B. Characteristics:

Image transducers are not omnidirectional and must be pointed; this implies an emplacement limitation. These sensors require high battery power.

4-9 (U) Seismic-Acoustic Transducer

A. Function:

The seismic and acoustic transducers detect signals generated by targets. These signals are amplified and filtered before being processed.

B. Characteristics:

(1) Seismic:

Type - Geophone
Resonant Frequency - 14 Hz $\pm$ 1 Hz
Sensitivity - 1.75 $\pm$ .17 V/IN/SEC above resonance
Coil Impedance - 4000 ohms $\pm$ 400 ohms

(2) Acoustic:

Type - Ceramic Microphone
Frequency Response - 20 - 2 KHz ± 5 db
Sensitivity - -80 db reference .0002 dynes/$_{Cm^2}$Min.
Directivity - Omnidirectional

(3) Amplifier (Seismic):

Bandwidth - 8 - 150 Hz
Gain - 100 db
AGC - 40 db
Noise - 1 u volt peak/peak maximum reference input

(4) Amplifier (Acoustic):

Bandwidth - 10 - 2000 Hz
Gain - 100 db
AGC - 40 db
Noise - 1 u volt peak/peak maximum reference input

4-10 (U) Variable Resistance Transducer

A. Function:

The transducer is a resistance wire which detects the presence of a target when the pressure of a target changes the resistance between it and the ground.

B. Characteristics:

The transducer is a 500 foot length of No. 32 resistance wire dispensed from a 35 mm film can.

C. Conditioner Logic:

The conditioner logic amplifies, shapes, and processes the signal.

4-11 (U) Magnetic-Strain Transducer

A. Function:

Intruders possessing magnetic properties will activate this combination sensor. However, each of the triggering phemomena, either strain or magnetic, can be viewed for possible classification of the target.

B. Characteristics:

(1) Transducer:

Type - Coaxial Cable (Microdot RG 170)
Frequency - 0.5 Hz to 2 Hz at 3 db points
Impedance - Over 10 megohms

(2) Electronics:

Bandpass - 0.2 Hz to 2.4 Hz 6db/active
Charge Amplifier Sensitivity - 10-11 amperes

C. Conditioner:

(1) Function:
To amplify and shape the signal prior to being encoded.

(2) Characteristics:
Sensor incorporates "AND" logic: Alarm only when changes occur in the two phenomena, magnetic and strain transducers.

4-12 (U) Strain Transducer

A. Function:
Detects strain imparted to the earth by the passage of a target.

B. Characteristics:
Coaxial cable.

(1) Transducer: Coaxial cable.

(2) Amplifier:
Bandwidth - 0.2 to 20 Hz
Gain - 52 db
AGC - 35 db
Noise - 120 u volts referenced to input
Input Impedance - 25 megohms

C. Conditioner:
The conditioner logic amplifies, shapes, and processes the signal.

4-13 (U) Encoder

A. Function:
After target detection occurs, the encoder generates a series of ones (1's) and zeros (0's) in a sequence which identifies the activated sensor and modulates the transmitter.

B. Characteristics: (Refer to para. 5-1).

4-14 (U) Transmitter

A. Function:
The transmitter sends sensor activation data to other components of the system.

B. Characteristics: (Refer to para. 5-2).

4-15 (U) Antenna (Non-Commandable)

A. Function:
To couple the rf energy into the air.

B. Characteristics:

(1) Transmit MODE Frequency: 138 MHz - 153 MHz

(2) Transmit Power: 6 watts maximum

(3) Insertion Loss: Transmit mode = 0.50 db maximum

(4) Impedance: 50 ohms nominal

(5) VSWR: Transmit MODE: 3.8 - 1 maximum

4-16 (U) Chassis Electronics

A. Function:
The chassis electronics provides power regulation, wire interconnection, arm, and test features.

B. Characteristics:

(1) Security Switches: 2 bit code, 2 - 10 position rotary switches

(2) End of Life: destruct setable for 5, 10, 20, 60 days

(3) Self Test: injects signal between sensor output logic and encoder input which simulates sensor activation

(4) Disable: anti-tamper destroys fuseable link in transmitter. End of battery - fuseable link breaks when voltage drops below 80% of full charge

(5) Arm Switch: 3 position rotary - part of on/off. Activates and disables

(6) Voltage Regulator: $\pm$ 1%

(7) Connectors: TBD

4-17 (U) Case

A. Function:
The case provides environmental protection for the sensor and hampers unauthorized entry to the electronics.

B. Characteristics:
Compact, ruggedized, water and dust proof, contains arm and security switches and antenna mount.

4-18 (U) Battery

A. Function:
To provide power necessary to operate the sensor for the prescribed mission life.

B. Characteristics:
Compact, rugged, and capable of withstanding extreme environments.

4-19 (U) Wire Link

A. Function:
Provides a hard wired electrical connection between the sensor and other components of the system as an alternate mode to the rf link.

B. Characteristics:
The wire is stranded, highly flexible, with good tensile strength and sufficient diameter to conduct the signals without appreciable loss.

4-20 (U) Classifier (Classifying sensors only)

A. Function:
The objective of a classifier is to have an automatic method of recognizing and identifying the generic class, or type of target that comes within the field of view of the sensor transducer. A "class" of target is understood to mean (but is not limited to) tracked vehicles, wheeled vehicles, humans, helicopters, etc.

B. Characteristics:

(1) Processing Time: $\leq$ 10 seconds

(2) Repetition Period: 10 ± 2 seconds

4-21 (U) Receiver

A. Function:
The receiver, operating full time, receives only the command signal, detects it, and sends a signal to the decoder.

B. Characteristics: (Refer to para. 5-2.)

4-22 (U) Decoder

A. Function:
The decoder processes a received signal and determines its validity before activating the sensor.

B. Characteristics: (Refer to para. 5-2.)

4-23 (U) Antenna

A. Function:
To couple the rf energy into the air.

B. Characteristics:

(1) Receive MODE Frequency: 138 - 153 MHz

(2) Transmit MODE Frequency: 138 - 153 MHz

(3) Transmit Power: 6 watts maximum

(4) Insertion Loss: Receive MODE: 2 db maximum
Transmit MODE: 0.5 db maximum

(5) Impedance: 50 ohms nominal

(6) VSWR: Receive MODE: 3.8:1 maximum
Transmit MODE: 1.7:1 maximum

4-24 (U) Diplexer

A. Function:
The diplexer is an automatic switch which transfers one antenna between the transmitter output and receiver input.

B. Characteristics:

(1) Insertion Loss: Transmit - 0.5 db maximum
Receive - 2.0 db maximum

(2) Transmit-Receive Isolation: 20 db minimum

4-25 (U) Hand-Emplaced Low Power Non-Commandable Seismic Sensor (HE LP NC SS)

A. Function:
Detect or classify personnel, vehicles, and aircraft.

B. General:
A hand-emplaced, low power, non-commandable seismic sensor that is self-contained. Two versions include a detector only and a classifier. Either version is intended to operate in conjunction with a Sensor Control Module (SCM) by means of a rf or wire link.

C. Characteristics:

(1) Transducer: Geophone

(2) Range: 10 - 50 M (Personnel)
90 - 250 M (Wheeled Vehicle)
300 - 1000 M (Tracked Vehicle)
70 - 200 M (Aircraft)

(3) Probability : Detection 85% Aircraft
85 - 99% (Other)
Classification 65 - 85% (Personnel, wheeled vehicle, tracked vehicle, aircraft)

(4) False Alarm Rate (per 24 hours):

Benign	Noisy	Stormy
1	200	100

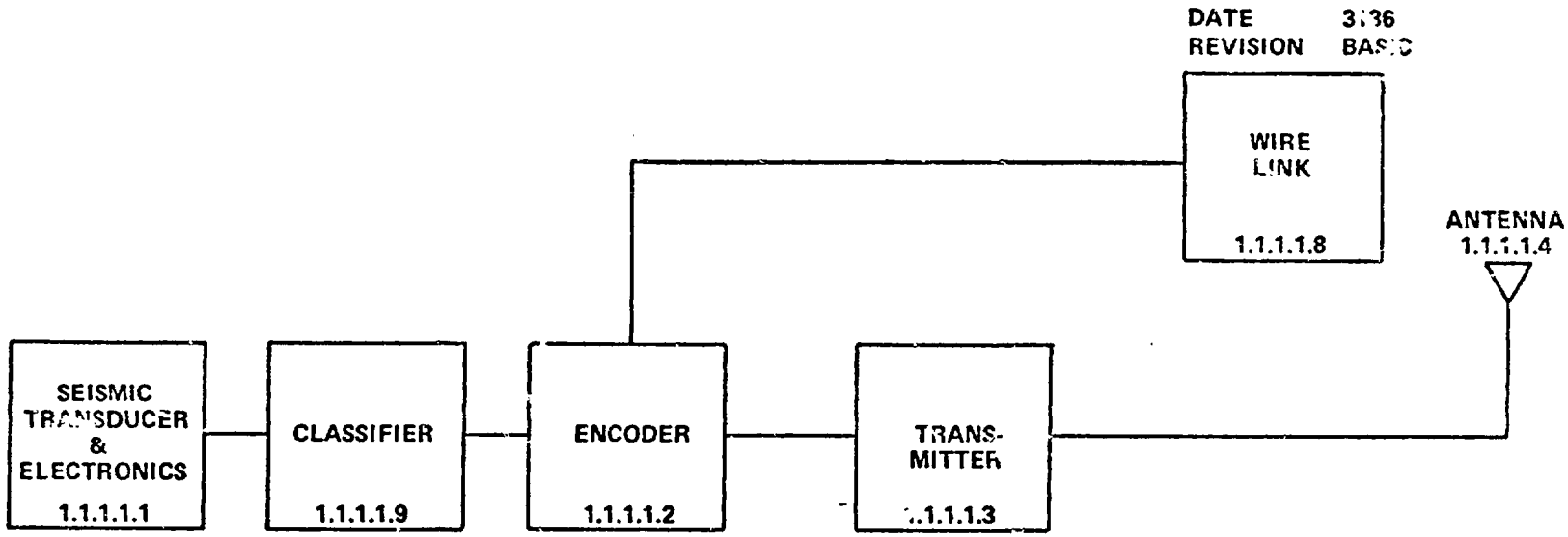
(5) Size: 200 cubic inches

(6) Weight: 5 pounds

(7) Reliability: 90% for 30 day mission

(8) Power Requirements: 6.7 Ah (60 dy)

D. Elements:
Elements are shown on figure 4-1 and described in paragraphs 4-1 through 4-24.



BATTERY	CHASSIS ELECTRONICS	CASE
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Figure 4-1 (U) HE LP NC SS 1.1.1.1

4-26 (U) Hand-Emplaced Low Power Non-Commandable Magnetic Sensor (HE LP NC MS)

A. Function:
Detect or classify armed personnel or vehicles.

B. General:
A hand-emplaced, low power, non-commandable magnetic sensor that is self-contained. Two versions include a detector only and a classifier. Either version is intended to operate in conjunction with a SCM by means of a rf or wire link.

C. Characteristics:

(1) Transducer: Magnetometer

(2) Range: 3 - 5 M (Armed Personnel)
10 - 15 M (Vehicle)

(3) Probability: Detection 90 - 95% (all targets)
Classification 90 - 95% (all targets)

(4) False Alarm Rate (per 24 hours):

Benign	Noisy	Stormy
0.1	200	25

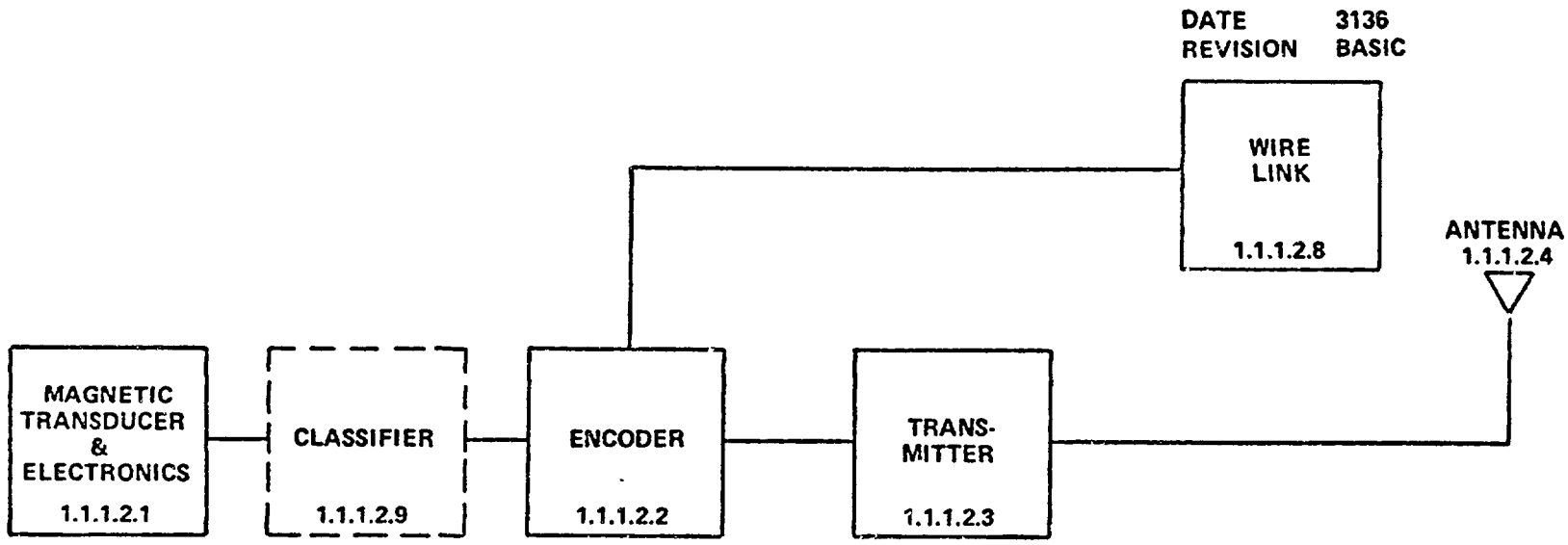
(5) Size: 200 cubic inches

(6) Weight: 5 pounds

(7) Reliability: 90% for 30 day mission

(8) Power Requirements: 6.7 Ah (60 dy)

D. Elements:
Elements are shown on figure 4-2 and described in paragraphs 4-1 through 4-24.



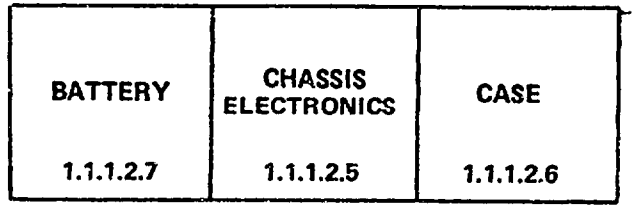


Figure 4-2 (U) HE LP NC MS 1.1.1.2

4-27 (U) Hand-Emplaced Low Power Non-Commandable Electromagnetic Sensor (HE LP NC ES)

A. Function:
Classify personnel, vehicles, and boats.

B. General:
A hand-emplaced, low power, non-commandable electromagnetic sensor that is self-contained. This sensor is a classifier and is intended to operate in conjunction with a SCM by means of a rf or wire link.

C. Characteristics:

(1) Transducer: Low power rf transmitter

(2) Range: 10 - 15 M (Person)

(3) Probability: Classification 65 - 75% (all targets)

(4) False Alarm Rate (per 24 hours):

Benign	Noisy	Stormy
0.1	25	100

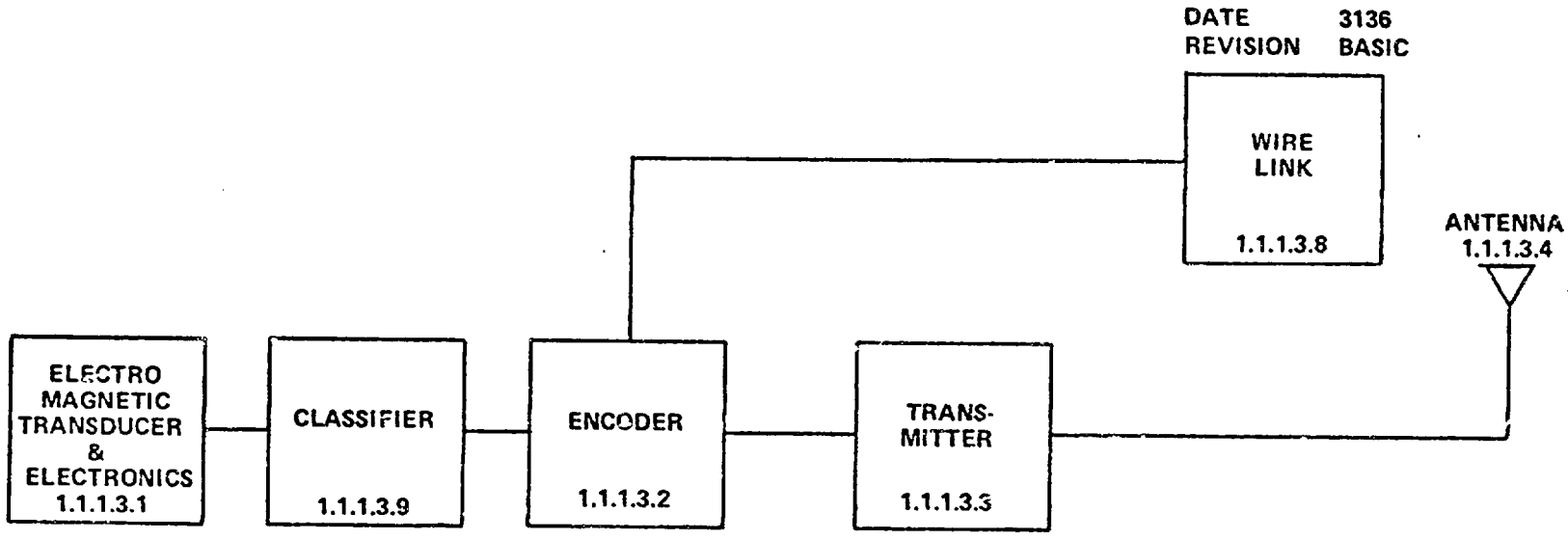
(5) Size: 200 cubic inches

(6) Weight: 5 pounds

(7) Reliability: 90% for 30 day mission

(8) Power Requirements: 6.7 Ah (60 dy)

D. Elements:
Elements are shown on figure 4-3 and described in paragraphs 4-1 through 4-24.



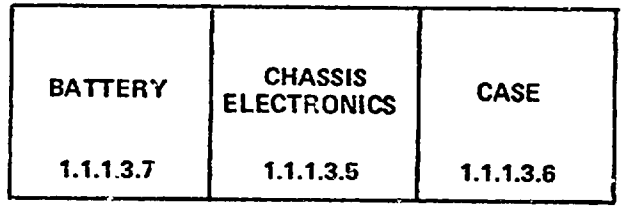


Figure 4-3 (U) HE LP NC ES 1.1.1.3

4-28 (U) Hand-Emplaced Low Power Non-Commandable Acoustic Sensor (HE LP NC AS)

A. Function:
Provide acoustic data.

B. General:
A hand-emplaced, low power, non-commandable acoustic sensor intended to operate in conjunction with a SCM by means of a wire link only. The sensor will provide acoustic analog signal when triggered by an SCM.

C. Characteristics:

(1) Transducer: Ceramic Microphone

(2) Range: 200 - 500 M (Vehicle)
500 - 750 M (Aircraft)

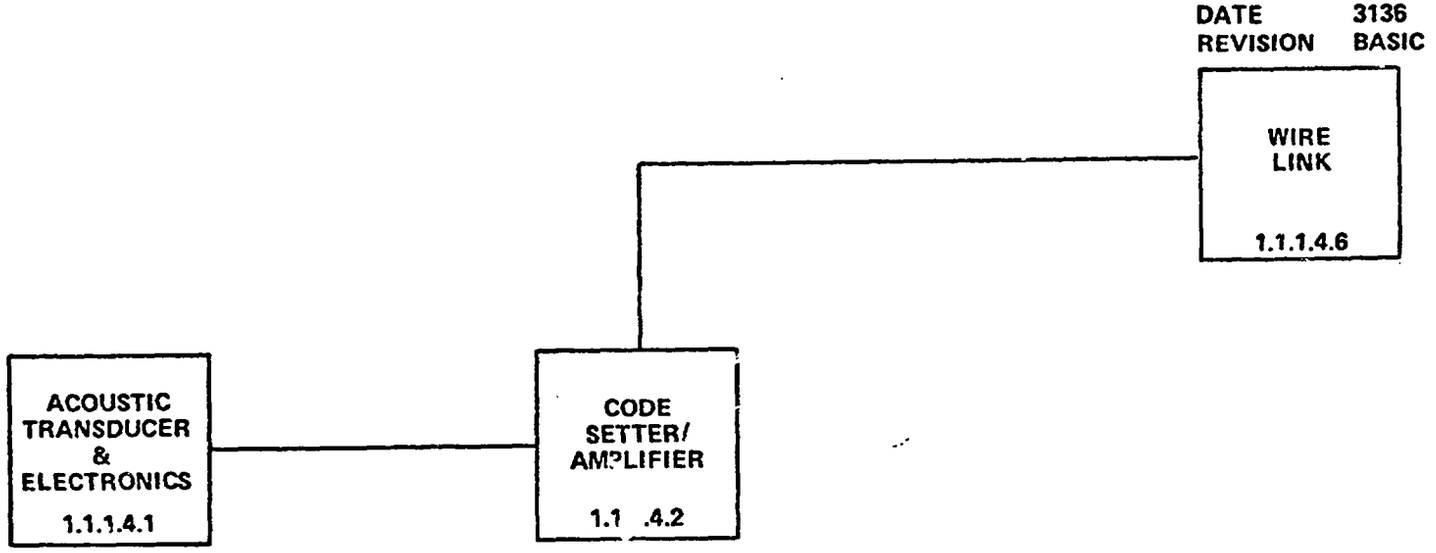
(3) Size: 200 cubic inches

(4) Weight: 5 pounds

(5) Reliability: 90% for 30 day mission

(6) Power Requirements: 6.0 Ah (60 dy)

D. Elements:
Elements are shown in figure 4-4 and, except for the code setter/amplifier, described in paragraphs 4-1 through 4-24. The code setter/amplifier is unique to this sensor. It provides the identification code and amplification of the signal. The amplifier is small, rugged, and low power with a gain of 80 db and a 20 - 2000 Hz bandwidth.



BATTERY	CHASSIS ELECTRONICS	CASE
1.1.1.4.5	1.1.1.4.3	1.1.1.4.4

Figure 4-4 (U) HE LP NC AS 1.1.1.4

4-29 (U) Hand-Emplaced High Power Non-Commandable Seismic Sensor (HE HP NC SS)

A. Function:
Detect or classify personnel, vehicles, and aircraft.

B. General:
A hand-emplaced, high power, non-commandable seismic sensor that is self-contained. Two versions include a detector only and a classifier. Either version will communicate with the readout either directly (rf or wire link) or through a relay.

C. Characteristics:

(1) Transducer: Seismic point

(2) Range: 10 - 50 M (Personnel)
90 - 250 M (Wheeled vehicle)
300 - 1000 M (Tracked vehicle)
70 - 200 M (Aircraft)

(3) Probability: Detection 85% Aircraft
85 - 99% (Other)
Classification 65 - 85% (Personnel, wheeled vehicle, tracked vehicle, aircraft)

(4) False Alarm Rate (per 24 hours):

Benign	Noisy	Stormy
1	200	10

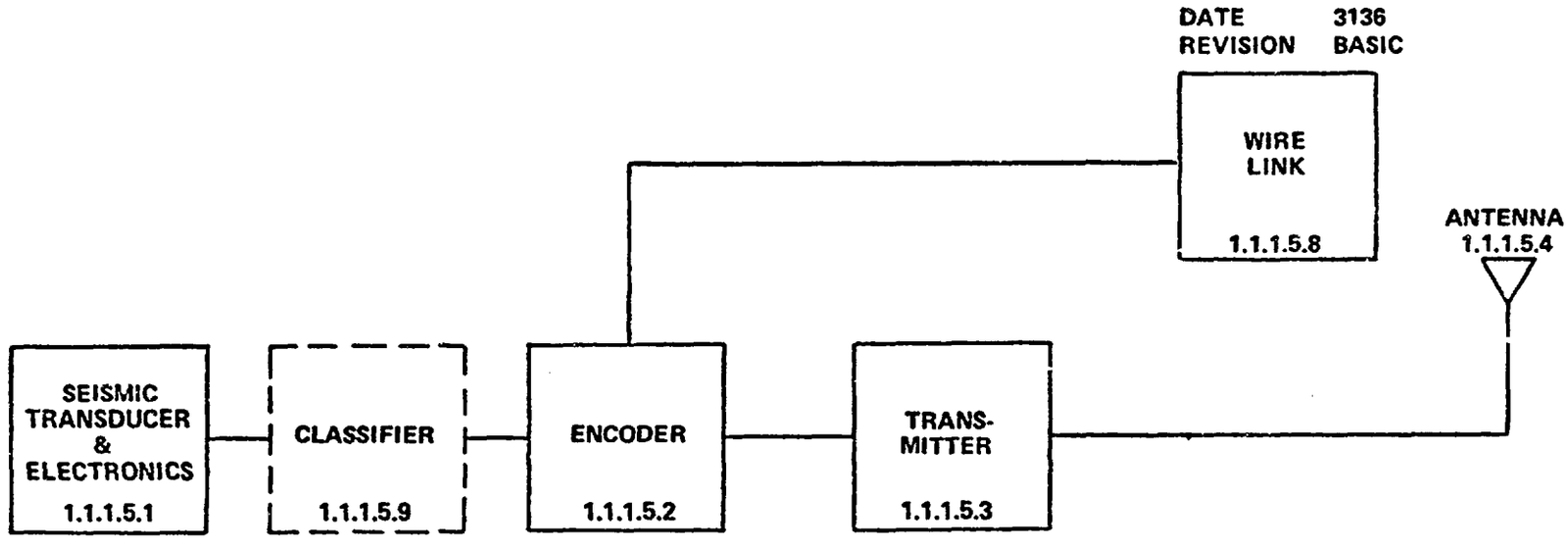
(5) Size: 200 cubic inches

(6) Weight: 5 pounds

(7) Reliability: 90% for 30 day mission

(8) Power Requirements: 6.7 Ah (60 dy)

D. Elements:
Elements are shown on figure 4-5 and described in paragraph 4-1 through 4-24.



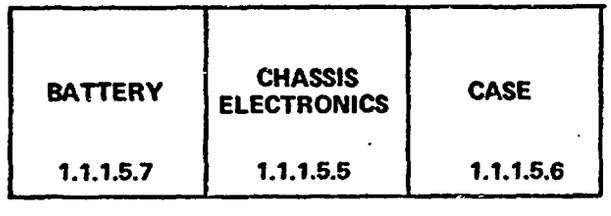


Figure 4-5 (U) HE HP EC SS 1.1.1.5

4-30 (U) Hand-Emplaced High Power Non-Commandable Magnetic Sensor(HE HP NC MS)

A. Function:
Detect or classify armed personnel or vehicles.

B. General:
A hand-emplaced, high power, non-commandable magnetic sensor that is self-contained. Two versions include a detector only and a classifier. Either version will communicate with the readout either directly (rf or wire link) or through a relay.

D. Characteristics:

(1) Transducer: Magnetometer

(2) Range: 3 - 5 M (armed personnel)
10 - 15 M (vehicle)

(3) Probability: Detection 90 - 95% (all targets)
Classification - 95 - 95% (all targets)

(4) False Alarm Rate (per 24 hours):

Benign	Noisy	Stormy
0.1	25	200

(5) Size: 200 cubic inches

(6) Weight: 5 pounds

(7) Reliability: 90% for 30 day mission

(8) Power Requirements: 6.7 Ah (60 dy)

D. Elements:
Elements are shown on figure 4-6 and described in paragraphs 4-1 through 4-24.

4-30 (U) Hand-Emplaced High Power Non-Commandable Magnetic Sensor(HE HP NC MS)

A. Function:
Detect or classify armed personnel or vehicles.

B. General:
A hand-emplaced, high power, non-commandable magnetic sensor that is self-contained. Two versions include a detector only and a classifier. Either version will communicate with the readout either directly (rf or wire link) or through a relay.

D. Characteristics:

(1) Transducer: Magnetometer

(2) Range: 3 - 5 M (armed personnel)
10 - 15 M (vehicle)

(3) Probability: Detection 90 - 95% (all targets)
Classification - 95 - 95% (all targets)

(4) False Alarm Rate (per 24 hours):

Benign	Noisy	Stormy
0.1	25	200

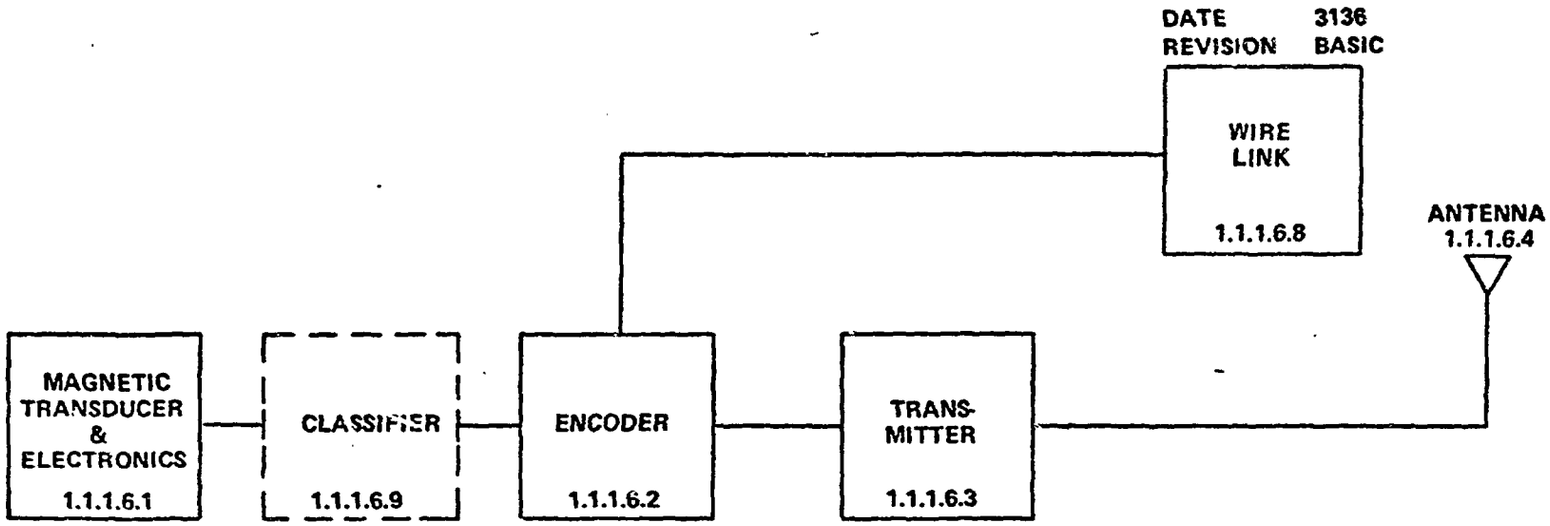
(5) Size: 200 cubic inches

(6) Weight: 5 pounds

(7) Reliability: 90% for 30 day mission

(8) Power Requirements: 6.7 Ah (60 dy)

D. Elements:
Elements are shown on figure 4-6 and described in paragraphs 4-1 through 4-24.



BATTERY	CHASSIS ELECTRONICS	CASE
1.1.1.6.7	1.1.1.6.5	1.1.1.6.6

Figure 4-6 (U) HE HP NC MS 1.1.1.6

4-31 (U) Hand-Emplaced High Power Non-Commandable Seismic-Magnetic-Acoustic Sensor (HE HP NC S-M-AS)

A. Function:
Detect or classify personnel and vehicles.

B. General:
A hand-emplaced, high power, non-commandable combination sensor that is self-contained. This sensor has seismic, magnetic, and acoustic transducers that can be used in any combination to classify the target. The sensor will communicate with the readout either directly (rf or wire link) or through a relay.

C. Characteristics:

(1) Transducer: Combination geophone, microphone, and solenoid.

(2) Range: 3-5 M (Personnel)
10-15 M (Vehicles)

(3) Probability: Detection 85-99% (all targets)
Classification 65-85% (all targets)

(4) False Alarm Rate (per 24 hours):

Benign	Noisy	Stormy
.1	15	60

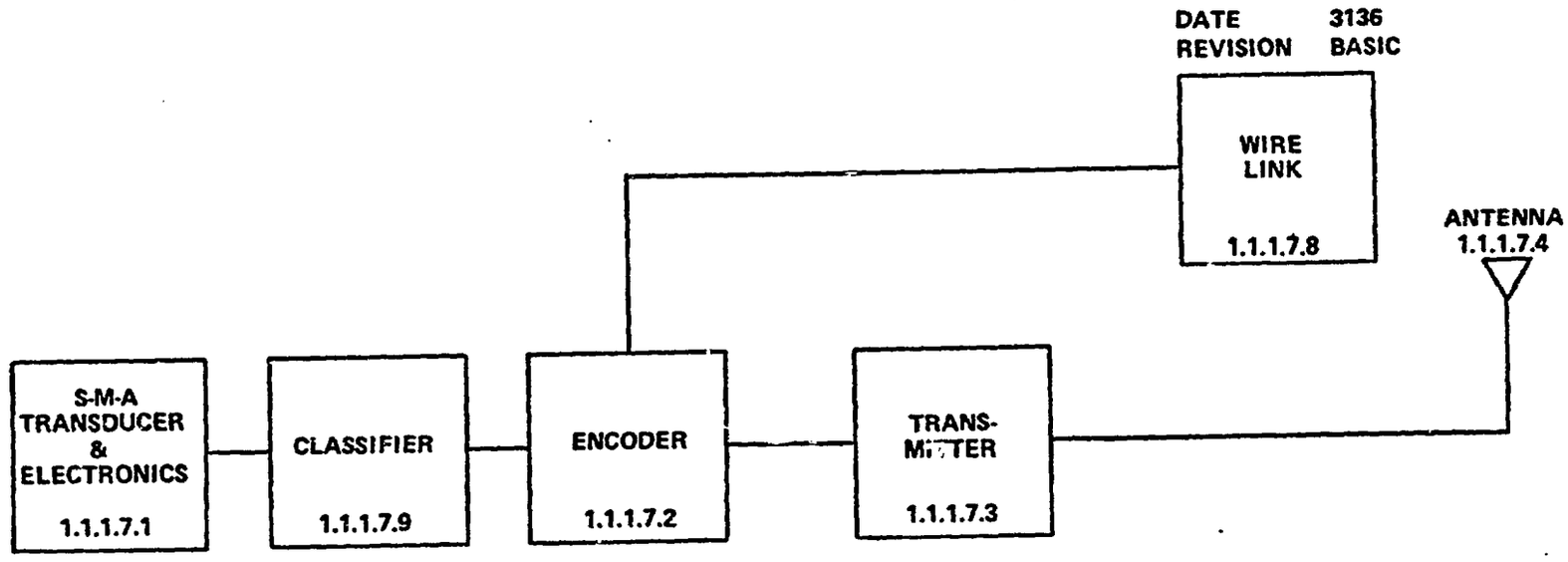
(5) Size: 200 cubic inches

(6) Weight: 5 pounds

(7) Reliability: 90% for 30 day mission

(8) Power Requirements: 15 Ah (60 dy)

D. Elements:
Elements are shown on figure 4-7 and described in paragraphs 4-1 through 4-24.



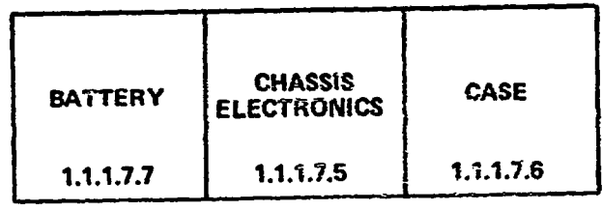


Figure 4-7 (U) HE HP NC S-M-AS 1.1.1.7

4-32 (U) Hand-Emplaced High Power Commandable Acoustic Sensor (HE HP C AS)

A. Function:
Classify personnel, vehicles, and aircraft.

B. General:
A hand-emplaced, high power, commandable acoustic sensor that is self-contained. This sensor is a classifier and will communicate with the readout either directly (rf or wire link) or through a relay in either a real time or non-real time mode.

C. Characteristics:

(1) Transducer: Ceramic Microphone

(2) Range: 200 - 500 M (Vehicle)
500 - 750 M (Aircraft)

(3) Probability: Classification 75 - 85% (all targets)

(4) False Alarm Rate (per 24 hours):

Benign	Noisy	Stormy
5	100	500

(5) Size: 200 cubic inches

(6) Weight: 5 pounds

(7) Reliability: 90% for 30 day mission

(8) Power Requirements: 6.0 Ah (60 dy)

D. Elements:
Elements are shown on figure 4-8 and described in paragraphs 4-1 through 4-24.

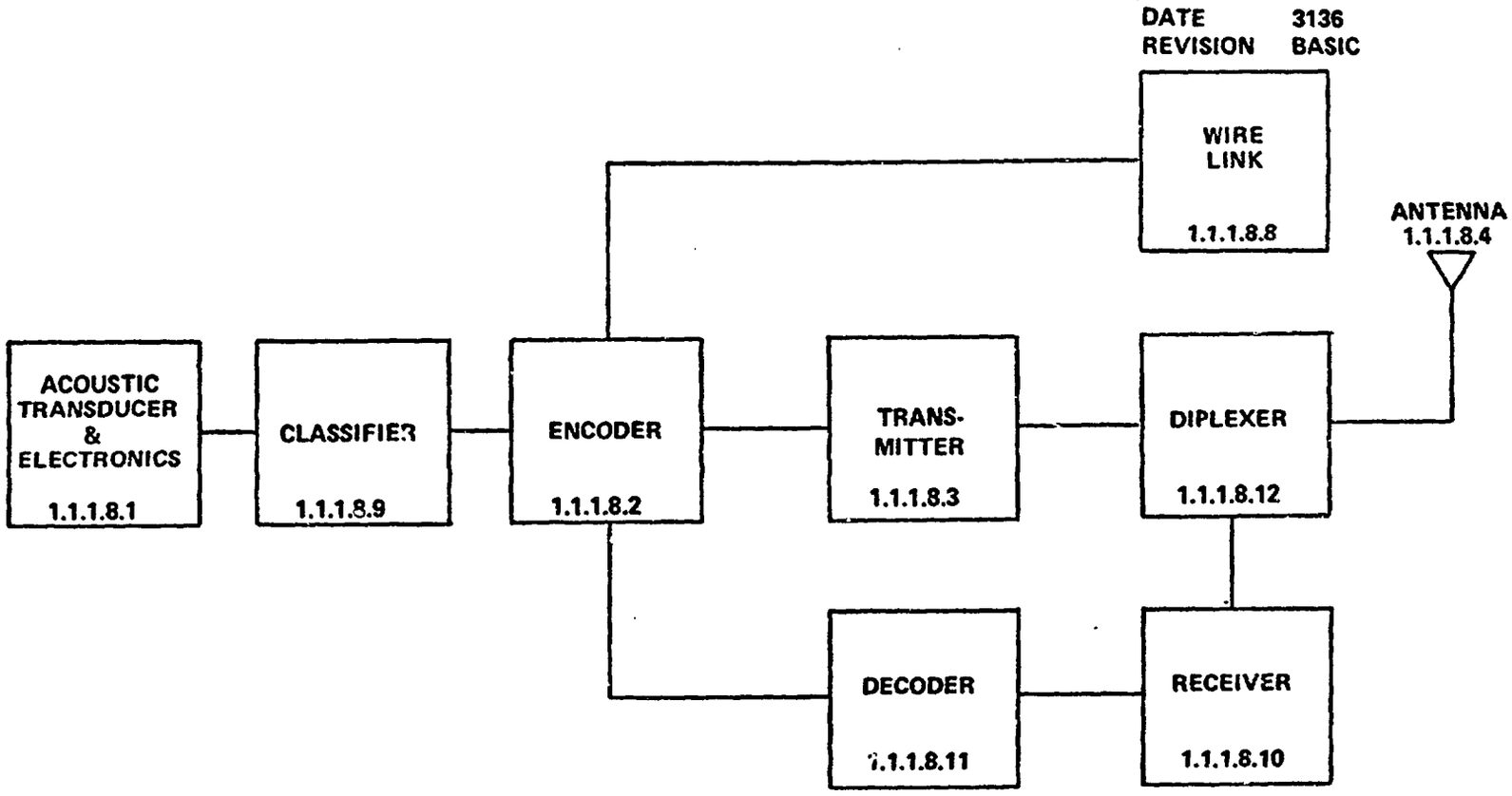


Figure 4-8 (U) HE HP C AS 1.1.1.8

4-33 (U) Hand-Emplaced High Power Commandable Seismic-Magnetic-Acoustic Sensor (HE HP C S-M-AS)

A. Function:
Classify personnel, vehicles, and aircraft.

B. General:
A hand-emplaced, high power, commandable combination sensor that is self-contained. This sensor has seismic, magnetic, and acoustic transducers that can be used in any combination to classify a target. The sensor will communicate with the readout either directly (rf or wire link) or through a relay in either a real time or non-real time mode.

C. Characteristics:

(1) Transducer: combination geophone, microphone, and mg.

(2) Range: 3 - 5 M (Personnel)
10 - 15 M (Vehicles)

(3) Probability: Classification 65 - 85% (all targets)

(4) False Alarm Rate (per 24 hours):

Benign	Noisy	Stormy
.1	15	60

(5) Size: 200 cubic inches

(6) Weight: 5 pounds

(7) Reliability: 90% for 30 day mission

(8) Power Requirements: 15 Ah (60 dy)

D. Elements:
Elements are shown on figure 4-9 and described in paragraphs 4-1 through 4-24.

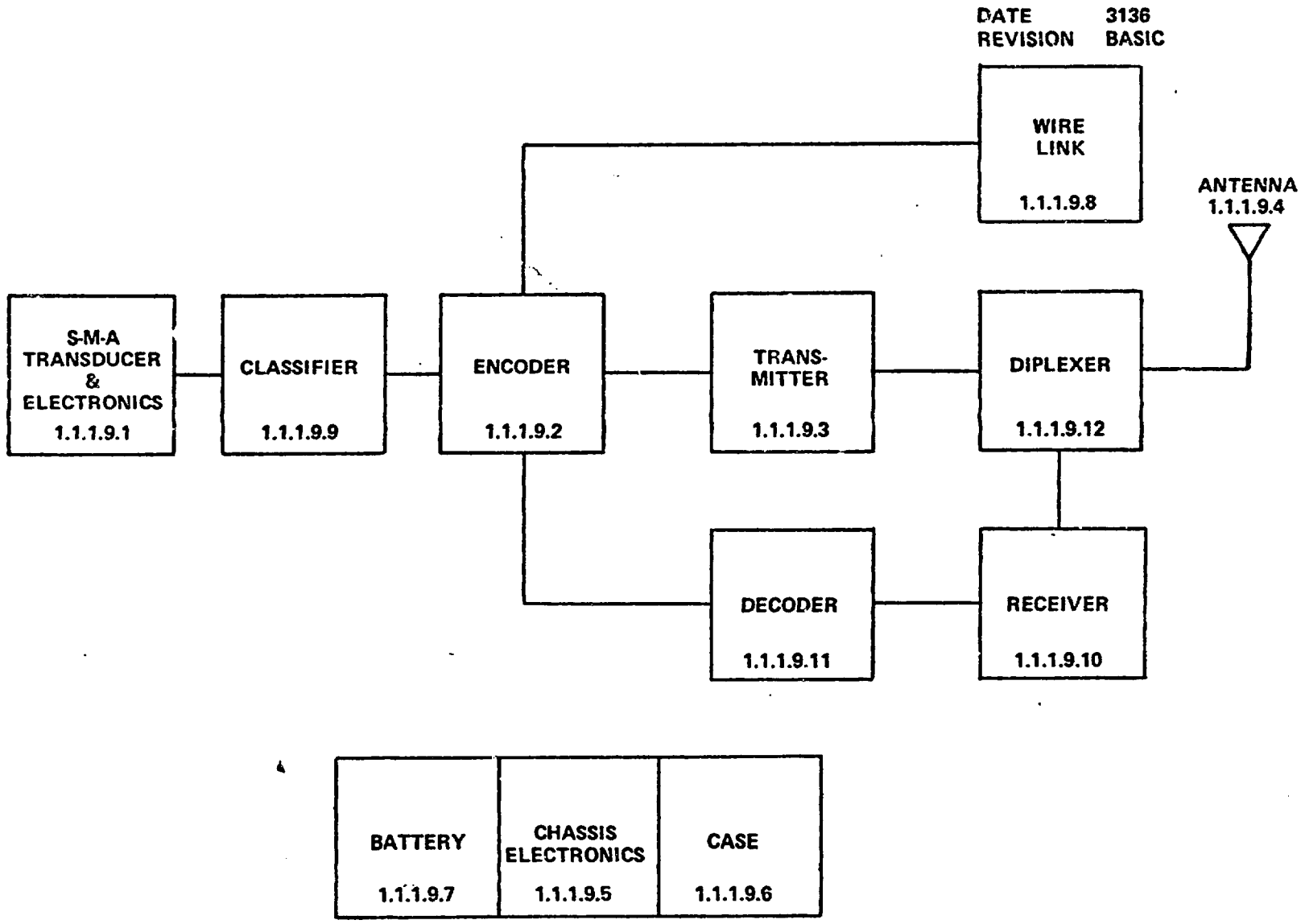


Figure 4-9 (U) HE HP C S-M-AS 1.1.1.9

4-34 (U) Hand-Emplaced High Power Commandable Infrared Sensor (HE HP C IRS)

A. Function:
Detect personnel, vehicles, and boats.

B. General:
A hand-emplaced, high power, commandable infrared sensor that is self-contained. This sensor is a detector only capable of counting the number of targets. The sensor will communicate with the readout either directly (rf or wire link) or through a relay in either a real time or non-real time mode.

C. Characteristics:

(1) Transducers: Thermopile

(2) Range: 50 - 100 M (Personnel)
50 - 250 M (Vehicles)

(3) Probability: Detection 75 - 95% (all targets)

(4) False Alarm Rate (per 24 hours):

Benign	Noisy	Stormy
		20

(5) Size: 200 cubic inches

(6) Weight: 5 pounds

(7) Reliability: 90% for 30 day mission

(8) Power Requirements: 10 Ah (60 dy)

D. Elements:
Elements are shown on figure 4-10 and described in paragraphs 4-1 through 4-24.

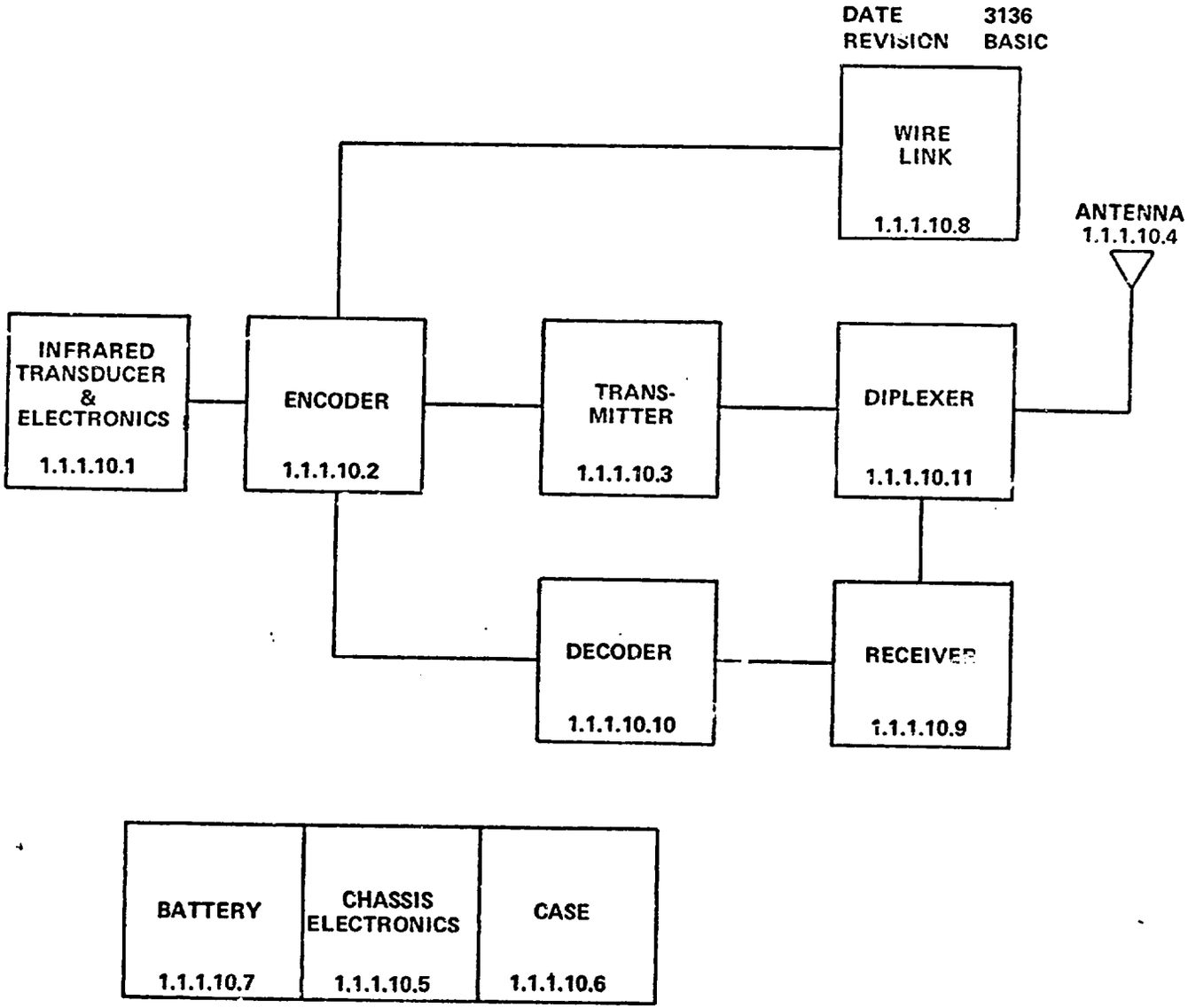


Figure 4-10 (U) HE HP C IRS 1.1.1.10

4-35 (U) Hand-Emplaced High Power Commandable Imaging Sensor (HE HP C IS)

A. Function:
Detects personnel, vehicles, and boats.

B. General:
A hand-emplaced, high power, commandable imaging sensor that is self-contained. This sensor will provide a digitized analog signal on command. The sensor will communicate with the readout either directly (rf or wire link) or through a relay on command.

C. Characteristics:

(1) Transducer: Optical

(2) Range 200 - 1000M (all targets)

(3) Probability: Detection 85 - 95% (all targets)

(4) False Alarm Rate: N/A

(5) Size: 100 cubic inches

(6) Weight: 10 pounds

(7) Reliability: 90% for 30 day mission

(8) Power Requirements: 10 Ah (60 dy)

D. Elements:
Elements are shown on figure 4-11 and described in paragraphs 4-1 through 4-24.

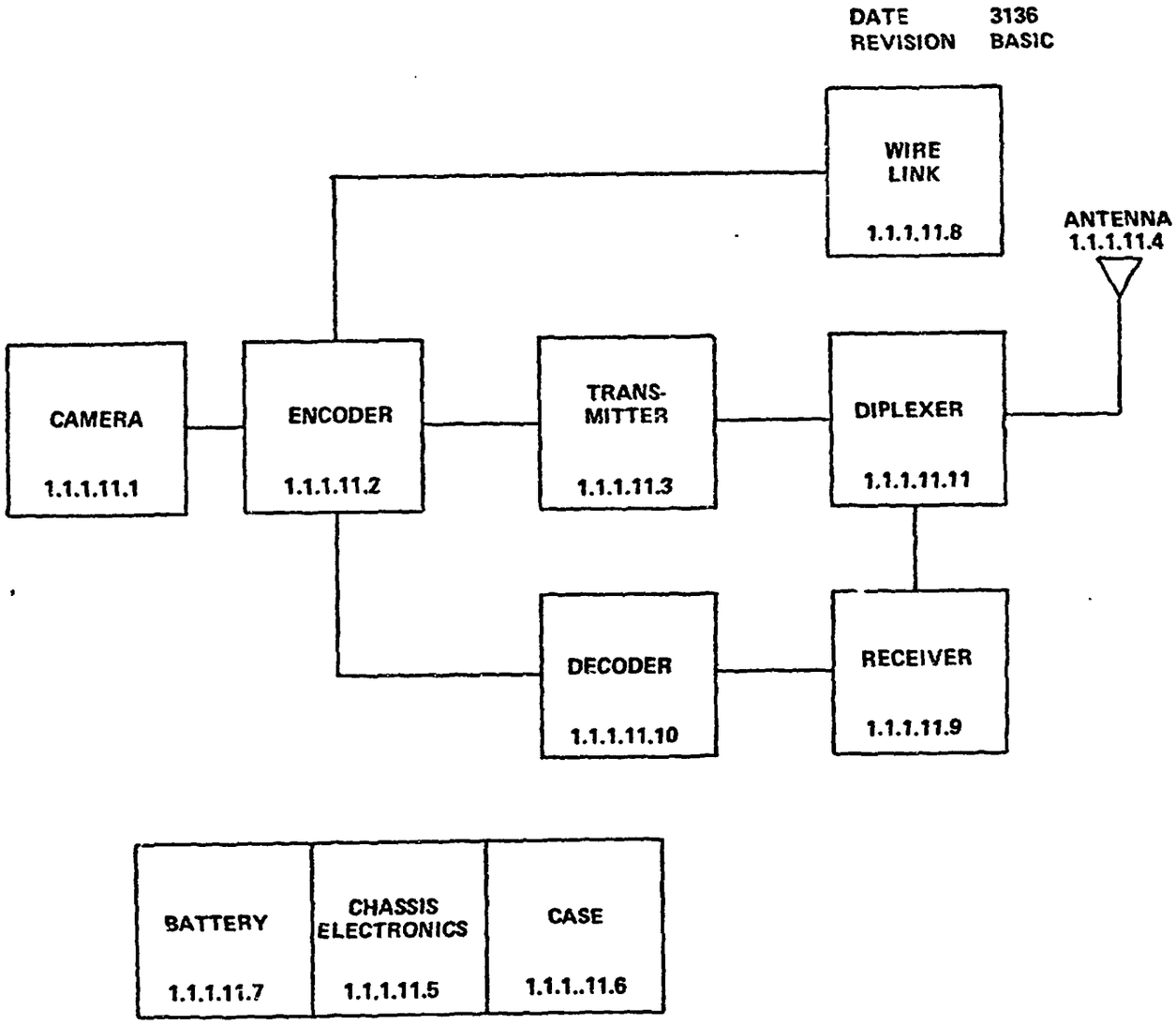


Figure 4-11 (U) HE HP C IS 1.1.1.11

4-36 (U) Air-Emplaced High Power Non-Commandable Seismic Sensor (AE HP NC SS)

A. Function:
Detect or classify personnel, vehicles, and aircraft.

B. General:
An air dropped, high power non-commandable seismic sensor that is self-contained. Two versions include a detector only and a classifier. Either version will communicate with the readout either directly or through a relay.

C. Characteristics:

(1) Transducer: Seismic point

(2) Range: 10 - 50 M (Personnel)
90 - 250 M (Wheeled vehicle)
300 - 1000 M (Tracked vehicle)
70 - 200 M (Aircraft)

(3) Probability: Detection 85% Aircraft
85 - 99% (Other)
Classification 65 - 85% (Personnel, wheeled vehicle, tracked vehicle, aircraft)

(4) False Alarm Rate (per 24 hours):

Benign	Noisy	Stormy
1	200	100

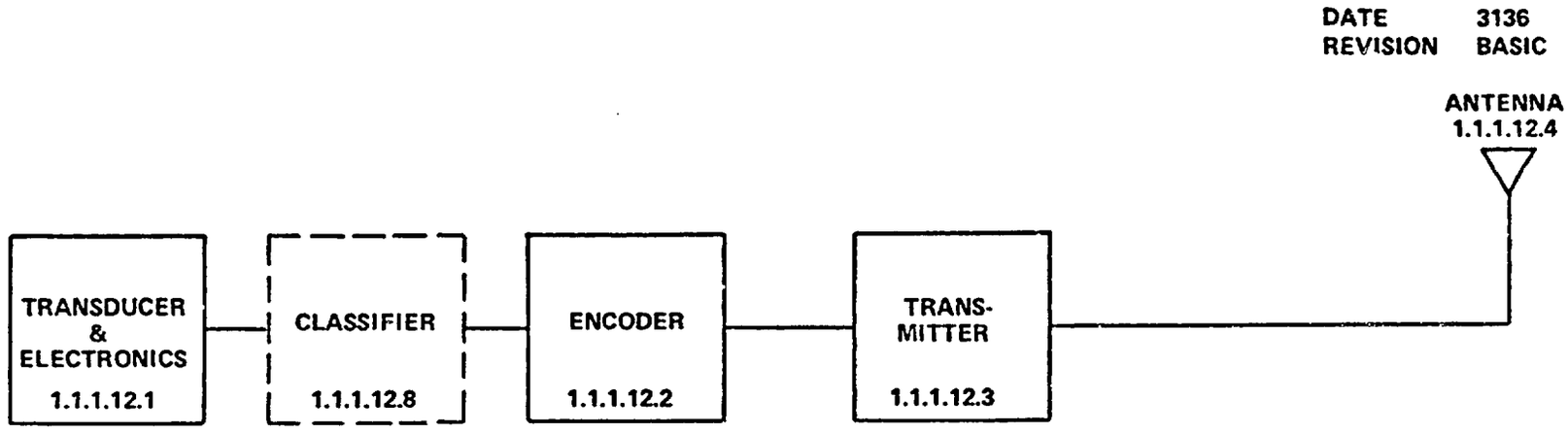
(5) Size: 200 cubic inches

(6) Weight: 5 pounds

(7) Reliability: 90% for 30 day mission

(8) Power Requirements: 6.7 Ah (60 dy)

D. Elements:
Elements are shown on figure 4-12 and except for added information following on the case, described in paragraphs 4-1 through 4-24. The case provides shock as well as environmental protection for the sensor and is aerodynamically designed to facilitate proper air emplacement. The case and antenna are well camouflaged.



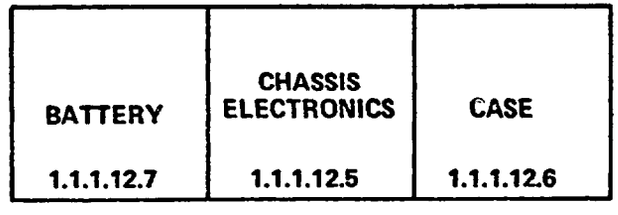


Figure 4-12 (U) AE HP NC SS 1.1.1.12

4-37 (U) Air-Emplaced High Power Non-Commandable Seismic-Acoustic Sensor (AE HP NC S-AS)

A. Function:
Classify personnel, vehicles, and aircraft.

B. General:
An air dropped, high power, non-commandable seismic/acoustic sensor that is self-contained. This sensor is a classifier and will communicate with the readout by means of an rf link either directly or through a relay.

C. Characteristics:

(1) Transducer: Geophone-ceramic microphone

(2) Range: 90 - 250 M (Wheeled vehicle)
300 - 500 M (Tracked vehicle)
70 - 200 M (Aircraft)
10 - 50 M (Personnel)

(3) Probability: Classification 65 - 85% (all targets)

(4) False Alarm Rate:

Benign	Noisy	Stormy
1	100	50

(5) Size: 200 cubic inches

(6) Weight: 5 pounds

(7) Reliability: 90% for 30 day mission

(8) Power Requirements: 10 Ah (60 dy)

D. Elements:
Elements are shown on figure 4-13 and except for the added information on the case (see para. 4-36 preceding), described in paragraphs 4-1 through 4-24.

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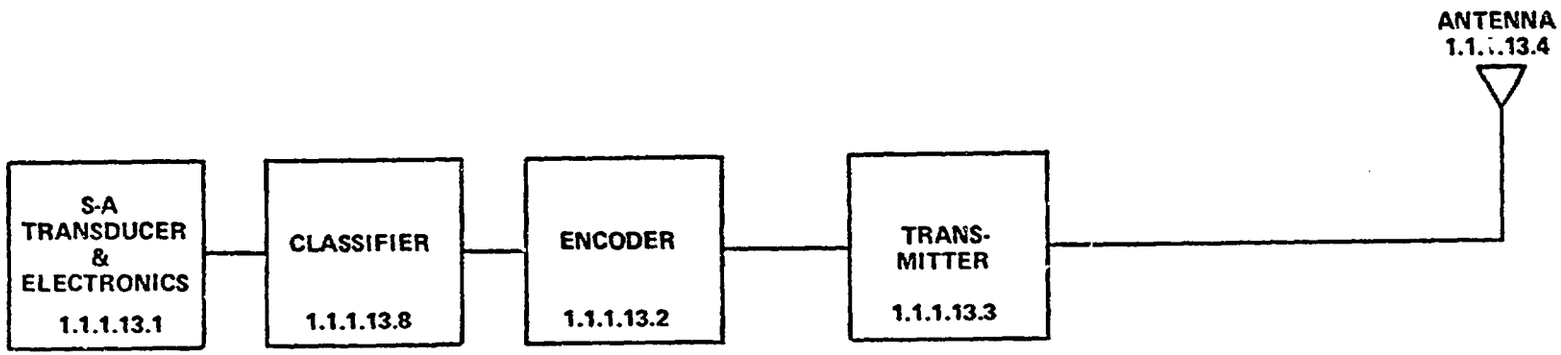


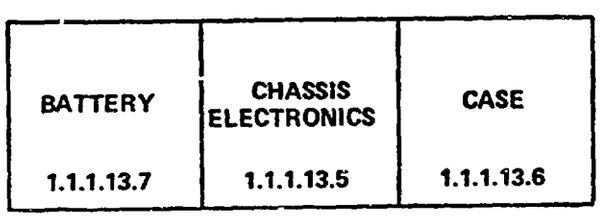


Figure 4-13 (U) AE HP NC S-AS 1.1.1.13

4-38 (U) Air-Emplaced High Power Commandable Acoustic Sensor (AE HP C AS)

A. Function:
Classify personnel, vehicles, and aircraft.

B. General:
An air dropped, high power, commandable acoustic sensor that is self-contained. This sensor is a classifier and will communicate with the readout by means of an rf link either directly or through a relay in either a real time or non-real time mode.

C. Characteristics:

(1) Transducer: Ceramic microphone

(2) Range: 200 - 500 M (Vehicles)
500 - 750 M (Aircraft)

(3) Probability of Classification: 75 - 83% (all targets)

(4) False Alarm:

Benign	Noisy	Stormy
5	100	500

(5) Size: 200 cubic inches

(6) Weight: 5 pounds

(7) Reliability: 90% for 30 day mission

(8) Power Requirements: 6.0 Ah (60 dy)

D. Elements:
Elements are shown on figure 4-14 and except for the added information on the case (see para. 4-36 preceding), described in paragraphs 4-1 through 4-24.

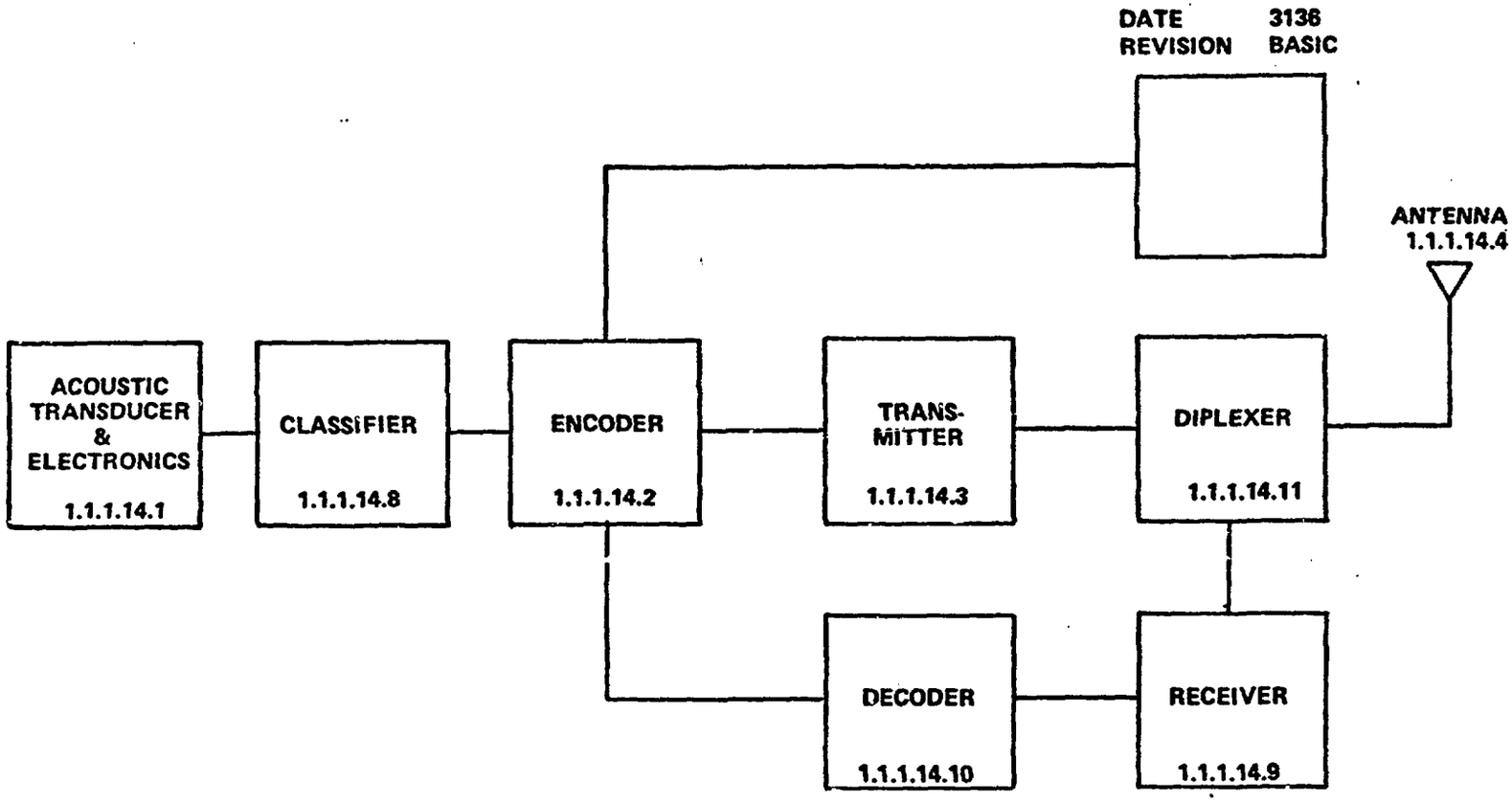


Figure 4-14 (U) AE HP C AS 1.1.1.14

4-39 (U) Ballistic-Emplaced High Power Non-Commandable Seismic Sensor (BE HP NC SS)

A. Function:
Classify personnel, vehicles, and aircraft.

B. General:
A ballistically-emplaced, high power, non-commandable seismic sensor that is self-contained. This sensor is a classifier and will communicate with the readout by means of an rf link either directly or through a relay.

C. Characteristics:

(1) Transducer: Geophone

(2) Range: 10 - 50 M (Personnel)
90 - 250 M (Wheeled vehicle)
300 - 1000 M (Tracked vehicle)
70 - 200 M (Aircraft)

(3) Probability: Classification 65 - 85% (Personnel, wheel, track, aircraft)

(4) False Alarm Rate (per 24 hours):

Benign	Noisy	Stormy
1	200	100

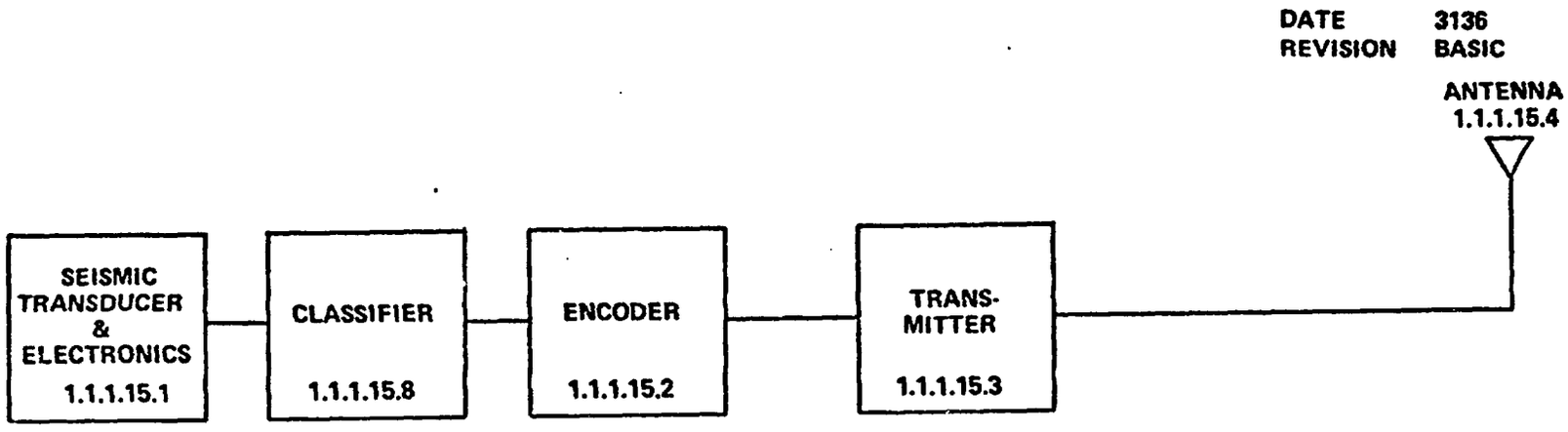
(5) Size: 200 cubic inches

(6) Weight: 5 pounds

(7) Reliability: 90% for 30 day mission

(8) Power Requirements: 6.7 Ah (60 dy)

D. Elements:
Elements are shown on figure 4-15 and, except for the added information following on the case, described in paragraphs 4-1 through 4-24. The case houses and protects the electronics from the ballistic environment; it must conform to the vehicle shape and withstand high g forces.



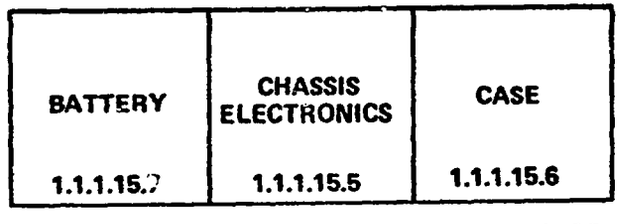


Figure 4-15 (U) BE HP NC SS 1.1.1.15

4-40 (U) Variable Resistance Line Sensor (VRLS)

A. Function:
Detect personnel and vehicles.

B. General:
A hand-emplaced, high power, non-commandable variable resistance line sensor that is self-contained. This sensor is a detector only and will communicate with the readout either directly (rf or wire link) or through a relay.

C. Characteristics:

(1) Transducer: #32 wire

(2) Range: 500 feet along the line

(3) Probability: Detection - 90 - 95% (all targets)

(4) False Alarm Rate:

Benign	Noisy	Stormy
0.1	2	5

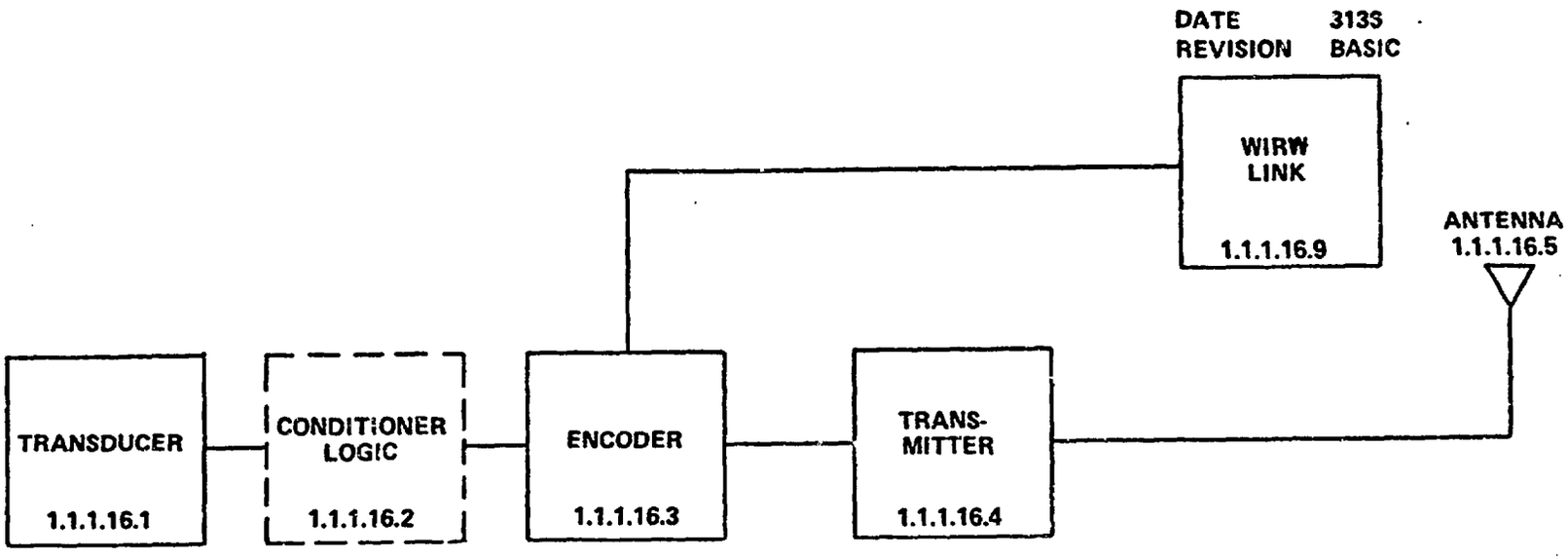
(5) Size: 200 cubic inches

(6) Weight: 5 pounds

(7) Reliability: 90% for a 30 day mission

(8) Power Requirements: 5.0 Ah (60 dy)

D. Elements:
Elements are shown on figure 4-16 and described in paragraphs 4-1 through 4-24.



BATTERY	CHASSIS ELECTRONICS	CASE
1.1.1.16.8	1.1.1.16.6	1.1.1.16.7

Figure 4-16 (U) VRLS 1.1.1.16

4-41 (U) Magnetic-Strain Line Sensor (M-S LS)

A. Function:
To detect armed personnel and vehicles.

B. General:
A hand-emplaced, high power, non-commandable magnetic/strain line sensor, that is self-contained. This sensor is a detector only and will communicate with the readout either directly (rf or wire link) or through a relay.

C. Characteristics:

(1) Transducer: Combination strain and magnetic line sensors

(2) Range: 100 meters

(3) Probability: Detection 90 - 99% (all targets)
Classification N/A

(4) False Alarm Rate:

Benign	Noisy	Stormy
1	10	200

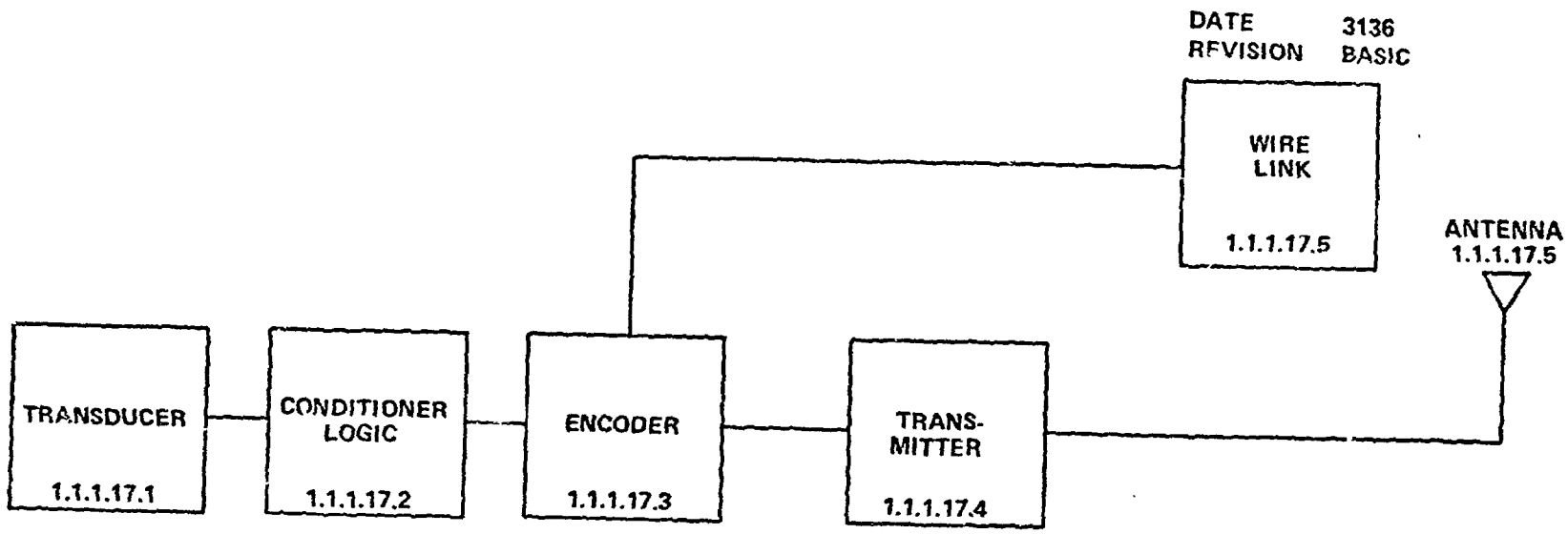
(5) Size: 400 cubic inches

(6) Weight: 15 pounds

(7) Reliability: 90% for 30 day mission

(8) Power Requirements: 5.0 Ah (60 dy)

D. Elements:
Elements are shown on figure 4-17 and described in paragraphs 4-1 through 4-24.



BATTERY	CHASSIS ELECTRONICS	CASE
1.1.1.17.8	1.1.1.17.6	1.1.1.17.7

Figure 4-17 (U) M-SLS 1.1.1.17

4-42 (U) Strain Line Sensor (SLS)

A. Function:
Detect personnel and vehicles.

B. General:
A hand-emplaced, high power, non-commandable strain line sensor that is self-contained. This sensor is a detector only and will communicate with the readout either directly (rf or wire link) or through a relay.

C. Characteristics:

(1) Transducer: Coaxial cable

(2) Range: 100 M (all targets)

(3) Probability: Detection 90 - 99% (all targets)

(4) False Alarm Rate:

Benign	Noisy	Stormy
1	5	25

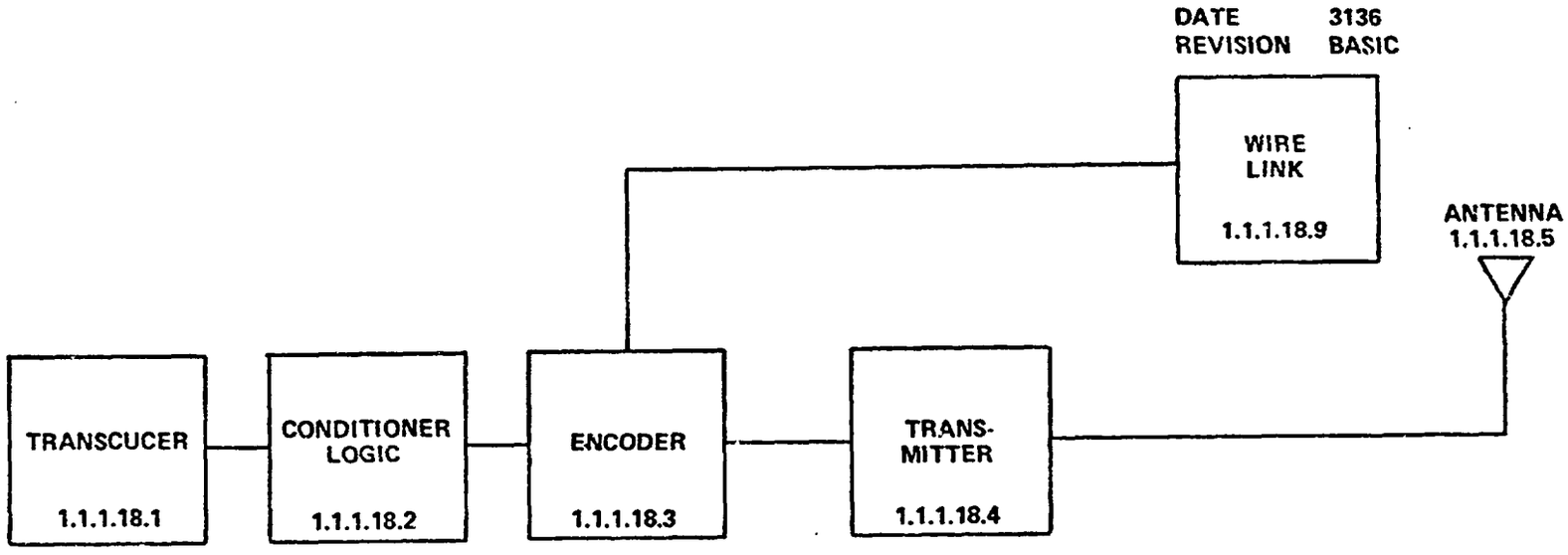
(5) Size: 200 cubic inches

(6) Weight: 5 pounds

(7) Reliability: 90% for 30 day mission

(8) Power Requirements: 3.0 Ah (60 dy)

D. Elements:
Elements are shown on figure 4-18 and described in paragraphs 4-1 through 4-24.



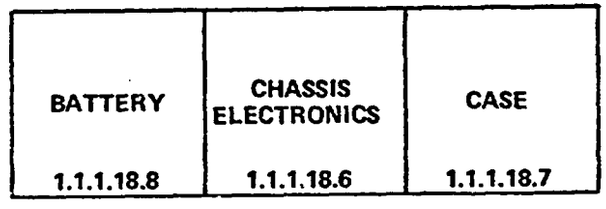


Figure 4-18 (U) SLS 1.1.1.18

CHAPTER 5 (U)

DATA TRANSMISSION (U)

Paragraphs 5-1 and 5-2 are

included in a separate classified annex.

5-3 (U) Sensor Control Module (SCM) (Fig. 5-1)

A. Function:

The Sensor Control Module is a hand-emplaced remote command and control unit which receives, processes, and retransmits activations from low power sensors and which receives, decodes, and executes commands from the UCR/T either directly or via a radic relay (RR).

B. General:

The SCM receives activation (digital) data from associated minisensor and commands from the readout site. Depending on the mode of operation, it either stores activations or retransmits them in real time to the readout site. In the non-real time (NRT) mode, activations are stored until readout on command. Analog input signals intended for real time retransmission must be inputted via the wire link. The only limitation is on real time relay of analog data. The SCM can accept analog inputs for processing via the rf link and can transmit analog data inputs received via the wire link. Processing of low power sensor messages in the SCM includes classification and false alarm reduction. Data storage capacity for the non-real time mode of operation will vary from relatively simple "event counts," as used in the SEAOPS sensors, to time order recording of target classifications and activations. The SCM will be a hand-emplaced item. The units will operate on the ground or hanging from trees. Terminals for the wire link will accept field wire. The wires need not be run from each sensor to the SCM but rather from sensor to sensor. The SCM will have Security/Recovery anti-tamper circuits to disable the transmitter if the control settings are changed or if covers are removed while the power control switch is in the armed position. The SCM will require the assignment of two operating frequencies: one for the receive channel and one for the transmit channel. Channel selection will be made by installing appropriate oscillator modules into the receiver and transmitter and manually returning them to the proper operating frequencies. The circuitry needed to provide fixed tuning will consume 10 mw or less.

C. Characteristics:

(1) Size: 8" X 2-1/2" X 10-1/2"

(2) Volume: 210 in. cu.

(3) Weight: 7 lbs.

(4) Life: 60 days

(5) MTBF: 2000 hrs.

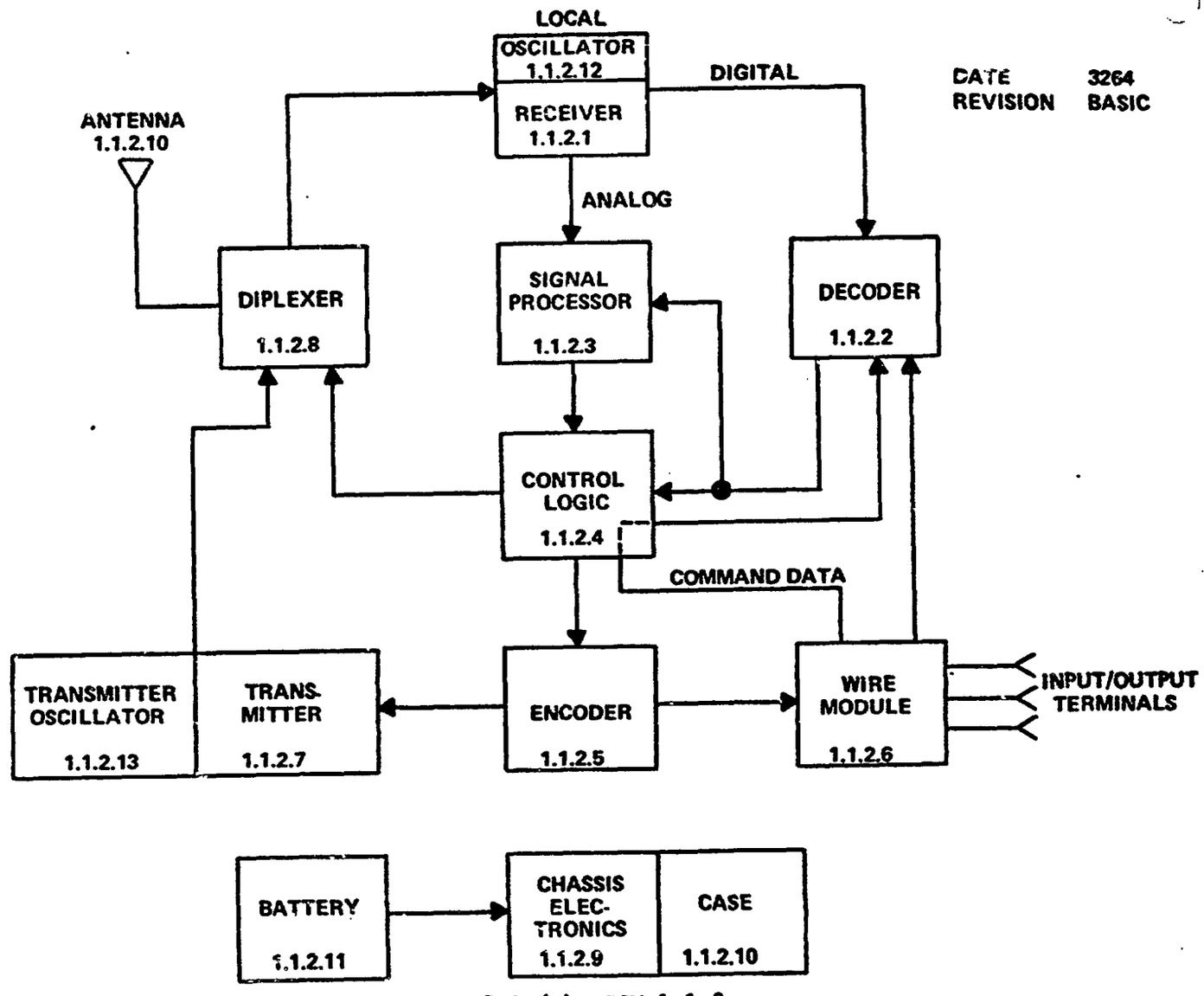


Figure 5-1 (U) SCM 1.1.2

(6) Connectors & Controls:

(a) Antenna Connectors: Type N, female

(b) Wire Inputs: threaded wire clamps

(c) Power Control Settings:

Off

On/Test

On/Arm

(d) Security recovery switches (2 required - 11 position)

Set, A, B, C, D, E, F, G, H, I, J

Set, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

(e) Channel Selection

LO substitution

(f) Relay ID

D. Test Equipment:

(1) Equipment checkout:

(a)	REMBASS message generator	Special Purpose
(b)	Signal generator	Marconi Instruments
(c)	Spectrum analyzer	Hewlett Packard HP851 Display Section HP8551B RF Section
(d)	In-line watt meter	Bird-type 43W/5C element
(e)	FM/AM Modulation Meter	Marconi Instruments TF2300
(f)	Power Meter	Hewlett Packard HP432A

(2) Fault isolate to component: Same as (1)

E. Receiver:

(1) Function:

The SCM Receiver uses the plug-in local oscillator module to receive the selected channel. It amplifies signals received on that channel to the

desired level and demodulates the signals to recover the base band information. A single unit will serve as both the command and data receiver. This same receiver module is also used in the UCR and RR. The receiver is a low power fm device employing limiter/discriminator demodulation. The separation of the receiver and local oscillator module is to permit use of the same receiver module in fixed-tuned and synthesizer-tuned applications. When used in the SCM, the receiver squelch is hardwired open by the absence of the squelch control as used on the UCR unit.

(2) Characteristics:

Essential receiver parameters are listed in paragraph 5-2. The receiver module will be a high performance, hybridized fm receiver with the physical and electrical characteristics shown below:

(a) Size: 1" X 2-1/2" X 4" (Receiver module)

1" X 1" X 2" (Oscillator module)

(b) Power consumption:

Receiver Module	10 mw/35 mw
Oscillator module	10 mw

(c) Input voltage:

12V nominal (10 to 15V)

(3) Test Equipment:

(a) Fault isolate to a module:

Signal generator	Hewlett Packard PH-608F
Synchronizer	Hewlett Packard HP-8708A
Oscilloscope, high frequency	Tektronix Model 454A
Vacuum Tube Voltmeter	Hewlett Packard HP-400H
3 ft. coaxial cable (RG-59) with type N, male connectors	
Frequency counter	Hewlett Packard HP-52466 w/HP-5253B Plug-in Unit

(b) Fault isolate to a component: Same as above

F. Decoder:

(1) Function:

The receiver input is pure noise in the absence of a signal and is a noisy, bi-phase coded (Manchester) word during signal presence. The decoder accepts the receiver output (or wire input), determines when a signal is present, and regenerates a clean (non-noisy) waveform in NRZ format; it also provides a synchronous clock output. The data inputted from the receiver is in serial form and the output section of the decoder converts the data to a parallel form and outputs it to the control logic.

(2) Characteristics:

The decoder will be used in the SCM, RR, and UCR as a command and data decoder and, for reasons of flexibility, it will be broken into two sections. The two-part fabrication allows decoding and the serial-to-parallel conversion to be performed in different locations. The major portion of the decoder will be hybridized to meet component size and reliability requirements. The total decoder will be mounted on one PC board measuring 3" X 4" and it will require a +12 volt (nominal) supply (10-15V).

(3) Test Equipment:

(a) Fault isolate to module:

REMBASS message generator	Special purpose
Signal generator	Marconi Instrument TF 1066B/6
Oscilloscope	Tektronic 453
VTVM	Hewlett Packard HP-400H

G. Signal Processor:

The signal processor accepts both analog and digital data as inputs and, using appropriate algorithms, performs the processing required to classify targets and/or to reduce false alarms.

H. Control Logic:

(1) Function:

The control logic receives messages from the decoder and outputs from the signal processor. It contains circuitry to interpret these inputs and effect the required response from the SCM. In the case of low power sensor messages, the control logic stores the data or causes it to be retransmitted. In the case of command messages, the control logic interprets and executes the command. When messages are to be transmitted, the control logic switches the diplexer to transmit, calls up the encoder and transmitter, and outputs the data being sent to the encoder. While certain functions

performed by the control logic are common from component to component, many functions are unique to the SCM.

(2) Characteristics:

Control logic will be hybridized for general application in REMBASS. The circuits will require a nominal +12 volts for operation. Inputs and outputs will be COS/MOS compatible logic levels; the Decoder will input standard format REMBASS words and the signal processor will input classification words and sensor I.D.

(3) Test Equipment:

(a) Fault isolate to module:

REMBASS message generator	Special purpose
Signal generator	Marconi Instruments TF1066B/6
Oscilloscope	Tektronic 453
VTVM	Hewlett Packard HP-400H

I. Encoder:

(1) Function:

The encoder formats the messages to be transmitted and converts the NRZ data to a bi-phase code. Transmitted information, such as sensor ID, event count, classification, status, is inputted from the control logic as an NRZ coded word; the fixed information, such as the preamble, SCM ID, RR ID, parity, is generated within the encoder. The encoder output is a bi-phase coded standard REMBASS message and it is routed to either the transmitter or wire module depending on the mode of operation. The encoder also contains the switch which controls the dc power to the transmitter. This switch is held closed by the encoder for the duration of an analog transmission.

(2) Characteristics:

The same encoder will be used at the SCM, RR, Sensors, and UCR/T. It will be a hybridized design requiring +12 volts for its operation. The encoder circuitry will be approximately 5 cu.in. in size.

(3) Test Equipment: Same as Control Logic (para. 5-3H).

J. Wire Module:

(1) Function:

The wire module contains buffers and line drivers to permit sending and receiving messages over field wire. Baseband messages from the UCR/T are inputted into one set of terminals, are passed through a buffer and level shifting section of the wire module, and are outputted to the decoder. Transmitted messages originate in the encoder and pass through line driver sections of the wire module and then to the output line pair.

(2) Characteristics:

The wire module will be used in the SCM, and the UCR/T. The design will be a relatively simple hybrid design. The wire module will operate from a nominal +12V battery without regulation. The design will allow for 2000 feet of field wire and one UCR/T load on the driver section, and 2000 feet of wire and a 16 low power sensor load on the low power sensor input terminals. A single terminal pair will be used to transmit data and receive commands from the readout site. To prevent ring-around, the command data line from the wire module to the decoder will pass through the control logic and will be shut off during transmission of messages.

(3) Test Equipment:

(a) Fault isolate to module:

Assorted cables and connectors	
Audio oscillator	Hewlett Packard HP200CD
Oscilloscope	Tektronic 452A
VTVM (or Vom)	Hewlett Packard HP400H (or a Simpson Vom)

K. Transmitter:

(1) Function:

Accepts the coded baseband signal from the encoder and converts it to an FSK modulated signal at the desired rf operating frequency and power level.

(2) Characteristics:

Essential parameters of the transmitter are listed in paragraph 5-2. The transmitter, like the receiver and decoder, is applicable to the SCM, sensors, radio relay, and UCR/T and will be of modular construction. The transmitter frequency will be selected by crystal plug-in. The transmitter will operate from +12V battery and will consume 6 watts of power when activated and essentially no power when quiescent.

(3) Test Equipment:

(a) Fault isolate to module:

Assorted cables and connectors

Audio oscillator	Hewlett Packard HP200A
Through line watt meter	Bird, Type 43W/5C Element
Spectrum analyzer	Hewlett Packard HP851 Display Section HP8551B rf Section
VTVM (or Vom)	Hewlett Packard HP400H (or Simpson Vom)

L. Diplexer:

(1) Function:

To switch the antenna from the receiver to the transmitter during transmission of messages. The control logic is the source of the switch signal. The diplexer permits the use of one antenna for both the receiver and transmitter and insures that the transmitter power does not damage the receiver.

(2) Characteristics:

The diplexer module will be used in the SCM, RR, sensors, and UCR/T. It will have the following characteristics:

(a) Insertion Loss:

receiver - $\leq$ 2.0 db

transmit - $\leq$ 0.5 db

(b) Power handling capability - $>$5 watts

(c) Isolation T to R - $>$ 40 db

(d) Bandwidth - The diplexer will satisfy the above requirements over the band from 138 to 154 MHz

(e) Power Drain:

receive - 0

transmit - $<$ 200 mw

(f) Size: (Estimated to be 5 cu. in.)

(g) Operating Voltage - 12 VDC

(3) Test Equipment:

(a) Fault isolate to module:

Signal generator	Hewlett Packard HP608F
Power meter	Hewlett Packard HP-432A
Vom or VTVM	Simpson
Power supply (0-20V; 0-1.0A)	Power Mate BP-18C-20
Assorted cables and connectors	

(b) Fault isolate to component: N/A. Item is non-repairable.

M. Chassis Electronic, Battery, Case:

(1) Function:

The chassis electronics consists of the operating controls, power conditioning circuits (power switch and regulator), security circuits, module interconnecting harnesses, etc. The function of the battery is to provide power to operate all SCM modules; the battery voltage will be conditioned by one or more regulators to provide necessary stability as the load, temperature, and battery conditons vary. The controls and security circuits were discussed previously.

(2) Characteristics:

The battery will be a 12V Lithium unit. The battery configuration is that of the BA-386 (PRC-25). The battery will be capable of supplying an average power drain of 100 mw for 1400 hrs. (144 watt hrs.), plus a peak power of 6 watts for 100 ms at a 1% duty cycle (100 watt hrs.). The case will be of injection molded plastic with two compartments: one for the battery and the other for the electronics. The electronics compartment will be sealed from the battery compartment to insure that the weather seal is not compromised when changing batteries in the field. Once installed, the SCM will become inoperative if either cover is removed without setting the security recovery switches to the correct position. The security circuits will be wired "safe" up to the time of deployment to avoid loss of items during storage, checkout, and testing. The power conditioning circuitry will contain an "end-of-battery-life" sensor to turn the SCM off if the battery voltage gets too low for proper regulator action. This circuit will remove power from all modules except for the security circuits. The SCM will be operable upon replacement of the battery or if the battery voltage rises above a preset threshold.

(3) Test Equipment:

(a) Fault isolate to module and component:

Vom (or VTVM)	Simpson
Power Supply	Power Mate BP-18C-20
Oscilloscope	Tektronic 453A

N. Antenna:

(1) Function:

The antenna is an impedance matching device used between the propagation media (air) and the rf electronics modules (receiver and transmitter). It collects energy radiated by the minisensor or UCR/T (or RR) and delivers this energy to the receiver; in the transmit mode it accepts rf energy generated by the transmitter module and efficiently radiates it toward the UCR (or RR).

(2) Characteristics:

The SCM antenna will be an electrically shortened, center driven, half-wave dipole with the connector being mounted in such position that the antenna can be rotated to allow SCM installation either on the ground or strapped in a tree. The half-wave dipole pattern is relatively independent of position in relation to the ground and this permits its use either in trees or mounted directly on an SCM installed on the ground.

(3) Test Equipment:

Direct substitution of a good antenna is the preferred check if antenna problems are suspected.

O. Receiver Oscillator Module:

(1) Function:

The receiver oscillator module generates the rf reference signal used in the first mixer and, as such, determines the channel of receiver operation. A separate receiver oscillator module is required for each communication channel on which the SCM will operate.

(2) Characteristics:

The oscillator module will be a crystal controlled, fixed frequency unit. The output frequency will be such that only the selected channel will be received. The module will be capable of driving 0 dbm into a 50 ohm load. It will operate from a regulated power supply at a nominal output voltage of +9 volts and consume less than 10 mw of power. The rf output connectors will be a miniature snap type. Module volume will be less than 5 cu.in.

(3) Test Equipment:

(a) Fault isolate to module:

Power meter	Hewlett Packard HP-432A
Frequency counter	Hewlett Packard HP-5246L w/HP-5253B Plug-in
Vom	Simpson
Spectrum analyzer	Hewlett Packard HP-851 Display Section and HP-8551B rf section

(b) Fault isolate to component: N/A. Hermetically sealed unit.

P. Transmitter Oscillator Module:

(1) Function:

The transmitter oscillator module provides a stable reference signal for use in generating the transmitter carrier frequency. A separate module is required for each REMBASS channel used.

(2) Characteristics:

Oscillator output power will be 0 dbm into a 50 ohm load. Supply voltage will be 9V with a ±10% regulator. The rf output connector will be a miniature snap type. DC power will be applied through the rf connector. Module volume will be less than 5 cu.in. The oscillator output frequency will be in the range of 17.0 MHz to 19.5 MHz as required to give the correct transmitter frequency after multiplication by a factor of e ht.

(3) Test Equipment:

(a) Fault isolate to module:

Power meter	Hewlett Packard HP-432A
Frequency counter	Hewlett Packard HP-5246L w/HP-5253B Plug-in
Vom	Simpson
Spectrum analyzer	Hewlett Packard HP-851 Display Unit HP-8551B rf section

(b) Fault isolate to component: N/A. Hermetically sealed unit.

5-4 (U) Radio Relays

A. Function:

At the rf frequencies used in REMBASS, line-of-sight between receivers and transmitters is essential for reliable data transmission. The sensors, SCM's and readout sites are frequently placed in low areas, such as valleys, and radio relays will be used to maintain line-of-sight. The relay is placed on a high point which affords a line-of-sight to both the sensor or SCM and the readout site (UCR) or another radio relay. The relay receives, amplifies, filters, and retransmits sensor and command messages.

B. General:

From a functional viewpoint, there are two (2) types of relays used in REMBASS: (1) Digital only, which will relay only digital type messages, and (2) Digital/Analog relay, which will handle both digital and analog signals. REMBASS relays include hand, air, and ballistically emplaced types. The digital radio relays are store and forward devices; that is, they receive a message, reformat it, switch the diplexer to transmit, and retransmit the message. During the transmit period, no data can be received since the receiver is blocked by the diplexer. The analog is a real time device which receives and transmits information simultaneously and, as a result, is somewhat more complex and expensive.

C. Characteristics:

The characteristics of hand-emplaced, air-delivered, and ballistically emplaced relays are quite different and are discussed in paragraph 5-5 through 5-9.

D. Test Equipment:

(1) Checkout:

(a)	REMBASS message generator	Special purpose
(b)	Signal generator	Marconi Instruments TF1066B16
(c)	Spectrum analyzer	HP-851 Display section HP-8551B rf section
(d)	In-line power meter	Bird type 43W/5C element

(2) Fault isolate to a module:

Same as above, plus:

Vom	Simpson

5-5 (U) Hand-Emplaced Digital Single Channel Radio Relay (HE D SC RR) (Fig. 5-2)

A. Function:
Relay single channel digital data.

B. General:
Channel selection, both receive and transmit, is by plug-in local oscillator modules. In addition to selecting channel frequencies, the user must program the ID Code into the relay. Receive and transmit frequencies must be identical since the relay is to serve as both a response and command relay, i.e., it will operate as a half-duplex link.

C. Characteristics:

(1) Size: 8" X 10" X 3-1/2"

(2) Operating Controls & Connectors:

(a)	Security recovery switches	2, 10-position
(b)	Channel selectors (tunable)	3, 10-position
(c)	Power	1, 3-position - (Off, test, arm)
(d)	Antenna connector	Type N, Female

(3) Weight: 15 lbs.

(4) Power (avg.): 50 mw

(5) Power (peak): 6 watts (1% duty cycle)

D. Elements:
Elements are shown on figure 5-2 and except for those described in subparagraphs E and F following, are described under the SCM (para. 5-3).

E. Control Logic:

(1) Function:
The relay control logic checks the messages received from the decoder and reconstitutes and retransmits messages as required. If the relay ID contained in the message matches that assigned to the receiving relay, the control logic recognizes it as a message which it had previously transmitted and therefore the message is not relayed again. If the address of the relay is not contained in the message, it will be processed and retransmitted as required.

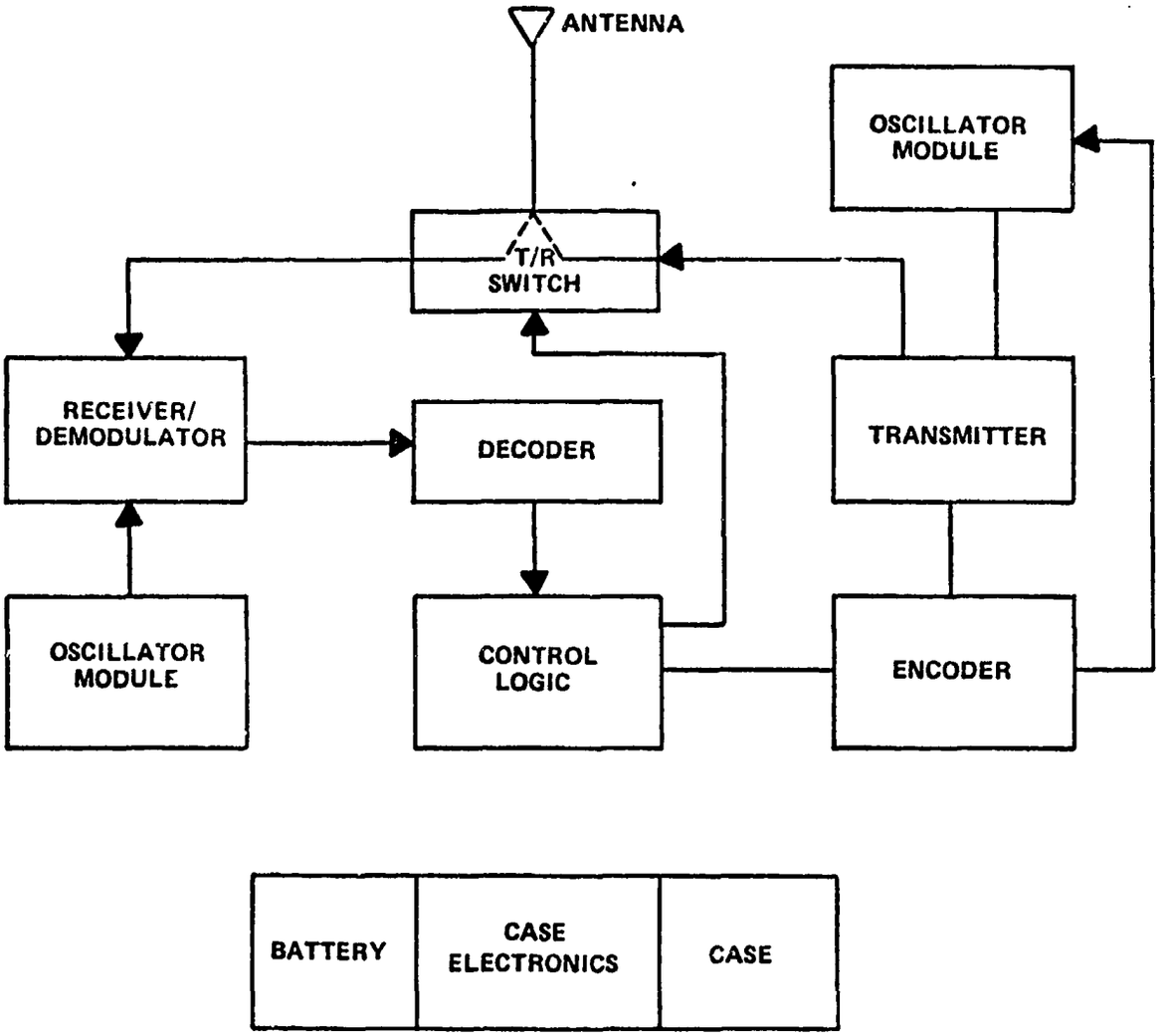


Figure 5-2 (U) HE D SC RR 1.1.3.1

(2) Characteristics:

The control logic module will be used in all digital radio relays. It will be designed to operate from a 12 volt battery (nominal) and will be COS/MOS compatible logic. The module will be approximately 2 in. cu., and will consume 2 mw of power.

(3) Test Equipment:

(a) Fault isolate to module:

REMBASS message generator	Special purpose
Oscilloscope	Tektronics 453A
High impedence voltmeter	RCA Master Voltohmyst WV-50

F. Chassis Electronics, Battery, Case:

(1) Function:

The chassis electronics consists of the operating controls, module connectors, wiring harnesses, and security circuits sensors. The security circuits sensors are discussed in Paragraph 5-3. The battery provides the power required to operate all of the modules. Battery conditioning circuits such as regulators and power switches are also considered to be chassis electronics. The battery output voltage will be conditioned by one or more regulators to provide necessary circuit stabilities under varying loads, temperatures, and battery conditions.

(2) Characteristics: See Paragraph 5-3.1

5-6 (U) Hand-Emplaced, Digital Multiple Channel Relay (HE D MC RR)

A. Function:

Fo_ many installations there is a requirement to relay data from sensor strings operating on different frequencies. The multiple channel radio is intended to satisfy this need.

B. General:

The multiple channel radio relay requirement will be satisfied through the use of multiple HE D SC RR. The relays may be located within 10 feet of each other without interference; each relay will operate as an independent unit.

5-7 (U) Hand-Emplaced Digital-Analog Single Channel Radio Relay (HE D-A SC RR)

A. Function:

To provide a capability for transmitting analog data, such as voice and pictures, from sensors to a readout station in situations where line-of-sight does not exist between them.

B. General:

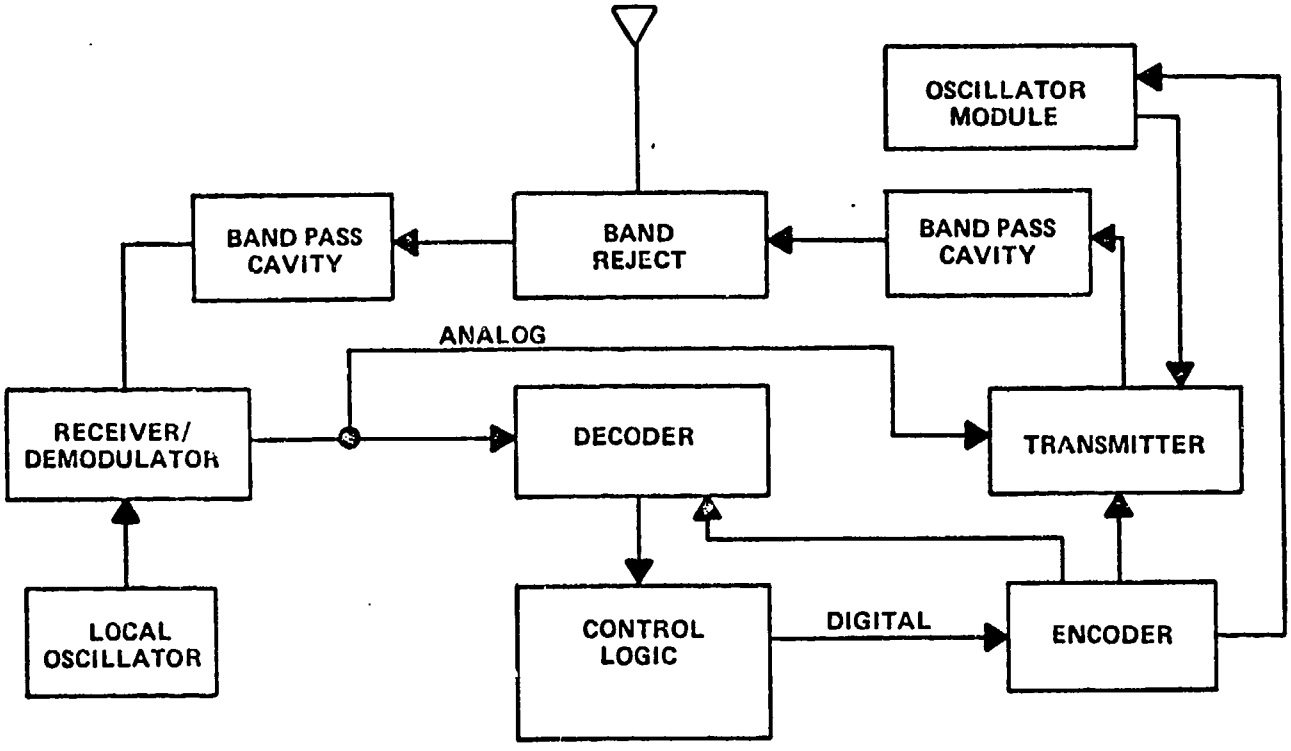
The difference between the digital and analog relay results from the real time transmission (i.e., simultaneous receive and transmit) dictated by the type of data being relayed. To provide the real time capability, the receiver and transmitter must be isolated by more than the gain across the relay. Two band pass filters, plus a duplexer provide this isolation. This permits the receiver and transmitter to share the same antenna on a real-time basis. The receive and transmit frequencies must be separated by at least 6 MHz to obtain the isolation in a reasonable size unit. To send commands, the D/A relay operates like a digital-only relay, except that the transmit frequency must be changed to provide reverse transmission.

C. Characteristics:

(1)	Size:	9" X 12" X 3-1/2" fixed tuned
(2)	Operating controls:	
	(a) Security recovery switches	2, 10-position
	(b) Power	1, 3-position (off, test, arm)
(3)	Antenna Connector:	Type N, female
(4)	Weight:	20 lbs.
(5)	Power (average steadystate):	90 mw
(6)	Power (peak):	6 watts (1% duty cycle)

D. Elements:

Elements are shown on figure 5-3 and, except for the control logic, described under the SCM (para. 5-3) and HE D SC RR (para. 5-4). The control logic in the HE D-A SC RR does not control a T/R switch. When an analog message type is received the encoder gates the receiver output (analog signal) into the transmitter for 10 seconds after transmission of the reformatted digital portion of the message has been completed. Sensor messages received during the analog transmission interval are ignored by the RR.



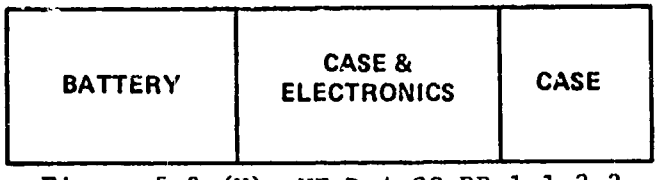


Figure 5-3 (U) HE D-A SC RR 1.1.3.3

5-8 (U) Air-Emplaced Digital Signal Channel Radio Relay (AE D SC RR)

A. Function:

To provide a capability for installing radio relays in inaccessable locations.

B. General:

For the air-emplaced radio relay, fixed frequency operation will be provided. The channel is selected by inserting a transmitter and receiver oscillator module into the relay at time of issue. The primary difference between the HE and AE Digital relay will be the case configuration and antenna deployment.

C. Characteristics:

(1) Size: 3" dia X 36" length

(2) Operating Controls:

(a)	Power	1, 3-position switch
(b)	Antenna Connector	TNC, Female
(c)	Weight	15 lbs.
(d)	Power Consumption	50 mw steadystate; 6 watts peak
(e)	MTBF	2000 hrs.

D. Elements:

Elements are shown on figure 5-4 and, except for the antenna and case, described under the SCM (para. 5-3) and HE D SC RR (para. 5-4). The antenna will be collapsible and contain a self-erecting feature; the case electronics will have circuits to sense that the relay has implanted correctly, then will activate the electronics and the antenna erection mechanism. The antenna will erect to a minimum height of 15 feet and will not be recoverable once it has erected.

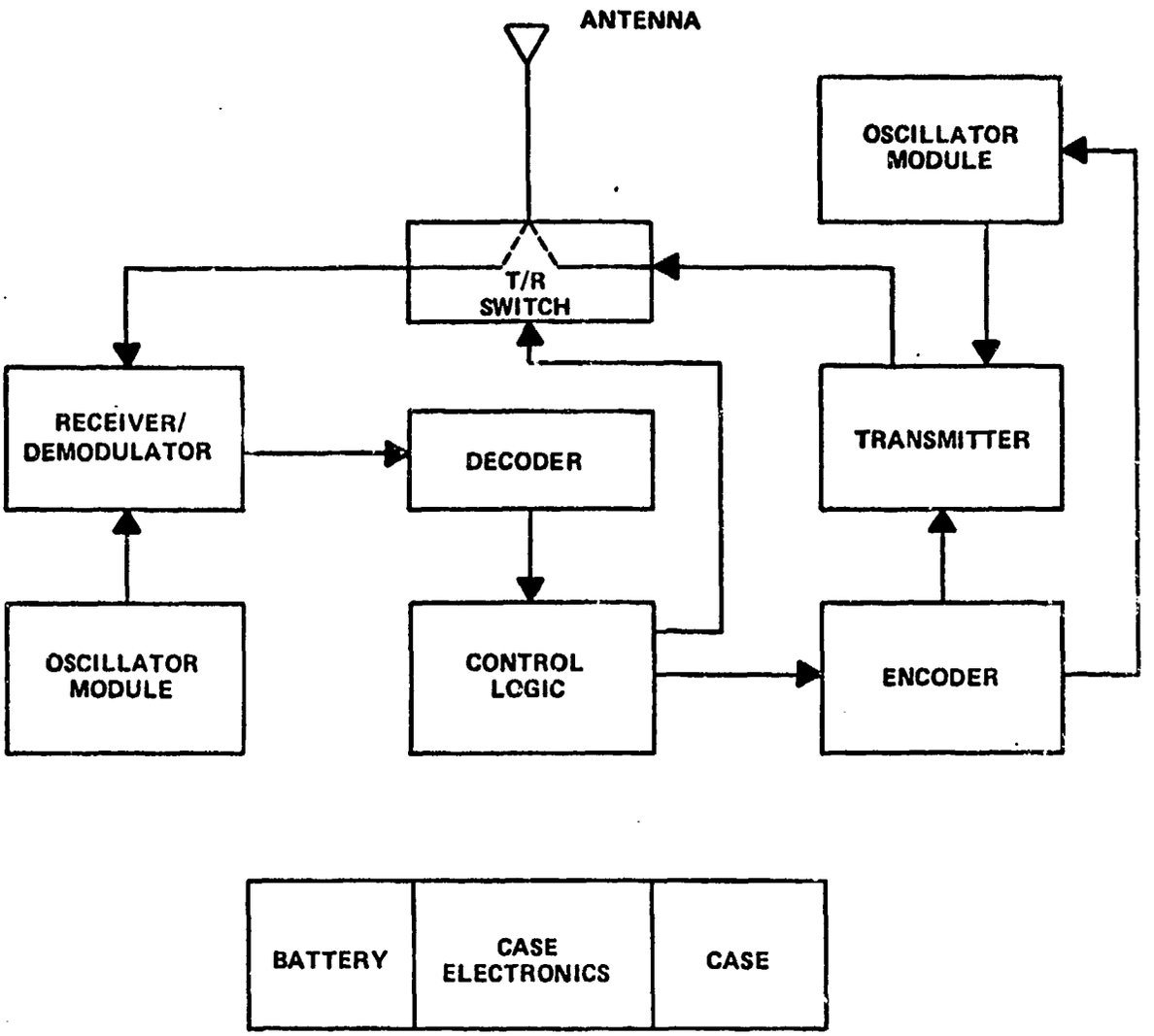


Figure 5-4 (U) AE D SC RR 1.1.3.4

5-9 (U) Ballistic-Emplaced Digital Single Channel Radio Relay (BE D SC RR)

A. Function:

The function of the ballistically emplaced relay is the same as other relays. It will be emplaced with the aid of a large calibre artillery piece.

B. General:

The BE RR is identical with the AD RR except for a shorter package. The package length reduction is achieved at the expense of shortening relay life by eliminating a section of the battery, and by using a 1/4 wave whip antenna which will erect on implant.

5-10 (U) Universal Control Receiver (UCR) (See Figure 5-5)

A. Function:

The UCR is a small modular receiver unit which is used at all levels of deployment of the REMBASS for receiving messages from remote sensors or SCM's, either directly or via a radio relay link. These messages may be responses to target activations or responses to commands. The UCR receives the low level rf input signals from an associated antenna and provides the necessary amplification and demodulation to provide the baseband modulation signals as serial outputs to external displays or recorders.

B. General:

In the concept adopted for the REMBASS, the data receiving function and display function are divided into separate hardware units. The receiver (UCR) module will plug into any display device which gets its information via an rf data link. The UCR does not have its own power source, neither does it have an integral display. It gets its regulated DC power from the display unit which it plugs into. The UCR can be plugged into a display unit containing a battery, a digital decoder, a serial to parallel converter, and a light matrix display. If the information to the display device is via a wire link, the UCR is replaced by a wire module. The UCR may also operate with a graph plotter or printer instead of the light display. Multi-channel operation may also be provided with several UCR's in a single package containing a common power source.

C. Characteristics:

Essential electrical parameters of the UCR are listed in paragraph 5-2.

(1)	Size:	4" X 4" X 5"
(2)	Weight:	1.5 lbs.
(3)	Power:	110 mw @ 12 volts
(4)	Controls:	3, 10-position channel select switches and squelch control
(5)	Connector:	ITT Cannon 13W3P or equivalent (all connections, including antenna)
(6)	MTBF:	3000 hrs.

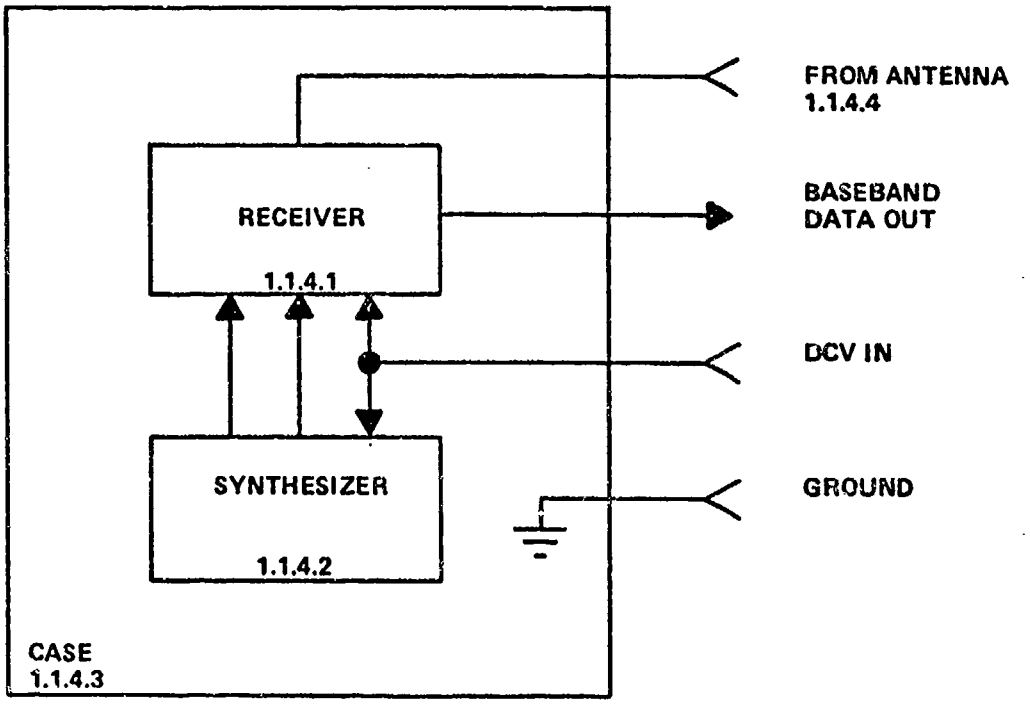


Figure 5-5 (U) UCR 1.1.4

D. Test Equipment:

Check Out:

Signal generator	Hewlett Packard HP-608F
Oscilloscope	Tektronic 452A
Power supply (0-20V; 0-1.0A)	Power Mate BP-18C-20
Synchronizer	Hewlett Packard HP-8708A
Frequency counter	Hewlett Packard HP-52466 w/HP-52520 Plug-in

E. Receiver:

The UCR receiver module is identical to the SCM receiver module (para. 5-3), with the exception that the squelch level will be adjustable from the front panel.

F. Synthesizer:

(1) Function:

The synthesizer module provides a convenient means for easily selecting any one of the 600 REMBASS channels on which the UCR will operate. This selection capability is provided by the rotary switches on the front panel of the UCR. The switches are set to the desired channel number and the synthesizer will then provide the required local oscillator output frequency to permit the receiver module to receive the channel indicated on the front panel switches. An output voltage level will also be provided (which is related to the channel number) to the receiver module which is used to change the center frequency of an rf preselector in the front end of the receiver module.

(2) Characteristics:

The synthesizer and receiver modules are designed to be physically and electrically connected together to form an integral unit. When inserted into the case, the modular UCR is formed. The input and output signal characteristics of the UCR are given in paragraph 5-2. The synthesizer will consume approximately 50 mw of power from a regulated power source in the unit into which the UCR is plugged. It will be assembled from integrated circuits, insofar as possible, to reduce size and improve reliability. Characteristics are as follows:

(a) RF output:

frequency -	(Channel frequency - IF)
level -	(0 dbm into 50 ohms)

(b) Filter Tuning Voltage (DC level as required).

(c) Size: Approx. 1-1/2" X 2-1/2" X 4"

(d) Weight: Less than 12 oz.

(e) Connectors: RF - Sealectro 51-045-0000 or equivalent

(f) Connectors: DC - Miniature pressure type.

(3) Test Equipment:

(a) Fault isolate to a module:

High impedance voltmeter	HP-400H, Hewlett Packard RCA Master Voltohmyst WV-510A
Spectrum analyzer	Hewlett Packard HP-851 Display w/HP-8551B RF Section
Power meter	HP-432A

Assorted cables and connectors

Power supply: (0-20V; 0-1.0A)Power Mate, BP-18C-20

(b) Fault isolate to component:

Same as above, plus:

Oscilloscope (high frequency) Tektronic 454A

G. Case:

(1) Function:

To house, hold, contain, support, and protect the receiver and synthesizer modules and the operating controls and to offer a means for mounting the unit into a display or other output device with which it is to be used.

(2) Characteristics:

The case will be a front panel attached to an open frame with provisions for attaching the synthesizer and receiver modules. The receiver module will connect directly to the synthesizer. A connector mounted on the rear of the frame permits interconnection of the UCR to the display, etc. The front panel will extend 3/8 of an inch on all sides beyond the synthesizer module to act as a mounting flange, and this flange will be provided with an environmental gasket to provide a seal between the UCR and the receptacle in the display unit. A squelch control and the channel selection switches will be mounted onto the front panel. A handle and locking screws will also be provided on this panel.

H. Antenna:

The UCR will be connected to its antenna through a type N, Female connector which will be located on the display unit. The antenna may be remotely located (up to 100 feet) by use of a coaxial cable. In most installations the antenna will be a ground plane whip ($\frac{3}{4}\lambda$ or $5/8\lambda$) mounted on a 30 foot mast. In portable displays (LLRP), a short whip can be mounted directly to the receiver antenna connector or on a short mast (10 feet). The antenna installation kit will include a mast-mounted preamp and a multicoupler, allowing up to eight receivers to share a common antenna. In this case, several UCR units would be mounted in a case with the multicoupler.

5-11 (U) Universal Control Transmitter (UCR/T)

A. Function:

The UCR/T is the equipment component of the REMBASS which provides a capability for sending command messages to sensors, SCM's, or radio repeaters in the relay links. A single UCR/T is sufficient to provide this capability at most sensor readout sites. The unit includes a digital synthesizer for selection of any of the channels on which commandable devices may operate. It also contains an encoder for formatting the command data word with the address of the device being commanded and the code of the command being sent. Manual selection of the address and command is by switches on the front panel of the UCR/T. Provisions are also made for selecting these items remotely by external logic input lines.

B. General:

A functional diagram of the UCR/T is given in Figure 5-6. The UCR/T, like the UCR, is generally used in conjunction with an external display or readout unit, and the UCR/T will be designed as a modular attachment to these units. In this configuration, dc power would be supplied by the unit to which it is attached. The UCR/T capability may also be required in a portable configuration. The UCR/T module would then be packaged in a case containing a UCR and battery. Two modes of operation are possible with the UCR/T. In the manual mode, the operator selects the command code, the address, and the operating channel of the item being commanded. By manually pressing a "send" button, the command is formatted by the encoder and transmitted to the item. The response to the command is received within a very short time by the associated UCR. An automatic mode is also provided for use when the UCR/T is installed at a SRU where a central processing unit (CPU) is used. In this mode, the UCR/T is under control of the CPU which provides the desired command, address, etc., to the UCR/T as logic input signals. The CPU also controls the activation of the UCR/T to send the command. Sequential polling of many sensors by the CPU is also possible in this mode.

C. Characteristics:

Essential data link parameters are listed in paragraph 5-2. Additional characteristics of the UCR/T are:

(1)	Power Requirements:	+12V dc; average power drain 100 mw; Peak power during transmit, 7 watts.
(2)	Size:	
	(a) UCR/T Module, alone	9" X 4" X 3" (without case or battery)
	(b) Portable UCR/T, with case and battery only	9-1/2" X 4-1/2" X 6"

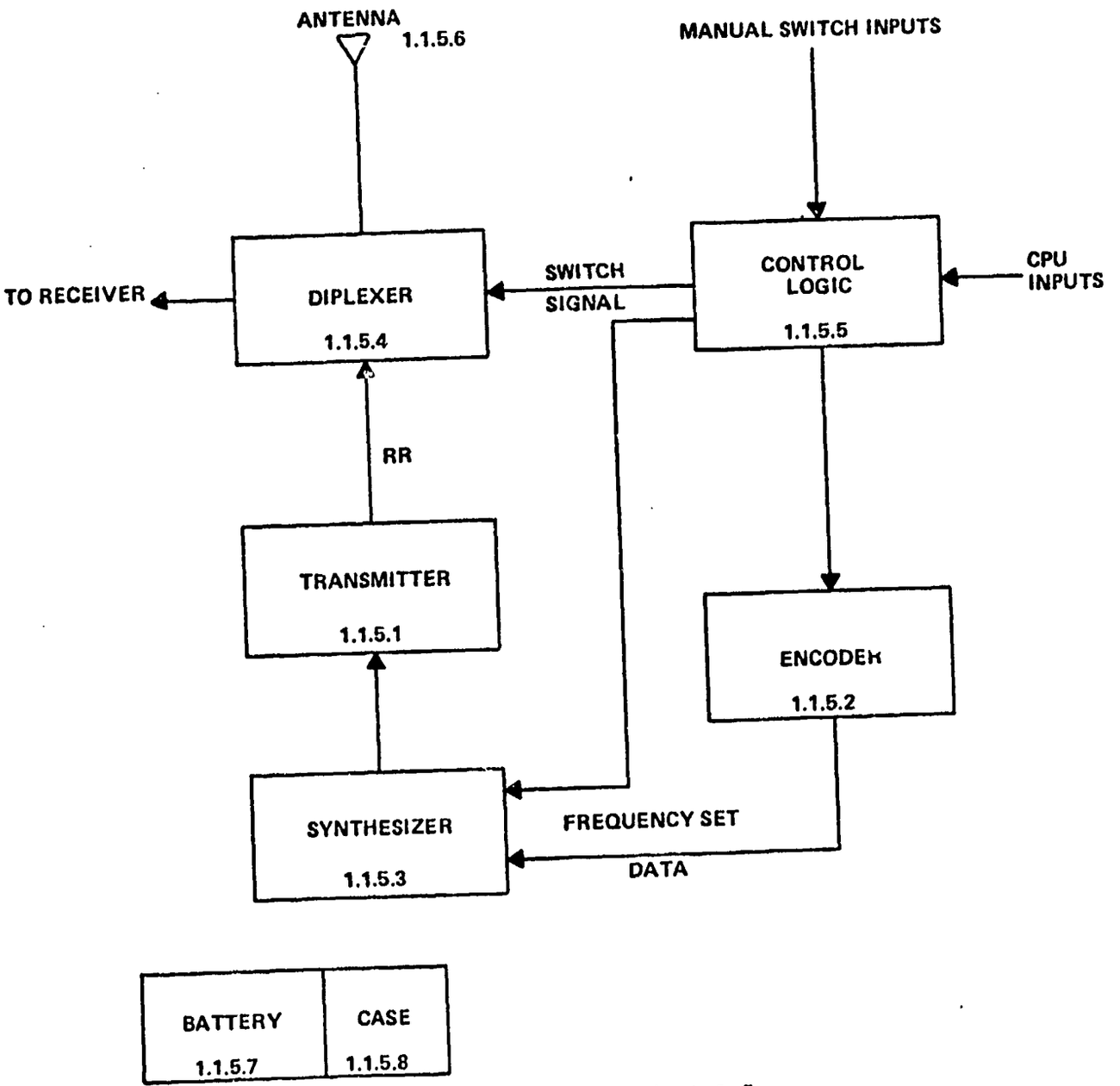


Figure 5-6 (U) UCR/T 1.1.5

(3)	Number of channels	600
(4)	Channel selection	Synthesizer - Manually or automatically
(5)	Power connector	ITT Cannon 13W3P or equivalent (all connectors including antenna)
(6)	Controls	
	(a) Channel select:	3, 10-position switches
	(b) Mode:	2-position (manual/automatic)
	(c) Message (Digs Switches):	3 ID
		2 Field or Group
		2 Command
	(d) Power switch:	3 position - off, on, test.

D. Test Equipment:

(1)	Checkout:	
	(a) Power supply (0-20V; 0-1.0A)	Power Mate BP-18C-20
	(b) Inline power meter	Bird
(2)	Fault isolate to component:	
	(a) Vom	Simpson
	(b) Spectrum analyzer	Hewlett Packard
	(c) Frequency counter	Hewlett Packard HP-5246L w/HP-5253B Plug-in
	(d) Inline power meter	Bird
	(e) REMBASS message generator	Special purpose

E. Transmitter:

The transmitter module used in the UCR/T is identical with the module used in the SCM (para. 5-3), except that only an FSK modulator is used.

F. Encoder:

The encoder module used in the UCR/T is identical with the module used in the SCM (para. 5-3).

G. Synthesizer:

Form, fit, and function of the UCR/T synthesizer is identical with the module used in the UCR with one exception (para. 5-9). The output frequency of the transmitter synthesizer will be the frequency associated with the selected channel number, except for tolerances; whereas, with the UCR, the synthesizer output frequency will be offset from this frequency by an amount equal to the UCR if frequency.

H. Diplexer:

The diplexer module is identical to the module used in the SCM (para. 5-2).

I. Control Logic:

(1) Function:

The control logic module, with inputs from the external CPU or associated manual switches, directs the sending of a command from the UCR/T. These address channel number and command inputs are converted to logic level signals in the control logic and are outputted on parallel lines to the encoder and synthesizer. When the signal to transmit the command is given, the encoder outputs a pulse to activate the encoder. It also provides a switching signal to the T/R switch, as required, to switch the antenna from the receive to the transmit mode. The control logic provides a lock-out to the CPU to control the rate of command inputs from the processor. No lock-out is required in the manual mode as the operator will determine when a new command may be sent.

(2) Characteristics:

The control logic will be a hybrid plug-in module 2" X 2" X 1/2". Inputs will be COS/MOS compatible and the device will operate on 12 volts dc (nominal).

(3) Test Equipment:

(a)	Fault isolate to module:	
	REMBASS message generator	Special purpose
	Oscilloscope	Tektronics 453A
	High impedance voltmeter	RCA Master Voltohmyst WV-510A
	Power supply (0-20V; 0-1.0A)	Power Mate
(b)	Fault isolate to component:	N/A: Hybrid unit non-repairable.

J. Antenna:

The antennas used with the UCR/T are identical to those used with the UCR (para. 5-9).

K. Battery and Case:

(1) Function:

The battery provides power to the UCR/T circuits when the UCR/T is used as a portable self-supporting component. The battery is identical with that used in the SCM. The case houses the UCR/T and UCR when used as a portable unit. For operation with the SRU as a plug-in module, the UCR/T is removed from the case.

(2) General:

The case will be fabricated in two compartments; one for the battery section and the other for the electronics. All connections to the UCR/T Module will be made by a mating connector on the rear of the UCR/T Module. The front section of the case will have provisions for attaching the antenna, Type N, Female Connector.

CHAPTER 6 (U)

SENSOR REPORTING UNIT (SRU) (U)

6-1 (U) Introduction

The REMBASS sensor reporting unit (SRU) consists of a number of data processing and display components. These components are configured in various groupings to provide the sensor reporting function at different organizational levels. Paragraphs 6-2 through 6-7 describe the SRU configurations. Paragraphs 6-8 through 6-14 describe each SRU component in detail. Table 6-1 summarizes the usage of components for each configuration.

6-2 (U) Long Range Reconnaissance Patrol (LRRP) SRU (Fig. 6-1)

The LRRP SRU will consist of an Interface Box and two (2) Event Recorders. Up to forty (40) Sensors will be monitored by this system, with a few commandable into and out of non-real time operation and some commandable into and out of audio mode operation.

6-3 (U) Armored Cavalry Squadron (ACS) SRU (Fig. 6-2)

The ACS SRU will consist of a Central Processing Unit, a Spectal Display, a Page Printer, a Control Panel, five (5) Recorders, and two (2) Map Situation Displays. This SRU will monitor up to 250 sensors, including commandable non-real time and audio mode sensors.

6-4 (U) Battalion (BN) SRU (Fig. 6-3)

The Battalion SRU consists of an Interface Box, a Spectral Display, an Image Receiver Display, and two (2) Recorders. In this configuration, 100 sensors can be monitored, including imaging sensors and sensors operating in non-real time and audio mode.

6-5 (U) Artillery Battalion (ARTY BN) SRU (Fig. 6-4)

The ARTY BN will maintain a deployment capability of 35 sensors which will be emplaced in planned fire zones and will operate in real time. A few of these sensors will be audio types, and will transmit on command for purposes of target classification. The ARTY BN SRU will consist of an Interface Box, a Recorder, and a Digital Display.

Table 6-1 (U) SRU Components

COMP \ SRU	LRRP	ACS	BN	ARTY BN	BDE	DIV
INTERFACE BOX	1		1	1		
CPU		1			1	1
RECORDER	2	5	2	1	3	5
SPECTRAL DISPLAY		1	1		1	1
MAP DISPLAY		2			2	2
PAGE PRINTER		1			1	1
IMAGE DISPLAY			1		1	1
DIGITAL DISPLAY				1		

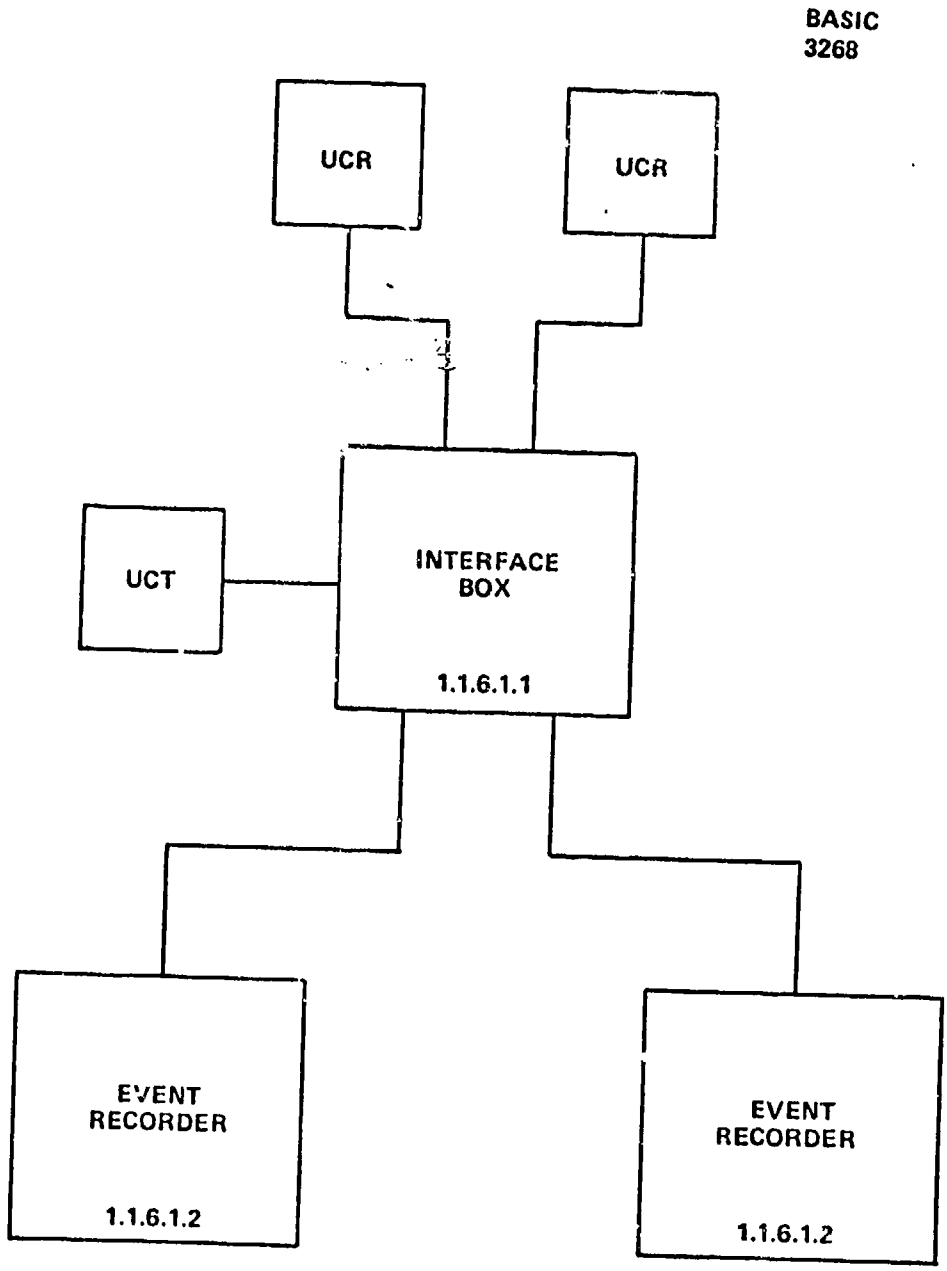


Figure 6-1 (U) LRRP SRU 1.1.6.1

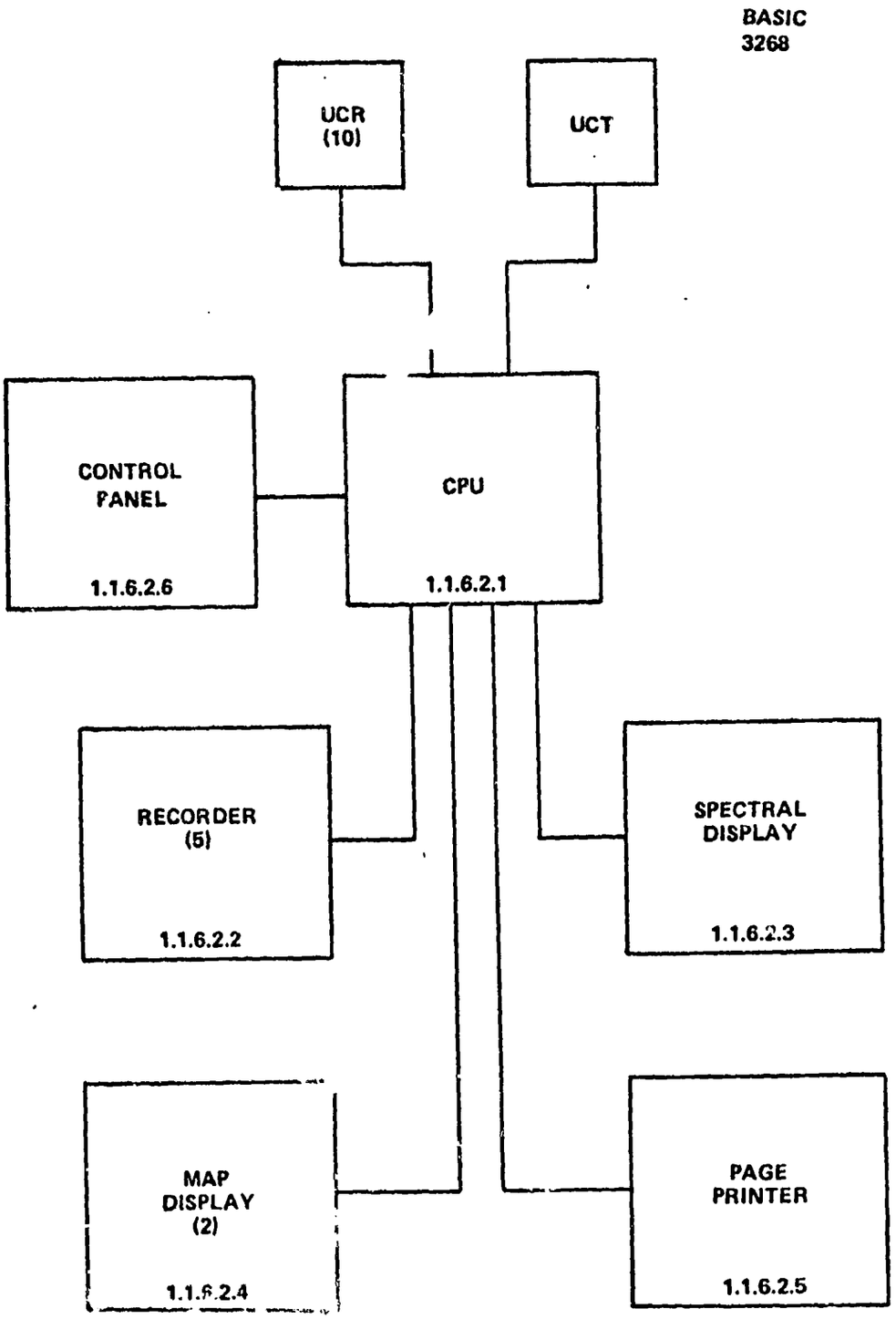


Figure 6-2 (U) ACU SRU 1.1.6.2

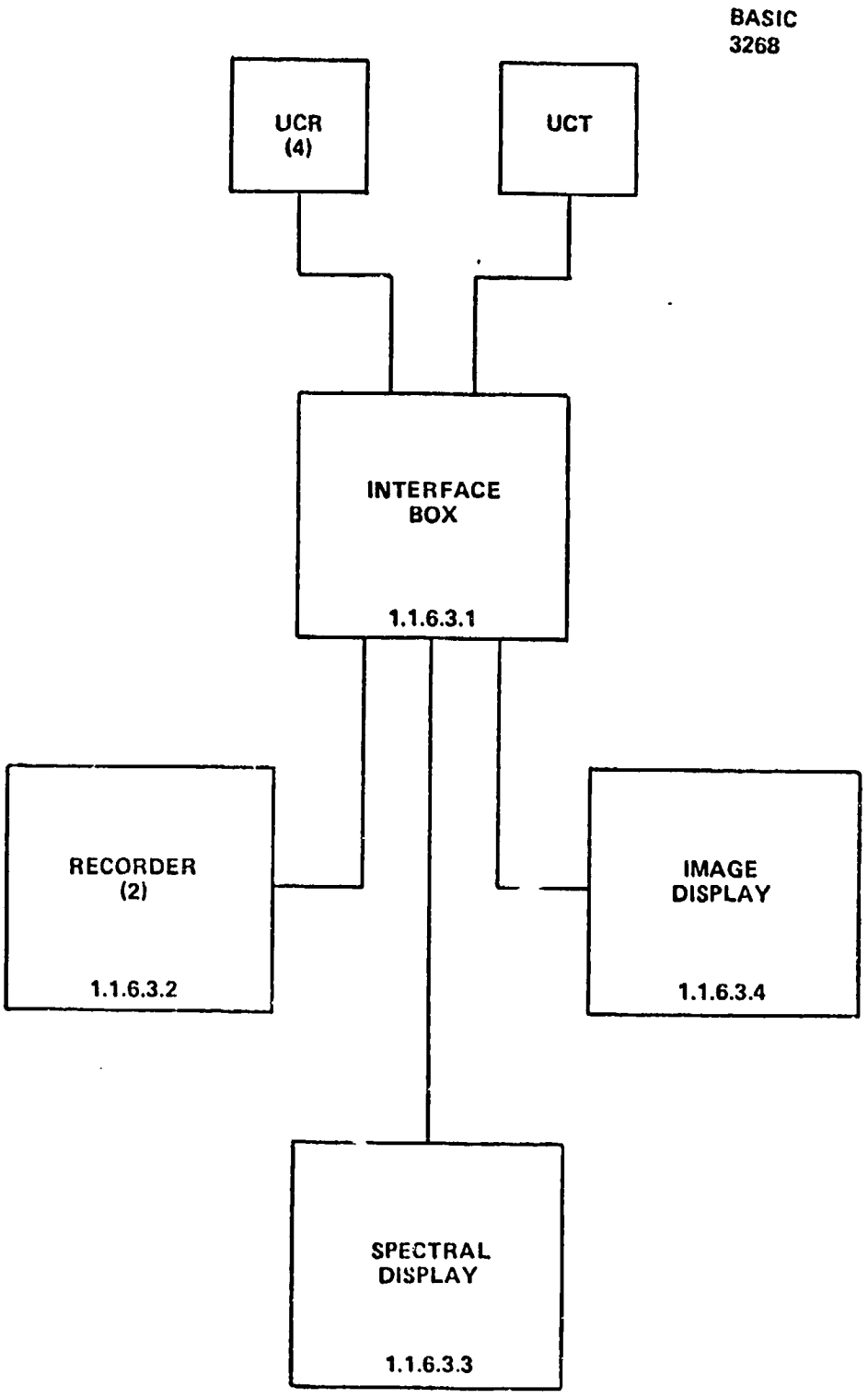


Figure 6-3 (U) BN SRU 1.1.6.3

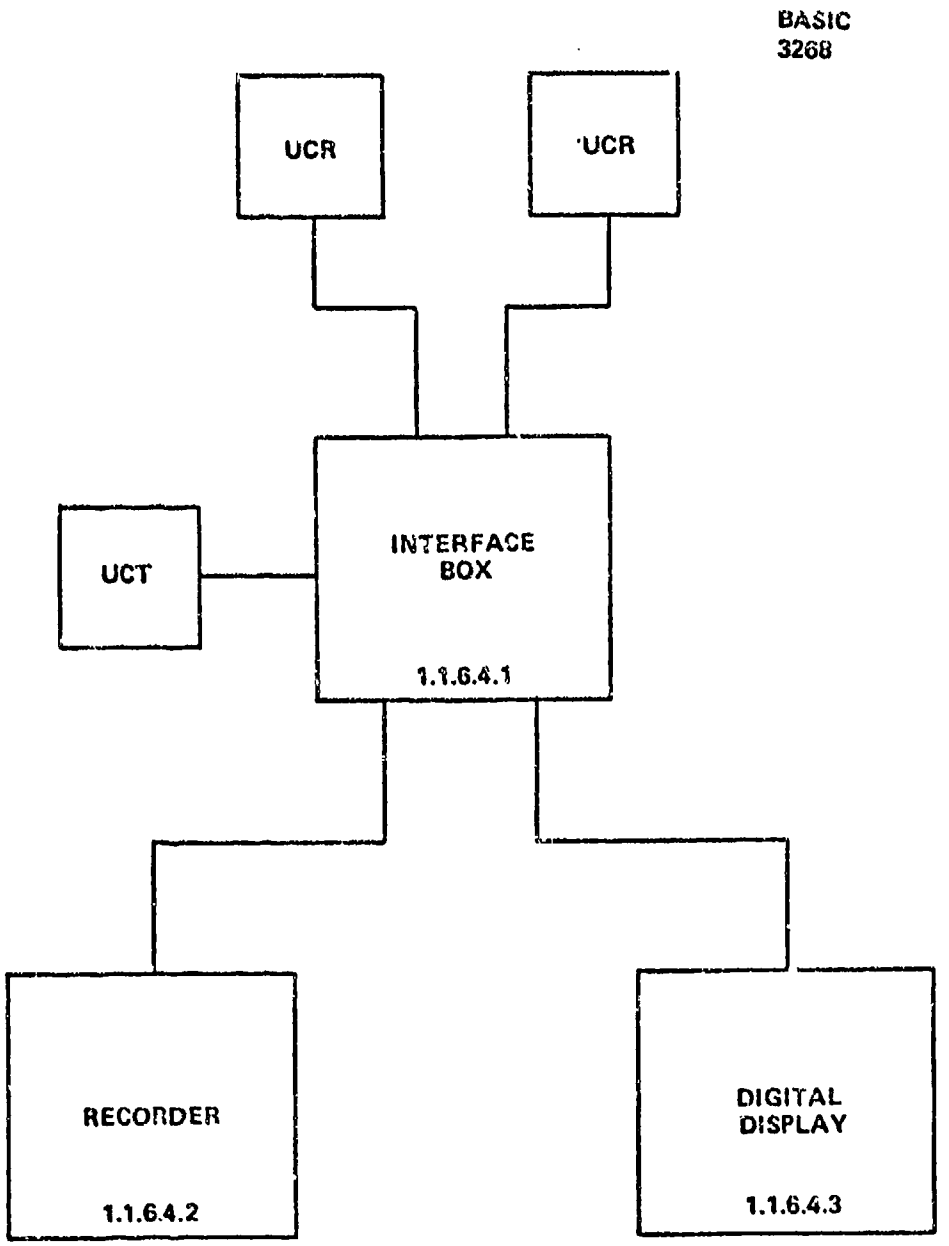


Figure 6-4 (U) ARTY BN SRU 1.1.6.4

6-6 (U) Brigade (BDE) SRU (Fig. 6-5)

The BDE SRU will accept sensor reports from real-time, non-real-time, audio, and image sensors. Deployment capability of this system will be up to 150 sensors. The BDE SRU will include a Central Processing Unit, a Spectal Display, a Page Printer, a Control Panel, an Image Receiver Display, two (2) Map Situation Displays, and three (3) Recorders.

6-7 (U) Division (DIV) SRU (Fig. 6-6)

The DIV SRU will maintain a capability to deploy 250 sensors. Types of sensors will consist of real time, non-real time audio, and image. Some of these sensors will be commandable. The DIV SRU will include a Central Processing Unit, a Spectral Display, a Page Printer, a Control Panel, an Image Receiver Display, two (2) Map Situation Displays , and five (5) Recorders.

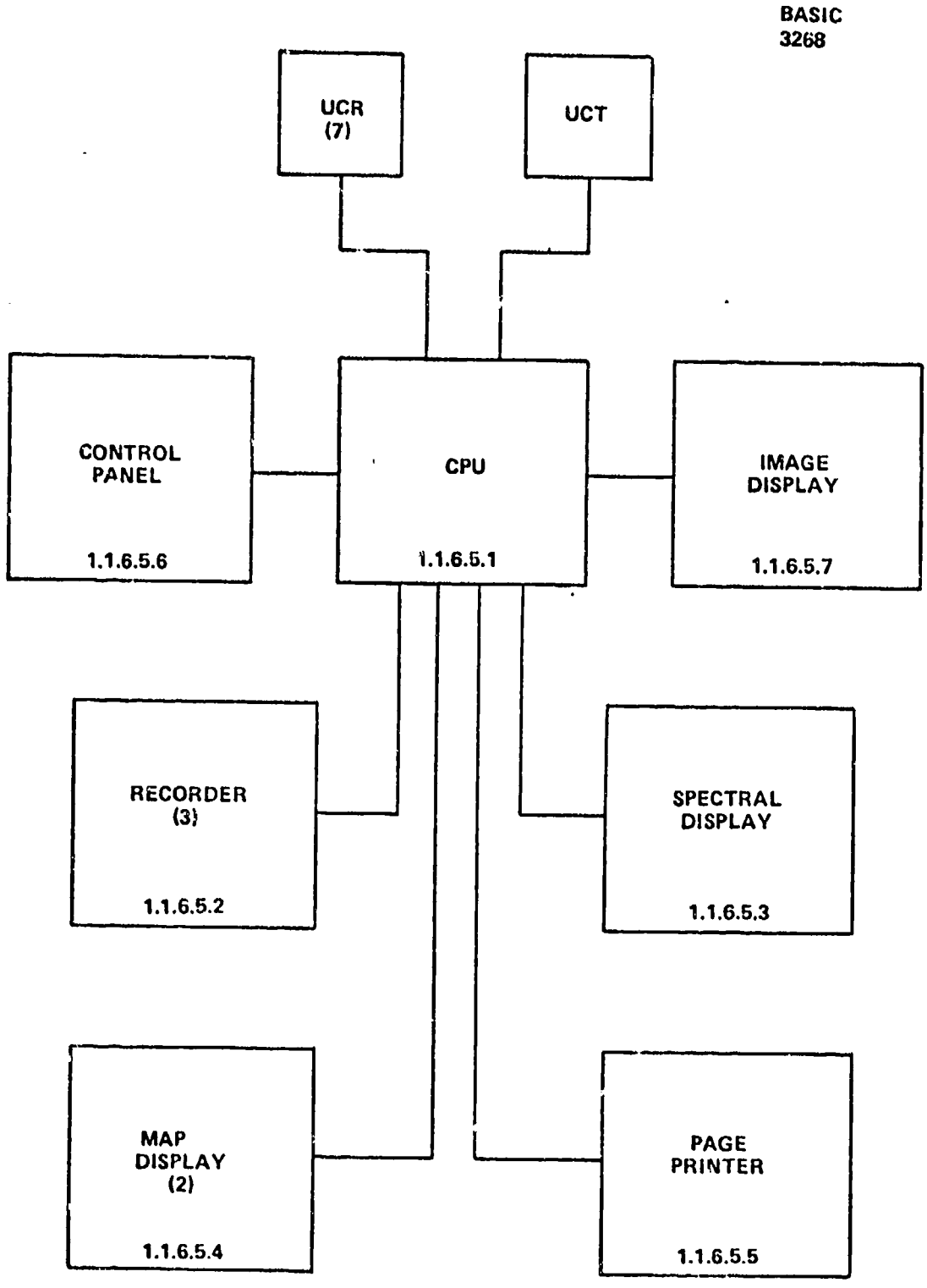


Figure 6-5 (U) BDE SRU 1.1.6.5

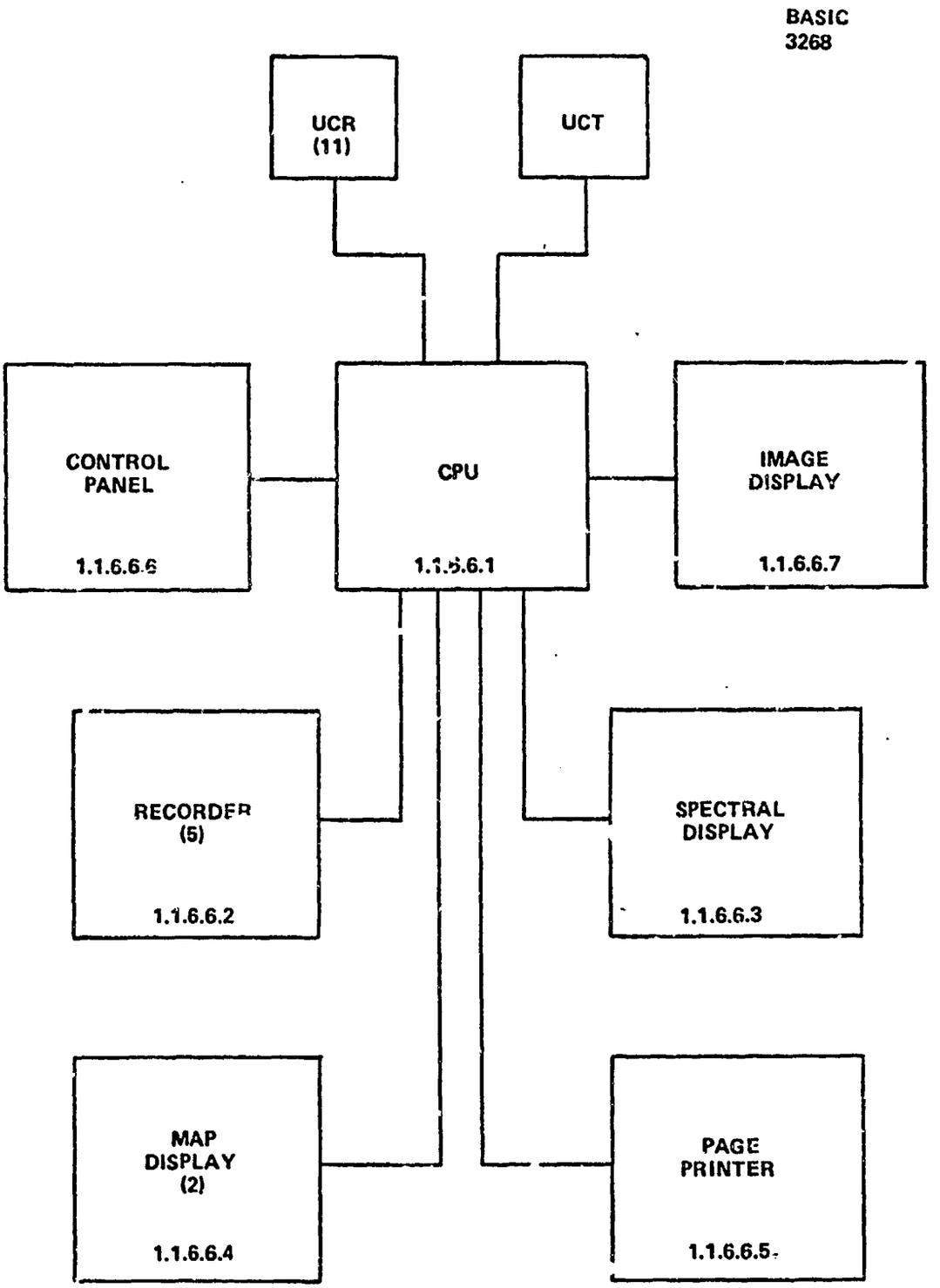


Figure 6-6 (U) DIV SRU 1.1.6.6

6-8 (U) Interface Box (Fig. 6-7)

A. Function:

The Interface Box provides the necessary data formatting to allow the recording of data from two (2) UCR's on one event recorder. It can also display target classifications and transmit commands through a UCR/T to commandable sensors.

B. General:

(1) Signals representing sensor activations and target classifications are received from a UCR in serial form.

(2) These signals are converted into parallel form for use by the processor module.

(3) The processor electronically patches this data to activate the desired pen on the event recorder.

(4) This patching scheme is reprogrammable.

(5) Target classification is displayed on a three (3) digit LED display.

(6) Transmit commands from CPU memory are made to commandable sensors through the UCR/T.

C. Characteristics:

(1) Dimensions: 5" W X 7" L X 8" D

(2) Weight: 10 lbs.

(3) Power requirements: 3 watts (standby)

D. Test Equipment:

The unit will perform self-test routines which will exercise the displays and allow the operator to determine component operation.

E. Random Access Memory (RAM) Module:

(1) Function:

The RAM is used as storage for sensor, SCM, and Relay administrative data. Storage will also be maintained for data such as weather and soil conditions, position of base stations, return fire data. The processor uses this as a temporary store during calculations and as storage for the calculated results.

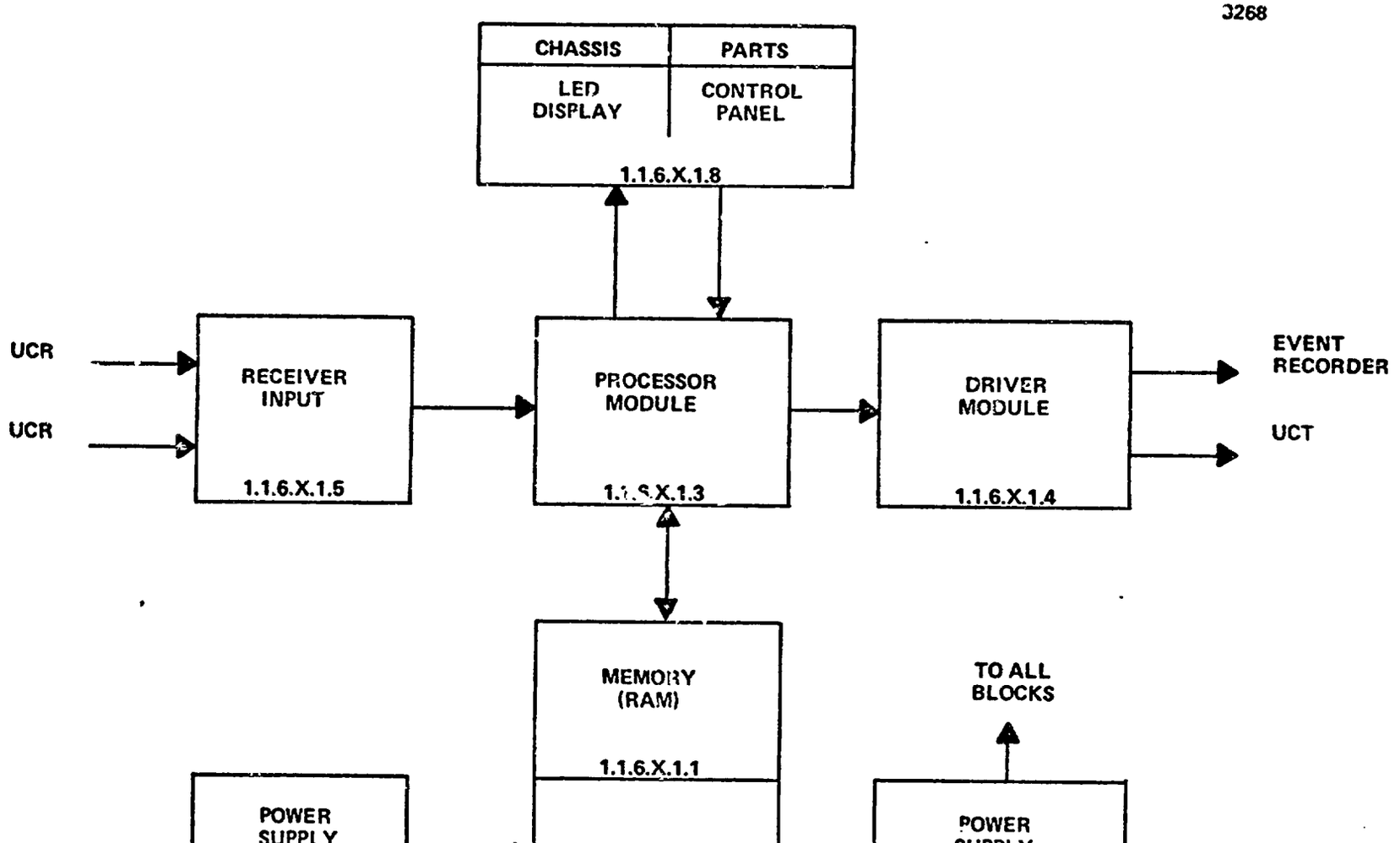


Figure 6-7 (U) Interface Box 1.1.6.X.1

(2) Characteristics:

(a) Size: 5 X 7 X 3/4 inches

(b) Weight: 0.5 lbs. each

(c) Power:

Standby: 0.9 Watts

Memory access: 1.8 Watts

(3) Test Equipment:

(a) Fault isolate to module:
The operator will utilize a self-test program stored in ROM to determine that an RAM card is faulty and to replace a faulty card with a good one.

(b) Fault isolate to part:
After verifying the proper working order of the CPU, CRT display and printer, a special program on an ROM card will be used with a Multimeter (volt, ohm meter) and schematics so that a technician can determine which part is faulty and replace it with a good part.

F. Read Only Memory (ROM) Module (one each):

(1) Function:
Provides permanent storage of programs to implement the data formatting and patching of receiver inputs to the recorder.

(2) Characteristics:

(a) Size: 5 X 7 X 3/4 inches

(b) Weight: 0.5 lbs.

(c) Power:

Standby: negligible

Memory access: 0.6 Watts

(3) Test Equipment:

(a) Fault isolate to module:
After testing the other system components using the self-test programs, a suspected faulty ROM card is replaced with a good ROM card.

(b) Fault isolate to part:

With a CPU known to be in good working order, a special purpose ROM card is used in the system to check out a faulty ROM card replaced into the CPU. By observing the computer readout, a technician can determine which part is faulty.

G. Processor Module (one each):

(1) Function:

Controls all data processing within the Interface Box under the control of ROM stored programs.

(2) Characteristics:

(a) Size: 5 X 7 X 3/4 inches

(b) Weight: 0.5 lbs.

(c) Power: 0.6 Watts

(3) Test Equipment:

(a) Fault isolate to module:

A self-test program will be utilized by the technician to determine the faulty card, which will be replaced.

(b) Fault isolate to part:

With a CPU previously checked and in good working condition, a faulty card is placed into an Extender card which is inserted into the proper CPU card position. With the aid of a Dual Beam Oscilloscope and Multimeter, the faulty part is found and replaced.

H. Driver Module:

(1) Function:

This contains the circuitry necessary for the CPU to communicate with the recorder, map display, and the UCT devices. The digital codes from the Driver will connect the CPU to a selected device and will send digital information to the device, to which that device will respond. Therefore, in the case where the map display is selected, the proper lights will flash corresponding to those devices selected by the CPU.

(2) Characteristics:

(a) Size: 5 X 7 X 3/4 inches

(b) Weight: 0.5 lbs.

(c) Power:

Standby: negligible

Operating: 1.25 Watts for 2 m sec. per activation

(3) Test Equipment:
Same as processor module (para. 6-8 G.(3)).

I. Receiver Input Module:

(1) Function:
Receives the serial messages from the UCR and converts them to a parallel format which is stored until the processor is ready. This data is then retrieved by the CPU and processed.

(2) Characteristics:

(a) Size: 5 X 7 X 3/4 inches

(b) Weight: 0.5 lbs. each (1.0 lb. total)

(c) Power: negligible

(3) Test Equipment:

(a) Fault isolate to module:
Checkout of this module will be done by using a UCR simulator. Output of the CPU will be compared with those inputs set into the simulator and, if a malfunction occurs, the module will be replaced.

(b) Fault isolate to part:
Using an Extender card, a Dual Beam Oscilloscope, a Multimeter, a UCR Simulator, Displays, and a CPU known to be in working order, a technician will plug a faulty module into the equipment thru the extender card. Using the above test equipment, the technician will trace signals and voltages until the fault is located, and will replace the part.

J. Power Supply, minus 9 volts:

(1) Function:

Provides voltage to the processor chip logic circuitry with the required regulation.

(2) Characteristics:

(a) Size: 3 X 3 X 2 inches

(b) Weight: 1 lb.

(c) Power: Dependent on logic circuit chain

(d) Efficiency: At least 80%

(3) Test Equipment:

(a) Fault isolate to module:

A multimeter will be used to verify that this module is in proper working condition.

(b) Fault isolate to part:

Utilizing a multimeter, dual beam oscilloscope and a 28 volt power supply, a technician will connect the 28 volt power supply to the module input. The module fault will be found using signal tracing and the bad part will be replaced.

K. Power Supply; plus 3 volts and plus 5 volts:

(1) Function:

(a) This supply will be used to power the random access memory. Power will be conserved by having the +3 volts on standby and will be used only by the memory chip being selected.

(b) This supply is also used to power the other logic circuits of the CPU.

(2) Characteristics:

(a) Size: 5 X 7 X 1.5 inches

(b) Weight: 1 lb.

(c) Power: 6 Watts

(d) Efficiency: 90%

(3) Test Equipment:
Same as minus 9 volt power supply (para. 6-8 J.(3)).

L. Chassis Parts (includes case and LED Display) (one each):

(1) Function:

(a) Provides input and output connections to unit and front panel controls to include: power ON/OFF switch, programming switches, brightness and ON/OFF control, fuse plus spare.

(b) Provides a twelve (12) digit readout for programming the electronic patching for displaying target coordinates, and target classification.

(2) Characteristics:

(a) Dimensions (Case): 5" X 7" X 8"

(b) Weight: 6.5 lbs.

(c) Power requirements: 4.2 Watts (6 digits energized); zero standby

(3) Test Equipment:

(a) Multimeter, field standard, for checking wiring and connectors.

(b) Oscilloscope to check for errors in timing or control wave forms.

6-9 (U) Central Processing Unit (CPU) (Fig. 6-8)

A. Function:

The CPU is the prime operational control, interface, storage facility, and computational device. The CPU is used in the ACS, BDE, and DIV SRU configurations. From the CPU Control Panel (Keyboard), all data pertaining to administration functions of the Sensors, SCM's, and Relays are input and used by the various computational programs for reference. Operational control is maintained over the Recorders, Situation Map Display, Image Receiver Display, Printer, UCR/T thru special programming instructions. All incoming signal data is processed automatically and is output to the appropriate display device as per instruction already input by the operator. Computations consist of: locating and classifying targets; calculating proper artillery firing time to fire on a located target; performing record-keeping functions of sensors, SCM's, and Relays operational life (battery life).

B. General:

The CPU consists of a special purpose computational device. Processing is performed by digital techniques with incoming and outgoing data in digital format. Signal sensor data from the UCR's is input to the CPU in serial format and converted to parallel format for processing by the CPU. Specific sensor processing consists of the classification of an event into the categories: a) None, b) Personnel, c) Vehicles, d) Tracked Vehicles, e) Wheeled Vehicles, f) Indirect fire weapons, g) Helicopters, h) Trains. This data is converted to a digital format for presentation to the different displays as commanded by the operator.

C. Characteristics:

(1) Volume: 0.75 cu. ft.

(2) Weight: 30 lbs.

(3) Power: 10 Watts

D. Test Equipment:

(1) Check out equipment:

The CPU will contain diagnostic programs which will be used to verify proper operation of all components. Outputs from the CPU will be used by the operator as a match for the expected outputs.

(2) Fault isolate to component:

The operator will use a different diagnostic program to isolate a problem which shows up in (1) above. The faulty component will then be replaced with a properly operating component.

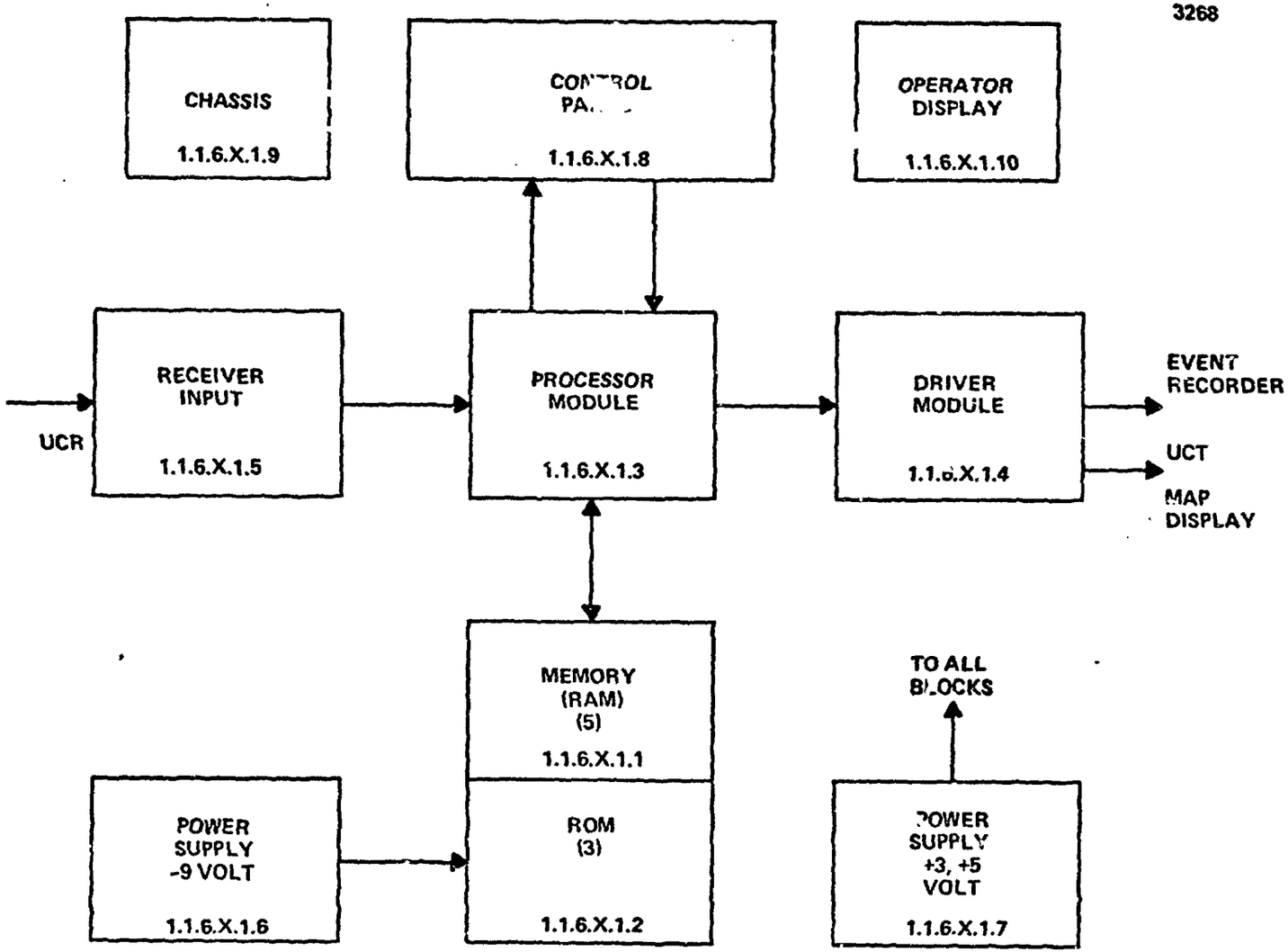


Figure 6-8 (U) CPU 1.1.6.X.1

E. Control Panel:

(1) Function:

All the main operator functions are done thru this Keyboard. The operator can enter data into the CPU, request stored data to be output from the CPU, command the processor to perform computations, and initiate commands to the sensors, SCM's, relays, or UCR/T.

(2) Characteristics:

(a) Size: Trapezoidal 12 W X 6 D X 6 H X 2 H inches

(b) Weight: 5 lbs.

(c) Power: 0.25 Watts

(3) Test Equipment:

(a) Fault isolate to module:

A storage oscilloscope will be used by a technician to determine that this module is in proper operation.

(b) Fault isolate to part:

Using a storage oscilloscope and multimeter with schematics, waveform guides, and voltage references, a technician will find a faulty part thru signal tracing techniques and will replace the part.

F. Chassis:

(1) Function:

(a) The Chassis provides mounting for all the input/output connectors. Connectors for power input, UCR/T, keyboard, displays, etc. will be made thru this equipment.

(b) All front panel controls such as ON/OFF switch, special CPU input switches will be provided.

(2) Characteristics:

(a) Size: 11 X 8 X 14 inches (approx.)

(b) Weight: 15 lbs.

(c) Power: none

(3) Test Equipment:

(a) Fault isolate to module:
The chassis is used to interface to other modules, therefore a fault in the chassis will be found in isolating the faults of other modules.

(b) Fault isolate to part:
Using an oscilloscope and multimeter, a technician will isolate the faulty part and make the necessary repair.

G. Operator Display:

(1) Function:
The operator display provides a temporary display of transitory alphanumeric information such as data being entered by the operator.

(2) Characteristics:

(a) Size: 12" W X 1" H X 1" D

(b) Weight: 1 lb.

(c) Power requirements: 18 Watts (max.)

(3) Test Equipment:
None required.

H. Other:
Other modules in the CPU are identical with those in the interface box (para. 6-8).

6-10 (U) Recorder (Fig. 6-9)

A. Function:

The Recorder serves as the primary record of sensor activation providing a long term record of activity. It also acts as a target classification aid.

B. General:

Signals representing sensor activation and target classification are received from the CPU in binary form. Sensor activation input signals consist of ten (10) bits of parallel data: six (6) bits represent the pen to be activated; three (3) bits represent the recorder select; one (1) bit represents data present. Classification input signals consist of four (4) bits of parallel data. Two event marks are printed on a strip chart to indicate sensor activation. Coded event marks on the strip chart indicate target classification information. Time is printed on the strip chart at intervals of several minutes. A total of sixty-four (64) pens provide sensor activation presentation. A loudspeaker and headphones are provided for listening to acoustic data.

C. Characteristics:

(1) Dimensions: 12 X 12 X 6 inches

(2) Volume: 0.5 cu. ft.

(3) Weight: 27.5 lbs.

D. Test Equipment:

The CPU will generate test inputs. The operator will observe the resultant recorder output to determine equipment operation. The operator, utilizing BITE and observing the resultant output, will determine component operation.

E. Decoder and BITE:

(1) Function:

The Decoder and BITE module decodes inputs to select the pen to be activated and the classification symbol to be printed. It generates signals for the self-test check.

(2) Characteristics:

(a) Dimensions: 5 X 7 X 3/4 inches

(b) Weight: 0.5 lbs.

(c) Power: negligible

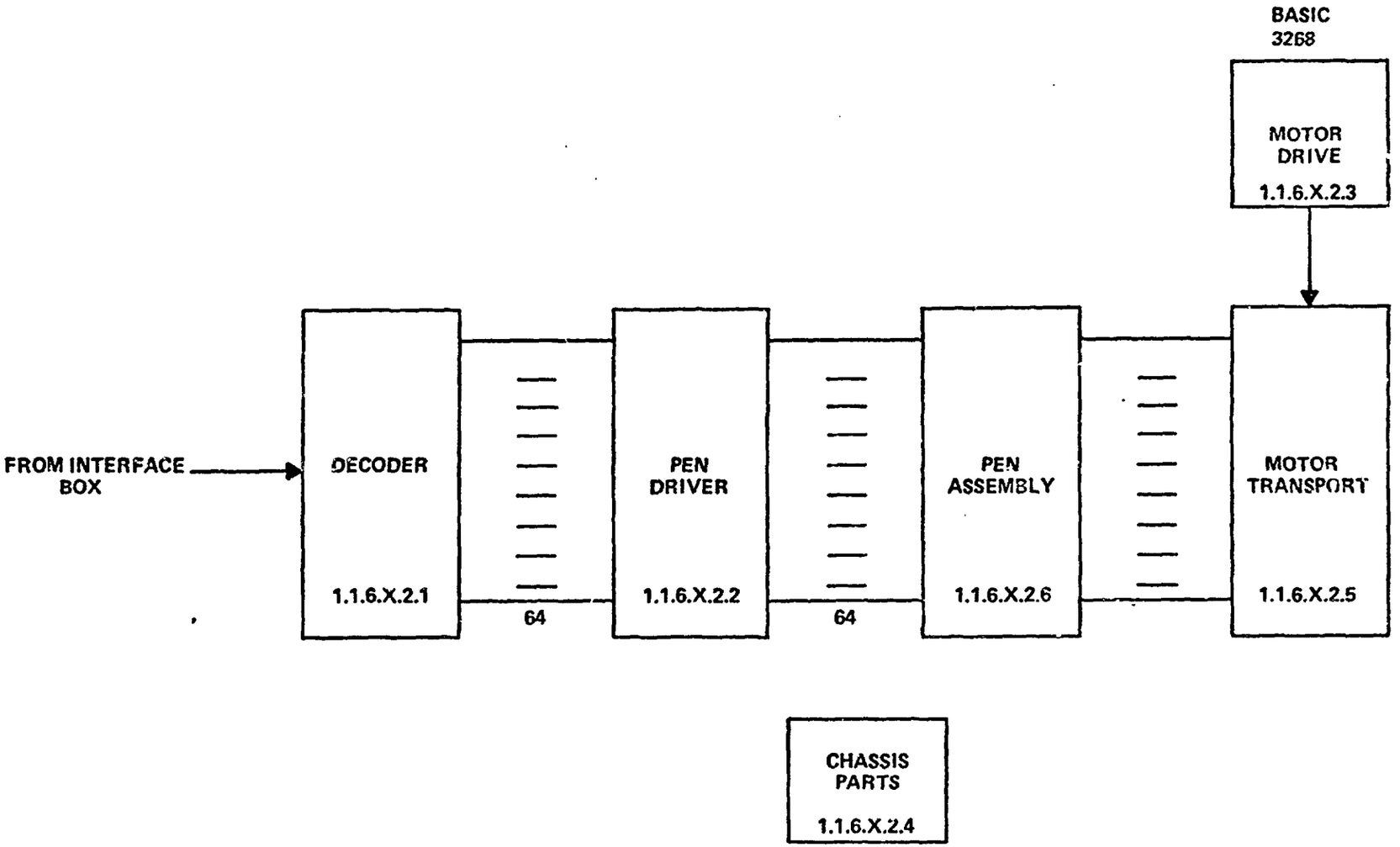


Figure 6-9 (U) Recorder 1.1.6.X.2

(3) Test Equipment:

(a) Fault isolate to a module:

To isolate a fault to a module, a general purpose Dual Beam Oscilloscope and Multimeter (volt-ohm meter) will be utilized. Test signals generated by the BITE will be traced, utilizing test points provided on each module. A faulty module will be replaced with a new module.

(b) Fault isolate to a part:

To repair a faulty module, the same test equipment as in (a) above will be used. Thru the use of schematics, waveform guides, and voltage references, an electronic technician will isolate and replace a faulty part.

F. Pen Driver:

(1) Function:

The decoded signals from the Decoder and BITE are converted into signals of 20 milliseconds duration, with sufficient power so the proper coded event marks are printed.

(2) Characteristics:

(a) Dimensions: 5 X 7 X 3/4 inches

(b) Weight: 0.5 lbs.

(c) Power:

Standby - negligible

Operating - 6 Watts per pen for 20 ms.

(3) Test Equipment:

Same as Decoder and BITE (para. 6-9 E.(3)).

G. Motor Drive and Power Supply:

(1) Function:

(a) The Power Supply provides a regulated power for the digital circuitry and the writing current to the sixty-four (64) pens.

(b) Motor Drive circuit is required as an interface for the paper drive motor to maintain the paper speed to within 1%.

(2) Characteristics:

(a) Dimensions: 5 X 7 X 1-1/2 inches

(b) Weight: 1 pound

(c) Power: 2 Watts

(3) Test Equipment:
Same as Decoder and BITE (para. 6-9 E.(3)).

H. Chassis Parts (including case):

(1) Function:

(a) The outer case provides mounting for the operator controls, input/output and power connectors, and chart illumination.

(b) Operator controls will consist of an ON/OFF switch, a trace density potentiometer, volume control for the loudspeaker/headset, and variable chart illumination control. Input/output connectors will be provided for interface to the CPU and for headset connection. The speaker will be disabled when sensor monitoring is desired from the headset.

(2) Characteristics:

Weight: 11 lbs.

(3) Test Equipment:
Same as Decoder and BITE (para. 6-9 E.(3)).

I. Motor and Transport:

(1) Function:
The Motor and Transport configuration provides paper movement of 30 inches per hour. Chart speed is maintained to within a 1% accuracy. Guides are also provided to eliminate any apparent transverse pen motion.

(2) Characteristics:

(a) Dimensions: 12 X 9 X 5 inches

(b) Weight: 10 lbs.

(c) Power: Supplied by motor driver

(3) Test Equipment:
Same as Decoder and BITE (para. 6-9 E.(3)). In addition, the chart speed will be measured using a frequency counter for checking timing rate and a ruler for measuring the distance between time marks.

J. Pen Assembly:

(1) Function:
This is a mechanical assembly which maintains pen alignment with respect to the chart movement. This fixture also assures proper pressure between the pens and chart for thermal marking of the chart.

(2) Characteristics:

(a) Dimensions: 8 X 2 X 1 inches

(b) Weight: 0.5 lbs.

(c) Power: Obtained from the Pen Driver

(3) Test Equipment:
Same as Decoder and BITE (para. 6-9 E.(3)).

K. Cable with Connectors:

(1) Function:
To provide connection to the CPU or Interface Box.

(2) Characteristics:

(a) Length: 6 ft.

(b) Weight: 1 lb.

(3) Test Equipment:
Field Standard Multimeter to test for continuity or short circuits.

6-11 (U) Spectral Display (Fig. 6-10)

A. Function:

The Spectral Display serves to provide a visual presentation of spectral energy content of the acoustic or seismic noise generated by an intruder in a sensor field. The SRU Monitor Operator observes the spectral energy distribution presentation, compares it with a handbook of typical energy distribution records characteristic of various vehicles and groups of people, and selects the most likely category as being the particular intrusion requiring this analysis.

B. General:

(1) The spectral display will use a brief interval of audio frequency signals transmitted by a commandable sensor through a UCR into an audio spectral analyzer.

(2) The analyzer outputs are fed into a 3-D display control which displays the information on a CRT in a spectrum amplitude vs frequency vs time presentation.

(3) A hard copy of this spectral display will enable the operator to compare the displayed signature with those in his handbook while new information is being presented in the CRT; thereby minimizing the possibility of losing new data.

C. Characteristics:

(1) Dimensions: 27" X 17" X 24"

(2) Weight: 114 lbs.

(3) Power requirements:

(a) 120 watts, less hard copier

(b) Hard copier

D. Test Equipment:

A swept frequency oscillator will feed signals into the analyzer. The operator's observation of the outputs with the aid of an oscilloscope will enable determination of component operation.

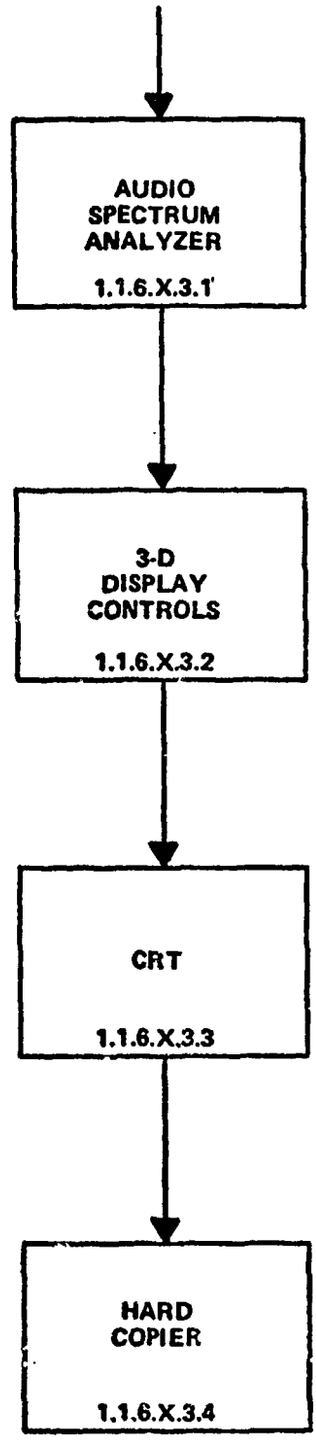


Figure 6-10 (U) Spectral Display 1.1.6.X.3

E. Audio Spectrum Analyzer:

(1) Function:
To examine the energy in the frequency bands that comprise the spectrum being observed.

(2) Characteristics:

(a) Dimensions: 4" X 17" X 22"

(b) Weight: 25 lbs.

(c) Power requirements: 60 Watts

F. 3-D Display Control:

(1) Function:
The 3-D Display Control interfaces the analyzer and the CRT, controlling the display of spectrum amplitude vs frequency vs time.

(2) Characteristics:

(a) Dimensions: 3-1/2" X 17" X 15"

(b) Weight: 10 lbs.

(c) Power requirements: Supplied by analyzer

G. CRT:
The function of the CRT is to display spectral data. This is the same CRT used for image display (para. 6-14).

H. Hard Copier:

(1) Function:
The Hard Copier provides hard copy of data displayed on the CRT.

(2) Characteristics:

(a) Dimensions: 11" X 17" X 24"

(b) Weight: 69 lbs.

(c) Power requirements:

1450 Watts (for 40 sec. after turn-on)

100 Watts (standby)

220-520 Watts (for 18 sec. per copy)

6-12 (U) Map Situation Display (Fig. 6-11)

A. Function:

The Map Situation Display provides a visual display to a commander. A tactical situation is observed in the form of 128 light indicators placed at equivalent map coordinates, each corresponding to a sensor location. Intrusions are observed by a lamp flash when its corresponding sensor is activated.

B. General:

Each lamp is placed manually on a tactical map secured by a transparent overlay. As stated above, the 128 lamps are placed where corresponding sensors are located at the same map coordinates. Lamp control is provided by the CPU representing sensor activations thru an eight (8) bit binary code. Seven (7) bits will identify the lamp which is to be activated and the eighth bit activates the lamp. Aside from being a visual tactical display, the map is also used as a backup presentation in the event of recorder failure.

C. Characteristics:

(1) Dimensions: 24 X 30 X 6 inches

(2) Volume: 2.5 cu. ft.

(3) Weight: 34 lbs.

D. Test Equipment:

(1) Checkout equipment:

Test inputs will be generated by the CPU. The operator will observe that the resultant lamp flash pattern matches the CPU test pattern to determine performance of the Map Situation Display.

(2) Fault isolate to component:

Utilizing an oscilloscope and a multimeter, together with BITE, a technician will narrow a fault to a component and replace the faulty component.

F. Decoder and BITE:

(1) Function:

(a) The Decoder input from the CPU is a decimal decoder converting the 8 bit code so that a single lamp is selected and lighted.

(b) The BITE is used for self-testing the Map Situation Display. Binary signals are generated for an operator to determine if the Display is working properly.

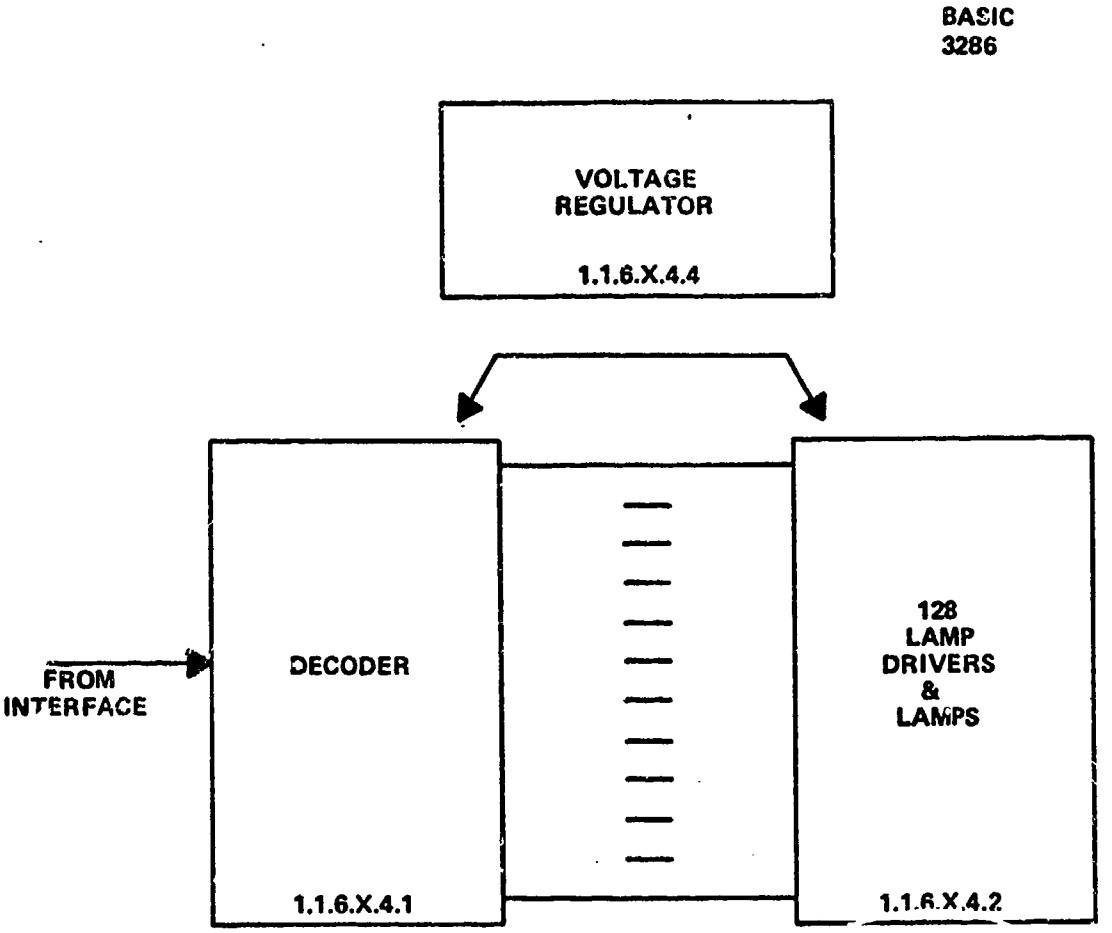


Figure 6-11 (U) Map Display 1.1.6.X.4

(2) Characteristics:

(a) Dimensions: 5 X 7 X 3/4 inches

(b) Weight: 0.5 lb. ea. (1 lb. total)

(c) Power: negligible

F. Lamp Driver:

(1) Function:

The Lamp Driver is a power converter, taking the signals from the Decoder and providing sufficient power to drive the selected lamp. This device also assures that the turn on time for the lamp will be five (5) seconds.

(2) Characteristics:

(a) Dimensions: 5 X 7 X 3/4 inches per card (4 cards total)

(b) Weight: 0.5 lb. each (2 lbs. total)

(c) Power:

standby - negligible

operating - 20 mw per lamp for 5 seconds

G. Chassis Parts and Case:

(1) Function:

Contained here are the operator controls and input connectors. The operator controls consist of an ON/OFF Switch and a lamp intensity control. The input connectors provide for cable connection to the CPU.

(2) Characteristics:

Weight: 30 lbs.

H. Voltage Regulator:

(1) Function:

The Voltage Regulator provides the proper voltage to the digital logic circuits of the Decoder and BITE, and Lamp Drive.

(2) Characteristics:

(a) Dimensions: 5 X 7 X 1.5 inches

(b) Weight: 1 pound

(c) Power: 13 Watts maximum

6-13 (U) Page Printer (Fig. 6-12)

A. Function:

The Page Printer provides the capability of producing a permanent record of entered data, stored data or results compiled by the Central Processing Unit in the form of a line-by-line printout of such information.

B. General:

(1) The Page Printer will share the same case and chart transport with the Event Recorder (para. 6-10). The electronics and print head assembly will be unique, however.

(2) The Printer will print out CPU formatted messages one line at a time at the maximum rate of 30 lines per minute.

(3) The characters will be formed by a 5 X 7 dot matrix. The print head will contain a horizontal row of 5 dots for each character. The dot matrix will be produced by stepping the paper beneath the head seven times. All characters on a line will be printed before the paper advances. The characters will be printed several at a time until the row is completed, to minimize power drain.

(4) The electronics for producing the dot matrix code will be contained in the printer.

(5) A thermal printing technique will be used.

C. Characteristics:

Same as Recorder (para. 6-10).

D. Test Equipment:

Same as Recorder (para. 6-10).

E. Print Control Module (one each):

(1) Function:

The Print Control Module produces the timing pulses that control the length of time that the elements are active to control the clarity of the printing and to allow for the head to cool between print-outs.

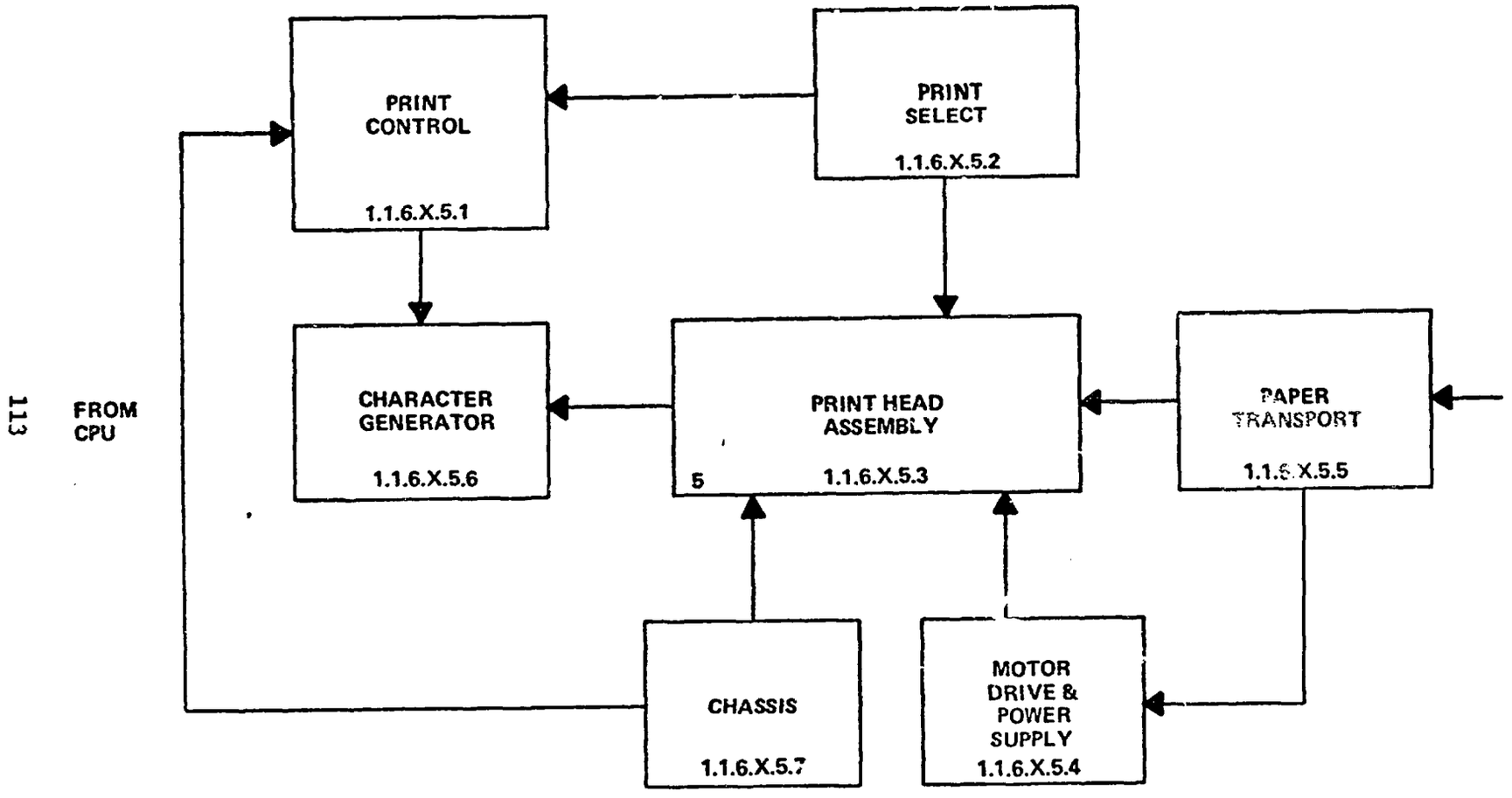


Figure 6-12 (U) Page Printer 1.1.6.X.5

(2) Characteristics:

(a) Dimensions: 5" X 7" X 1-1/2"

(b) Weight: .5 lbs.

(c) Power requirements:

standby: negligible

operating: 20 Watts

(3) Test Equipment:

A dual beam oscilloscope will be required to check control pulse timing.

F. Print Select Module (one each):

(1) Function:

The Print Select Module selects the characters that will be printed and sequences through the line printing one character per head simultaneously. It signals the end of a step (7 steps per line of characters) and the end of a line to reset the electronics for the next step or line.

(2) Characteristics:

(a) Dimensions: 5" X 7" X 3/4"

(b) Weight: .5 lbs.

(c) Power requirements:

standby: negligible

operating: .4 Watt

G. Print Head Assembly (one each):

(1) Function:

The Print Head Assembly is a group of integrated circuit thermal print heads. These produce the print-out by selectively heating thermally sensitive paper.

(2) Characteristics:

(a) Dimensions

(b) Weight

(c) Power requirements

standby: zero

operating: 20 Watts

(3) Test Equipment:
Oscilloscope to check timing and control waveforms.

H. Motor Drive and Power Supply (Miscellaneous Circuits) Module:

(1) Function:
The Motor Drive and Power Supply Module provides control of the paper drive motor to produce the stepping action required for printing. It also supplies the necessary regulated voltages for the logic circuits in the printer.

(2) Characteristics:

(a) Dimensions: 5" X 7" X 1-1/2"

(b) Weight: 1 lb.

(c) Power requirements:

standby: negligible

operating: 2 Watts

I. Motor and Transport Assembly (one each):
Same as Recorder (para. 6-10).

J. Character Generator Module (one each):

(1) Function:
The Character Generator circuit accepts the character stream representing one line of printout, stores it, and generates the appropriate 5 X 7 matrix code to operate the print heads. This code will be generated as 7 lines of 5 dots per character (see para. 6-13 B.(3)).

(2) Characteristics:

(a) Dimensions: 5" X 7" X 3/4"

(b) Weight: .5 lbs.

(c) Power requirements:

standby: .4 Watts

operating: .6 Watts

(3) Test Equipment:
A dual beam oscilloscope will be required to check the timing of the dot matrix code.

K. Chassis Parts (including case) (one each):

(1) Function:
Chassis Parts provide front panel controls such as power ON/OFF, RUN/TEST, lighting ON/OFF, lighting brightness and input connector. Also provides case and internal mountings.

(2) Characteristics:

(a) Dimensions (case): 12" X 12" X 6"

(b) Weight: 16 lbs.

L. Control Panel:
Same as Recorder (para. 6-10).

6-14 (U) Image Display (See Figure 6-13)

A. Function:

The Image Display provides the means for display of images transmitted by image sensors on command by the SRU monitor operator.

B. General:

(1) Electrical signals, in binary digital form, are received by an appropriate radio receiver, demodulated, then entered into and stored in the logic, from which the image signal is then repeatedly applied to the input of the image display for refresh purposes. The input to the image display is in serial form from which it is converted to parallel form, reformatted, and applied in a new parallel digital format to the switching plates of the display.

(2) The display is a flat CRT (as developed by Northrup Corp.) which is digitally addressable. Dynode plates, with electrically deposited mettalic patterns, selectively mask the electron stream from an area cathode until the stream is confined to a spot. The switching voltage arrangement determines the position of the spot. This design obviates the need for the yoke, the focus coil, and the linearity compensating circuits normally used with a conventional CRT.

(3) The image is displayed until the monitor operator has recognized the object being observed, or until he decides the image is inadequate, after which he removes the image by clearing the CPU memory.

C. Characteristics:

(1) Dimensions: 10" H X 19" W X 6" D

(2) Weight: 30 lbs.

(3) Power requirements: 125 Watts

D. Test Equipment:

The display electronics will include provision for a self-test routine which will illuminate the CRT in sections, enabling the operator to determine operational readiness and to isolate faults to the module level. A conventional electronic multimeter will be used to isolate faults to a component.

E. CRT:

(1) Function:

Displays images from image sensors.

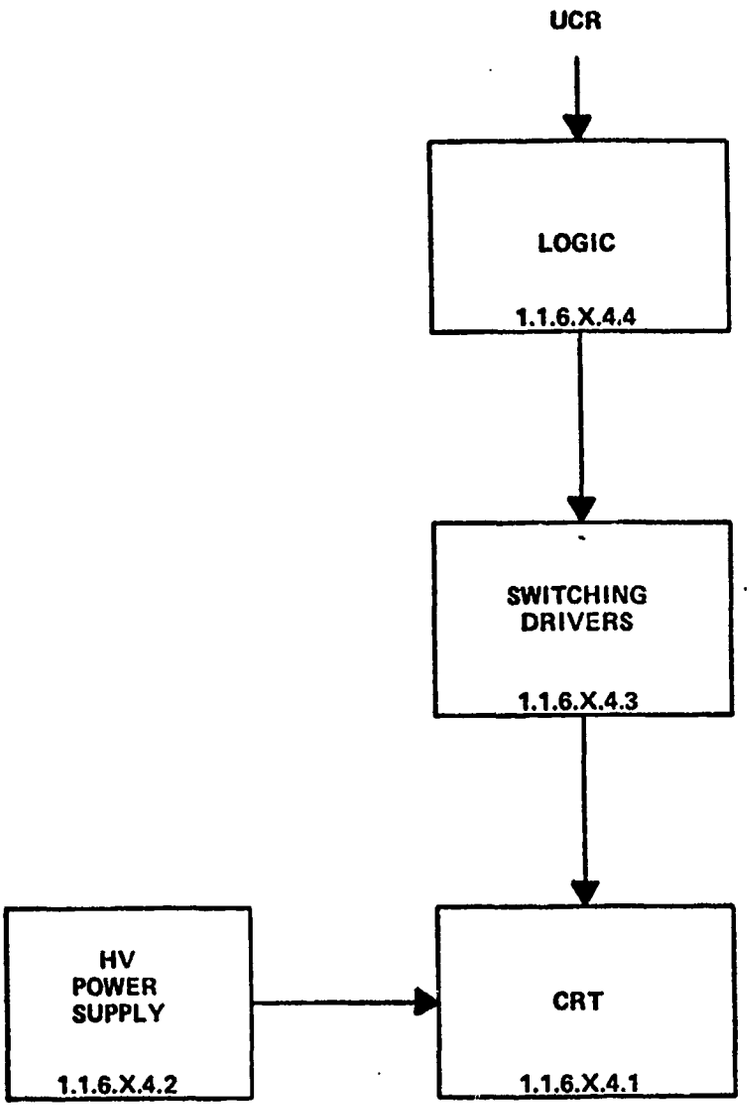


Figure 6-13 (U) Image Display 1.1.6.X.4

(2) Characteristics:

(a) Size: 9.5 in. X 9.5 in. X 3 in.

(b) Weight: 10 lbs.

(c) Power requirements: 60 Watts

F. High Voltage Power Supply:

(1) Function:
Provides high voltage for CRT operation.

(2) Characteristics:

(a) Dimensions: 9.5" X 9.5" X 3"

(b) Weight: 3 lbs.

(c) Power: 60 Watts

(3) Test Equipment:
Multimeter, field standard, for checking wiring, connectors, components, and voltages.

G. Switching Drivers:

(1) Function:
Provide power amplification to the digital voltages controlling the position of the spot on the CRT phosphor.

(2) Characteristics:

(a) Dimensions: 6 cards each, 5" X 7" X 1.5"

(b) Weight (6 cards): 6 lbs.

(c) Power: 60 Watts

(3) Test Equipment:

(a) BITE to activate all circuits to illuminate entire raster.

(b) Field standard electronic multimeter and oscilloscope for fault isolation to the component part.

H. Logic:

(1) Function:

Accepts video data from receiver in serial form, stores it, then converts it to a parallel format suitable for addressing the CRT via the switching drivers.

(2) Characteristics:

(a) Dimensions, 2 cards each: 5" X 7" X 1.5"

(b) Weight: 2 lbs.

(c) Power: negligible in standby

0.1 Watt when operating

CHAPTER 7 (U)

DELIVERY (U)

To be furnished at a later date.

CHAPTER 8 (U)

LOCATION (U)

To be furnished at a later date.

CHAPTER 9 (U)

POWER (U)

To be furnished at a later date.

APPENDIX A (U)

REFERENCES (U)

(C) REMBASS Trade-Off Determination

(C) REMBASS Trade-Off Analysis

(C) REMBASS Best Technical Approach

(FOUO) REMBASS Baseline Cost Estimate