FIELD MANUAL
NO 34-10-1

*FM 34-10-1
HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 18 June 1991

TACTICS, TECHNIQUES, AND PROCEDURES FOR THE REMOTELY MONITORED BATTLEFIELD SENSOR SYSTEM (REMBASS)

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*This publication supersedes TC 34-10-1, 20 May 1986.

PREFACE

Armies that concentrate superior combat power at decisive times and places win battles. While there are no simple solutions to winning, there are certain key factors for success on the battlefield to support AirLand Battle. One factor is the support provided to the combined arms team through the remotely monitored battlefield sensor system (REMBASS).

This manual describes the REMBASS mission on the modern battlefield; the REMBASS role in maximizing the combat power of the combined arms team; the principles that govern REMBASS operations; the importance of sustaining REMBASS capabilities. The doctrine in this manual orients on principles and general procedures, based on Army of Excellence and tables of organization and equipment (TOEs). More specific operational procedures are provided in the appropriate operator manuals.

This manual is designed for use by commanders, staffs, and trainers at all echelons. It is the foundation for Army service school REMBASS instruction and serves as the basis for doctrinal, training, and combat developments.

The proponent of this publication is the United States Army Intelligence Center and Fort Huachuca. Send comments and recommended changes on DA Form 2028 (Recommended Changes to Publications and Blank Forms), to Commander, US Army Intelligence Center and Fort Huachuca, ATTN: ATSI-TDL-D, Fort Huachuca, AZ, 85613-7000.

Unless this publication states otherwise, masculine nouns and pronouns do not refer exclusively to men.

CHAPTER 1

INTRODUCTION

In a tactical environment, REMBASS provides the airborne, air assault, and light divisions; separate brigades; armored cavalry regiments (ACRs); and battalion commanders with a situation and target development capability. This capability is necessary for the timely allocation of resources and combat power. With the REMBASS, commanders have the capability to detect enemy forces and their exact location in real-time.

REMBASS is integrated into the overall battlefield reconnaissance, surveillance, and target acquisition (RSTA) plans at each echelon. In turn, each RSTA plan is incorporated into the entire intelligence network, thereby using its full value along with other information gathering methods. In this manner, information from multiple sources can be checked to provide rapid and reliable analysis to confirm an enemy's presence or detect possible intrusions.

Once the information has been confirmed and its urgency established, the commander may act on it immediately. The information is passed as target acquisition data and, at the same time, passed to higher, lower, and adjacent echelons. While this may seem lengthy and time consuming, the time from first detection, through confirmation, to reaction, is only a matter of minutes.

There are other situations which need a system to detect and classify movement of personnel and equipment. The information could come from the rear area or security zones as well as depots, storage facilities, airports, demilitarized zones, and other restricted areas.

CONCEPT

The REMBASS system is organic to airborne, air assault, light divisions, separate brigades, and ACRs. Personnel from assigned military intelligence (MI) units provide support to the system. REMBASS supports offensive, defensive, rear area, and special operations such as military operations on urbanized terrain, rear security, and border surveillance.

Operationally, the sensor asset can remain under division control in general support (GS). REMBASS can also be attached in direct support (DS) to division support command headquarters, maneuver brigades and battalions, or ACRs.

The system is tasked by the division collection management and dissemination (CM&D) section. REMBASS teams report directly to the Intelligence

Officer (S2) of the supported unit. The S2 plans sensor employment with assistance from the ground surveillance system (GSS) team leader. The intelligence preparation of the battlefield (IPB) requirements guide REMBASS planning and employment.

The REMBASS sensor monitor set (SMS) functions as the sensor output display, and provides target identification and classification data. In most cases, the SMS is placed at the supported unit's battlefield tactical operations center (TOC).

ORGANIZATION

Trained REMBASS personnel come from the MI battalion (division) and MI company (separate brigade and ACR) to monitor and deploy the sensors and relays (repeater). Specialized training of operator personnel is required to effectively interpret, analyze, and report sensor information. Supported units are not required to provide personnel to operate a monitoring device. They may be required to provide security for the implanting team.

MANAGEMENT

The command is responsible for REMBASS management and general employment guidance. REMBASS must provide accurate and timely information at each echelon where combat forces move to take full advantage of the information. Because of its flexibility, REMBASS is employed by units from battalion to division.

Coordinating REMBASS operations is normally accomplished by the CM&D section at each command as a part of their overall surveillance plan. A trained ground surveillance systems operator (96R) noncommissioned officer (NCO) assists and advises on the technical aspects and employment of REMBASS. At brigade and battalion, close coordination is needed between the commander, S2, operations and training officer (S3), fire direction center (FDC) officer, and the 96R NCO to get the maximum benefit from REMBASS operations.

Possible sensor locations are determined by a study of terrain, the enemy's past movements, and their suspected course of action. The decision process for employment action normally occurs at the lowest level, consistent with requirements for centralized control. This reduces reaction time and permits screening of REMBASS information into the intelligence system.

A request for REMBASS support by subordinate units is forwarded from the battalion S2 to the brigade S2, who checks for duplication of effort and determines if the request meets the brigade's own requirements. The brigade S2 then submits the request through the division tactical surveillance officer (TSO) to the division CM&D, who will check it for division requirements. If confirmed, the division CM&D tasks the MI battalion, which then tasks the intelligence and surveillance company. This process is susceptible to change based on input from special organizations in the intelligence chain.

A secure communication capability is critical because of the amount and type of traffic that a surveillance network generates. A secure communication system must be established to support the surveillance platoon to reduce the reaction time between detection and response. The support organization provides for a communication network organic to the platoon. The surveillance platoon communication network is tied into the intelligence communication network and automatically disseminates the information gained from REMBASS.

Field wire communication is used with the TOC or FDC located within the immediate locale. This provides a fairly secure communication system while reducing radio traffic. Unsecure communications from the monitoring sites can compromise the intentions of friendly forces. Additionally, poor COMSEC could provide the enemy with insight into our knowledge of their locations and actions, enabling them to take countermeasures.

Frequency control and management are command responsibilities which are discharged at theater or equivalent staff level. In addition, each major command organization (for example, division headquarters) that employs REMBASS must regulate and control the channels and identification (I.D.) codes used by each subordinate unit. Adjacent units within a command must not communicate on the same channel or use similar I.D. codes within the same area of operations (AO), except where severe line-of-sight (LOS) limitations exist. Poor frequency management and control decrease the system's effectiveness and may render it useless. Centralized control is vital to restrict and manage limited equipment and to ensure maximum use.

CAPABILITIES

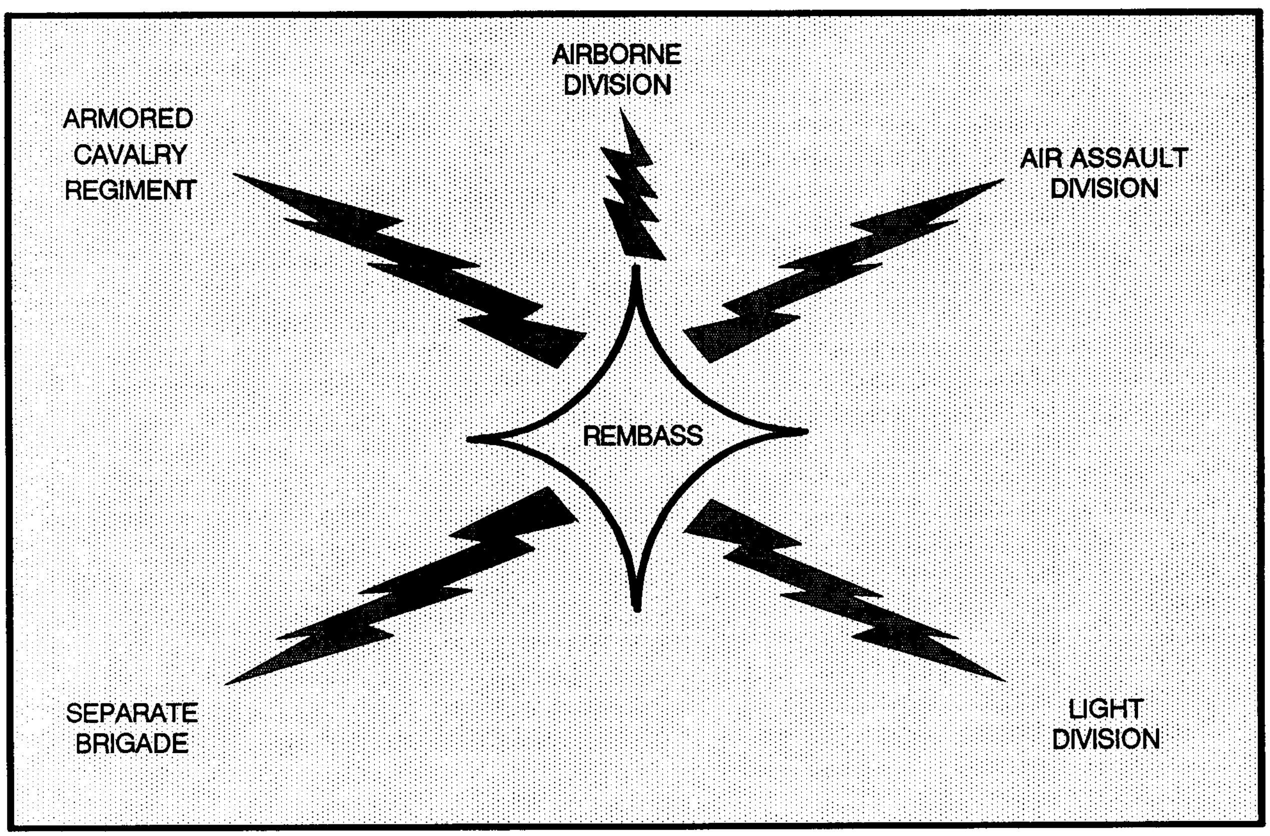
REMBASS provides a real-time detection capability. Sensors are portable, movement activated, and data transmitting. REMBASS sensors provide surveillance in a near all-weather and terrain, day or night, offensive, defensive, rear area, or special operations environment. Employed sensors are activated by magnetic, seismic, acoustic, or infrared (temperature) changes from moving targets. This disturbance or movement is transmitted to radio repeater or monitoring sites. Operators analyze the data and report information on--

- Target location.
- Target direction.
- Rate of speed.
- Length of column (LOC).
- Approximate number of targets.
- Target type.

REMBASS sensors can transmit from 15 kilometers (ground-to-ground) and 100 kilometers (ground-to-air). Because of equipment flexibility and range of applications, various REMBASS equipment (Chapter 2) combinations can be selected to suit any mission.

LIMITATIONS

REMBASS does have limitations. The sensor and repeater must be emplaced by hand. This increases the response time to employ the system, and in hostile areas, exposes the implant team. The sensors require radio LOS to transmit data to the monitors. The equipment's weight and size limit the amount and distance it may be carried for emplacement. Operator proficiency greatly affects the results. REMBASS cannot discriminate between enemy, friendly or indigenous personnel, or vehicles.

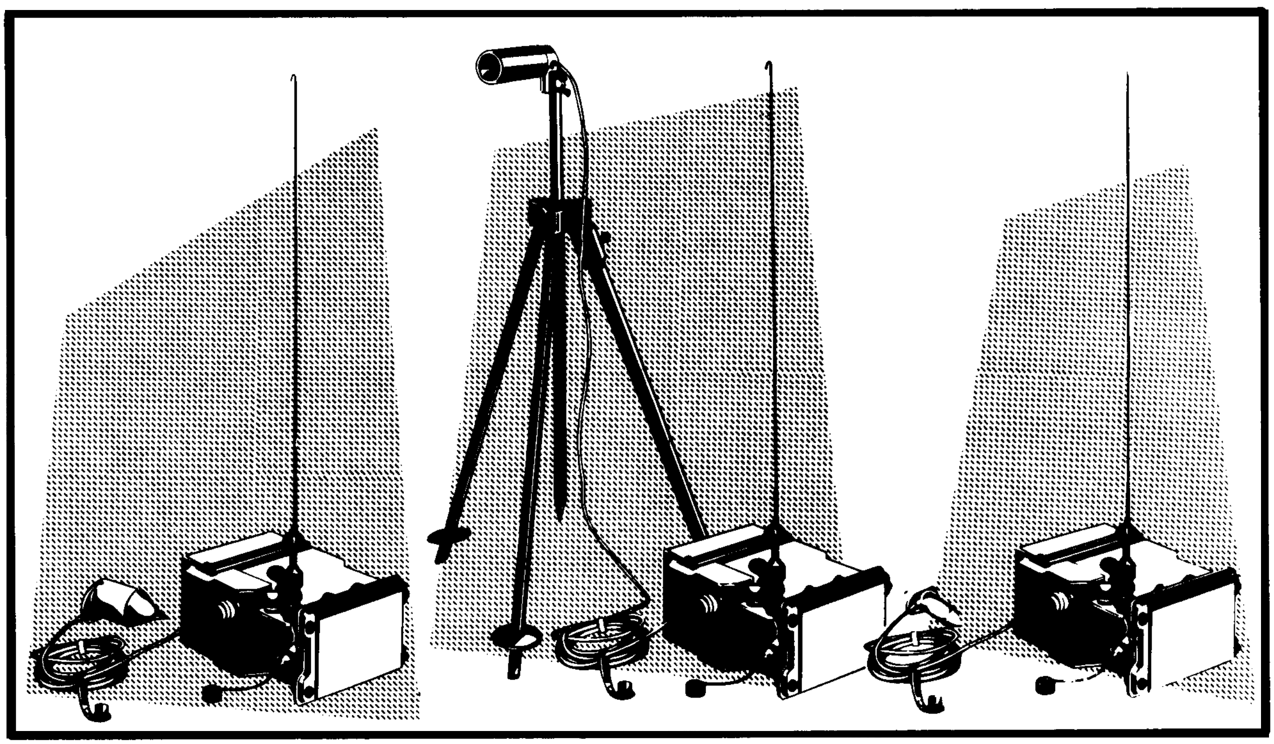


CHAPTER 2

EQUIPMENT

This chapter explains the different types and characteristics of REMBASS equipment. You must know the basic characteristics of the sensors and related REMBASS equipment to understand the information they provide.

The three different types of sensors (magnetic sensor (MAG), seismic acoustic sensor, and infrared-passive sensor (IP)) are arranged in complementary strings. They are designed to function automatically, transmitting data when movement activates them. Each sensor has detection and classifying techniques suited to the physical disturbance (for example, magnetic, seismic, acoustic, and infrared). Each sensor consists of a transducer, transmitter, and battery. For planning purposes expect the batteries to activate 1,000 times per day for 30 days. There is a high degree of commonality among the three types of sensors; the transmitter module, encoder board, battery, antenna, and housing assembly are interchangeable. They use the same standard communications format for data transmission output, and all sensors have a self-disabling and anti-tampering feature.



MAGNETIC SENSOR DT-561/GSQ

The MAG uses a passive magnetic technique to detect targets and determine direction of movement (left to right (L-R) and right to left (R-L)). The MAG is programmed with two I.D. codes, the first indicating L-R direction and the second indicating R-L direction in relation to the transducer. If a target passes the transducer going L-R, the first I.D. code is transmitted to the repeater monitor from the sensor. The MAG detects moving objects that contain ferrous metal (iron) within its detection range. It will not classify targets but will send a "detection only" (-) message to the SMS. The detection range is limited (3 meters for armed personnel, 15 meters for wheeled vehicles, and 25 meters for tracked vehicles). Therefore, the sensor must be placed in proximity to expected routes of travel. Since only one target will usually be within the detection range at a given time, the approximate number of targets can be estimated by counting the detections.

GENERAL TECHNICAL CHARACTERISTICS

Weight:	Sensor and battery 2.95 kilograms or 6.5 pounds
Number of Channels:	599 (593 usable) excluding 208, 211, 267, 342, 345, 354
I.D. Codes (each channel):	63 (codes 01 through 63)
Sensor Signal Output:	2 watts nominal
Frequency Range:	138-153 megahertz (MHz)
Channel Spacing:	25 kilohertz (kHz) apart
Detection Ranges:	Personnel 3 meters Wheeled 15 meters Tracked 25 meters
Power Source:	Battery BA-5598/U
Battery Life:	1,000 activations per day for 30 days
Reference:	TM 11-6350-220-12

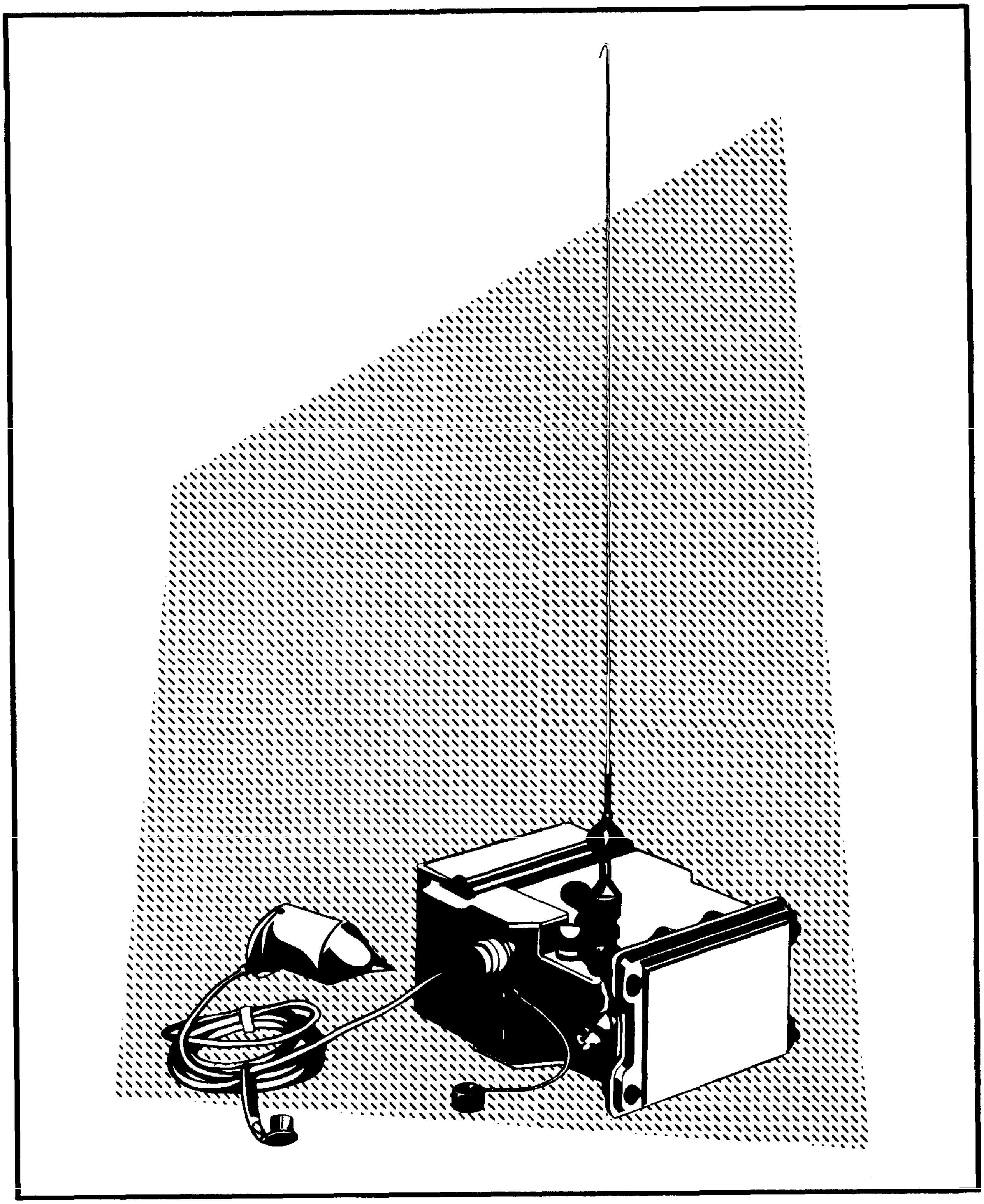


Figure 2-1. Magnetic sensor DT- 561/GSQ.

SEISMIC-ACOUSTIC SENSOR DT-562/GSQ

The SA sensor detects and classifies P - personnel, V - vehicles, W - wheeled vehicles, and T - tracked vehicles by analyzing target signature information (SA signal intensity changes) and transmits a target classification report to the monitor. The sensor detects ground vibrations and acoustic signals. Because soil composition varies for different locations and soil composition affects the detection range of the SA, the SA "gain" of sensitivity can be set to high, medium, or low. The gain is set and only appears while programming the SA. If the SA detects movement but cannot determine the classification, a "Detection only" (-) message will be sent. If it determines a vehicle but cannot classify it as wheeled or tracked, a "V-vehicle" message will be transmitted. The SA sensor has a detection range of 50 meters for personnel, 250 meters for wheeled vehicles, and 350 meters for tracked vehicles.

GENERAL TECHNICAL CHARACTERISTICS

Weight:	Sensor and battery 2.95 kilograms or 6.5 pounds
Number of Channels:	599 (593 usable) excluding 208, 211, 267, 342, 345, 354
I.D. Codes (each channel):	63 (codes 01 through 63)
Sensor Signal Output:	2 watts nominal
Frequency Range:	138-153 MHZ
Channel Spacing:	25 kHz apart
Detection Ranges:	Personnel 50 meters Wheeled 250 meters Tracked 350 meters
Power Source:	Battery BA-5598/U
Battery Life:	1,000 activations per day for 30 days
Reference:	TM 11-6350-220-12

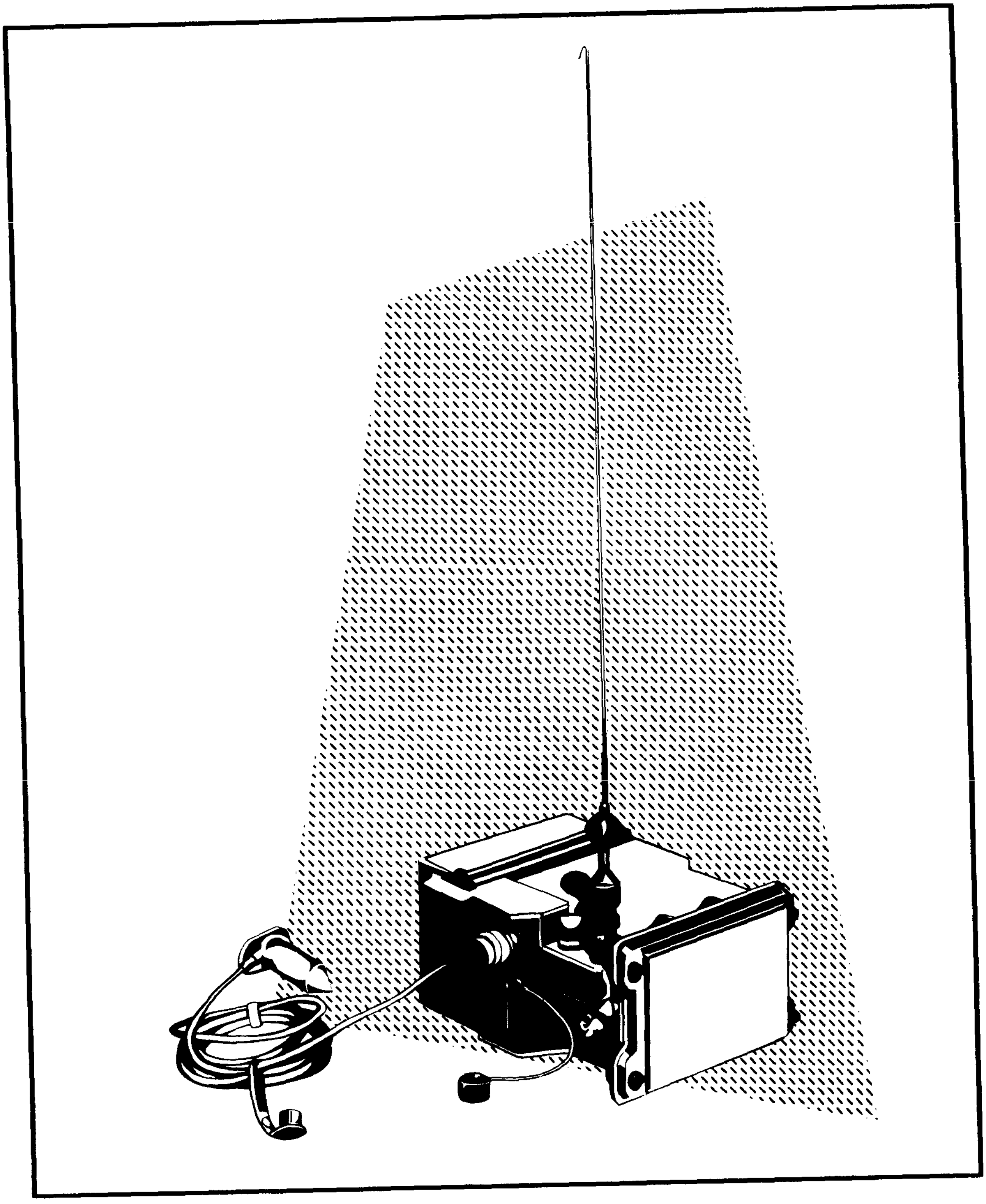


Figure 2-2. Seismic-Acoustic sensor DT-562/GSQ.

INFRARED-PASSIVE SENSOR DT-565/GSQ

The IP sensor detects and responds to a temperature change of 1.5 degrees Celsius (C) of the target. The IP is programmed using two I.D. codes; the first indicating L-R direction and the second indicating R-L direction, in relation to the transducer. In other words, if a target passes the transducer going L-R the first I.D. code will be transmitted to the repeater monitor from the sensor. The IP has a range of 3 to 20 meters for personnel and 3 to 50 meters for vehicles. Careful emplacement is required to ensure an uninterrupted LOS from the transducer to the detection zone. The IP is a count indicator type sensor (for personnel). It sends a detection signal for each target that passes within the detection zone.

GENERAL TECHNICAL CHARACTERISTICS

Weight:	Sensor and battery 2.95 kilograms or 6.5 pounds
Number of Channels:	599 (593 usable) excluding 208, 211, 267, 342, 345, 354
I.D. Codes (each channel):	63 (codes 01 through 63)
Sensor Signal Output:	2 watts nominal
Frequency Range:	138-153 MHz
Channel Spacing:	25 kHz apart
Detection Ranges:	Personnel 3-20 meters Vehicles 3-50 meters
Power Source:	Battery BA-5598/U
Battery Life:	1,000 activations per day for 30 days
Reference:	TM 11-6350-220-12

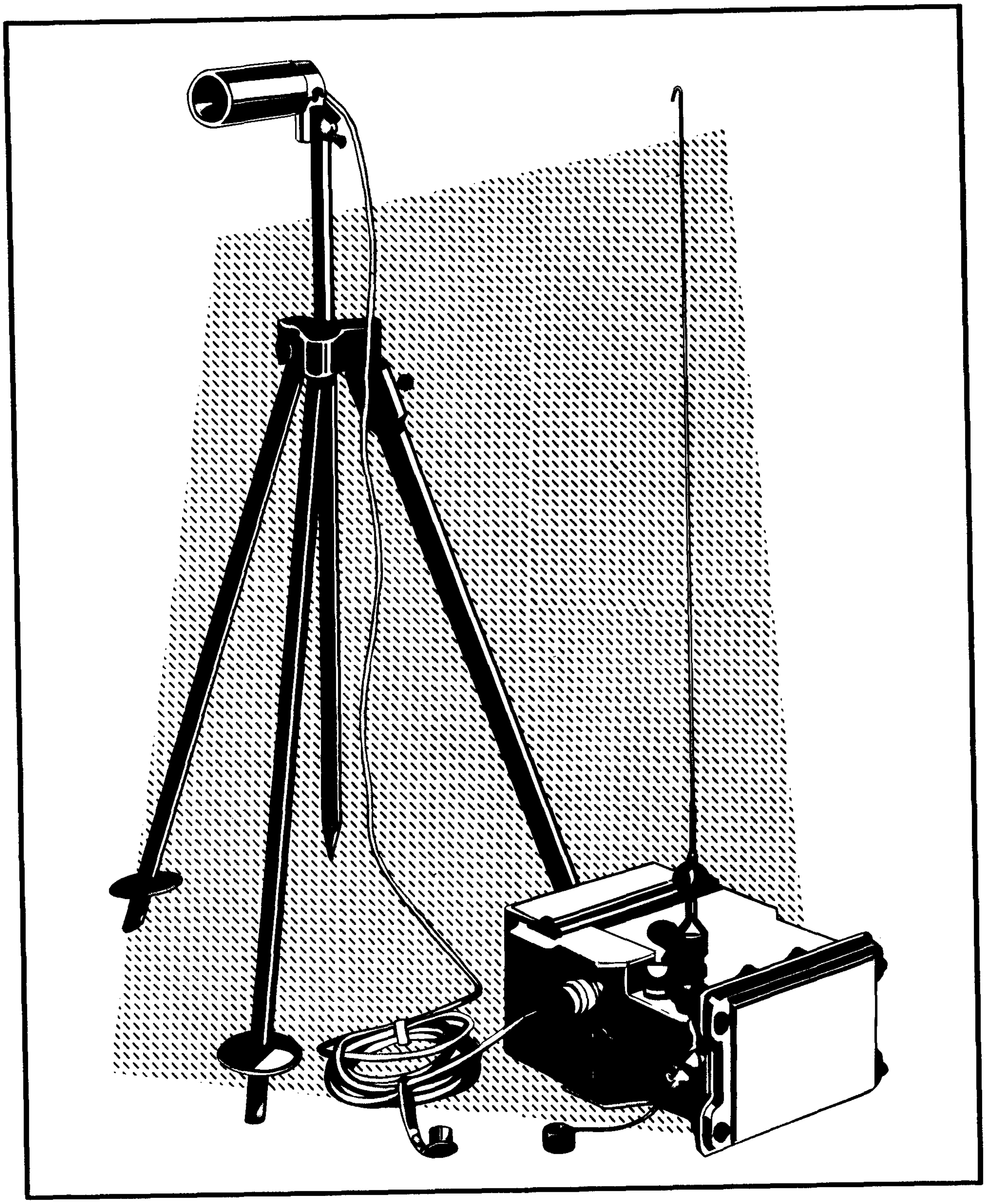


Figure 2-3. Infrared-passive sensor DT-565/GSQ.

CODE PROGRAMMER C-10434/GSQ

The code programmer (commonly called the programmer) is a portable device used to program a sensor or repeater to a desired operating channel, I.D. code number, mission life, arm mode, and gain. The I.D. code is a two-digit number ranging from 01 to 64, but only 01 to 63 are used when programming the sensors. I.D. code 64 is reserved for the repeater. The programmer is powered by the power source of the equipment being programmed (battery in the sensor or repeater). It loads parameters into the sensors and repeaters and conditions batteries in the equipment being programmed. It has a built-in visual self test, to ensure the proper information was programmed into the sensor or repeater. The programmer is not totally foolproof. It allows devices to be programmed in the wrong mode.

GENERAL TECHNICAL CHARACTERISTICS

Weight:	Code Programmer 1.1 kilograms or 2.5 pounds
Number of Channels:	599 (593 usable) excluding 208, 211, 267, 342, 345, 354
Power Source:	The code programmer receives its power from the power source of the equipment it is programming.
Reference:	TM 11-6350-288-12

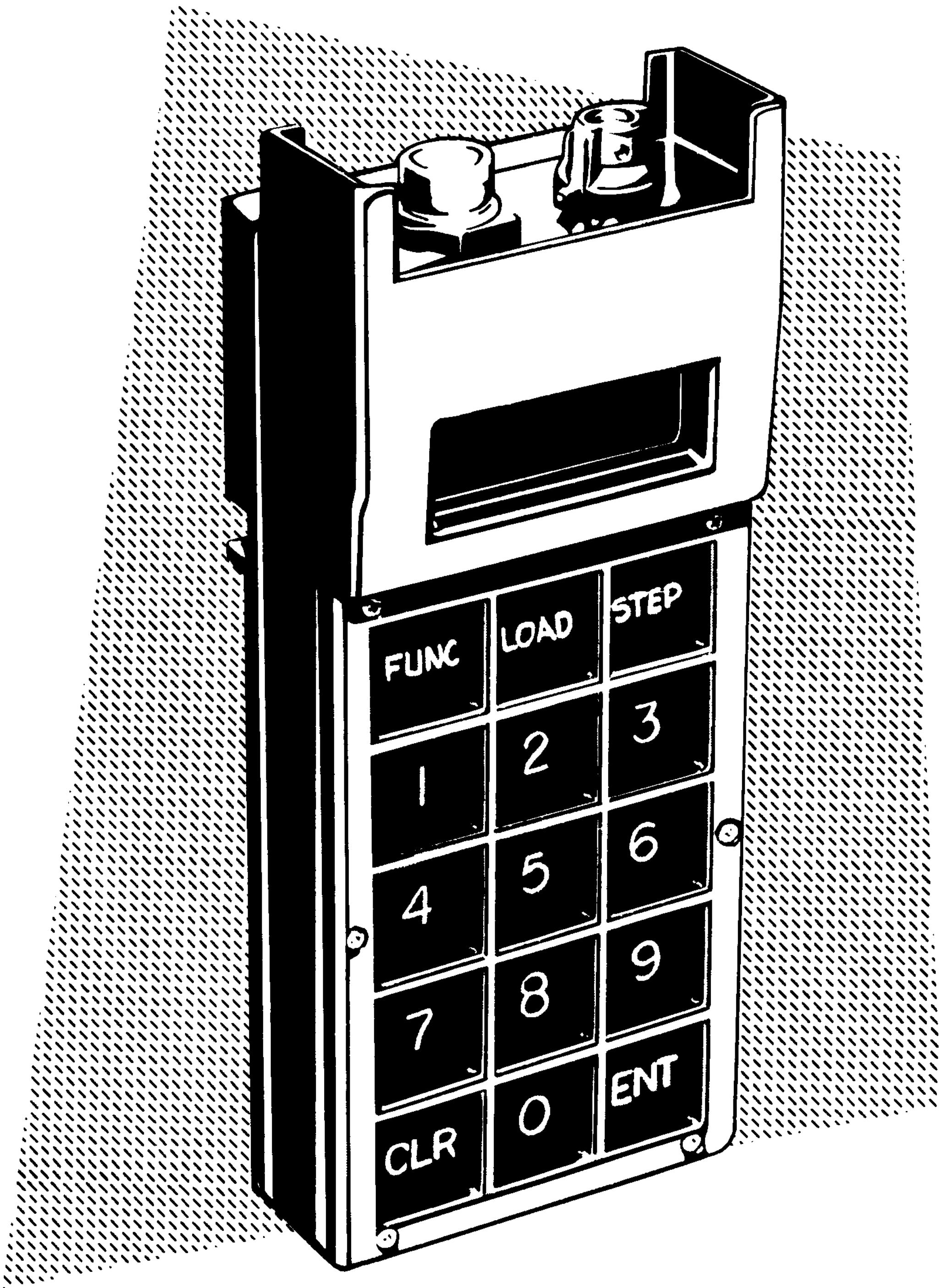


Figure 2-4. Code programmer C-10434/GSQ.

RADIO REPEATER RT-1175/GSQ

The radio repeater shown in Figure 2-5 (commonly called the repeater) relays data transmissions between the sensors and the monitoring sites. The 599 channel REMBASS band is divided as follows:

- o Low-band (1-160).
- o Mid-band (161-439).
- o High-band (440-599).

When the repeater transmit and receive channel assignments are in the high-low or low-high bands, the repeater configures itself in simultaneous transmit and receive mode (full duplex) as shown in Figure 2-6.

If the transmit and receive channel assignments are not high-low or low-high it reverts to a storing unit buffer and forwards the configuration (half duplex) as shown in Figure 2-7.

Each channel can accommodate 64 I.D. codes. Each sensor contains a transmitter capable of operating on any one of the 593 available channels. The channels are numbered from 001 to 599 excluding 208, 211, 267, 342, 345, and 354. These excluded channels are not used because of internal interference with the radio repeater.

The radio repeater receives the encoded radio message from either a sensor or another like repeater. It then decodes the message, verifies bit integrity, as shown in Figure 2-8, and retransmits the message on another channel. This provides system flexibility in the REMBASS communication link to operate over and around terrain features that may block the radio LOS from a sensor to a remote monitor set. The radio repeater can be operated from an airborne platform to extend transmission up to 100 kilometers under LOS conditions. The radio repeater has a built-in anti-tampering shutdown feature.

The radio repeater provides a message of 64 over 8 to the monitor whenever it receives electromagnetic interference. It also sends a message of 64 over 1 every 84 minutes to the monitor, indicating that it is still operational.

GENERAL TECHNICAL CHARACTERISTICS

Weight:	Repeater and 6 batteries 18 kilograms or 40 pounds
Number of Channels:	599 (593 usable) excluding 208, 211, 267, 342, 345, 354
I.D. Codes (each channel):	1 per channel (64)
Transmitter Power output :	2 Watts nominal
Antenna Type	Radial - unidirectional (mast with antenna 5.5 kgs or 12 lbs)
Frequency Range:	138-153 MHz
Channel Spacing:	25 kHz apart
Power Source:	Primary - battery BA-5590/U Alternate - PP-8080\GSQ (power supply)
Transonic Ranges:	Ground to ground - 15 kilometers Ground to air - 100 kilometers
Battery Life:	16,000 activations per day for 30 days with six batteries
Reference:	TM 11-5820-872-12

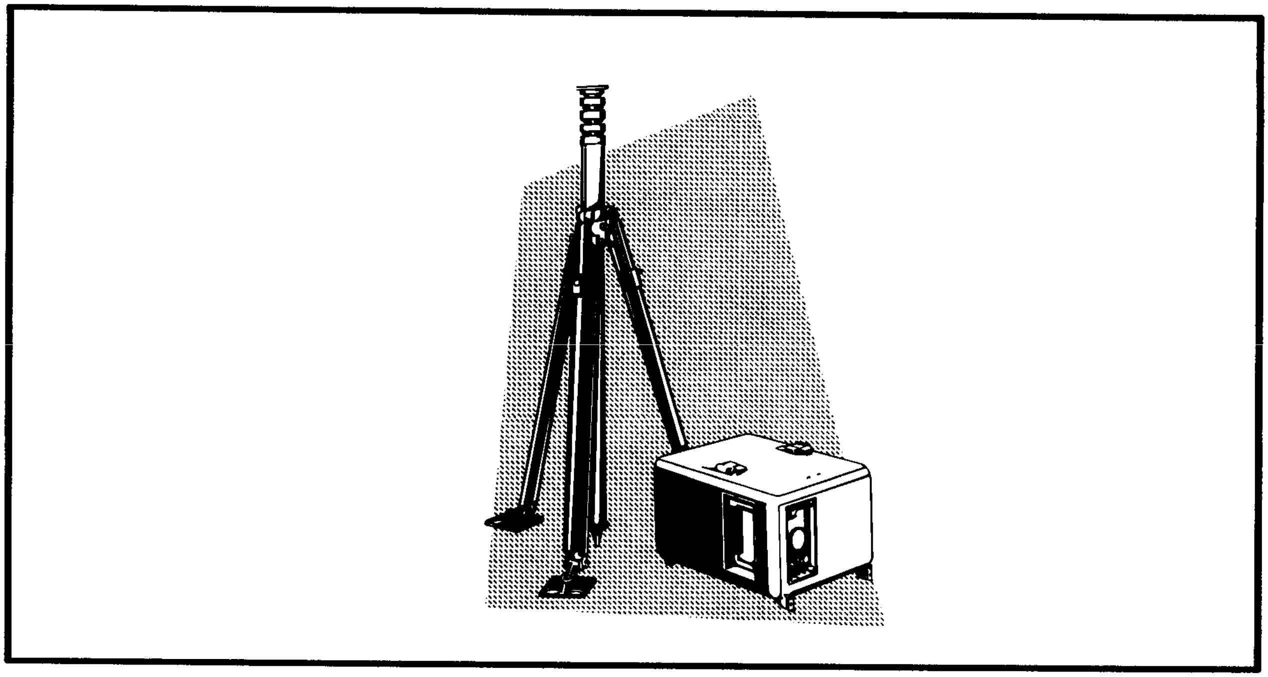


Figure 2-5. Radio repeater RT-1175/GSQ.

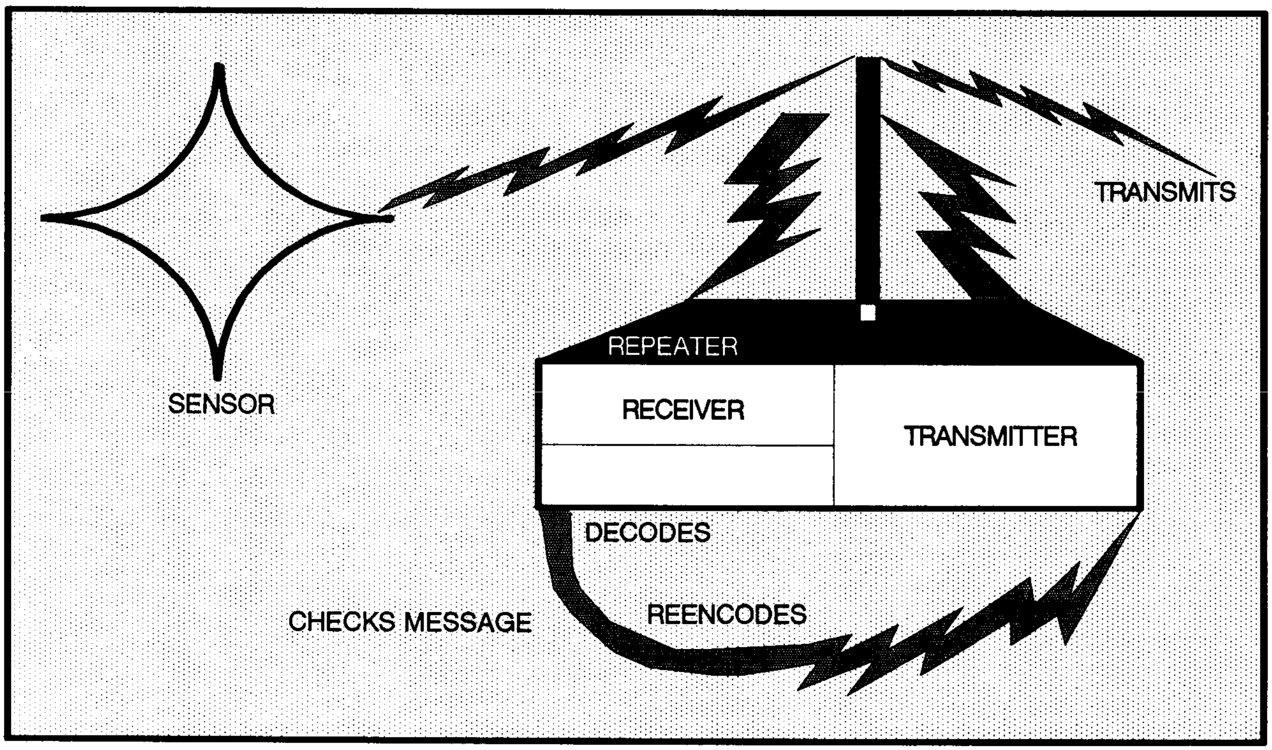


Figure 2-6. Full duplex.

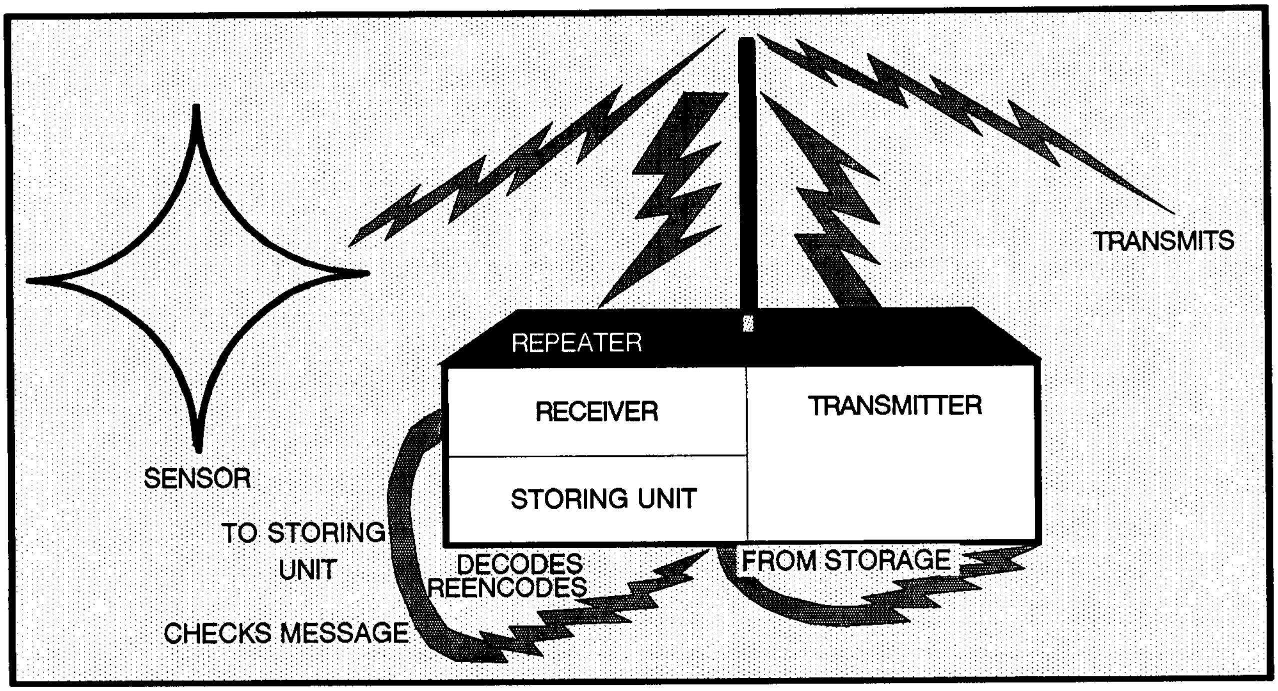


Figure 2-7. Half duplex.

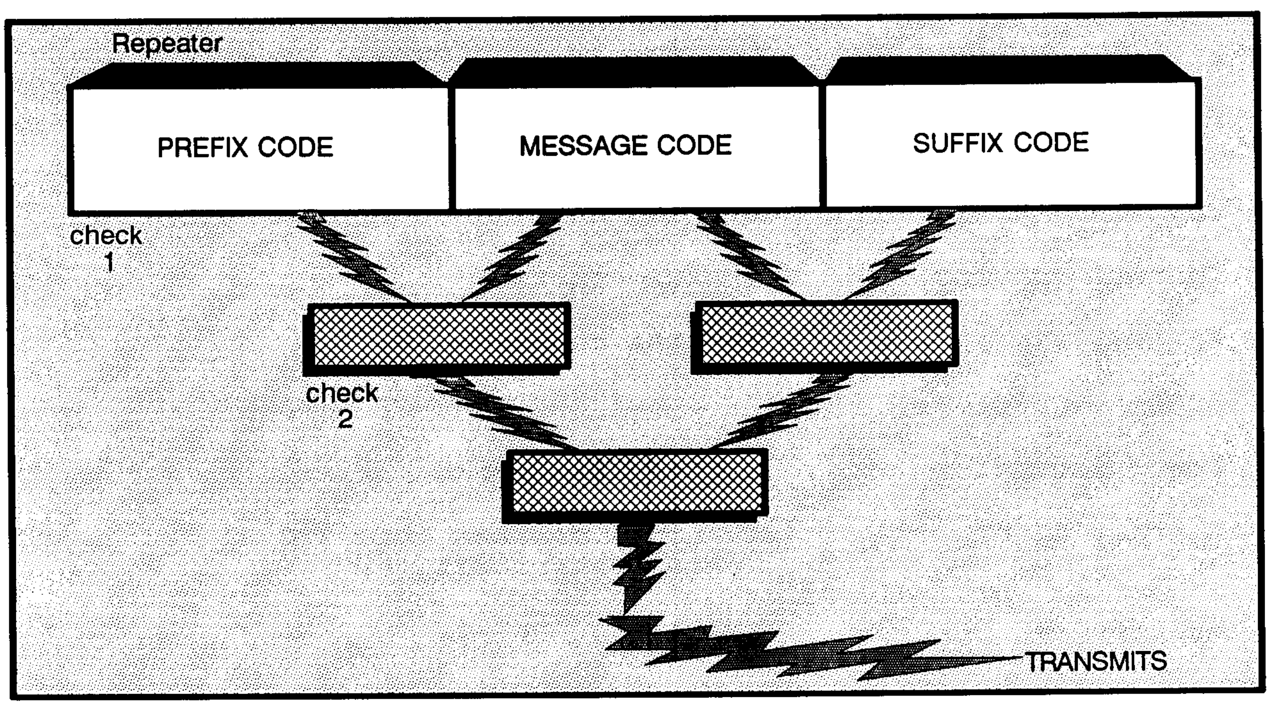


Figure 2-8. Bit integrity.

ANTENNA GROUP OE-239/GSQ

The antenna group is used as part of the radio frequency (RF) data link. The antenna group provides the SMS adequate signal strength to receive transmissions from extended ranges. The antenna includes an RF amplifier mounted to the antenna and powered by the antenna coupler through the RF cable. The antenna coupler connects up to four SMSs to one antenna. The antenna may also be used without the RF amplifier.

> **CAUTION**
>
> If the antenna is used without the RF amplifier, do not power the antenna coupler. This will send direct current to the antenna, damaging the antenna element.

GENERAL TECHNICAL CHARACTERISTICS

Weight:	Antenna group - 20 kilograms or 44 pounds Cable - 12.5 kilograms or 27.6 pounds
Antenna:	Antenna AS-4064 unidirectional collinear Array, 50 ohms impedance
Frequency Range:	138-153 MHz
Channel Spacing:	25 kHz apart
RF Amplifier:	Antenna mounted
Antenna Coupler:	RF input and four RF outputs
Power Source:	Battery BA-5590/U
Battery Life:	15 hours minimum at -32°C -25° Fahrenheit (F)
Reference:	TM 11-5820-867-12

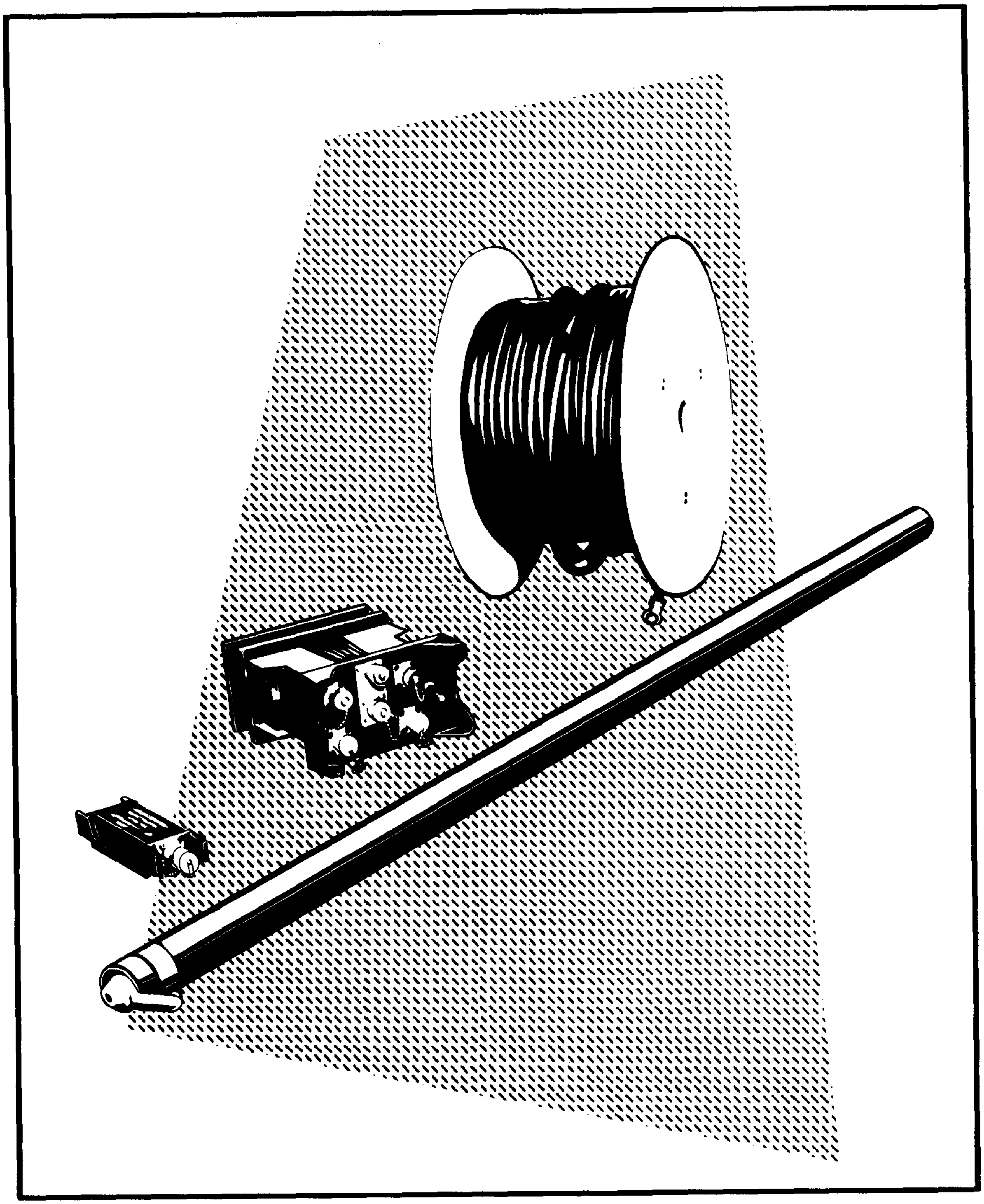


Figure 2-9. Antenna group OE-239/GSQ.

SENSOR MONITORING SET AN/GSO-187

The SMS is the primary monitoring device in the REMBASS system. It is used to monitor radio-linked sensor and repeater transmissions. The key pad is used to test and program the SMS with required information. The SMS is equipped with two single-channel programmable receivers. It receives, decodes, displays, and records sensor information. The SMS features temporary visual displays (TVDs), hard copy (printer paper), and is field operable with either batteries or power supply PP-8080/GSQ. The SMS operates with its own antenna or a remote antenna group. The TVD window can display messages from as many as ten activations for up to six seconds. The printer can generate a 60-column hard copy record of detections (dashes) and classifications (P, W, V, T). Each column of hard copy record is dedicated to display messages from a specific sensor or repeater I.D.

GENERAL TECHNICAL CHARACTERISTICS

Weight:	SMS and 2 batteries 20 kilograms or 44 pounds SMS and power supply 23 kilograms or 51 pounds
Number of Channels:	599 (593 usable) excluding 208, 211, 267, 342, 345, 354
I.D. Codes (each channel):	1 per channel (64)
Sensor Signal Readout:	TVD audio alarm and printer
Frequency Range:	138-153 MHz
Channel Spacing:	25 kHz apart
Power Source:	Primary - battery BA-5590/U Alternate - PP-8080\GSQ power supply
Battery Life:	15 hour minimum at -32° C -25° F
Printer:	Thermal printing, 60 column (pens), two speed printer: Low rate 15 inches per hour, high rate 30 inches per hour
Reference:	TM 11-5820-867-12

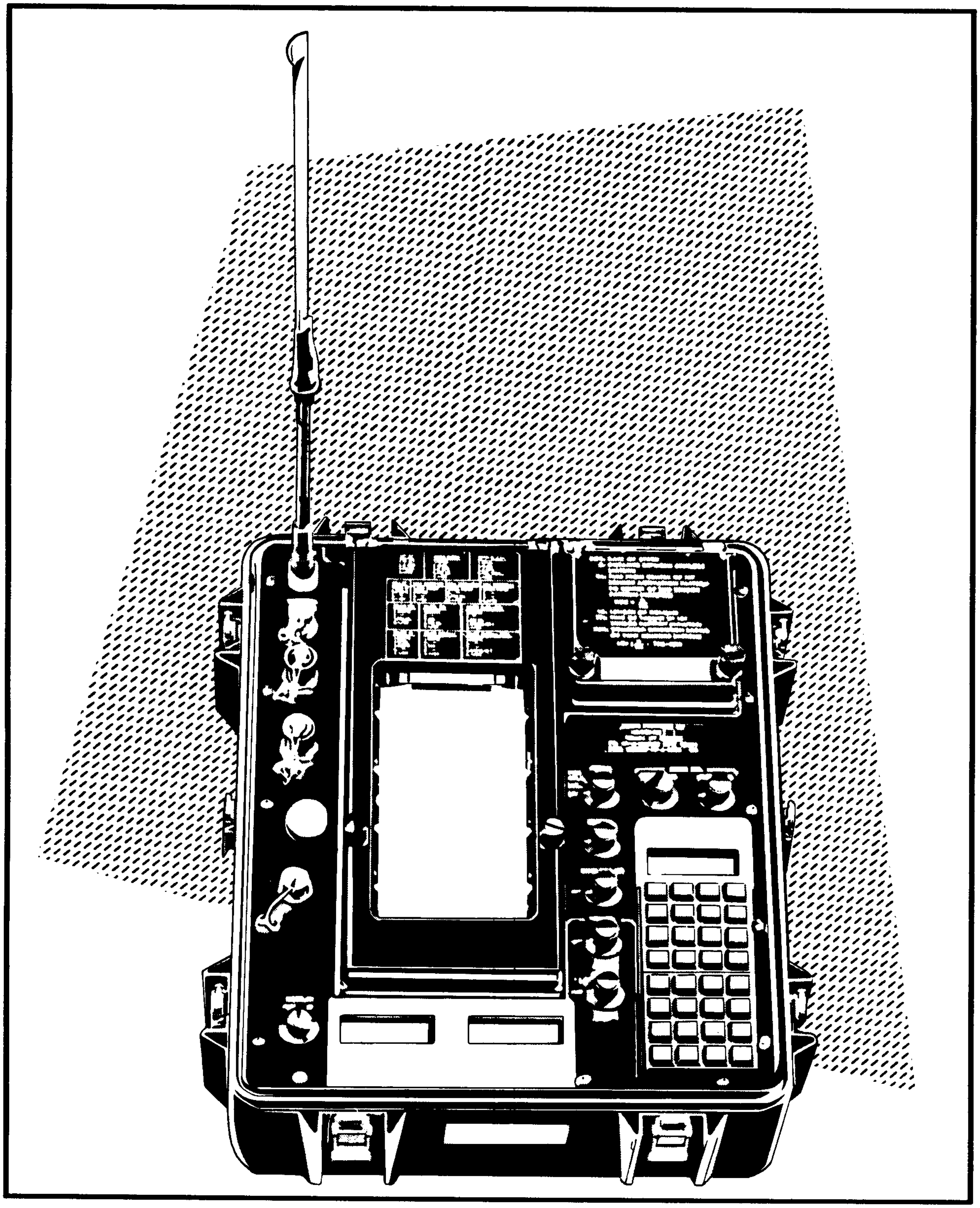


Figure 2-10. Sensor Monitoring set AN/GSQ-187.

RADIO FREQUENCY MONITOR R-2016/GSQ

The radio frequency monitor is a portable monitor set (PM) used to monitor REMBASS sensors and repeaters. The PMS is a battery operated, single channel receiver and message processor. It also has TVD, which can display up to ten activations from sensors at any time. An incoming message activates the audible alarm. At the same time the TVD displays the identity code of the sensor and the detection and classification data from the sensor. Successive activations are displayed L-R and top to bottom through the TVD. The primary application of the PMS is for verification of REMBASS sensor and repeater operation during the initial emplacement. It is also used as an alternate monitor if the SMS becomes inoperative.

GENERAL TECHNICAL CHARACTERISTICS

Common Name:	PMS
Weight:	PMS and battery 2.96 kilograms or 6.52 pounds
Number of Channels:	599 (593 usable) excluding 208, 211, 267, 342, 345, 354
I.D. Codes (each channel):	1 per channel (64)
Sensor Signal Readout:	TVD, audio alarm
Frequency Range:	138-153 MHz
Channel Spacing:	25 kHz apart
Power Source:	Primary - battery BA-5598/U
Battery Life:	168 hours of continuous operation
Reference:	TM 11-5820-870-12

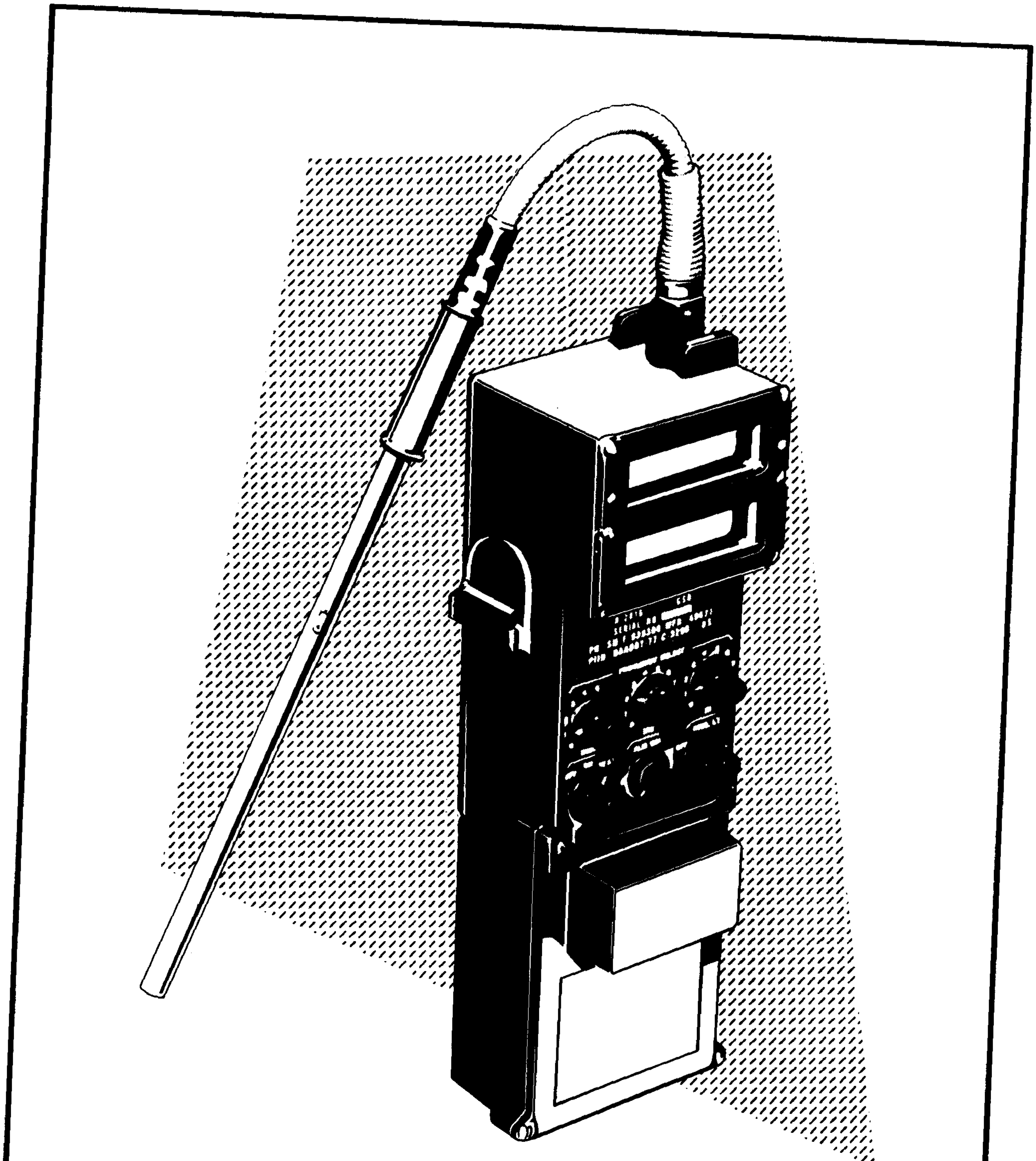


Figure 2-11. Radio frequency monitor R-2016/GSQ.

POWER SUPPLY, PP-8080/GSQ

The alternating current (AC) or direct current (DC) (AC/DC) power supply is used as an alternate source to power the SMS and radio repeater in place of batteries. The AC/DC power supply can adapt to 115 or 200 Volts AC (50 or 60 Hz) and also adapt to 24 Volts DC source.

GENERAL TECHNICAL CHARACTERISTICS

Common Name:	Power Supply
Weight:	3.7 kilograms or 8.1 pounds
Reference:	TM 11-6130-460-13

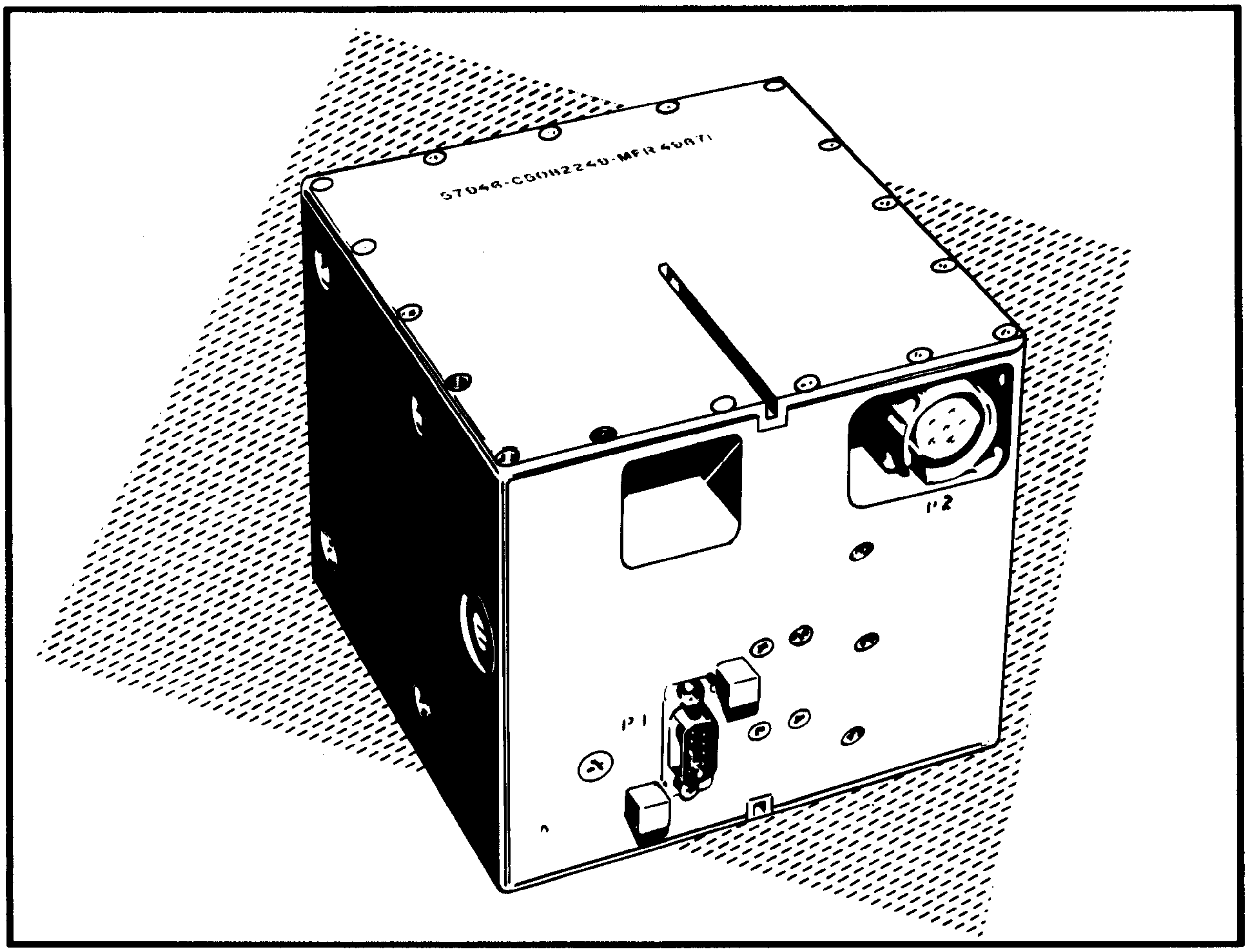


Figure 2-12. Power supply PP-8080.

CHAPTER 3

DATA ANALYSIS

To aid the staff in planning and conducting combat operations, a standardized system has been devised to annotate REMBASS locations and required information for REMBASS operations. The operator must have accurate records.

SYMBOLS

Refer to FM 101-5-1, Appendix E. The following Figures 3-1 through 3-3 are the symbols for REMBASS equipment. The first step in recording REMBASS locations is the use of the proper symbol.

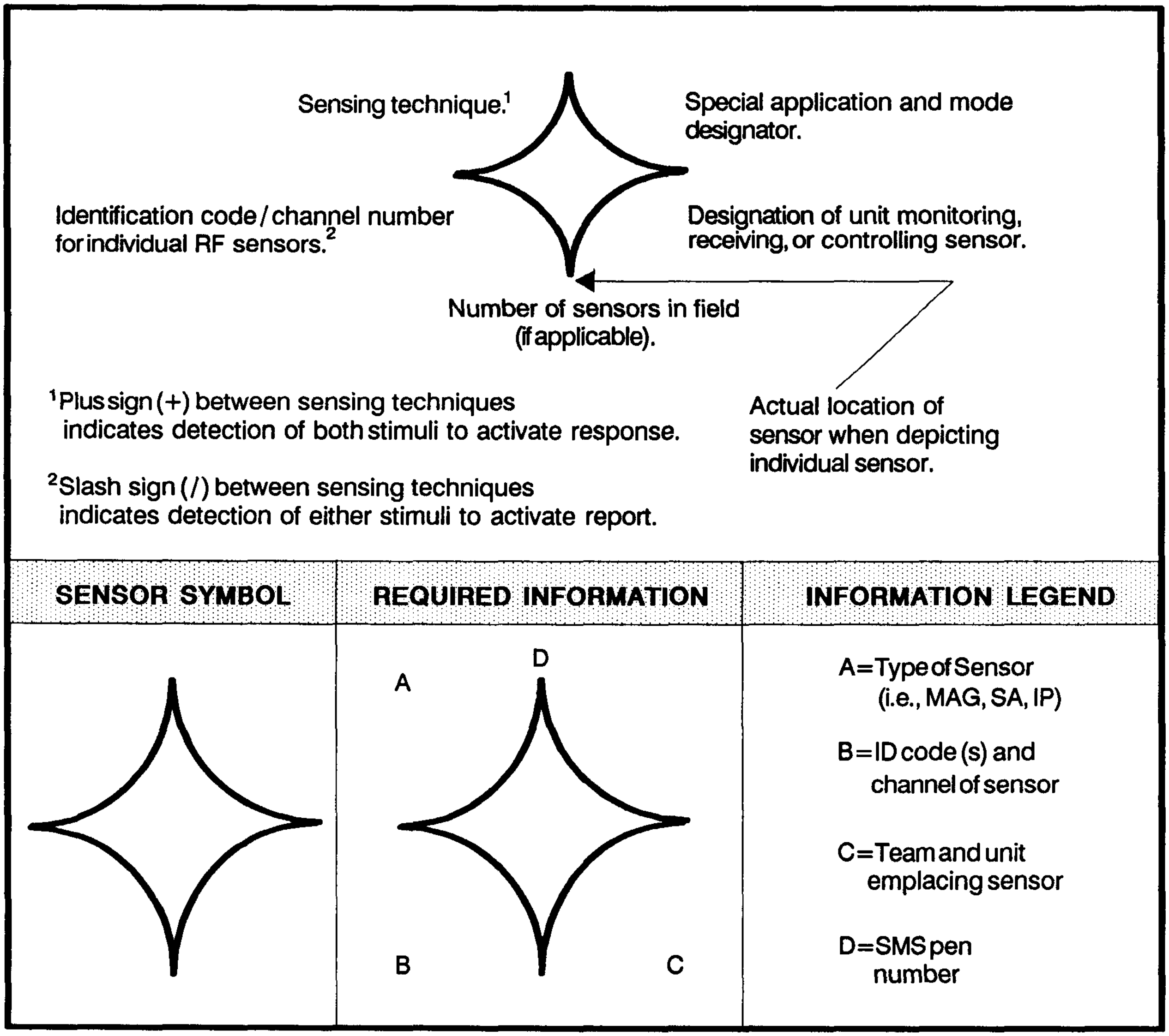


Figure 3-1. Sensor symbol.

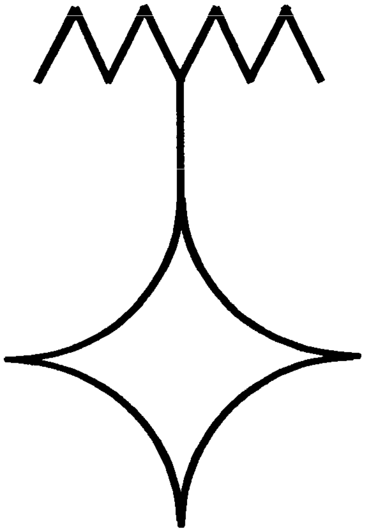
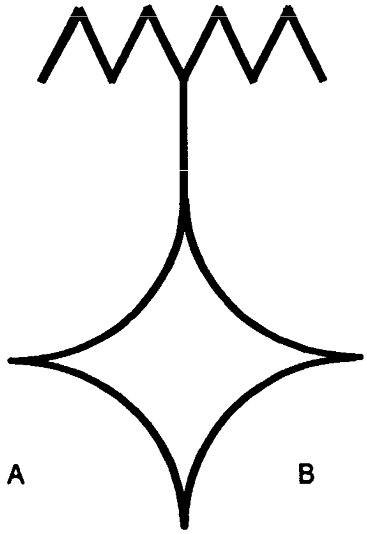
MONITOR SYMBOL	REQUIRED INFORMATION	INFORMATION LEGEND
		A=Receiver channel (designate A or B when using the SMS) B=Team and unit

Figure 3-2. Sensor monitor station.

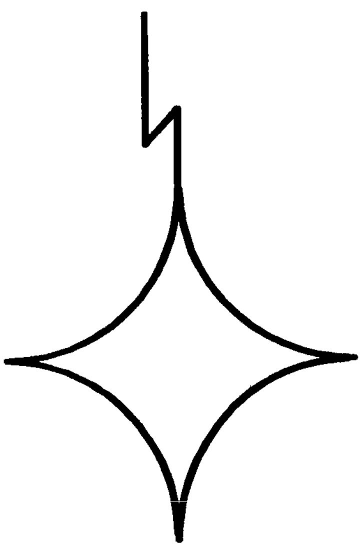
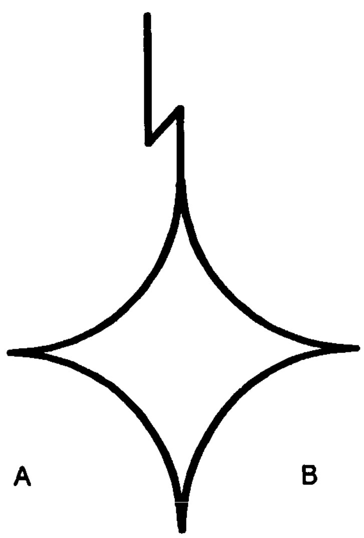
REPEATER SYMBOL	REQUIRED INFORTMATION	INFORMATION LEGEND
		A= Receiver and transmitting channel B= Implant team and unit

Figure 3-3. Sensor relay station (repeater).

On a sketch map, the sensor symbol will be placed with the bottom point at the exact location of the sensor. If this is not possible a "staff" is added to the sensor as shown in Figure 3-4. This method is used when the amount of symbols would clutter the map and make it hard to interpret.

SKETCH MAP

Before departing for a mission, a rough draft sketch map should be drawn with the aid of aerial reconnaissance photographs or ground reconnaissance information. Figures 3-5 and 3-6 shows example sketch maps.

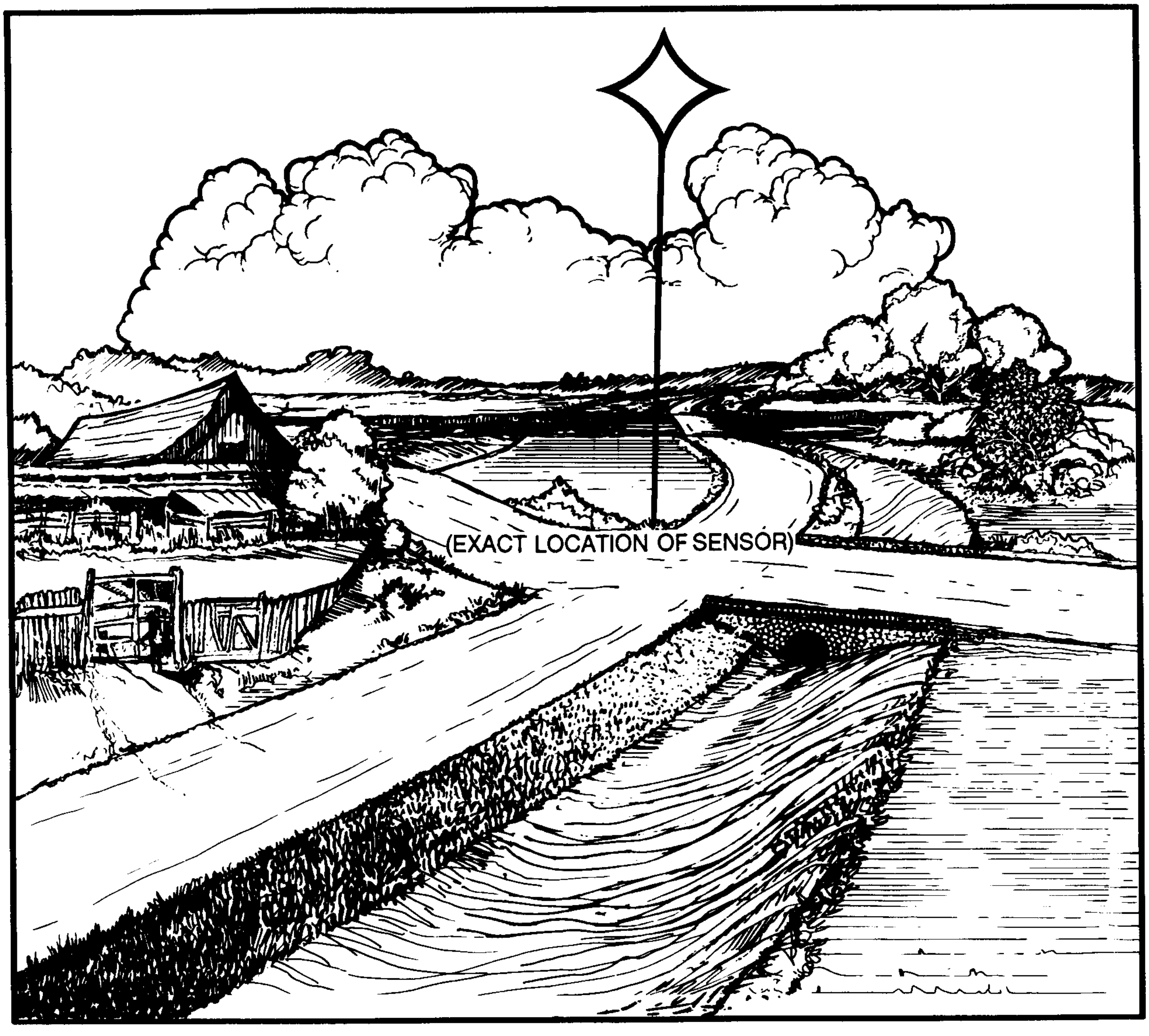


Figure 3-4. Sensor symbol with staff.

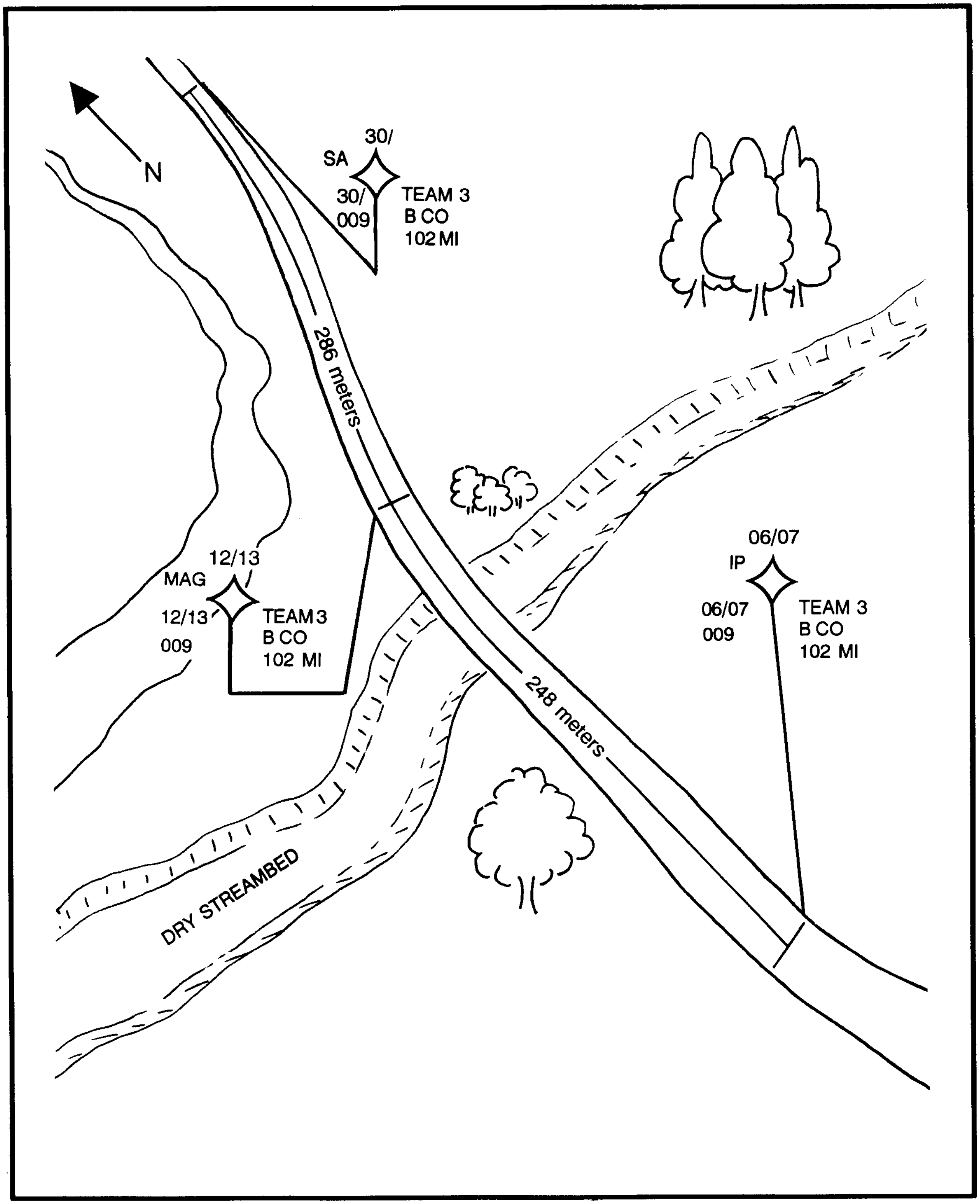


Figure 3-5. Rough sketch map.

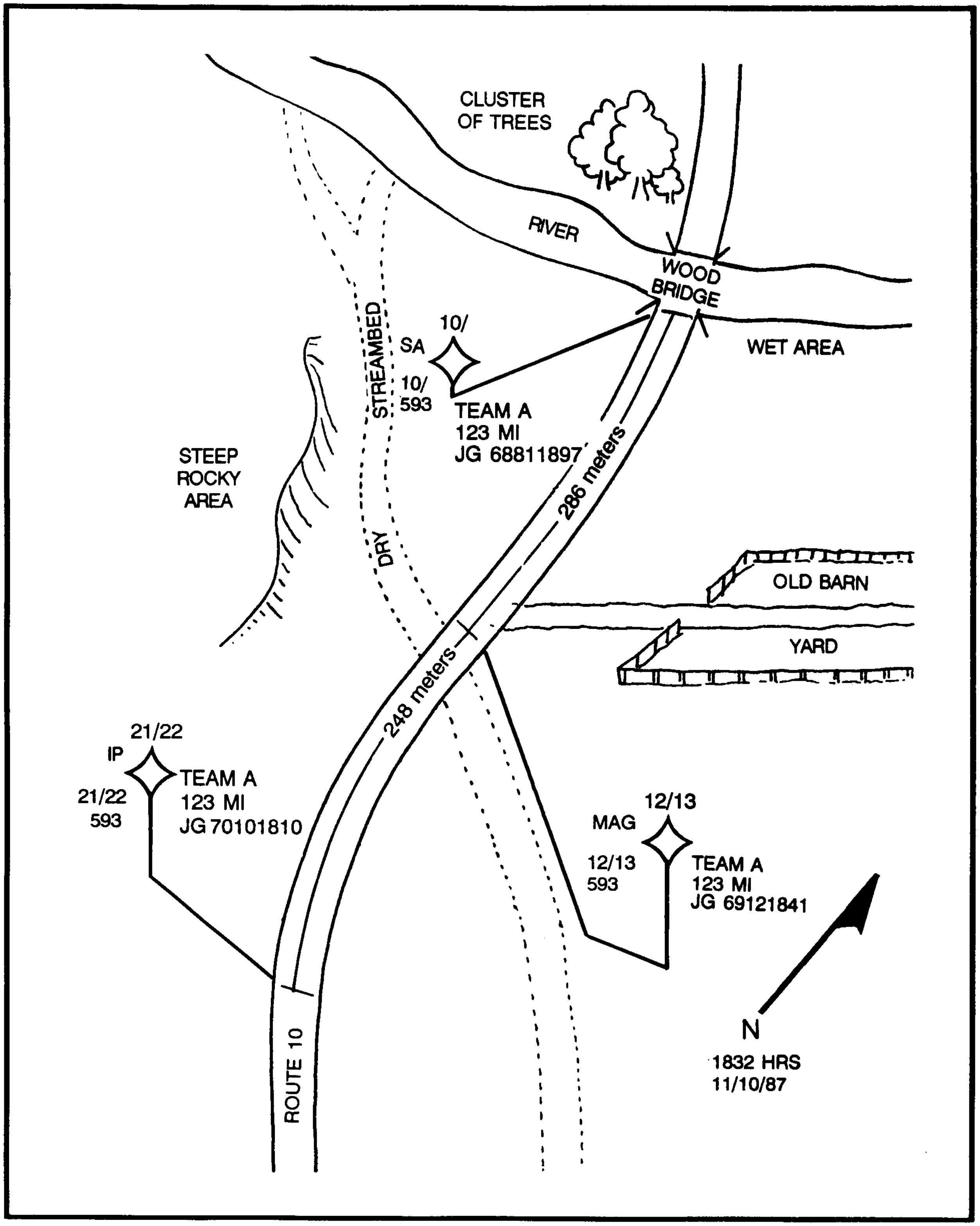


Figure 3-6. Sketch map with comments.

The importance of accurate sensor sketch maps cannot be overemphasized. The completed sketch map is prepared by the implant team when they implant the sensors and used by the operator at the monitor site. The sketch map contains any information that could aid in recovery operations. The only document used by the recovery team to recover sensors, its information is vital. Note that the team doing the implanting may not be the team recovering the equipment.

The information contained in the sketch map is vital in sensor data analysis. Employ the following in preparing a sensor sketch map:

o Draw the implant area as close to scale as possible.

o Annotate the sensor symbol adding sensor type, I.D. code(s) or channel, team and unit implanting the sensors or repeaters, and pen number (shown in Figure 3-7).

o Mark the distances between sensors in meters, not feet.

o Draw all the significant features in the sensors' area (large rocks, ditches, mounds, bridges, etc.).

o Mark north with an arrow indicating the direction (indicating magnetic or grid).

o Annotate the first, middle, and last sensors' eight digit grid coordinates.

o Mark azimuth (indicating magnetic or grid) and ranges (in meters) between each sensor and any significant features in the area.

o Add to the remarks section any information you feel may be important, such as poor road conditions that might cause abnormally slow rates of speed.

o Add any nonstandard map symbols in the legend.

Once you arrive at the objective and emplacement begins, the rough draft sketch map can be changed as needed. For additional information on map reading and overlays, refer to FM 21-26.

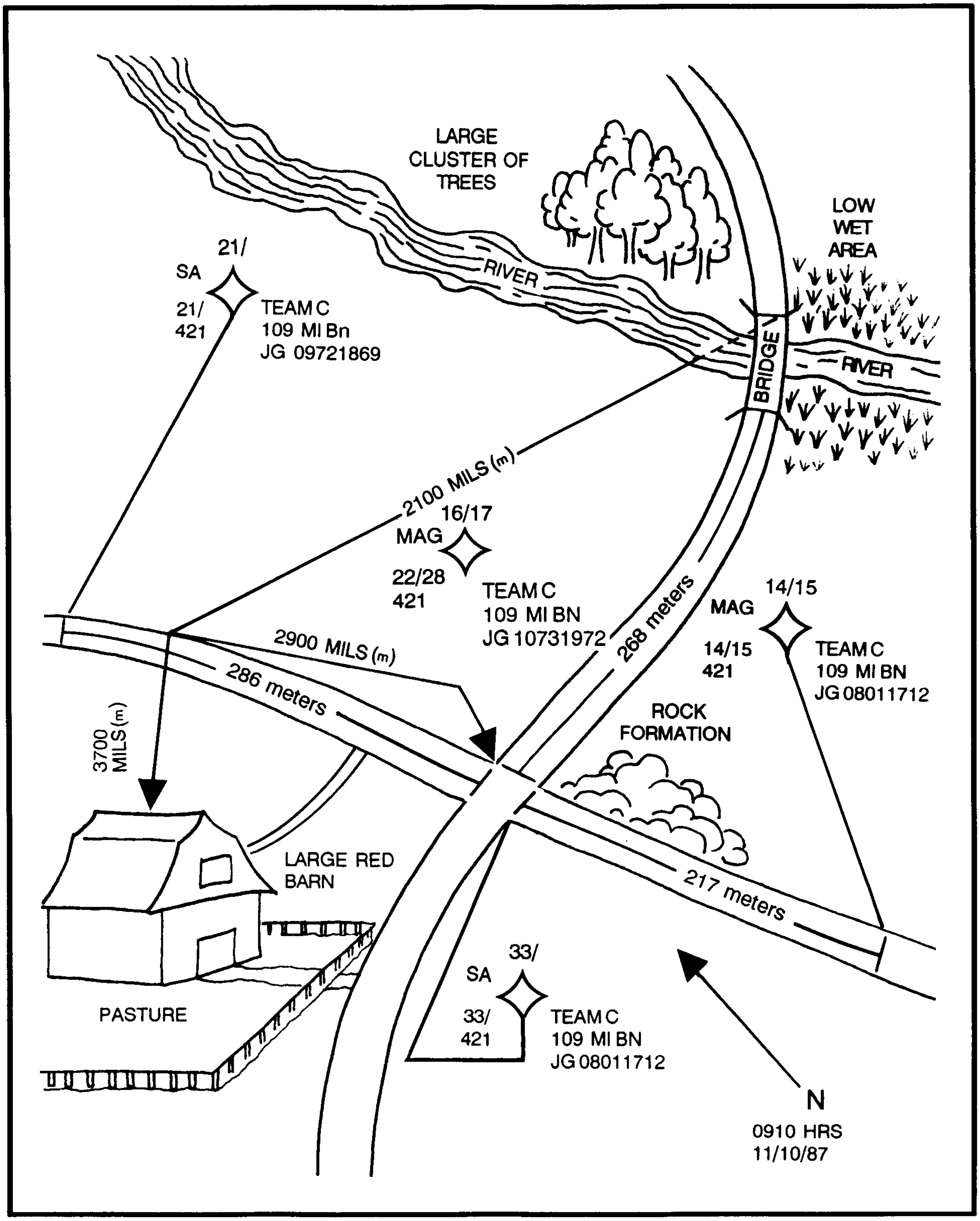


Figure 3-7. Completed sketch map.

Figure 3-8 shows an example of an overlay for REMBASS operations. The completed overlays are forwarded to the supported commander or the S2 of the supported command.

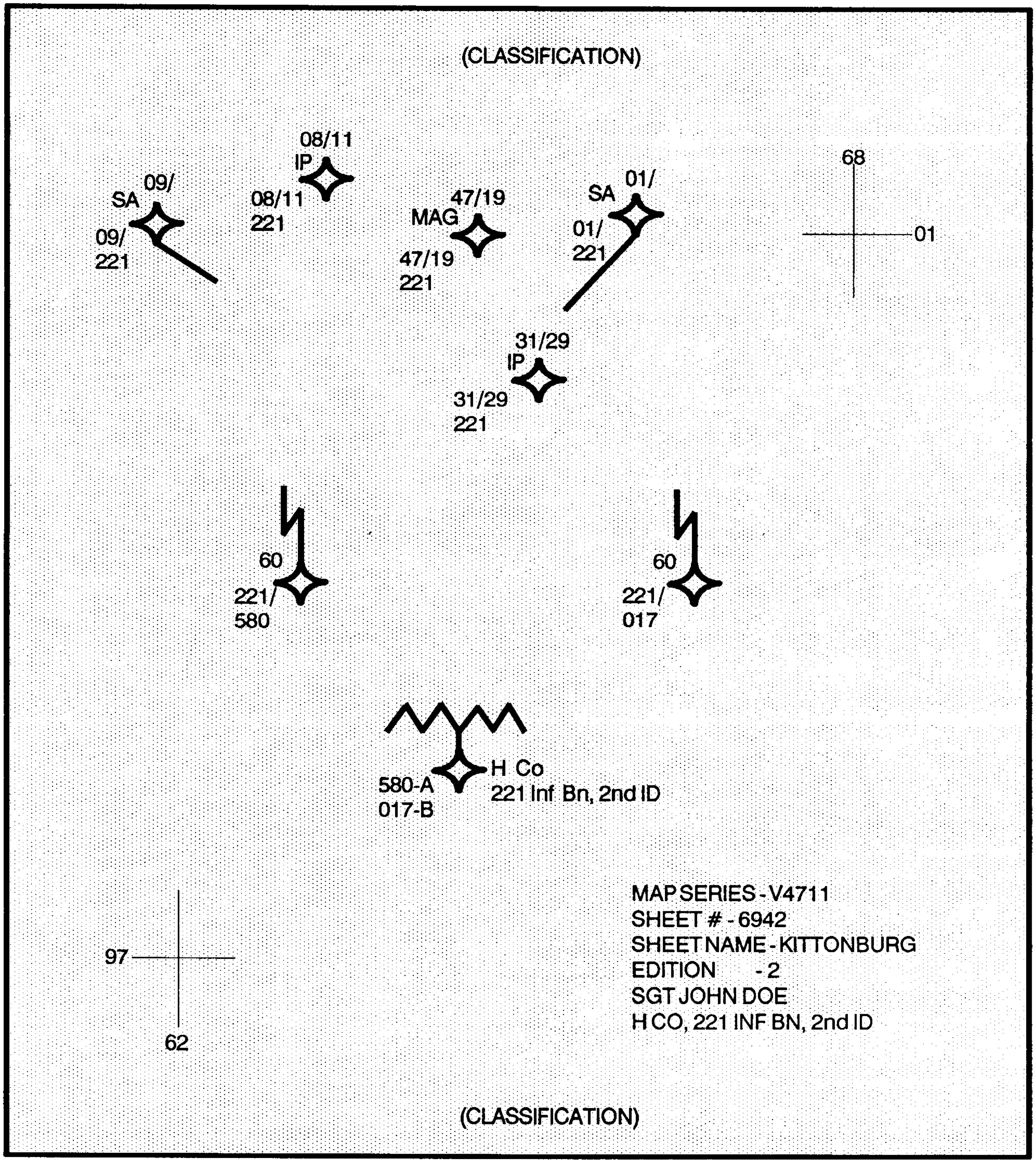


Figure 3-8. Overlay.

SENSOR DATA ANALYSIS

To succeed in battle, commanders must avoid enemy strengths and exploit enemy weaknesses. They must surprise the enemy forces, catching them at a disadvantage as often as possible. REMBASS provides a basis for the situation and target acquisition, which makes this possible. REMBASS reduces battlefield uncertainty and provides the confidence to generate superior combat power where it is needed through sensor data analysis--the interpretation of sensor transmissions. The transmissions are copied on a time-based readout. The information is analyzed to determine ROS, LOC, number of targets, type of targets, and last known location and time. Figures 3-9 and 3-10 are used to report and record the information.

RATE OF SPEED

Rate of speed (ROS) is determined by using the formula: distance (D) divided by time (T) equals ROS (D÷T= ROS). To use this formula, determine the values of D and T. ROS is in meters.

Distance

The measurement (D) is the distance between two count indicator sensors (MAG or IP). When emplacing the sensors, use a pace count (converted to meters) to determine the distance between sensors. Annotate this on the sensor sketch map. Because detection ranges are small, IP and MAGs are known as count indicators.

DIRECTION ______________________

RATE of SPEED ______________________

LENGTH of COLUMN ______________________

TYPE of TARGET ______________________

QUANTITY ______________________

LAST KNOWN LOCATION and TIME ______________________

SENSOR FIELD or STRING MONITORED ______________________

REMARKS ______________________

____

OPERATOR and UNIT ______________________

Figure 3-9. Sensor activation spot report.

STRING FIELD	I.D. CODE	SMS CH	PEN #	SENSOR CH	REPEATER CH	DETECTION RADIUS	TYPE SENS	COORDINATE	IMPLANT DATE	LIFE	REMARKS

Figure 3-10. Sensor operator data record (SODR).

Time

By knowing the printer speed (Low or High), you can determine the time it took a target to travel from one location to another. As messages arrive from a sensor string and displayed on the SMS printout, the T value is measured (using a ruler) from the first activation of one count indicator sensor to the first activation of the next count indicator sensor in the same string. To use the measurement (T) , first convert inches to minutes. The printer at high speed prints at a rate of 30 inches per hour or ½ inch per minute. The printer at low speed prints at a rate of 15 inches per hour or ¼ inch per minute. Table 3-1 shows the high and low printer speed in inches.

Table 3-1. Printer speed.

INCHES		HIGH (minutes)		LOW (minutes)
1	=	2	◄──►	4
1/2	=	1	◄──►	2
1/4	=	.5	◄──►	1
1/8	=	.25	◄──►	.5
1/16	=	.125	◄──►	.25
1/32	=	.0625	◄──►	.125

This is fairly accurate for determining length of time. Refer to the sketch map with the D in meters between the two count indicator sensors. You now have the two components (D and T) for the ROS formula: D÷T = ROS.

LENGTH OF COLUMN

To estimate length of column, another formula is used: LOC = ROS x total time count indicator (TTCI). By knowing the ROS and how long a target takes to pass a certain point you can estimate the length of column. To estimate the TTCI, you must first realize that the count indicators for targets vary depending on what type of target you have.

For personnel, use the IP sensor. For all vehicle targets, use the MAG sensor. These are also known as count indicator sensors since their detection ranges are so short. To measure TTCI, go from the first activation of the appropriate count indicator to the last activation of the same count indicator sensor. Taking this measurement and using the T measurement for ROS, convert inches to time. Then multiply the ROS by TTCI (ROS x TTCI) to get LOC.

NUMBER OF TARGETS

The SMS hard copy (printer paper) assists the operator in determining the number of targets from the number of activations reported by the sensors. However, some nontargetable activity can cause the SA sensors to transmit a message.

Nontargetable activations displayed on the monitor usually are random and have no distinguishable pattern. Battlefield explosions, helicopters, and low-flying aircraft may activate SA sensors. However, because of the aircraft speed, only one or two activations are likely to occur. When an aircraft pattern appears, it will be an almost horizontal straight line. Nontargetable activity usually will not cause MAG or IP sensors to activate. Figure 3-11 is an example of a signature pattern used to determine the number of targets.

TYPE OF TARGETS

The type of target is usually indicated by the target signature displayed on the SMS printer. From the appropriate SA sensor, target classification must be analyzed by the operator. In the SA sensor activation pattern, there will be from two to ten activations. In most cases, the SA sensor classification such as “T” (track vehicle) will be a clear majority. In other cases, all detections “-” (dashes) and “V” (vehicles) are excluded in the process. The general rule is that any majority classification is to be the type of target, as shown in Figure 3-12, however you must always react to the highest threat classification.

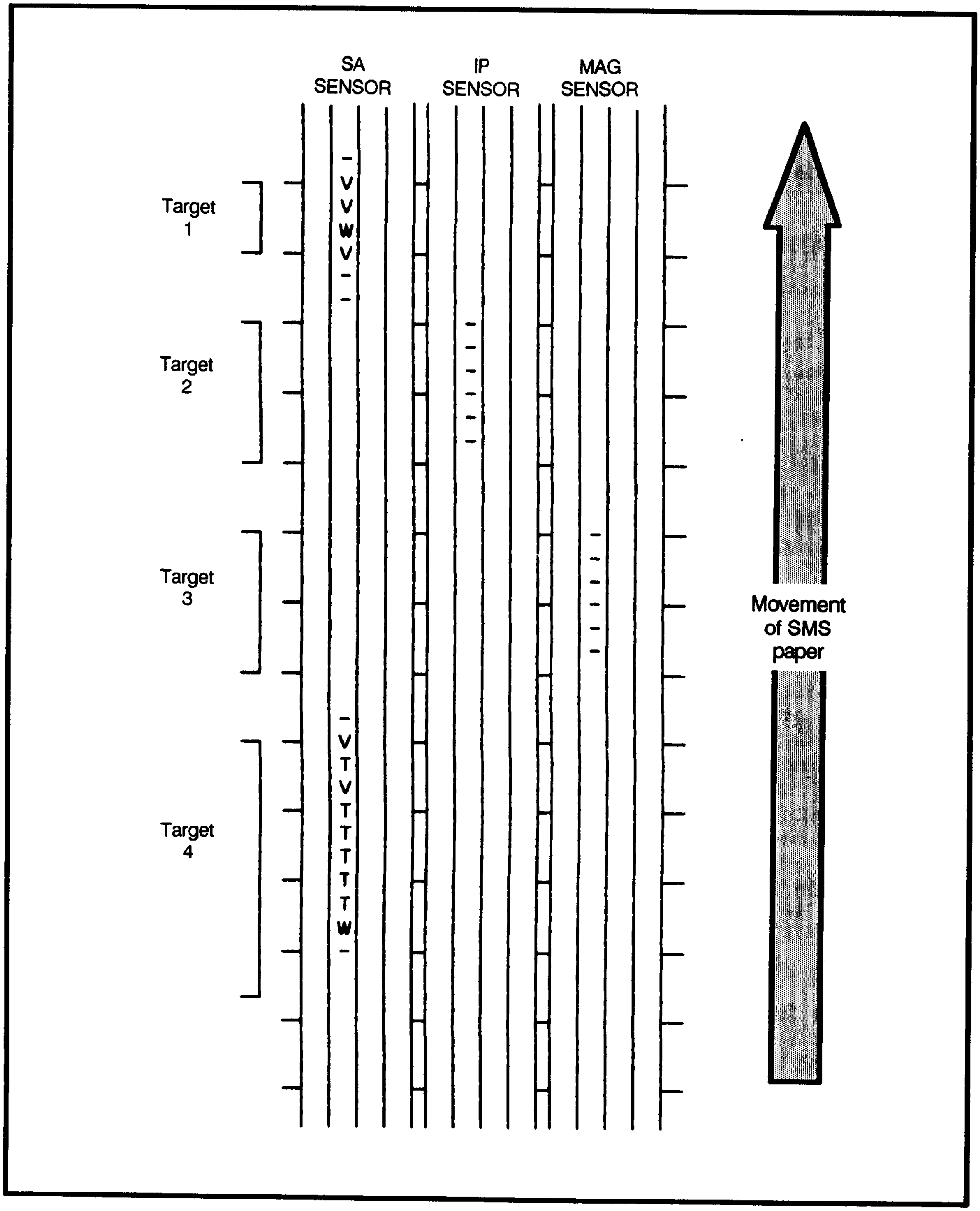


Figure 3-11. Tactical signature pattern.

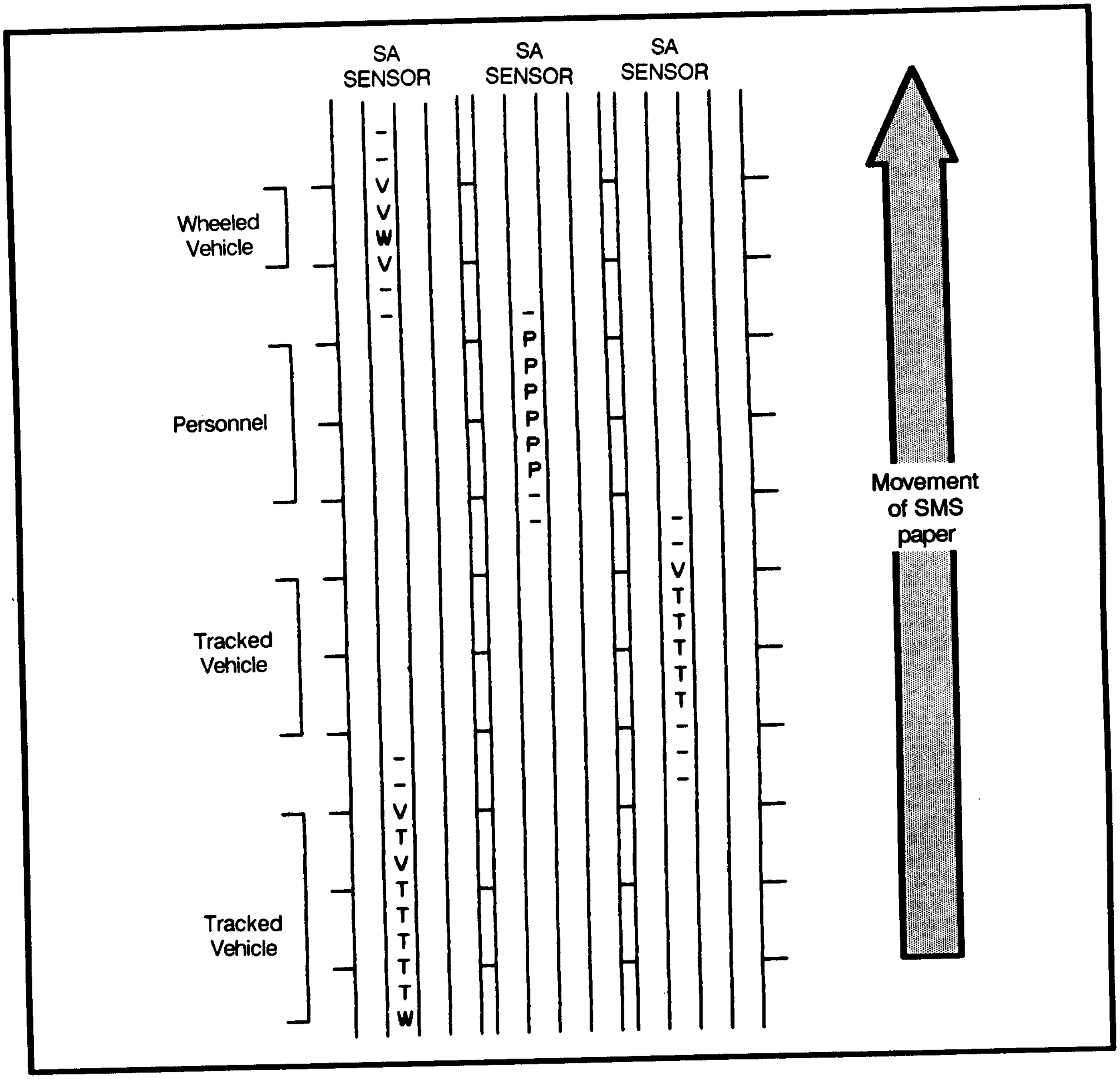


Figure 3-12. Types of targets.

LAST KNOWN LOCATION AND TIME

To determine the last known location, the operator must refer to the sketch map and identify the I.D. code(s) from the last sensor activated. By referring to the sketch map, you will be able to determine the eight digit grid coordinate of the sensor which sent the last activation, thus, determining the known location of the target. Time is the actual time (alpha or zulu, by unit standing operating procedure (SOP)) of the last sensor activation.

CHAPTER 4

MISSION PLANNING

As with any other missions in the Army, successful REMBASS operations come from careful planning and execution.

MISSION

The REMBASS mission is to provide commanders of battalions, regiments, brigades, and divisions with information from the rear area to beyond the forward line of own troops (FLOT) and to support the rear area. This can be LOC, ROS (meters per minute), approximate number of targets, last known location, time of last activation, type of target, and direction of travel.

OFFENSIVE OPERATIONS

REMBASS may be effectively used when emplaced deep in the enemy's rear area to provide indications of movement, reinforcement, withdrawal, or enemy intentions. Offensive operations, including exploitation and pursuit, will present only limited opportunities for planning and operational employment of REMBASS. By the time sensors are emplaced and data starts entering the intelligence system, the level of activity in the battle area may saturate the sensors beyond value. If the attack is successful and the enemy is forced to withdraw, friendly forces may overtake and negate locally emplaced sensors.

DEFENSIVE OPERATIONS

REMBASS may be effectively used in defensive operations as an early warning system to provide information of enemy movement and locations. The amount of activity detected by each sensor string or field may provide indications of main or supporting attacks.

REMBASS operations usually employ sensor strings and grids to detect enemy penetration or occupation of an area. This type of employment will not normally provide sufficient data for targeting purposes without the use of complementary sensor strings. The sensor string is normally used to identify enemy movement along expected avenues of approach (AAs). The sensor grid consists of two or more sensor strings emplaced in rows to monitor the entire area of concern. The grid is usually used for area surveillance to detect penetration or occupation of an area by the enemy when his suspected AA is not known.

When placed on lightly defended flanks, REMBASS provides early warning of enemy attempts to conduct envelopments. Sensors used in this role permit economy of force by reducing the number of personnel needed to protect a unit's flank during any type of operation.

REAR OPERATIONS

REMBASS can support rear operations within the divisional zone. The threat to the rear area is a key consideration when planning or conducting tactical operations. Targets in the rear include logistical; administrative, command and control, and communication centers; and lines of communications. Attacks on these targets interrupt the projection of support into forward areas. If combat operations are to be sustained, security of the rear area is critical. Both division and corps rear areas are highly vulnerable to intelligence collection and combat operations conducted by conventional and unconventional enemy forces. Counterintelligence operations conducted in these areas provide the intelligence needed to plan rear operations to preserve freedom of action. REMBASS can assist in rear operations by minimizing forces required to accomplish the mission.

RETROGRADE OR DELAY

During retrograde or delay missions, REMBASS may provide an element of security to units conducting the delaying action. REMBASS can be emplaced and left in a stay-behind role to provide warnings of when and where enemy forces are moving. Units conducting retrograde may be able to use REMBASS for flank and rear security. Once the forward echelon of the attacking enemy force has progressed beyond the stay-behind sensors, the sensors prove valuable by providing indications of resupply or reinforcement activities of enemy rear-echelon units. Plan carefully during retrograde or delay to locate and implant repeaters. They require camouflage and remote emplacement to avoid detection by enemy forces.

TARGET ACQUISITION

REMBASS provides units with target acquisition data. Combat information and targeting data collected by maneuver units are normally used by the collecting units to engage the enemy. REMBASS can provide artillery fire support teams (FIST) operating with maneuver units, sources of targeting, and other combat data.

CONSIDERATIONS

Minimum REMBASS planning considerations are mission requirements, the tactical situation, asset capaabilities, electronic countermeasures, radio frequency interference, terrain, weather, airborne platforms, and enemy tactics.

MISSION REQUIREMENT

The unit's requirement for REMBASS assets must be analyzed to ensure sufficient time for the implant team to complete necessary tests, assembly, and implantation of sensors and repeaters. The supported unit must ensure that REMBASS personnel understand what the mission is, and what is required by the commander's priority intelligence requirements and information requirements.

TACTICAL SITUATION

Operations in the employment area must be considered prior to actual employment. Offensive, defensive, and retrograde operations may affect planning and employment. Coordination with adjacent units in the area may be needed.

ASSET CAPABILITIES

The planner and the supported unit must understand the capabilities of all REMBASS assets, including personnel. Some important questions must be answered on the status of available assets. What type of sensors are to be used? Are the sensors available for the operation? How many sensors will be needed? Where are these sensors located? Are they readily available or must they be obtained from another area?

Operations in the employment area must be considered prior to actual employment. Coordination with units in the area for support and their concept of your mission. Planning with knowledge of existing assets allows maximum use of additional assets.

REMBASS employment must be flexible and maintain the ability to change as the situation dictates. If the team experiences unforeseen difficulties, it has the option to change the plans as long as the mission is performed.

ELECTRONIC COUNTERMEASURES AND RADIO FREQUENCY INTERFERENCE

REMBASS systems are susceptible to enemy radio electronic combat. Sensor relays, monitoring devices, and sensors are subject to jamming by high-powered RF signals. Jamming may electronically mask the reception and identification of information transmitted by the sensors and cover the movement of enemy forces through areas monitored by REMBASS. The effects of jamming may be decreased by using terrain to mask the receiving antenna from suspected or known jamming locations. However, radio LOS must be maintained among the monitor, repeater, and sensors.

TERRAIN

The terrain on which battles are fought presents opportunities on both sides. Most battles have been won by the side that used terrain to protect itself and to reinforce fires to destroy the enemy. All echelons must understand the nature, uses, and reinforcement of terrain to be effective with REMBASS. Because every sensor is affected in some way by terrain, these features must be carefully considered in sensor employment planning.

Terrain analysis will identify choke points, which are the primary emplacement sites. Choke points are natural or man-made terrain features that restrict or channel movement. Examine terrain information in the initial planning stages and plan sensor locations, method of implanting, relay and antenna locations, monitoring site locations, and target acquisition capabilities. Terrain has more impact on the battle (especially during inclement weather) than any other physical factor, including weapons, equipment, or supplies.

In planning of REMBASS employment, the terrain analysis matrix (TAM), shown in Figure 4-1, provides a guide for the terrain overlays needed in terrain analysis. To use

FUNCTIONS	SURFACE CONFIGURATION	SURFACE MATERIALS	VEGETATION	WEATHER AFFECTS ON TERRAIN	TRANSPORTATION	OBSTACLE (LINEAR)	BUILT-UP AREAS	DRAINAGE
OBSERVATION and FIELD of FIRE	X		X	X	X		X	
CONCEALMENT	X		X		X		X	
ASSEMBLY AREAS	X	X	X		X		X	
KEY TERRAIN	X			X	X		X	
GROUND AA	X	X	X	X	X	X	X	X
AIR AVENUE of APPROACH	X		X	X	X	X	X	
WEAPON SITES	X	X	X	X	X	X	X	X
DZ and LZ	X	X	X	X	X	X	X	X
MANEUVER	X	X	X	X	X	X	X	X
LINES OF COMMUNICATION and MSRs				X	X	X	X	
BARRIERS and FORTIFICATIONS	X	X	X	X	X	X	X	X
LINE of SIGHT	X		X	X	X	X	X	
COMMUNICATION SITES	X	X	X	X	X	X	X	
EARLY WARNING SITES	X	X	X	X	X	X		

Figure 4-1. Terrain analysis matrix (TAM).

the TAM, first find what function you are planning. Go to the appropriate columns marked to the right with an "X"; all appropriate marked columns would be considered when planning that function.

Soil Type and Composition

You cannot bury a sensor in rock. Sand and swamps affect detection ranges on SA sensors. Damp sand (soil) has a greater detection range than dry soil for the SA sensor, and loam type soil is the best. Experience during Operation Desert Storm indicates an increased radius of detection for sensors emplaced in sand or sandy soil with a silica base, while sensors emplaced in loose rocky soil degrade sensor detection radius. Therefore, it is critical to check the detection radius of each sensor in the type soil of its intended employment and annotate the results on the SODR. Soil composition has little or no affect on the NAG or IP sensor detection ranges.

Vegetation

Size, type, and density of vegetation affect the transmission of signals and may dictate using extension cables for the antenna to achieve the necessary radio LOS. Dense foliage weakens radio transmissions. Vegetation affects the detection capability of the IP sensor and can cause false activations.

Topography

Topography may affect radio transmission LOS. Mountainous terrain may degrade target acquisition and early warning capabilities. Such degradation places increased importance on careful REMBASS emplacement.

Road and Trail Networks

Where is enemy movement most likely to occur? Routes into and out of the implant area must be planned carefully by the team leader and S2. Escape routes must also be planned.

Waterway Networks and Associated Tide Levels

You must determine if tide levels will cover the implanted sensors. Detailed planning is important at possible tidal areas to ensure sensors will not be covered by water.

Ambient, SA Noise Levels

Do not plant a sensor next to a railroad track. Ground vibrations from a moving train could activate the anti-tampering devices, making the sensors useless. Do not emplace sensors close to large waterfalls because the seismic vibrations could give false activations. When implanting the IP, ensure the background cannot fluctuate in temperature; this could also give false activations.

Indigenous Population Density

REMBASS cannot be used if there is a large amount of local traffic. Some other method must be used to determine if movement is enemy or local.

Terrain Profile

One of the most important factors that enters into a REMBASS mission will be radio LOS. Personnel at the monitor site must be able to receive transmissions from the sensor emplacement area.

Prepare **a** terrain profile to determine if the operator has Los. A terrain profile determines the approximate locations for the repeaters, if needed, to maintain radio Los. For more information refer to FM 21-26.

Radio Line of Sight

Whenever possible, either the monitoring site or the sensor site should be above the other as shown in Figure 4-2.

This does not mean that the sensor itself must be physically seen, but there must be no large land masses between the two sites as shown in Figure 4-3.

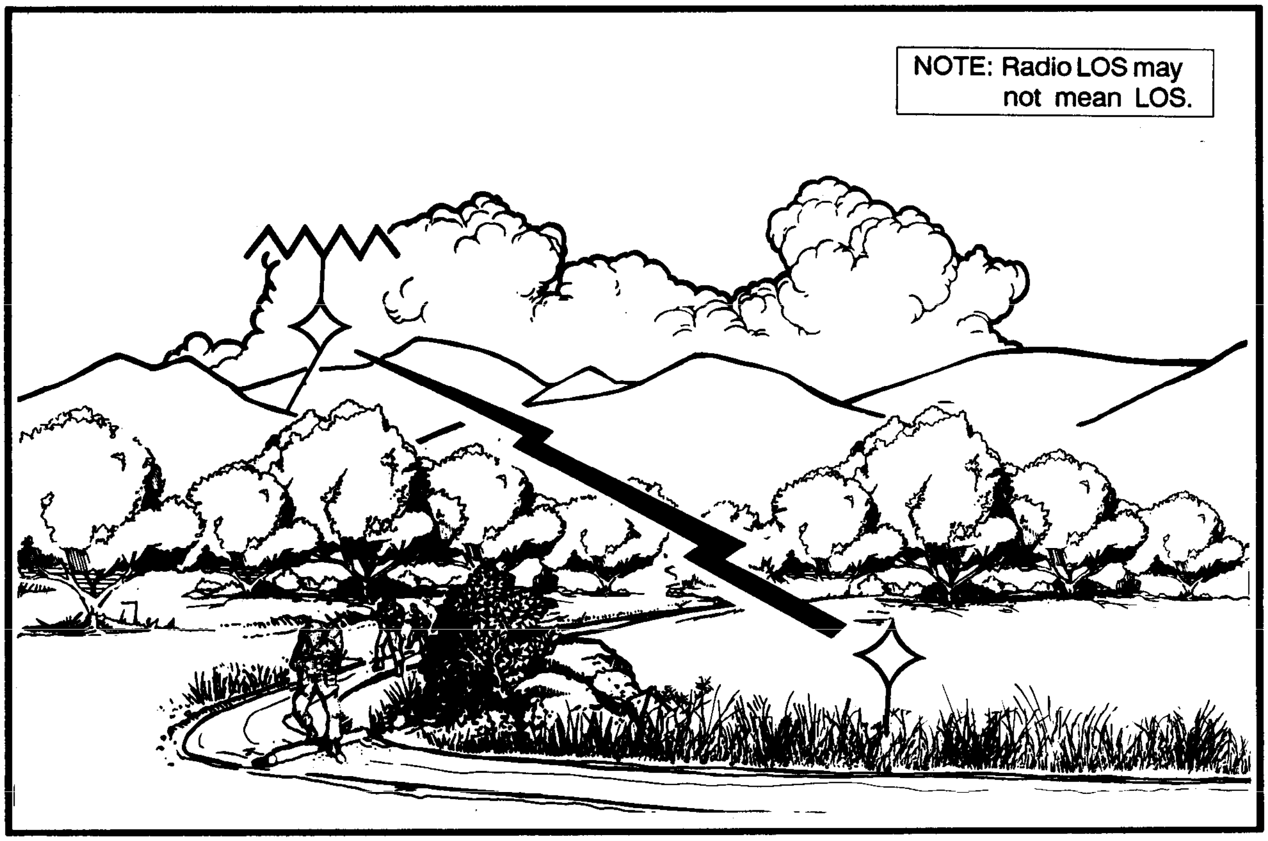


Figure 4-2. Radio line of sight (monitor above sensor).

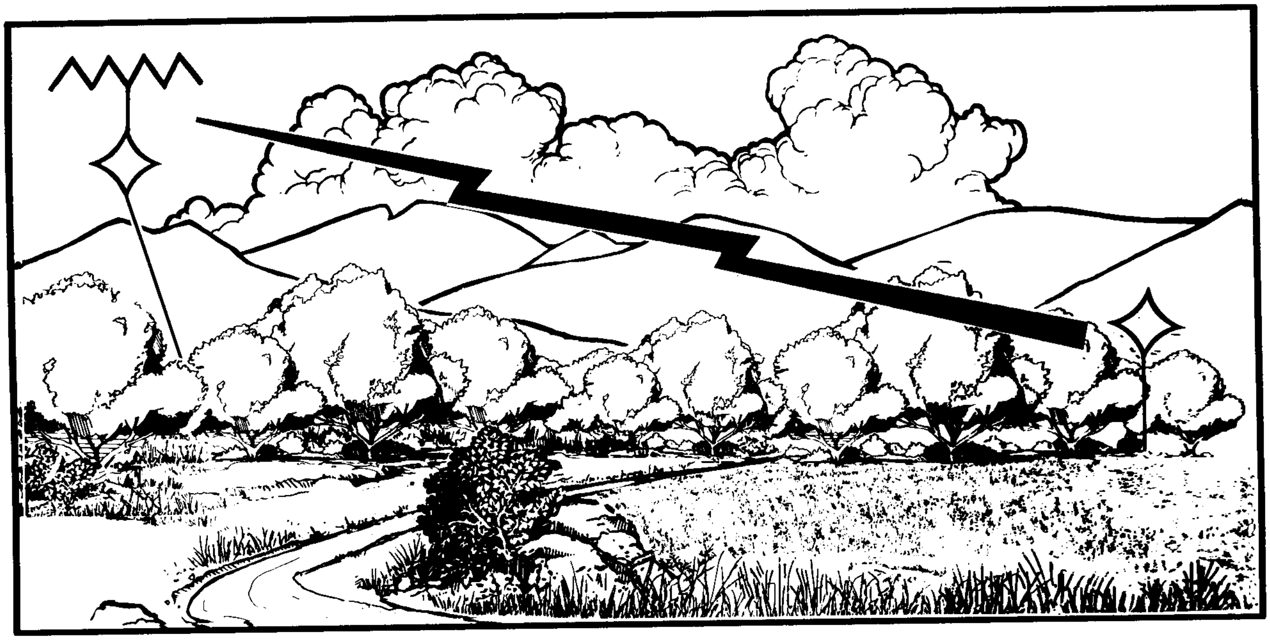


Figure 4-3. Radio line of sight (no land mass).

Trees and other foliage decrease the sensors signal strength, decreasing reception ranges between monitors and sensors. Examples of these are shown in Figure 4-4.

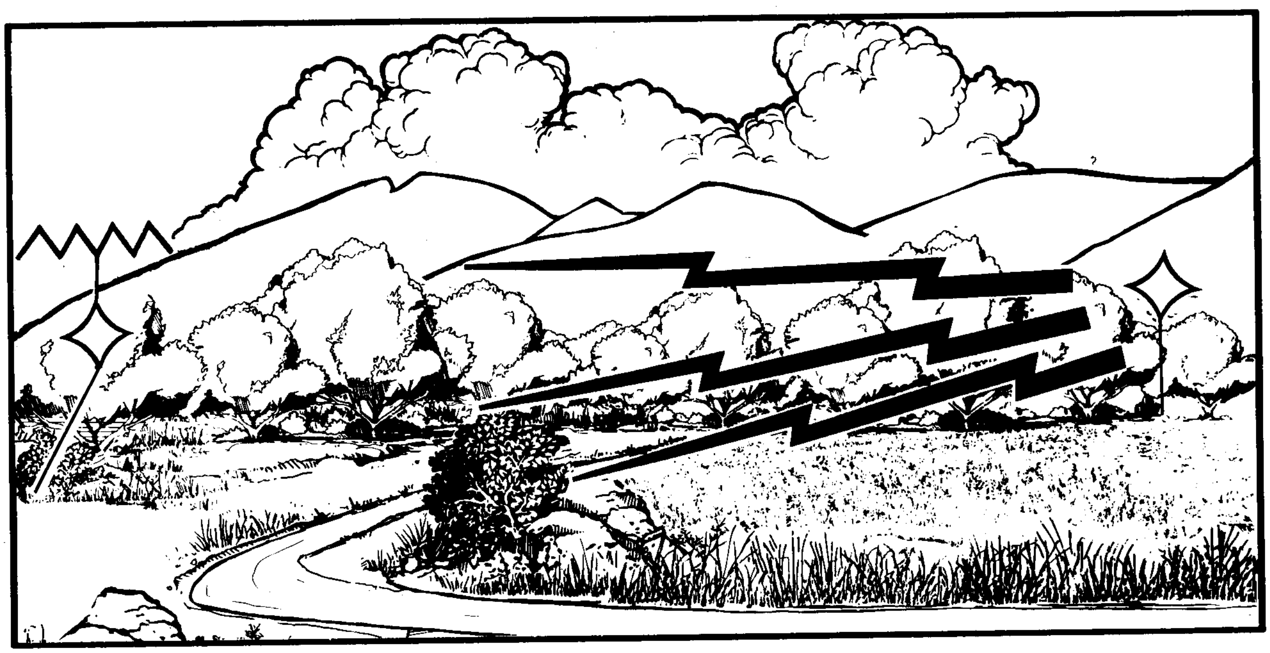


Figure 4-4. Signals in vegetation.

The less foliage that the signal has to travel through to reach the monitoring site, the better the chances are of receiving that signal. Figure 4-5 shows this.

WEATHER

Weather greatly impacts on planning REMBASS operations. The initial planning and employment of any surveillance system can be affected by the prevailing weather conditions and climate. While the impact of weather on sensors may vary from one type of sensor to another, the following factors are important in planning for the employment of REMBASS.

Sand and Dust

During heavy sand and dust conditions, keep covers secured. Drifting sand can bury the antennas of the sensors, making them useless. Wind-blown sand can permanently etch the REMBASS equipment TVDs and IP transducers, making it necessary to replace them. Winds can also adversely affect the antenna masts.

Precipitation

The equipment is designed to withstand high humidity and operate in rainstorms. However, it should be provided as much protection as possible. Type, quantity, duration, and frequency of precipitation have an effect on soil compaction. If it rains heavily for a long time, the sensors may dislodge or soil may loosen and shift, resulting in loss of sensor activations. Torrential rains may also adversely affect the implantation of sensors.

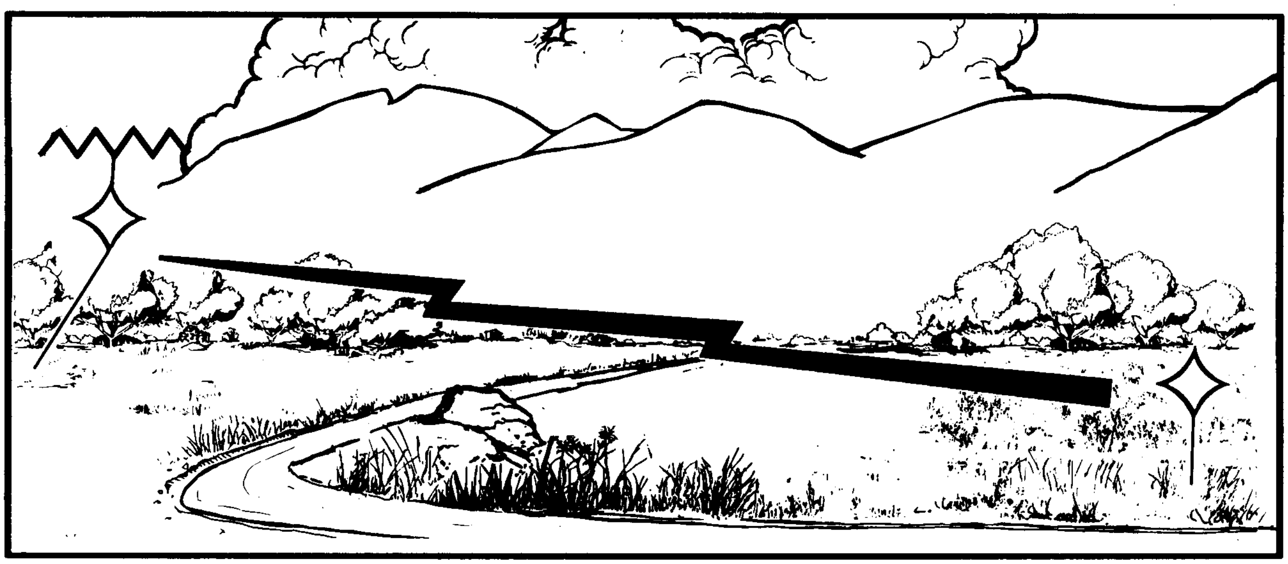


Figure 4-5. Sensors with sparse foilage.

Temperature and Humidity

In Northern climates, REMBASS will be greatly affected by extreme temperatures. The stresses caused by sudden extreme changes may impose severe structural strains on the equipment and may damage or shorten its useful life. In warm, humid climates growth of fungi can occur in the equipment. High temperatures may damage electronic components or make metal components hot enough to cause burns. If the temperature falls to the lower operating limit, the TVDs may slow down. As the temperature goes down, battery life decreases. Table 4-1 shows temperatures for REMBASS equipment.

Table 4-1. REMBASS operating temperatures.

EQUIPMENT	TEMPERATURE RANGE	
PMS	—37° to 51°C	—35° to 125°F
SMS	—32° to 49°C	—25° to 125°F
RADIO REPEATER	—46° to 49°C	—50° to 120°F
CODE PROGRAMMER	—37° to 49°C	—35° to 120°F
SENSORS	—46° to 49°C	—50° to 120°F
POWER SUPPLY	—46° to 49°C	—50° to 120°F
ANTENNA	—46° to 51°C	—50° to 125°F

Snow and Ice

Snow and ice change the path of seismic signals of the SA, since it changes the conductive characteristics of the ground. Snow and ice may also muffle acoustic noises. Accumulations of falling snow can affect the IP by blocking the infrared view. Icing conditions may load the antennas, causing missed transmissions.

Cloud Cover

Altitude, air density, and humidity (including fog) have a definite effect on the transmission ranges of sensors and repeaters. Clouds and fog can, because of their moisture content, absorb RF energy. Cloud cover and humidity can also affect the IP transducer by decreasing the detection range. Heavy fog can cause condensation on the optics of the IP transducer making it useless.

Weather Factors

To use the weather factor analysis matrix (WFAM), shown in Figure 4-6, first find what intelligence use you are planning. Go to the appropriate columns marked with an "X". All appropriate columns would be considered in the planning of that intelligence use.

AIRBORNE PLATFORM

Sensors are normally monitored at distances of 5 to 15 kilometers. Greater distances could be achieved if not for terrain restrictions. With direct LOS, ground-to-ground monitoring can go up to and above 15 kilometers, depending upon the receiving capabilities of the monitoring site. To extend the transmission range of the sensor on the battlefield an airborne platform or repeater system is used as shown in Figure 4-7.

INTELLIGENCE	TEMPERATURE	HUMIDITY	INTERVISIBILITY	SURFACE WINDS	PRECIPITATION	SNOW and ICE COVER	WINDS ALOFT	CLOUD DATA	LIGHT DATA	SEVERE WEATHER	FOG
OBSERVATION and FIELD of FIRE			X	X	X	X		X	X	X	X
ARTY EMPLACED	X	X		X	X	X	X			X	
CONCEALMENT			X	X	X	X		X	X	X	
CAMOUFLAGE	X	X	X	X	X	X		X		X	X
GROUND AA		X	X		X	X				X	X
AIR AA	X	X	X	X	X	X	X	X	X	X	X
CROSS-COUNTRY	X		X	X	X	X			X	X	
FORDING SITES	X		X	X	X	X			X	X	X
AIR DZs	X		X	X	X	X	X	X	X	X	X
AIR LZs	X	X	X	X	X	X	X	X	X	X	X
LINES of COMMUNICATION and MSRs	X		X		X	X		X	X		
NBC OPs	X	X			X	X	X	X		X	X
LINES of COMMUNICATION					X	X				X	
REMBASS EMPL	X			X	X	X				X	
INFILTRATION			X		X	X			X		X

Figure 4-6. Weather factor analysis matrix.

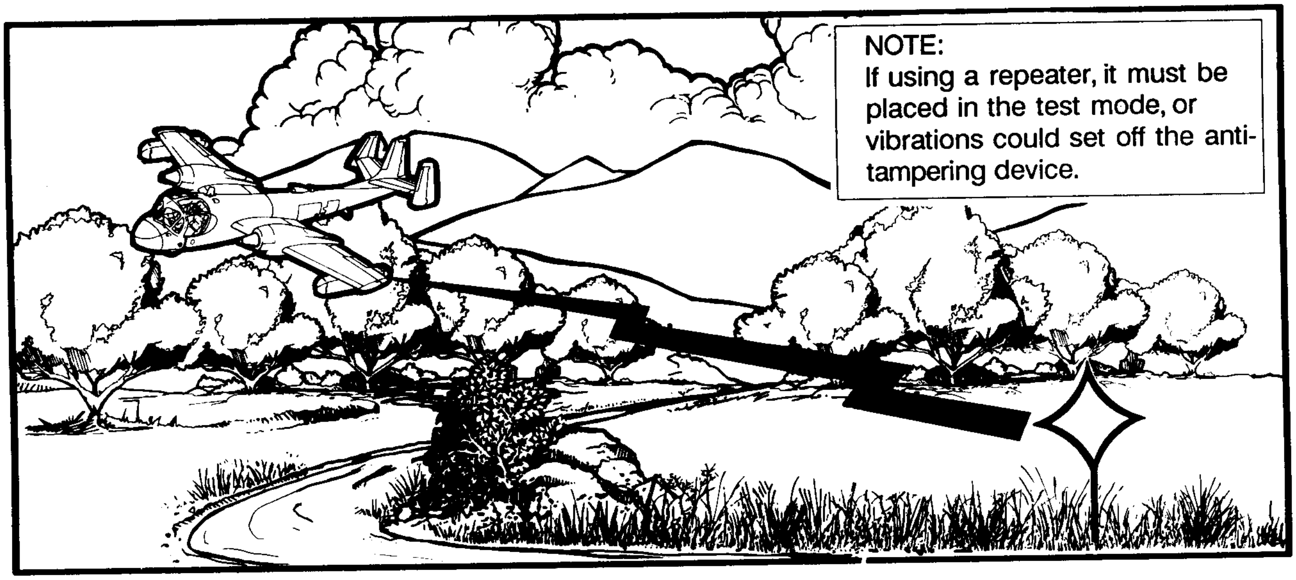


Figure 4-7. Aircraft with monitor or repeater.

ENEMY TACTICS

Enemy tactics are important to understand, especially when it comes to sensor data analysis.

The commander must understand enemy organization, equipment, and tactics (how the enemy fights). During planning consider factors such as:

- Dispositions.
- Capabilities.
- Limitations.
- Unit patterns.
- Operational techniques.
- Morale.
- Personalities.
- Intentions.
- Probable reactions.

During sensor data analysis the operator must apply a thorough knowledge of enemy patterns of activity. Understanding these patterns of activity is vital to the person doing sensor data analysis and may prevent inappropriate actions. For instance, increased activity of indigenous personnel occur during planting, harvesting, or a national holiday.

UNIT COORDINATION

Planned reconnaissance and surveillance (R&S) activities must support the requirements of the tactical operation and not conflict with other essential activities. To achieve these goals, the R&S staff officer coordinates every aspect of the plan with other staff sections and headquarters. The amount of coordination and with whom he coordinates depends on the nature of planned actions. He evaluates the plan and carries out the necessary coordination.

At the lower echelons (brigade and battalion), the S2 performs R&S functions as part of his intelligence duties. At corps and division the G2 has responsibility for intelligence; however, R&S functions are carried out, under G2 supervision, by the TSO and the CM&D section. The TSO supports and is supported by the CM&D section and the all-source analysis and production section. Their efforts are part of the integrated intelligence process supporting the commander. The S2 at brigade and battalion level ensures the requirements shown in Table 4-2 are coordinated for the supporting GSS assets.

The S2 briefs the GSS teams (as applicable) on the:

- Friendly and enemy situation.
- Mission.
- Maps, photos, and overlays.
- Expected targets (by type).
- Required reports.
- Reporting procedures.
- Communications.
- Security.
- Food service.
- Maintenance support.
- Sensor implant sites.
- Monitor sites.
- Mission security.
- Surveillance sectors.
- Operation periods and schedule.

Table 4-2. Coordination.

Coordinate with:	Coordinate for:
S1	Personnel data and normal administrative support.
S3	Team integration with battalion scheme of maneuver. Integration of GSS with patrol operations. Support required by each team. GSS implant team security. Fire support.
S4	Supply and direct exchange for organizational equipment. Food service support in battalion command post area. Organizational maintenance for all GSS TOE equipment.
C - E Officer	Signal operating instructions extracts. Frequency management. Wire communications. Electronic counter-countermeasures. Communications maintenance.
Unit Commander	Integration into unit's operations. Food service support. Security. Communications.
Adjacent Battalions	Surveillance between units. Exchange of information derived from GSS. Safety of GSS implant teams operating near unit boundaries.

CHAPTER 5

EMPLOYMENT

REMBASS provides timely surveillance and tactical data which is used to produce intelligence and combat information for immediate response and targeting data. It is significantly less affected by weather than human observers and other intelligence collection assets. REMBASS operates without regard to limited visibility or fatigue.

REMBASS sensors are expendable so they can be employed in high-risk environments, where they need not be recovered. They can also be employed in areas that may be attacked by supporting arms with a good chance that the sensors will not be damaged. However, because REMBASS sensors use battery power, their effectiveness is limited by battery duration. Since REMBASS sensors transmit via a radio link they are subject to electronic jamming and electronic interference. REMBASS sensors are also susceptible to terrain masking of radio LOS transmissions. Effective employment requires detailed planning for placing repeaters and establishing monitoring sites.

EMPLACEMENT

REMBASS must be hand-emplaced in the target area. The emplacement team is on the ground and is able to modify the emplacement plan as the situation demands. The team can also give eight-digit grid coordinates for sensor locations and properly place equipment at the implant site. Hand-emplacement depends upon the tactical situation, terrain, and assets available. During emplacement operators should wear gloves to reduce the chance that animals will detect their scent and dig up the equipment in search of food .

ROLES

REMBASS sensors may be employed in basic roles which are not bound by offensive or defensive considerations nor specific operational environments.

EARLY WARNING

Battalions fight what they can see and can engage. Battalion commanders need information on the enemy in their AO within minutes of detection. Defending battalion commanders require information about enemy armor, armored personnel carriers, infantry fighting vehicles, and troop concentrations, how many of each, and their direction of movement. Attacking battalion commanders need to know strengths and locations of enemy defensive positions, extent of obstacles and mines, and the direction of enemy movement in their AO. The primary means used to obtain information in the AO are battalion assets--organic elements, attached GSS teams, and artillery FIST. When REMBASS is employed correctly, it can provide the commander with some of the above information.

TARGET ACQUISITION AND SURVEILLANCE

Most REMBASS information is used to develop intelligence. REMBASS information can also be used immediately for fire and maneuver. Targeting data must be timely and accurate to support effective attack. When used immediately for fire it is called target acquisition. Target acquisition, based on data analysis, is the process of providing direct combat information, targeting data, and correlated targeting information to commanders and fire support means. REMBASS provides the commander with timely, accurate locations and activities of the enemy. Combat information and targeting data are exchanged constantly between operations and intelligence staffs and the field artillery TOC. This exchange takes place through the fire support elements at each tactical echelon.

The employment of REMBASS in the above roles does not restrict its use at any given echelon. Employment of REMBASS at the maneuver battalion provides the ability to react promptly to REMBASS activations. Targets are acquired and immediately attacked. If an enemy moves to the right or left, it is noted and higher and adjacent units are notified. Also, the requirement for real-time information is greater at this level and below. At the maneuver battalion the interaction of REMBASS data with other information can result in meaningful, timely intelligence. This, in turn, can swiftly be converted to target acquisition data and passed to the artillery support element for a timely response.

Terrain plays an important part in sensor employment. The detection ranges of two sensors, exactly alike except for location of emplacement, varies so much that if the same target passes by both it can appear as two completely different targets due to the differences in terrain. Elements such as soil composition, plants, water, and land mass affect the detection range of the SA, which has self-adjusting sensitivity circuits. For this reason the operator should have a good knowledge of the terrain in and around the sensors. Modifications can then be made to ensure proper identification of activations. When possible, the personnel responsible for monitoring a given number of sensors should also be the same personnel who employ those sensors.

EMPLOYMENT

Figures 5-1 through 5-13 are some of the standardized roles for sensor employment. These are only suggestions, and the operator must remember that the versatility of REMBASS depends on the situation.

The grid is normally used to detect penetration or occupation of an area by the enemy force when his AA is not known.

Choke points channel, restrict, stop, slow down, or divert movement. Choke points may be an advantage or disadvantage, whether man-made or natural, depending upon the direction of the attack.

Obstacles are natural or man-made terrain features. Obstacles can be found by conducting a thorough map reconnaissance and study of recent aerial photographs.

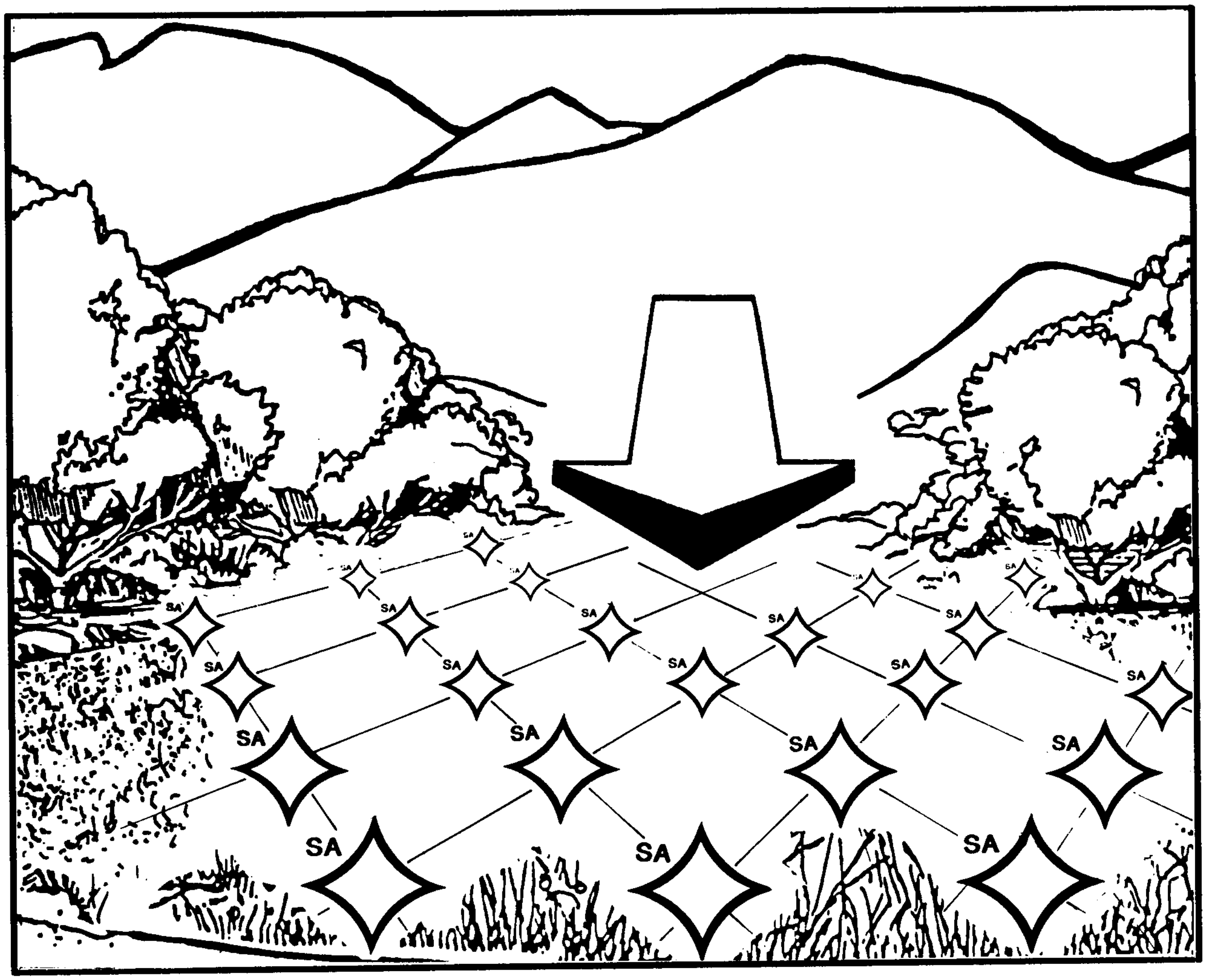


Figure 5-1. Grid.

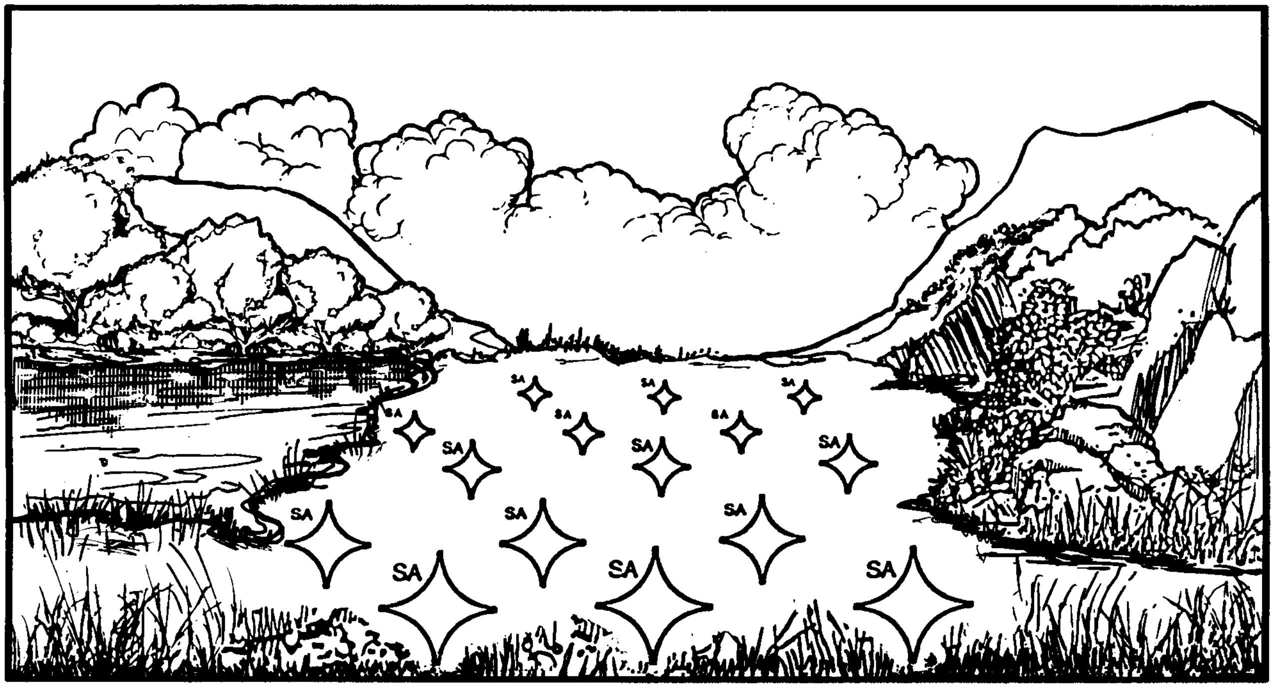


Figure 5-2. Choke points.

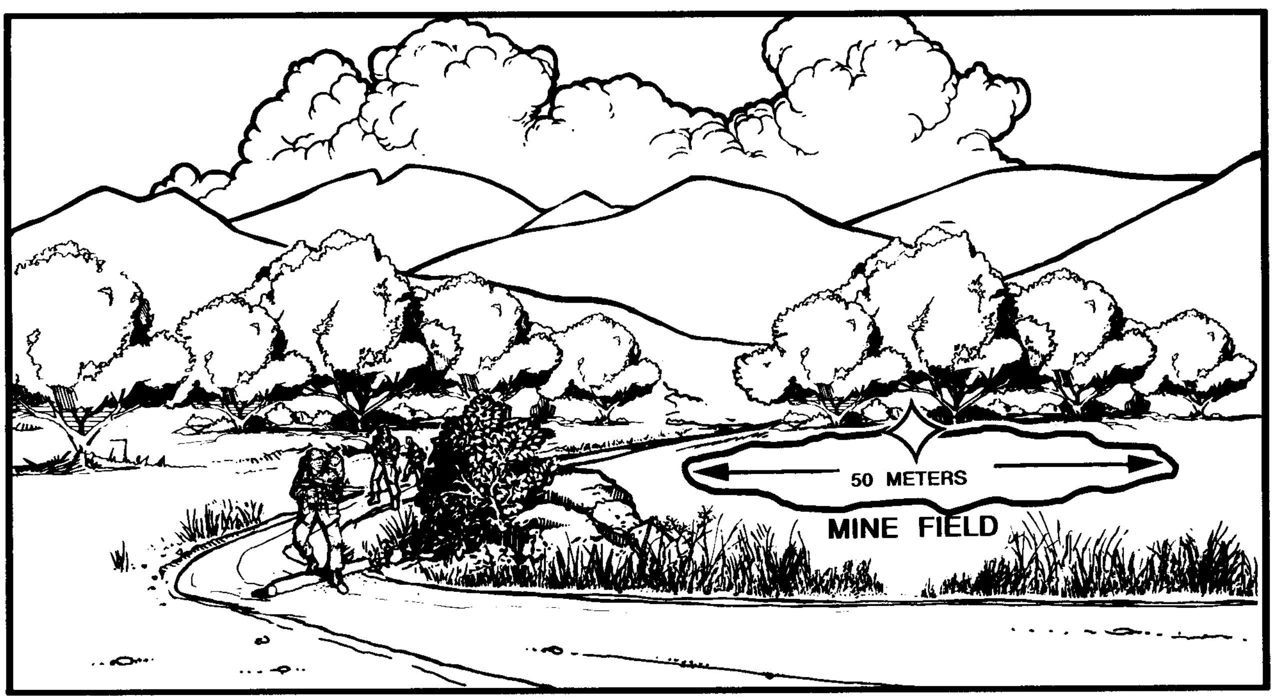


Figure 5-3. Obstacles.

Sensors may be placed in a string of three or more sensors. This provides reliable feedback, even if one sensor in the string becomes inoperative.

The first sensor alerts the operator that an activation has occurred and that further movement may take place in this target area. This sensor is normally an SA for early warning.

The second sensor confirms the movement and the direction of travel. It also gives an approximate count of the targets in the column. This sensor normally is the count indicator of the expected target type: MAG for vehicles and IP for personnel.

The third sensor is also a count indicator and it is used to provide ROS and LOC. It can also help establish the number of targets.

The fourth sensor, used as a target acquisition sensor, must be a count indicator-type sensor due to its small detection area. Artillery may be called on its exact location when the center of the enemy column passes the sensor. It also acts as a backup sensor.

Whenever possible, sensors should be spaced beside a trail at least 150 to 250 meters apart to detect personnel. Since the average detection ranges of the sensors are smaller for personnel, this technique ensures that one small target does not activate two sensors at the same time. It also gives the operator and response unit time to react and set up for a possible fire mission or to alert ground troops. Table 5-1 shows the distances required in ideal situations, but the operator must remember that terrain and the enemy order of battle will affect the emplacement distances of sensors on the battlefield.

Table 5-1. Required distance.

Miles per hour	Meters
10—15	400 or more
15—20	600 or more
25—30	800 or more
30 or more	1,000 or more

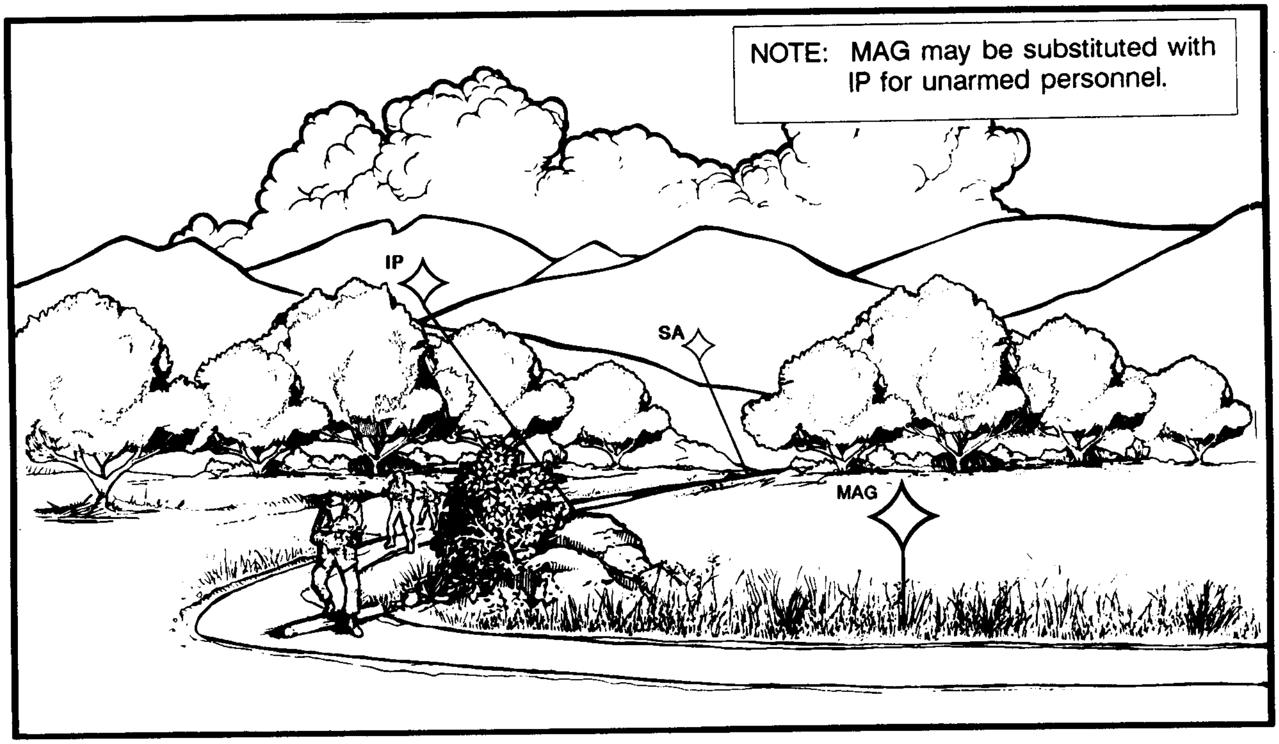


Figure 5-4. String (personnel).

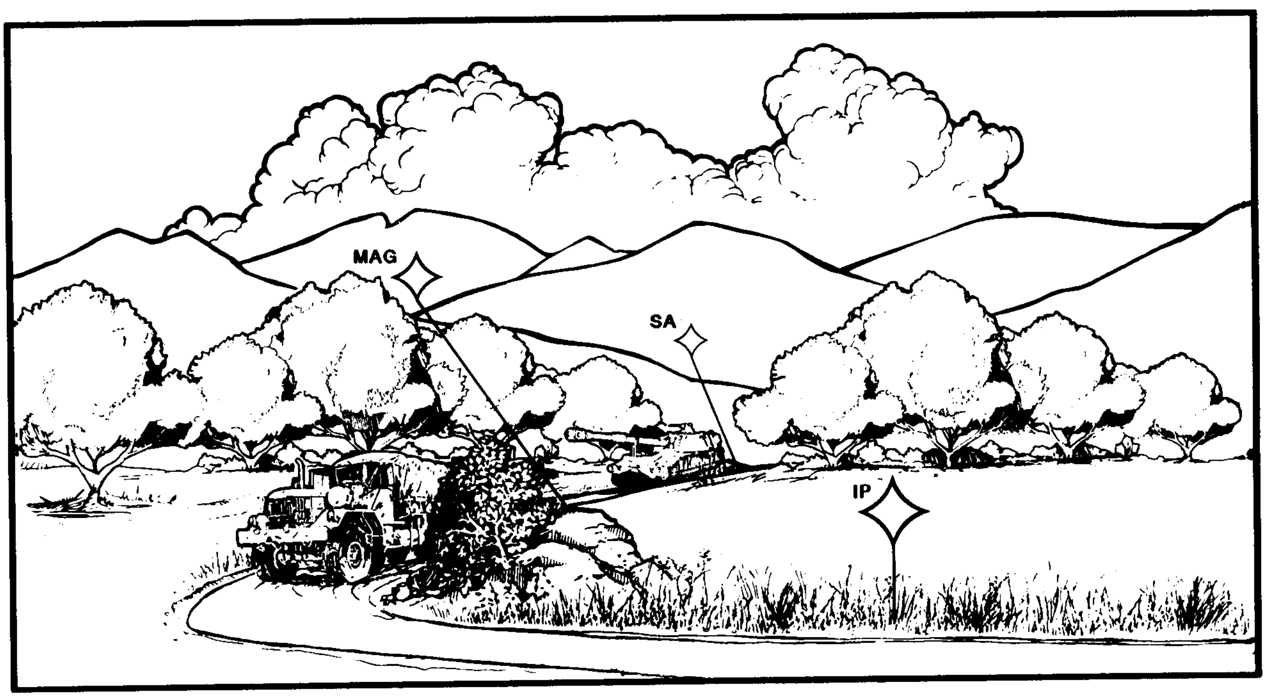


Figure 5-5. String (vehicle)

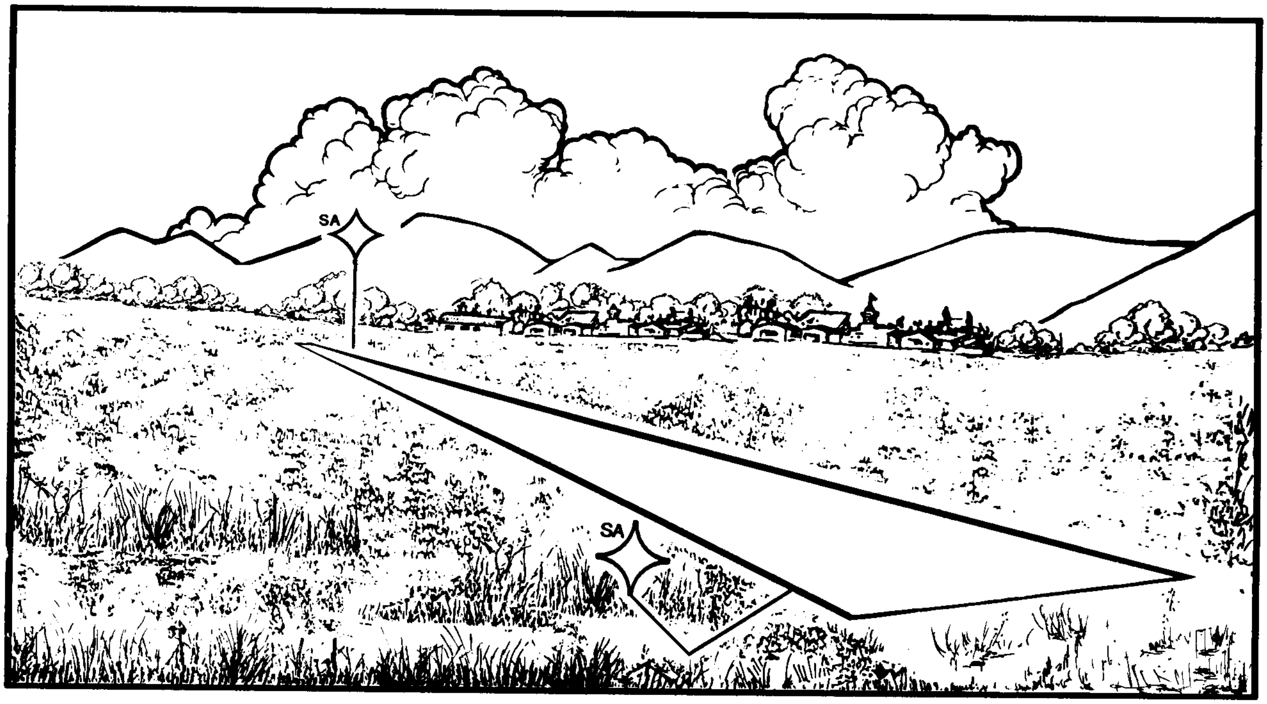


Figure 5-6. Airstrip.

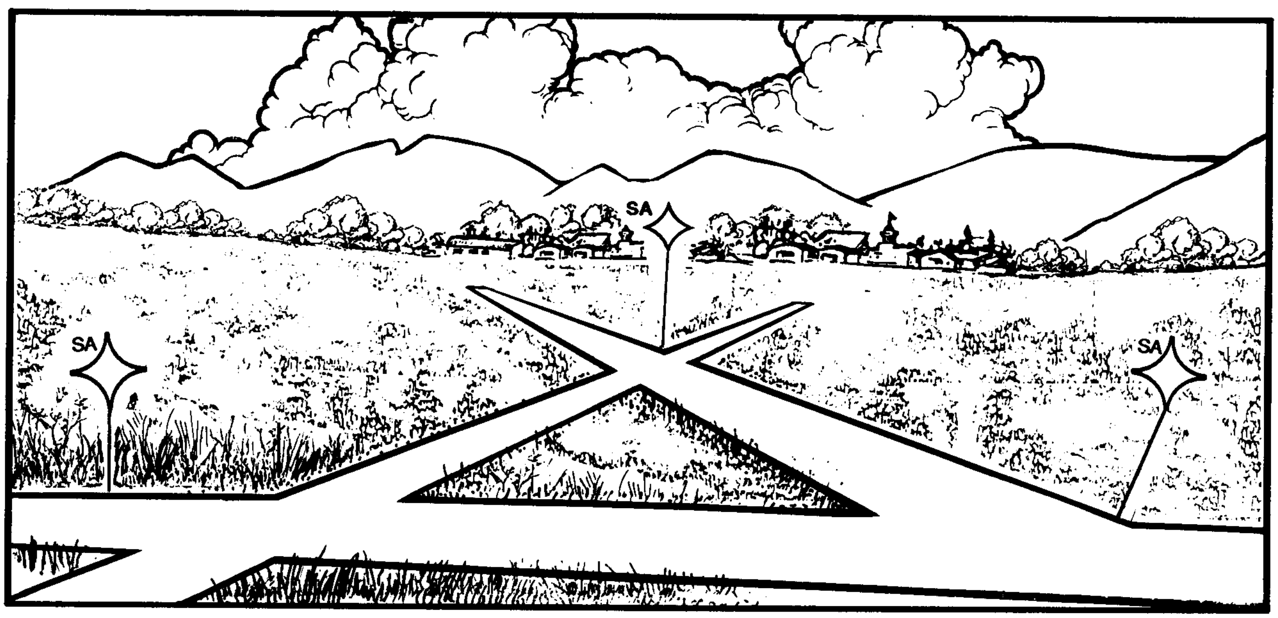


Figure 5-7. Airfield.

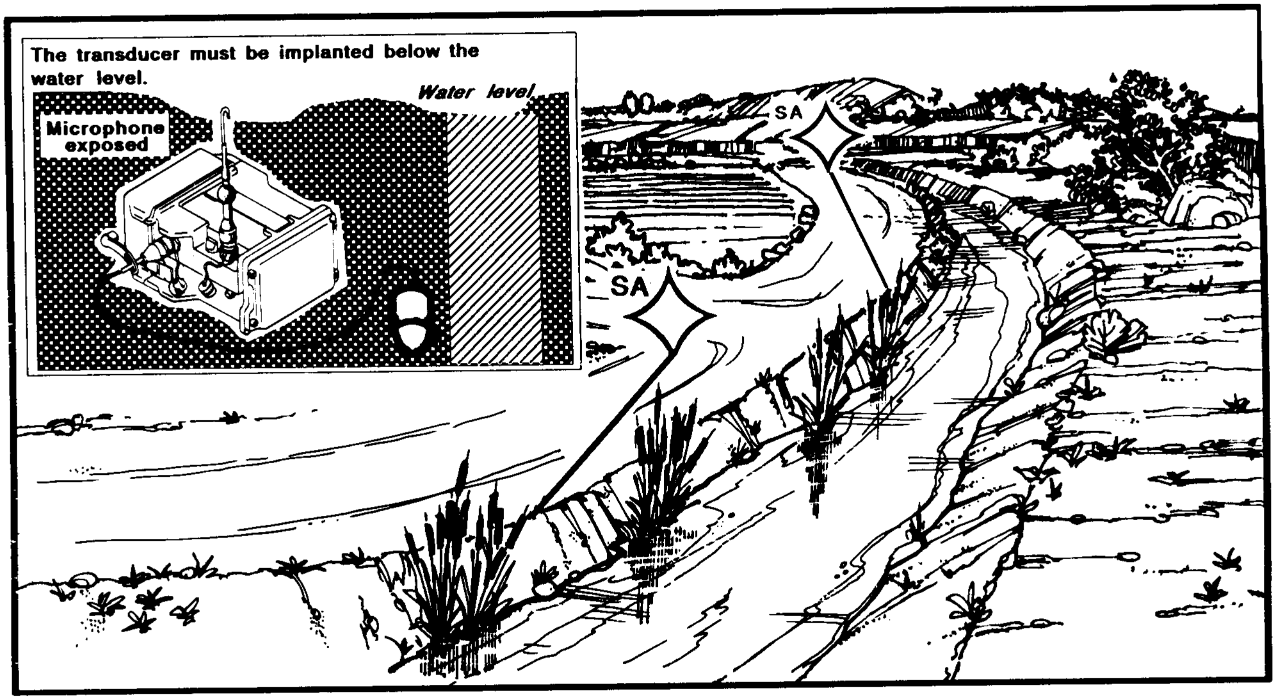


Figure 5-8. River.

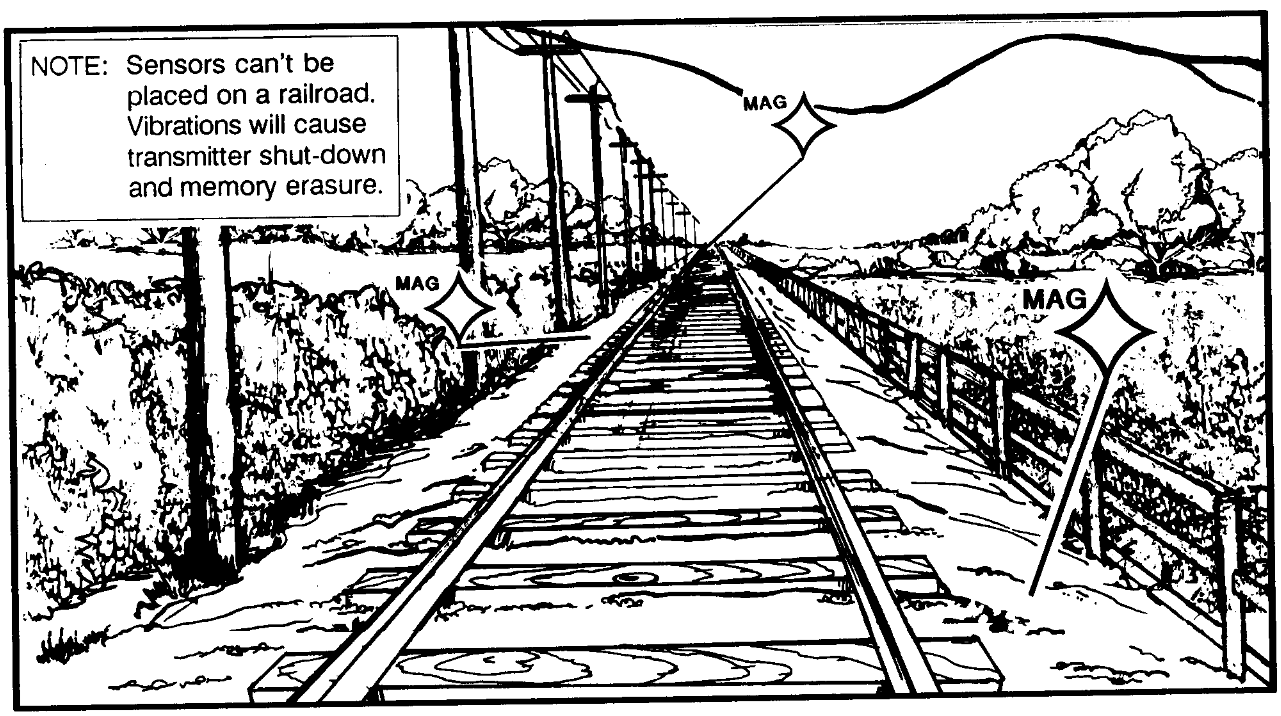


Figure 5-9. Railroad.

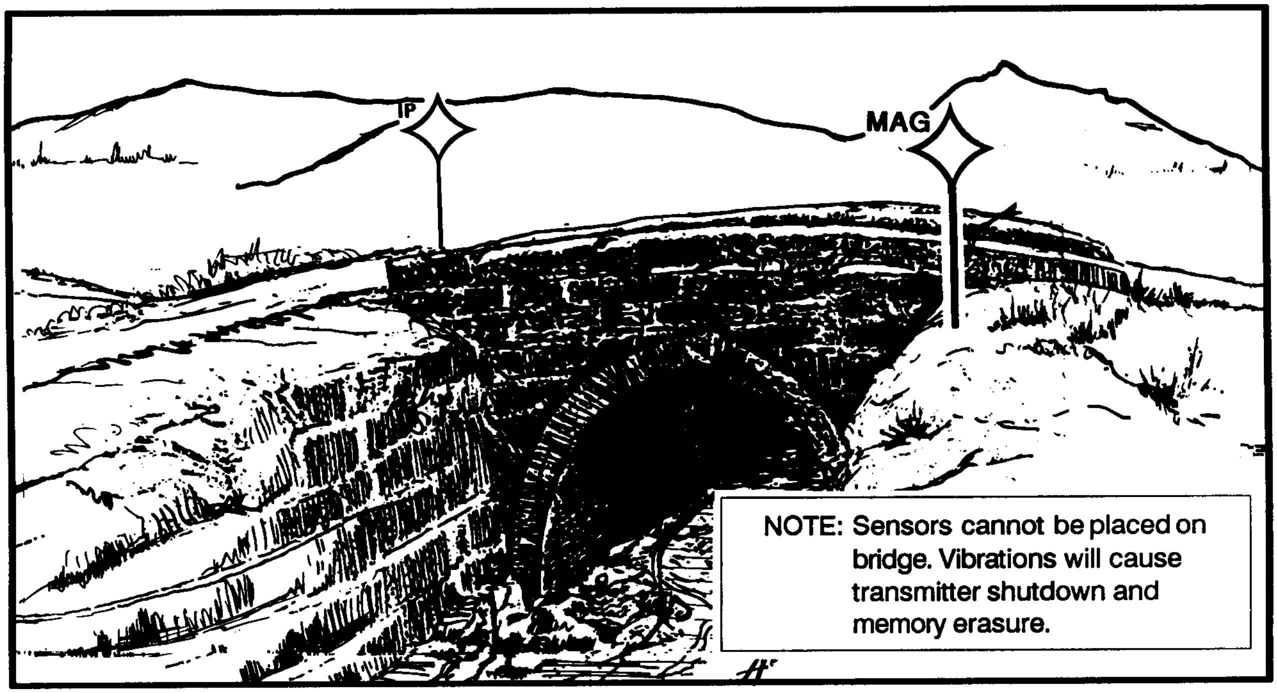


Figure 5-10. Bridge.

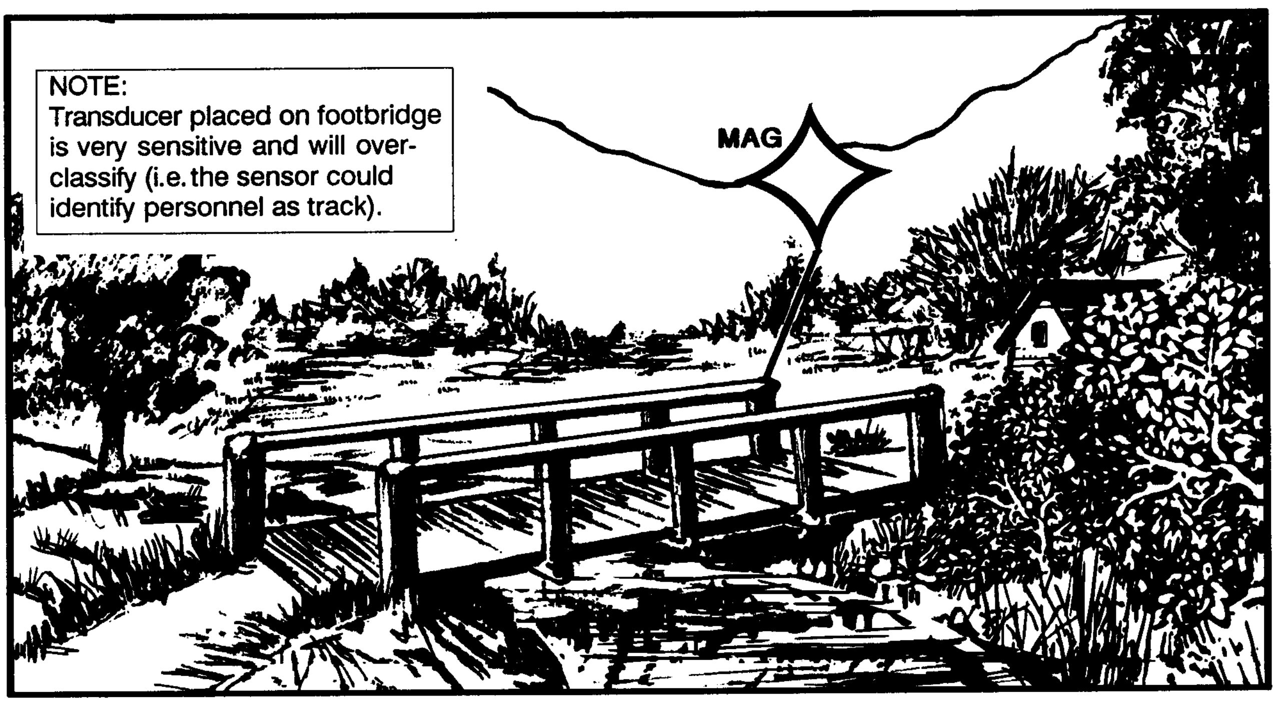


Figure 5-11. Footbridge.

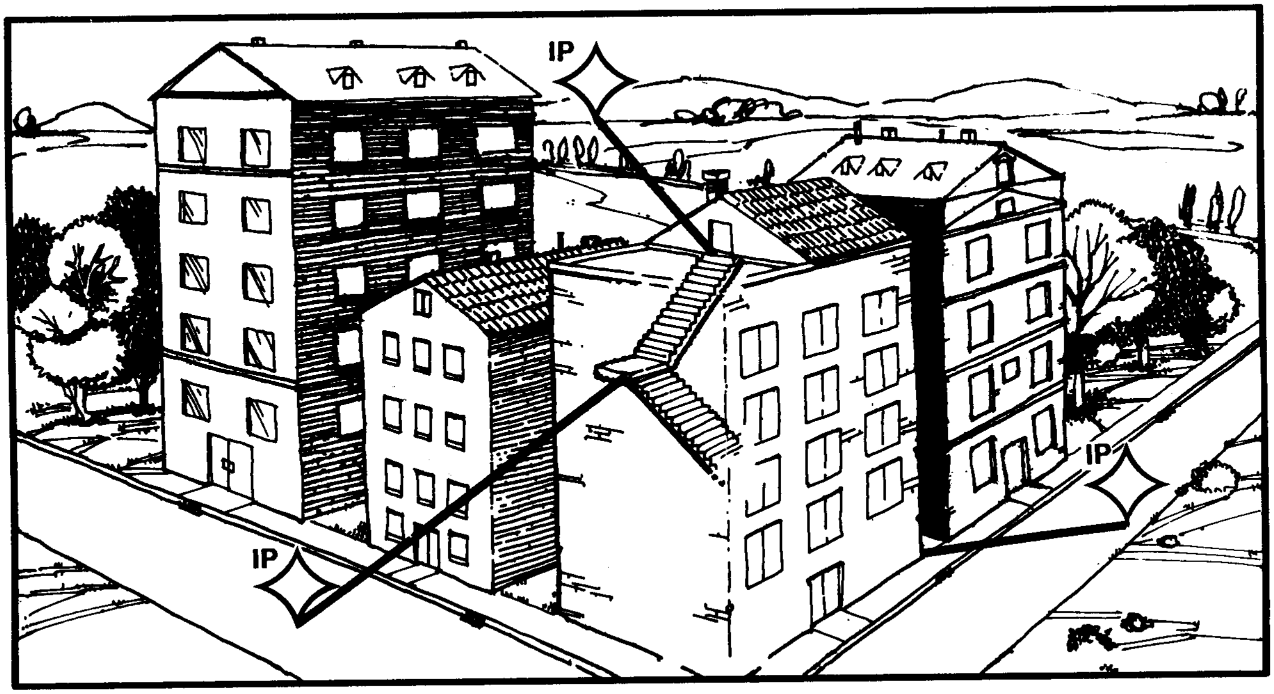


Figure 5-12. Building.

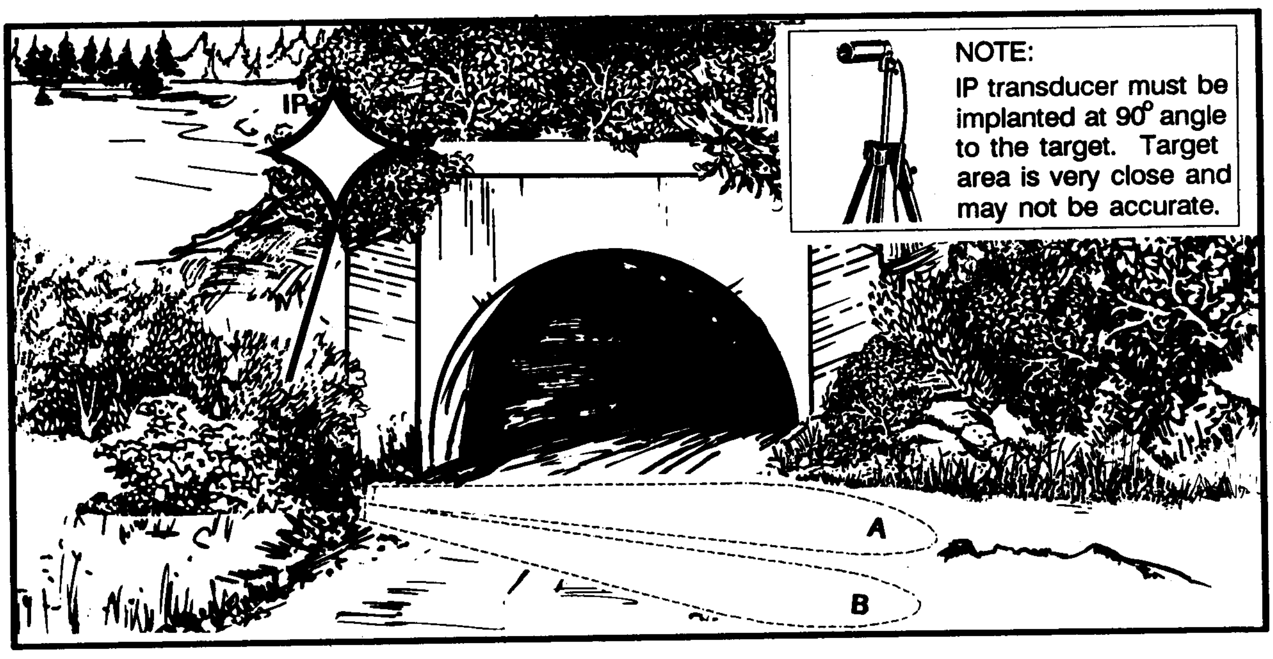


Figure 5-13. Tunnel.

Sensor strings should contain a mixture of sensors. The MAG is a count indicator for vehicles. It also shows direction L-R and R-L. The arrow on the transducer must be placed perpendicular to the route of travel, otherwise a false or incorrect direction of travel will be determined by the operator. Figure 5-14 is an example for implanting the MAG and its transducer.

The transducer must be placed as close to the target area as possible, due to the short detection range. Field of view is shown in Figure 5-15. The transducer must be carefully emplaced in order to ensure that targets do not pass behind the transducer. If a target passes within the detection range from behind the transducer, incorrect direction of travel will be sent to the monitoring site without the operator's knowledge.

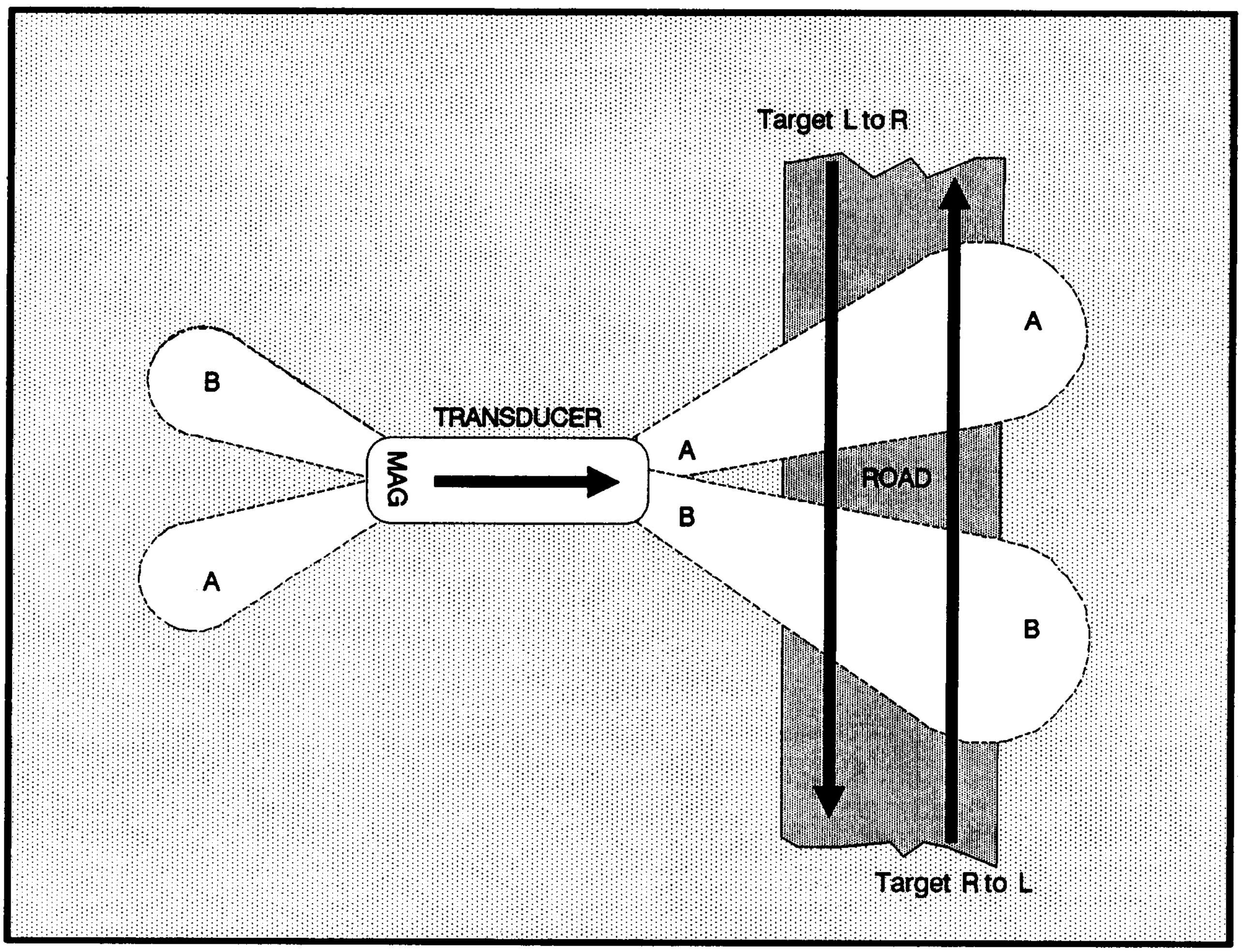


Figure 5-14. Transducer (correct).

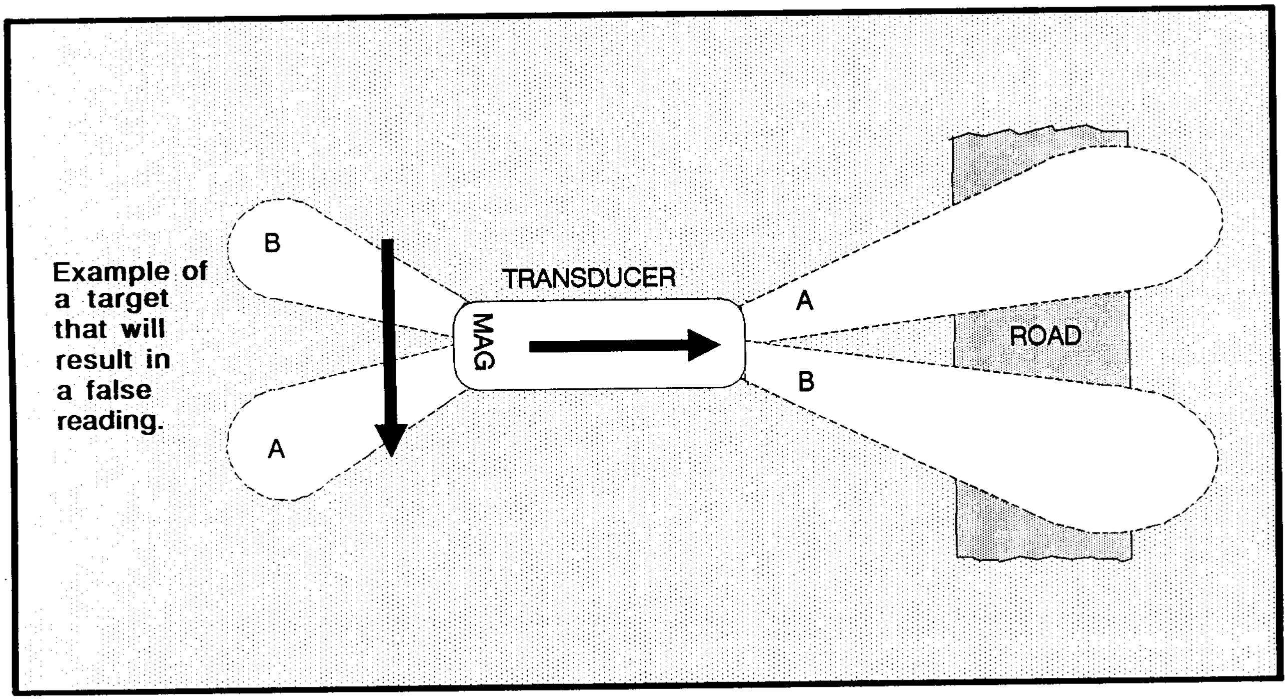


Figure 5-15. Transducer (incorrect).

Because of its large detection range, the SA is an area surveillance sensor. It will also classify target type (P, V, W, T) and provide early warning. The transducer must be implanted six to twelve inches or deeper; in sandy and desert areas it will be deeper.

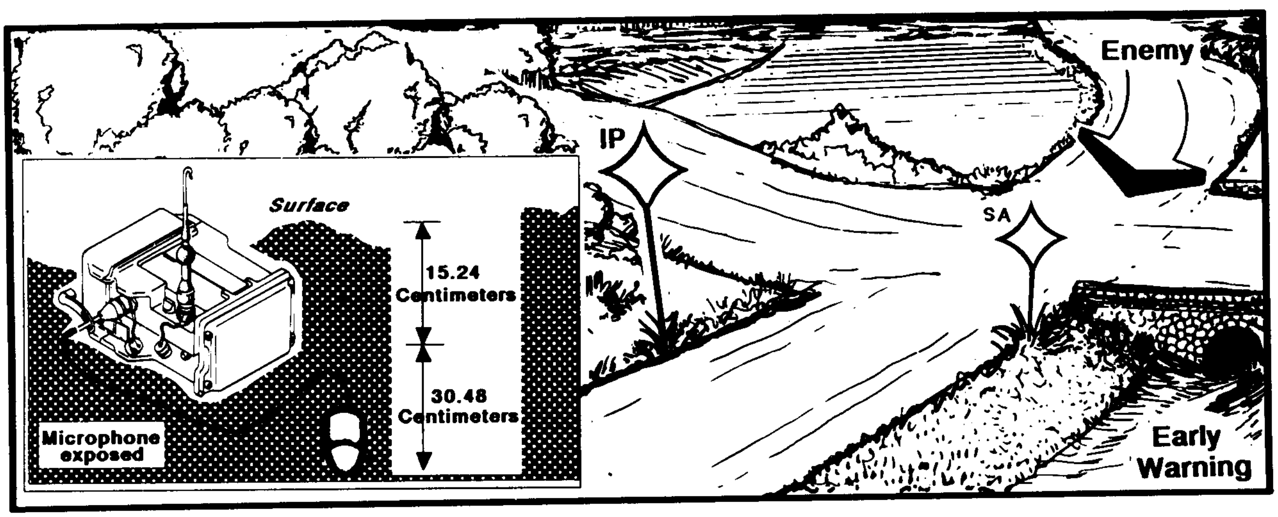


Figure 5-16. Implant of SA transducer.

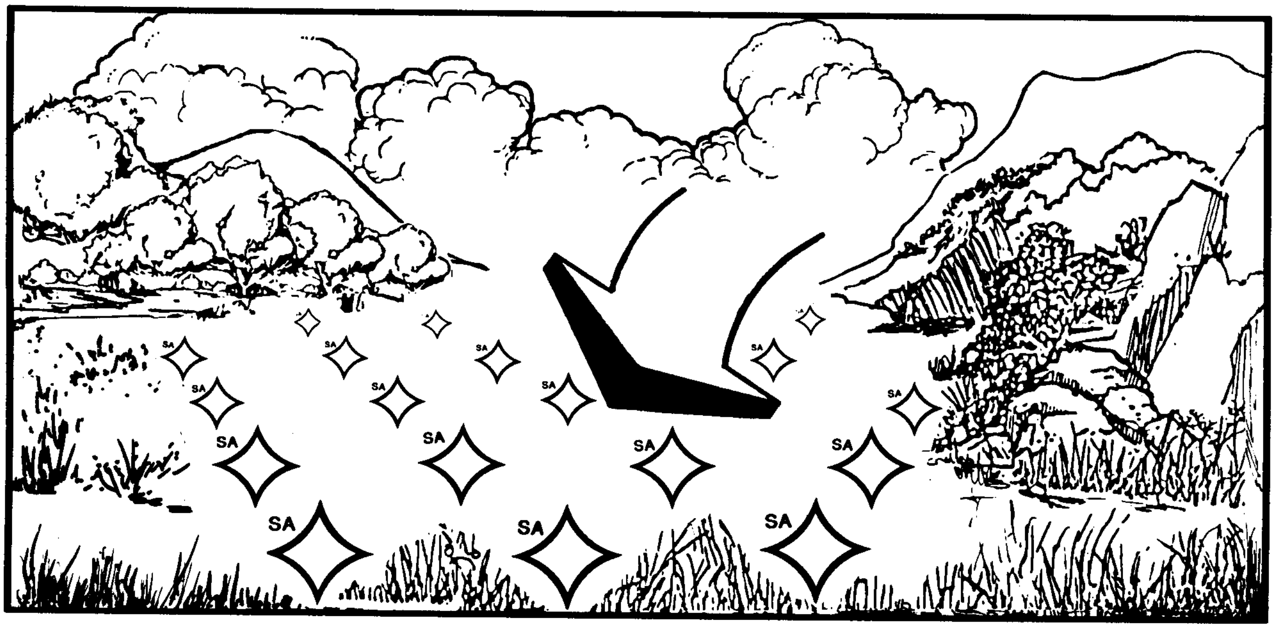


Figure 5-17. Area surveillance.

The transducer must be placed lower than the target area because seismic vibrations travel down and out from the targets. Implant sensor between 15.24 and 30.48 cm below target.

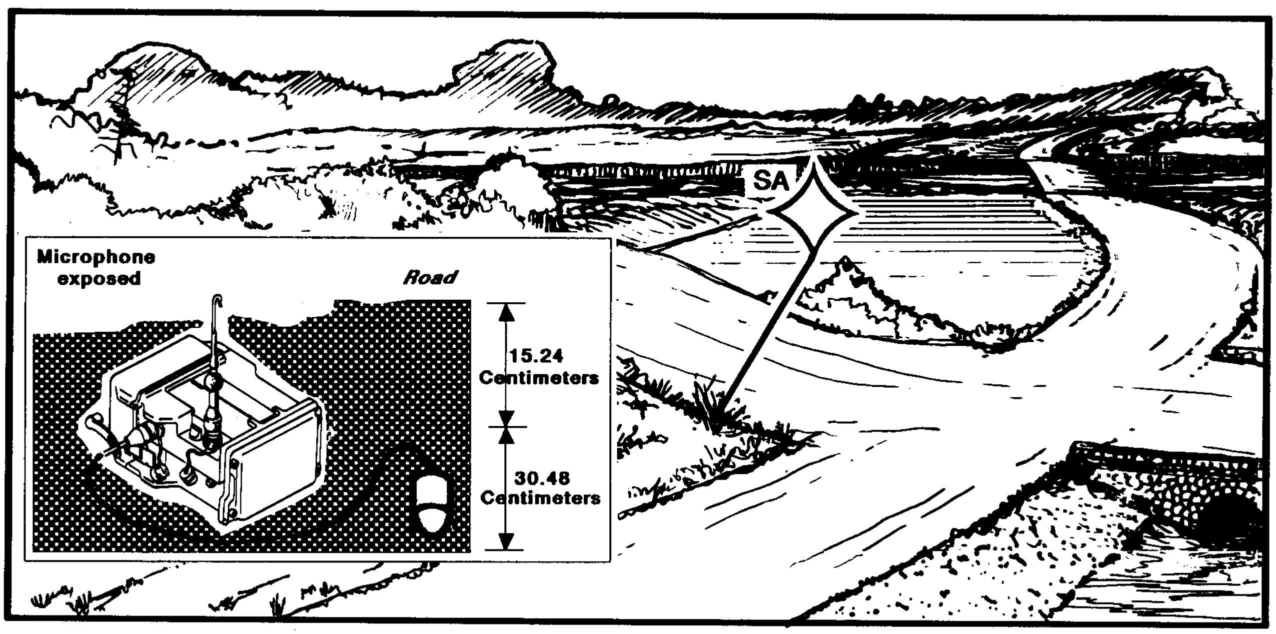


Figure 5-18. SA transducer below road level.

The IP is a count indicator for personnel. It also shows directions R-L and L-R. It must be carefully implanted to prevent chatter (false activation; for example, vegetation movements from wind within the infrared beam). The transducer must have an ambient background and be placed perpendicular to the target area, otherwise a false or incorrect direction of travel will be determined by the operator. Figure 5-19 is an example for implanting the IP and its transducer in a target area.

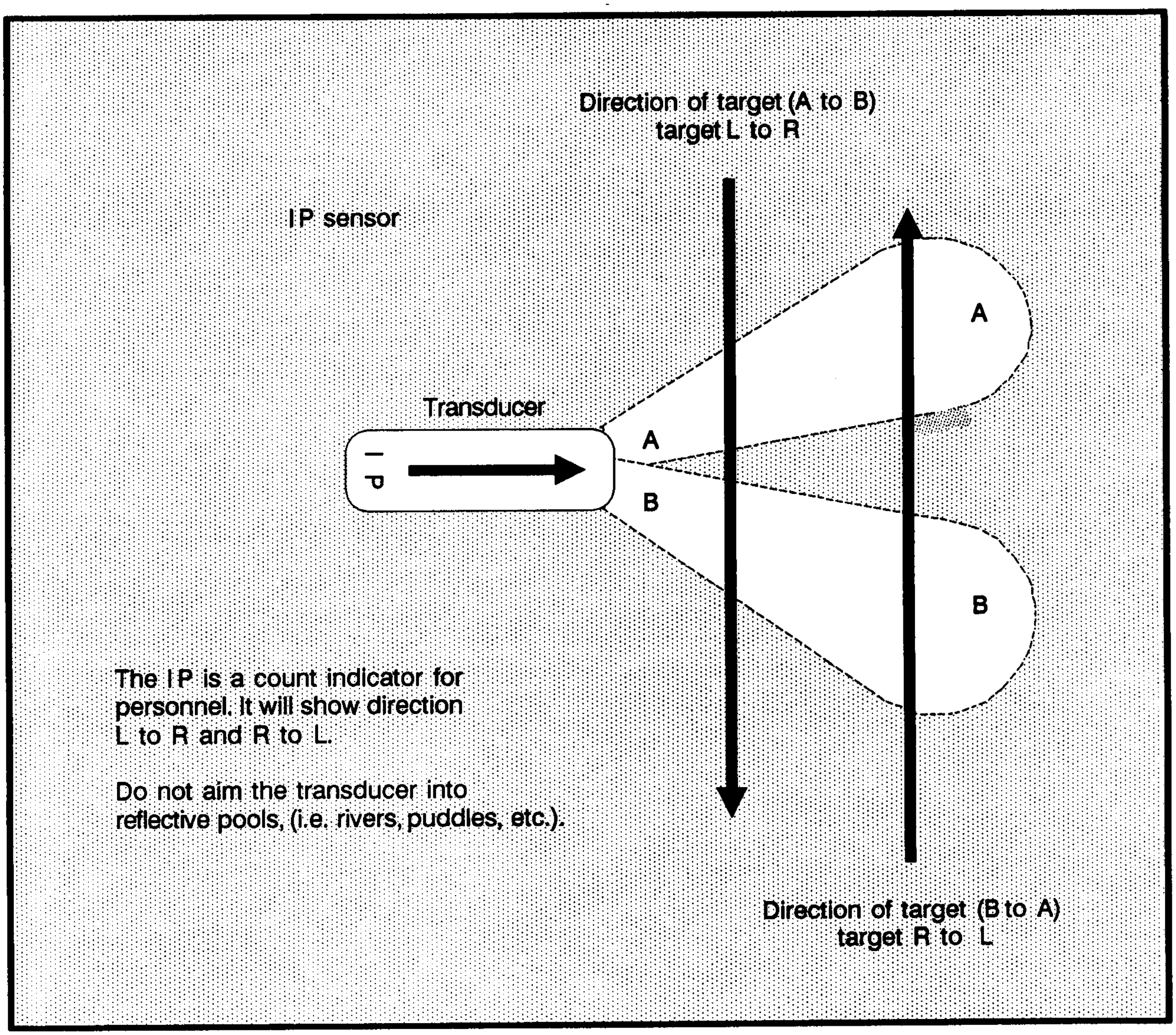


Figure 5-19. IP sensor field of view.

GLOSSARY

AA	avenue of approach
AC	alternating current
AC/DC	alternating current or direct current
ACR	armored cavalry regiment
AO	area of operations
arty	artillery
bn	battalion
C	Celsius
C-E	communications-electronics
CH	channel
cm	centimeters
CM&D	collection management and dissemination
co	company
D	distance
D/T	distance divided by time
DC	direct current
DS	direct support
DZ	drop zone
empl	emplace
F	Fahrenheit
FDC	fire direction center
FIST	fire support team
FLOT	forward line of own troops
FM	frequency modulated
G2	Assistant Chief of Staff, G2 (Intelligence)
GS	general support
GSS	ground surveillance system
Hz	hertz
ID	Infantry division
I.D.	identification (code)
inf	infantry
IP	infrared-passive sensor
IPB	intelligence preparation of the battlefield

kHz	kilohertz
LOC	length of column
LOS	line of sight
L-R	left to right
LZ	landing zone
m	meter
MAG	magnetic sensor
MHz	megahertz
MI	military intelligence
mph	miles per hour
MSR	main supply route
NBC	nuclear, biological, and chemical
NCO	noncommissioned officer
obs	obstacle
ops	operations
P (code)	personnel
PMS	portable monitor set
R&S	reconnaissance and surveillance
REMBASS	Remotely Monitored Battlefield Sensor System
RF	radio frequency
R-L	right to left
ROS	rate of speed
RSTA	reconnaissance, surveillance, and target acquisition
S1	Adjutant (US Army)
S2	Intelligence Officer (US Army)
S3	Operations and Training Officer (US Army)
SA	seismic acoustic sensor
SASR	sensor activation spot report
SENS	sensor
SMS	sensor monitor set
SODR	sensor operator data record
SOP	standing operating procedure
T	time
T (code)	tracked
TAM	terrain analysis matrix

TEMP	temperature
TOC	tactical operations center
TOE	table of organization and equipment
TSO	tactical surveillance officer
TTCI	total time count indicator
TVD	temporary visual display
V (code)	vehicle
W (code)	wheeled
WFAM	weather factor analysis matrix
96R	ground surveillance system operator

REFERENCES

REQUIRED PUBLICATIONS

Required publications are sources that users must read in order to understand or to comply with this field manual.

Field Manuals (FMs)

21-26	Map Reading and Land Navigation, 30 September 1987
34-10	Division Intelligence and Electronic Warfare Operations, 25 November 1986
101-5-1	Operational Terms and Symbols, 21 October 1985

Technical Manuals (TMs)

11-5820-867-12	Operator's and Organizational Maintenance Manual Sensor Monitoring Set AN/GSQ-187, 15 December 1987
11-5820-870-12	Operator's and Organizational Maintenance Manual, Monitor, Radio Frequency R-2016/GSQ, 15 December 1987
11-5820-872-12	Operator’s and Organizational Maintenance Manual Repeater, Radio RT-1175/GSQ, 15 December 1987
11-6130-460-13	Operator's, Organizational, and Direct Support Maintenance Manual Power Supply PP-8080/GSQ, 1 February 1988
11-6350-220-12	Operator’s and Organizational Maintenance Manual Sensor Anti-Intrusion DT-561/GSQ, 15 December 1987
11-6350-288-12	Operator's and Organizational Maintenance Manual Programmer, Code C-10434/GSQ, 15 December 1987

By Order of the Secretary of the Army:

CARL E. VUONO
General, United States Army
Chief of Staff

Official:

PATRICIA P. HICKERSON
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☆ U.S. GOVERNMENT PRINTING OFFICE : 1994 O - 300-421. (82883)