

OPERATOR'S MANUAL

Detecting Set, Mine.

- Aural/Visual Indication
- 6V DC Operating Power
- Portable
- Transistorized
- With Case



White's Electronics AF108
NATO No. 6665-99-743-5948

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Chapter 1 - Introduction

Section 1 - General

1. Scope
 - a. These instructions are published for the use of personnel to whom the White's Electronics Model AF108 Mine Detector Sets are issued. The manual gives a description of the detecting set, and provides information on operation, daily preventative maintenance and demolition of material to prevent enemy use.
 - b. Appendix I contains a list of all parts included in the mine detector set.
 - c. Appendix II contains the following diagrams;

DIAGRAMS

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Section II - Description and Data

2. Description

- a. The mine detector is a portable system capable of detecting metal mines and plastic mines which contain metal. The presence of a mine is indicated audibly through a headset and visually via an indicator situated on the control box and on the search coil.

Figure 1 illustrates the mine detector set.

- b. The assembled mine detector is illustrated in Figure 2 and comprises the sub-assembly described in Paragraphs b. 1. to b. 6.

1. Control Box Assembly

The control box shown in Figure 3 contains the transmitter, receiver, and signal processing circuit board with its associated components, connectors for search head, headset and battery box, indicators and controls. The control box is an aluminum, watertight enclosure with a gasketed lid secured by six screws.

2. Battery Box

The Battery box, shown in Figure 4, contains holders for four D-sized alkaline batteries, and connector to which the control box lead is connected. The holders are designed so that the batteries cannot be wrongly orientated when replaced in the dark. The battery box is a water tight aluminum box, with a gasketed lid secured by four thumb screws.

3. Shoulder Bag

The shoulder bag is used to carry the battery box and control box. The battery box is first placed inside a carrying pouch (Figure 4) prior to its positioning in the shoulder bag.

4. Search Head Assembly

The search head assembly consists of the transmitting and receiving antennae, search head rod, cable, cable clips and plug. The antennae are encapsulated in epoxy potting compound, and are sealed inside a plastic housing. An output indicator is mounted on the antennae housing, and is used to monitor the output of the mine detector while the operator is watching the search head. The indicator has a cover which is used when the operator has no need for it.

The search head rod is attached to the search head with a nylon nut and bolt, with rubber washers positioned between the search head and rod to increase friction between the two parts.

5. Handle Assembly

The handle assembly consists of two extension rods, two handles, armrest and spring clips. When used while the operator is in the prone position, a handle and armrest are fixed directly onto the search head rod. When used while the operator is standing, the thicker rod is attached between the search head rod and the thinner rod by the spring clips. The two handles and armrest are then attached to the top rod. The length of the rod assembly, handle and armrest position can be adjusted to suit the operator.

6. Headset Assembly

The headset provides an audible indication of the presence of metal. The headset has a single earphone with a rubber ear cushion and is secured so that it is held over the ear. The headset can be worn under a steel helmet. The headset is plugged into the control unit.

- c. The mine detector set and the mine detector also include the parts described in Paragraphs C. 1. to C. 4.

1. Extension Lead

The extension lead can be used when the mine detector is operated in cold conditions, to enable the battery box to be kept under clothing to raise the temperature of the batteries to increase operating time. The extension lead is connected between the battery box and control box.

2. Spare Parts Bag

The following parts are enclosed in a bag; two search head washers, one search head nut and bolt, five cable clips, two rod clips, two test pieces and a screwdriver. The screwdriver is used for adjusting the control box and battery box lid screws if required.

3. Carrying Satchel

The carrying satchel holds the detector and accessories. It is worn on the back and has adjustable straps.

4. Transit Case

The carrying satchel complete with mine detector and accessories is placed into the transit case for transportation. The transit case is aluminum, and has a rubber seal on the lid and is closed with two clips. It has a handle on each end.

3. Identification and Tabulated Data

a. Identification

The Model AF108 mine detector set has one identification plate located on the back face of the control box. The identification plate specifies assembly number, serial number, manufacture date, contract number, operating voltage, operating frequency, NATO number, and manufacturers name and address.

b. Tabulated Data

1. Control box assembly

Typetransistorized

Operating voltage6v (volts)

ManufacturerWhite's Electronics U. K. Ltd.

2. Handle

Length (min) 0.6 m

Length (max) 1.6 m

Number of sections3

Type of joints spring clips

3. Battery

Quantity (per battery box)4

Typealkaline, D size

Voltage.....4.2v to 6.5v

Battery life (continuous operation at 20° C) 70 hrs. (typically)

4. Dimensions and weight

Overall length 780 mm

Overall width 385 mm

Overall height 167 mm

5. Detector set characteristics

Pulse repetition rate; see identification plate

Pulse width 44 ns (bi-directional)

Audio frequencyapproximately 2 "clicks" per second,
rising in frequency when metal is located.

Temperature range (operating) -40°C to +55°C

Temperature range (storage and transport)..... -55°C to +70°C

Chapter 2 - Installation and Operating Instructions

Section 1 - Installation and Operating Instructions

4. Unpacking New Equipment

a. General

The complete mine detector set is received in a sturdy cardboard carton. The mine detector set transport case (see Figure 1) may also adequately serve as the shipping container for the mine detector set components, if shipping materials are not available.

b. Unpacking Boxed Mine Detector Sets

Open the cardboard carton and remove the mine detector sets.

5. Inspecting and Servicing Equipment

- a. Check the equipment against the packing list (appendix I)
- b. Carefully inspect the mine detector set for missing parts and possible damage that may have occurred during shipment.
- c. Inspect the controls for loose or missing mounting hardware and parts.
- d. Inspect the cables for cuts; frayed insulation and looseness at connections.
- e. See that the handle assembly slides together.
- f. Prepare the mine detector set for operation as outline in Paragraph 6.
- g. Perform the daily preventive maintenance services listed in Paragraph 17.
- h. Correct the deficiencies noted or report this condition to field maintenance.

6. Setting-Up Instructions

- a. Remove the satchel from the carrying case and remove from the satchel the following items; shoulder bag contains the control box and battery box, headset, search head assembly, both rods (if unit is to be used in the upright position), armrest and handle (or two handles if unit is used in the upright position). Proceed to set up the unit as follows:
- b. **Battery Attachment**
Connect the battery lead from the control box to the battery box, and turn unit on. The unit fault indicator should be on, and the battery alert and battery replace indicators should be off. If any of the battery indicators are on, replace the battery box with the spare one in the satchel and recheck the indicators. Turn unit off. Check that battery indicators flash when unit is turned off.
- c. **Handle and Rod Attachment**
 1. Detector used in prone position (see Diagram 5)

Slip one handle and armrest onto the rod attached to the search head. Position as required and tighten up knurled hand nuts.

2. Detector used in upright position (see Diagram 2)

Slide the thicker rod onto the search head rod by depressing the snap lock and lining up the markings on the two rods until the snap locks locate into the respective holes. Slide the remaining rod into the thick rod in a similar manner and adjust completed rod to the appropriate length. Slide the two handles and armrest on to the top rod, position as required and tighten up the knurled hand nuts.

d. Search Head

Fasten cable clips to rod and plug in search head socket to control box. Place search head at the appropriate angle and tighten thumbnut.

e. Headset

Plug headset into the front of the control box.

Section II - Movement to a New Worksite

7. Dismantling for Movement

A. Preparation for Movement

1. Unplug the search head plug, battery plug and headset plug.
2. Detach the handles and armrest, and place into pocket of satchel.
3. Disassemble the two extension rods (if used) from the search head rod by depressing the snap locks, and remove the cable clips from the two top rods. Coil up search head cable and store rods and search head assembly in the satchel.
4. Place headset into pocket of satchel.
5. Position shoulder bag in the satchel and close the zip.
6. The satchel can be worn or placed in the transit case.

B. Movement

The mine detector set case is provided with two handles for carrying, and is easily transported. If the movement required is greater than walking distance, the detector set may be loaded on any vehicle as the components are cushioned against shock, and the case is manufactured of sturdy material for the purpose.

8. Setting-Up After Movement

Refer to paragraph 6 for setting-up instructions after movement.

Section III - Controls and Indicators

9. General

This section describes, locates, illustrates and furnishes the operator with sufficient information about the various controls and indicators for proper operation of the mine detector set.

10. (1) Controls

Refer to Figure 3

a. ON/OFF Volume

Switch/potentiometer to apply power to the unit and to set audio level in headset. This control has a locking mechanism.

b. Auto - Tune

Push button switch used to automatically tune unit.

(2) Indicators

Refer to Figure 2 and 3

a. Output

Flashes in time with the 'clicking' heard in the headset, normally at a rate of approx. 2 per second, increasing in frequency when metal is located.

b. Search Head Indicator

Operates the same as the output indicator. Can be covered with a hood when not required.

c. Battery Alert

The battery alert indicator is normally off and will go on when the battery voltage has reached a level where only several hours operating time is left.

d. Replace Battery

The replace battery indicator is normally off, and will go on when the battery voltage has reached a level at which the performance of the mine detector will be effected. The unit should not be used with the batteries at this level. As an added safety feature when the replace battery indicator goes on, the audio and visual output will be turned off and it will no longer be possible to retune the unit.

e. Unit Fault

The unit fault indicator goes on for a short period when the unit is first switched on and then turns off. If the unit has a fault, such as in the search head, which would cause the unit to malfunction, the unit fault indicator will go on, and the unit should no longer be used. As an additional safety feature, when the unit fault indicator goes on, the audio and visual output will be turned off and it will no longer be possible to retune the unit.

Section IV - Operation of Equipment

11. General

- a. The instructions in this section are published for the information and guidance of the personnel responsible for the operation of the mine detector set.

- b. The operator must know how to perform every operation of which the mine detector set is capable. This section gives instructions on starting, operating, and stopping the mine detector set. Operation under unusual environmental conditions is also explained. Since terrain is so variable, the operator may have to adapt stated procedures to meet actual field conditions.

12. Starting and Stopping

a. Preparation for Starting

1. Perform the setting-up instructions (paragraph 6).
2. Perform the daily preventative maintenance services (paragraph 17).
3. Put on shoulder bag, and secure with belt if required.
4. Position headset on head so that earphone is held against the ear, and secure with touch fastener.

b. Starting

1. Turn volume control fully clockwise.
2. Hold search head well above ground level and away from all metal.
3. Press auto tune button for five seconds until audible click rate is approximately two per second.
4. Adjust volume as required, and lock in position.

c. Stopping

Loosen the locking nut on the volume control and turn control fully counter-clockwise.

13. Mine Detector Set Operation

a. General

The mine detector set functions electronically as a bi-directional pulse detector. The unit produces a magnetic field pulse from the search head which lasts for a short period of time and then rapidly reduces this field to zero. The sudden change in magnetic field induces eddy currents in any metallic object within the field. These eddy currents will take a short time to decay to zero. The decaying eddy currents will have an associated magnetic field which generates a signal on the detector search head which is sensed by a receiver circuit at a specific time after the transmitter magnetic field is switched to zero. This sequence is repeated many thousand times a second. When metal is detected, the frequency of the output indicators and audible output increases in proportion to the size of received signal.

Caution: Cease searching suspected mined area if it is no longer possible to retune the unit, or if the unit fault, or replace battery indicator are on.

b. Preliminary Adjustment

Refer to paragraph 13 b, and tune the unit.

c. Sensitivity Check

With the search head held away from all metal and the unit tuned, bring the aluminum cylinder test piece, found in the spare parts bag, towards the center of the search head. Check that the audio frequency and output indicator flash rate increase. The aluminum cylinder should first be detected at around 20cm from the search head.

d. Using the Detector Head

Standing Position Operation (Refer to Figure 2.)

Step 1. Grasp upright handle and secure armrest strap.

Step 2. Hold the detector head just above ground level and press auto tune button.

Step 3. Grasp lower handle, and make wide sweeping motions from left to right while walking forward slowly. (See Figure 6.)

Prone Position Operation (Refer to Figure 5.)

Step 1. Grasp upright handle with the right hand and secure armrest strap.

Step 2. Assume prone position, supporting weight on left forearm.

Step 3. Hold the detector head just above ground level, and press auto tune button.

Step 4. Make wide sweeping motions from left to right while crawling forward slowly.

Warning: If more than one mine detector set is being used in the area, keep the detector heads at least 2m apart, and ensure that in a group, each detector set operates at a different operating frequency (refer to identification plate on back face of control box).

e. Buried Metallic Object Encountered

An increase in audible click rate, and output indicator flash rate as the detector head is moved over the ground is an indication that a metallic object is buried in this particular area. Proceed to locate the exact position of the buried metallic object as outlined in "h" below.

f. Searching Areas Covered with Metal Fragments

Warning: Be extremely careful when searching an area that is covered with metal fragments. There is danger of encountering metallic mines yielding signals that might be mistaken for those caused by the metal fragments.

When searching over an area that is either covered with shrapnel or where metal fragmentation is evident, resultant signals will be similar to those produced where an actual mine is encountered.

In searching an area such as this, sweep the ground with the detector head raised at a height depending on the quantity, size, and distribution of metal fragments. Response from small metallic objects will be eliminated, but larger objects such as metallic mines will yield adequate signals.

g. Searching areas in which the ground contains naturally occurring metal particles

Certain types of soil cause the mine detector output to increase in frequency when the loop is brought close to it due to the presence of small particles of metal. To use the mine detector set under these conditions, raise the search head slightly above the ground level and retune the unit. Keeping the search head level, and at a constant height above the ground, sweep in the usual manner. If it is not possible to keep the output frequency constant, raise the search head further, retune and try sweeping again. Repeat this procedure until the lowest height is found at which the search head can be used.

h. Locating Exact Position of Buried Metal Object

If the search head is passed over a metal mine the output indicator and audio frequency will increase. This will reach a maximum when the metal is directly under the search head. If a maximum signal is obtained over a wide area, raise the search head until the maximum frequency occurs only over a small area. The metal will lie directly under the center of the search head where the maximum is found.

i. Procedure Upon Completion of Search

Turn off the mine detector set when a search operation is complete (paragraph 13).

14. Operation in Low Temperatures

At low temperatures the life of the batteries can be greatly reduced. An extension lead is therefore supplied which can be fitted between the battery box and control box, to enable the battery box to be kept under the operators outer clothing. This allows the operators body heat to keep the temperature of the batteries high enough to allow normal operating time.

Chapter 3 - Operator Maintenance Instructions

15. Section 1 - Battery Replacement

Refer to Figure 4.

1. Loosen the four thumb screws and withdraw the lid.
2. Remove the four batteries, and replace with new ones.
3. Replace the lid and tighten thumb screws.

Section 2 - Preventative Maintenance

17. General

To insure that the mine detector set is ready for operation at all times, it must be inspected systematically, so that defects may be discovered and corrected before they result in serious damage or failure.

The necessary preventative maintenance services to be performed are listed below.

Defects discovered during operation of the equipment shall be noted for future correction to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted during operation which would damage the equipment if operation were continued.

18. Daily Preventative Maintenance Services

This paragraph contains a list of preventative maintenance services which must be performed by the operator.

1. Case

Clean a dirty case. Check for worn damaged or defective case, lining, seal, latches or handles.

2. Detector Head Assembly

Clean a dirty head assembly. Check for worn, damaged or defective detector head assembly. Check for proper operation.

3. Headset Assembly

Clean a dirty headset. Check for worn, damaged or defective headset, wiring, plug, or headband.

4. Battery Boxes

Clean dirty battery boxes. Check that battery boxes operate mine detector set correctly and if battery indicators are turned on, replace batteries (refer to Paragraph 16). Open battery boxes and check for corrosion on contacts and clean if necessary.

5. Control Box

Clean a dirty control box. Check plug and sockets for damage. Check for proper operation.

6. Cables

Check for worn, cracked, or frayed cables.

7. Handle Assembly

Clean a dirty handle assembly. Check for worn, damaged or defective handle assembly.

8. Shoulder Bag

Check for worn, damaged or defective bag.

9. Carrying Satchel

Check for worn, damaged or defective satchel.

10. Extension Lead

Check for defective cable, plug, and socket.

Chapter 4 - Demolition of Material to Prevent Enemy Use

18. General

When capture of the mine detector set to an enemy is imminent, the responsible unit commander must make the decision either to destroy the equipment or render it inoperative. Based on this decision, orders are issued which cover the desired extent of destruction. Whatever method of demolition is employed, it is essential to destroy the same vital parts of all mine detector sets and all the corresponding repair parts.

19. Demolition to Render the Equipment Inoperative

a. Demolition by Mechanical Means

Use sledge hammers, picks, axes, or any other heavy tools which may be available to destroy the following:

1. Control Box (Note: This step is the minimum requirement for this method.)
2. Detector Head
3. Headset

b. Demolition by Misuse

Perform the steps listed below to render the mine detector set inoperative.

1. Run over the equipment with heavy equipment such as a truck, tank, etc.
2. Cut the cables with a sharp knife or other instrument.

20. Demolition by Weapons Fire

Fire on the mine detector set with the heaviest practical weapon available.

21. Other Demolition Methods

a. Scattering and Concealment

Scatter the various parts through dense foliage or bury them in soil or sand.

b. Burning

Pack rags, clothing, paper, canvas or other inflammable material around the equipment. Saturate the material with petrol, oil or diesel fuel and ignite.

c. Submersion

Loosen the screws on the control box, and the thumb screws on the battery boxes, and submerge all components in a body of water to provide water damage and concealment. Salt water does greater damage to metal parts than fresh water.

22. Training

All operators should receive thorough training in the destruction of the mine detector set. Simulated destruction, using all of the materials listed above, should be included in the operator training program. It must be emphasized in training that demolition operations are usually necessitated by critical situations when time available for carrying out destruction is limited. For this reason it is necessary that operators be thoroughly familiar with all methods of destruction of equipment, and be able to carry out demolition instructions without reference to this or any manual.

Appendix I

Mine Detector Set, Packing List

- 1 - Search head assembly, includes :
 - 1 search head
 - 1 search head rod (attached to search head)
 - 1 spring clip
 - 1 nylon nut and bolt
 - 2 washers
 - 2 cable clips
- 1 - Control box
- 2 - Battery boxes
- 1 - Rod 19mm (o.d) with 1 spring clip
- 1 - Rod 22.5mm (o.d) with 3 cable clips
- 2 - Handles
- 1 - Armrest
- 1 - Headset
- 1 - Carrying satchel
- 1 - Shoulder bag
- 1 - Battery box pouch
- 1 - Extension cable
- 1 - Spare parts bag, includes:
 - 1 nylon nut
 - 1 nylon bolt
 - 2 washers
 - 1 screwdriver
 - 5 cable clips
 - 1 steel pin test piece
 - 1 aluminum cylinder test piece
 - 2 spring clips
- 1 - Aluminum transport case

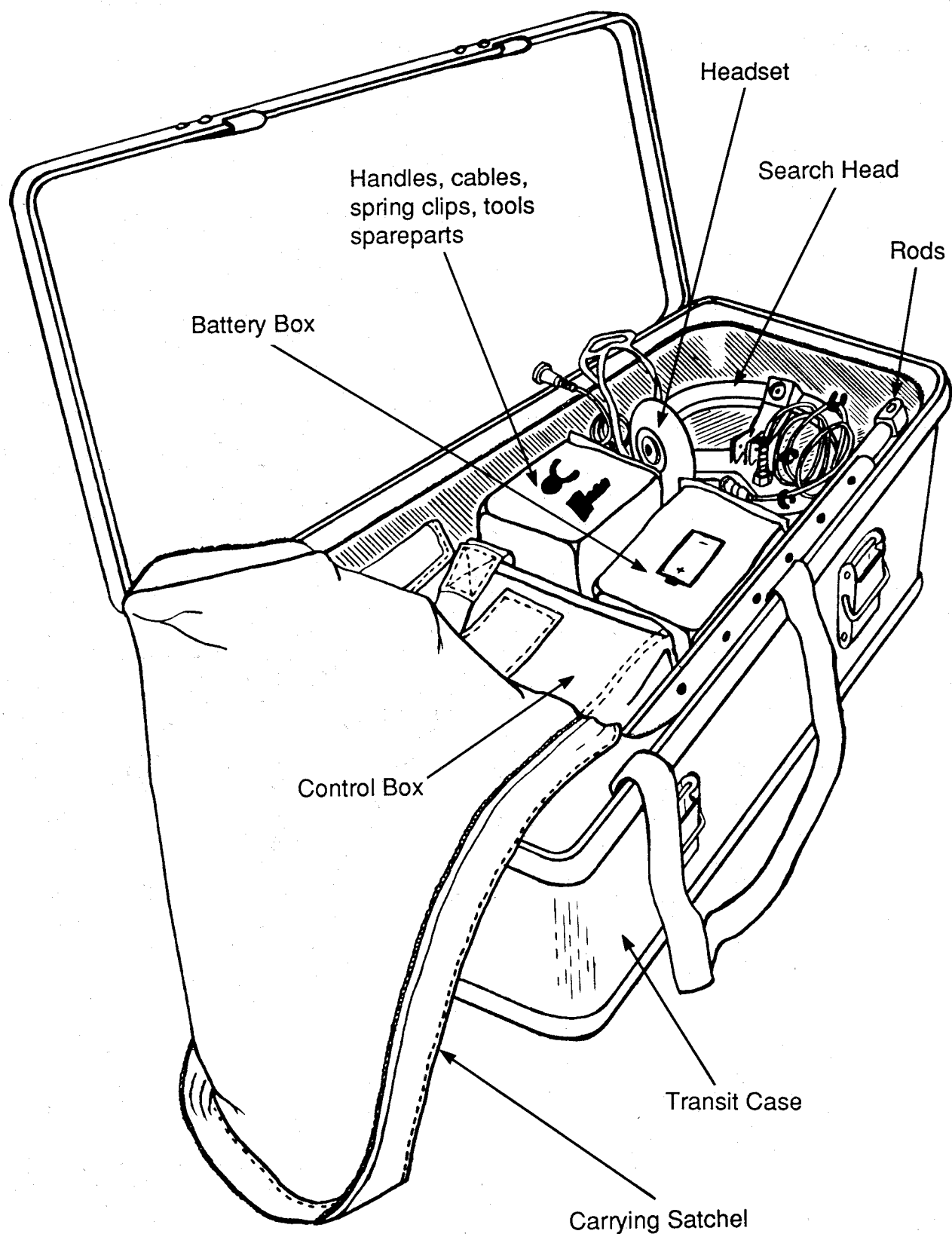


FIGURE 1 MINE DETECTOR SET Model AF 108

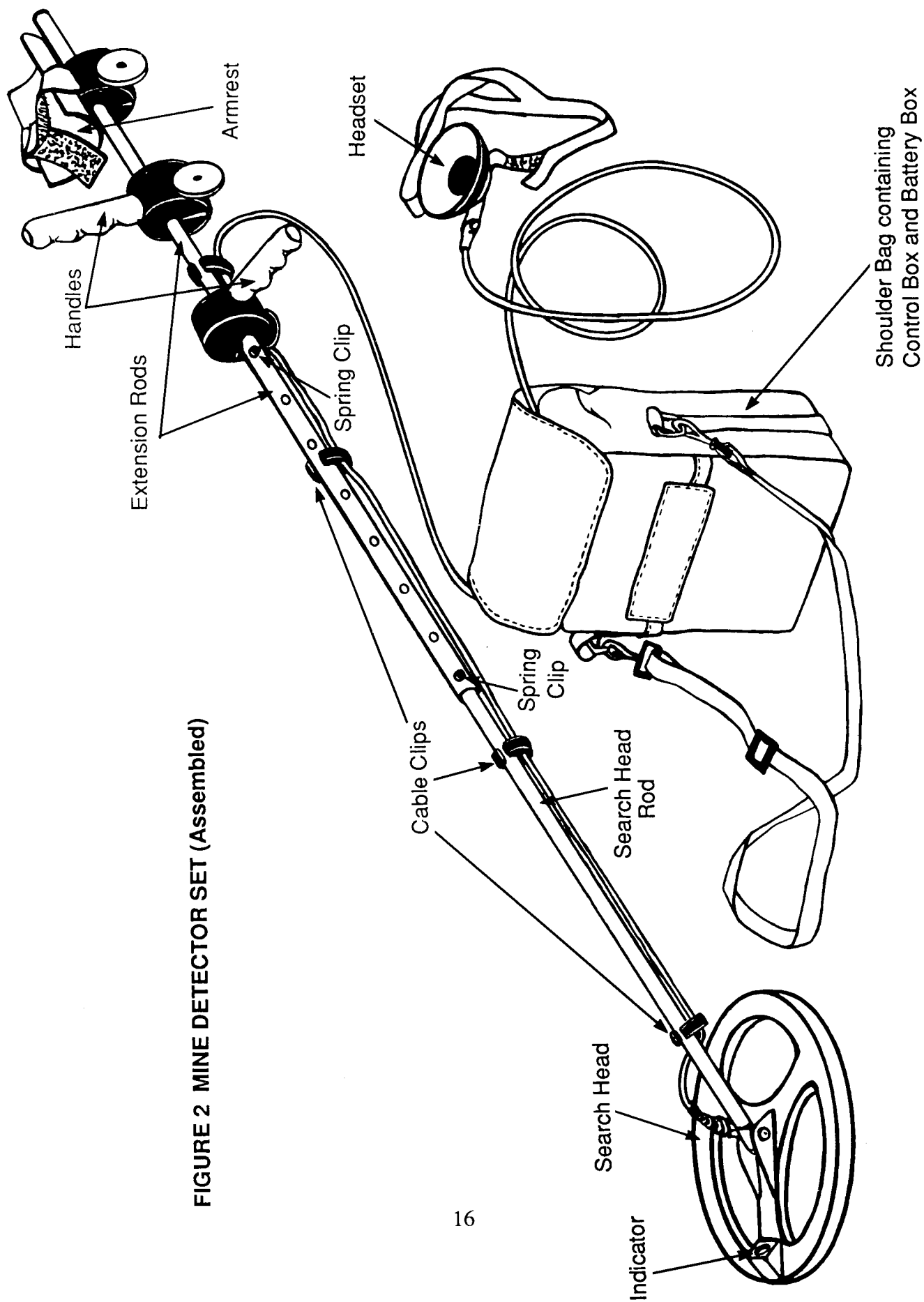


FIGURE 2 MINE DETECTOR SET (Assembled)

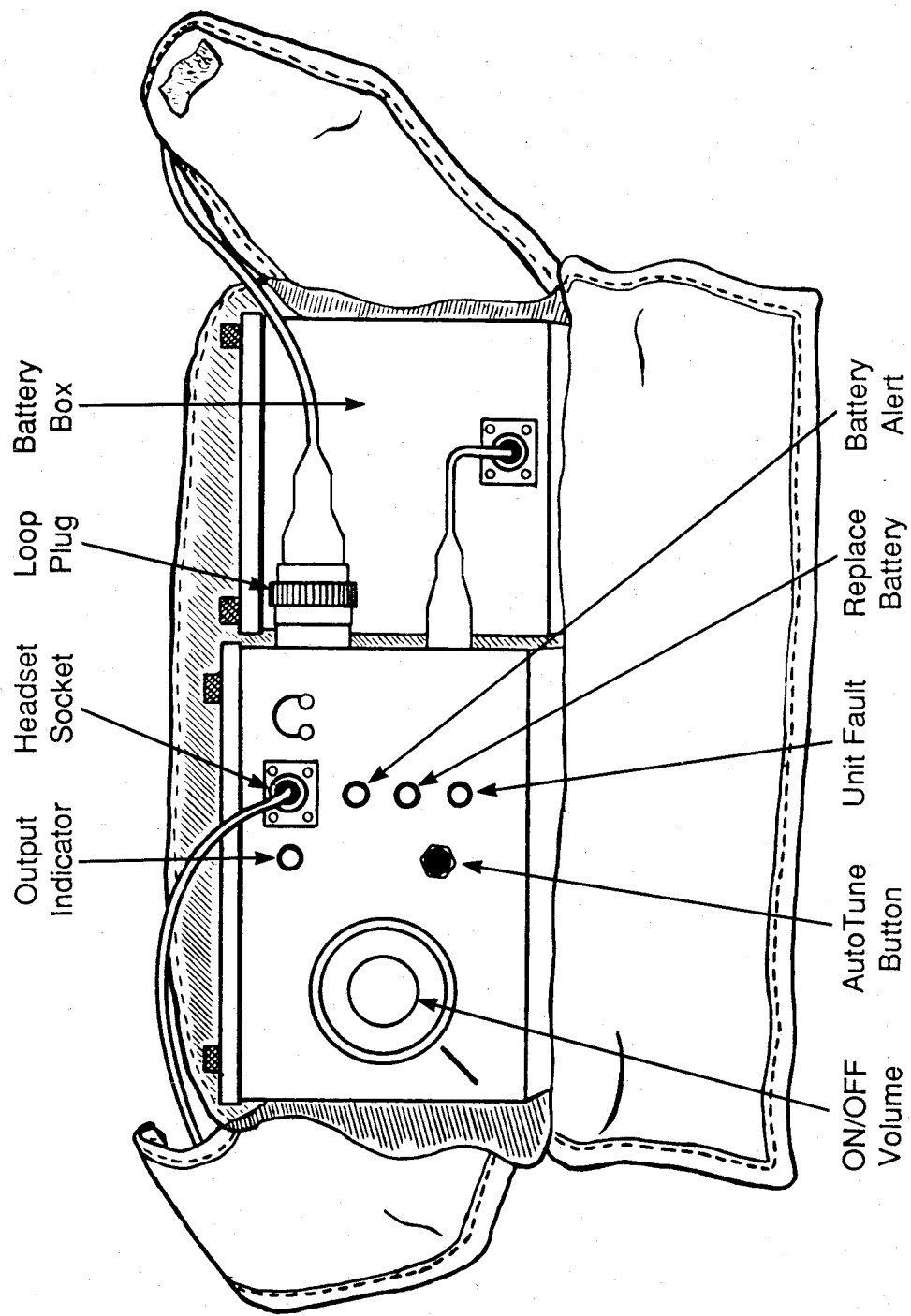


FIGURE 3 CONTROL AND BATTERY BOX

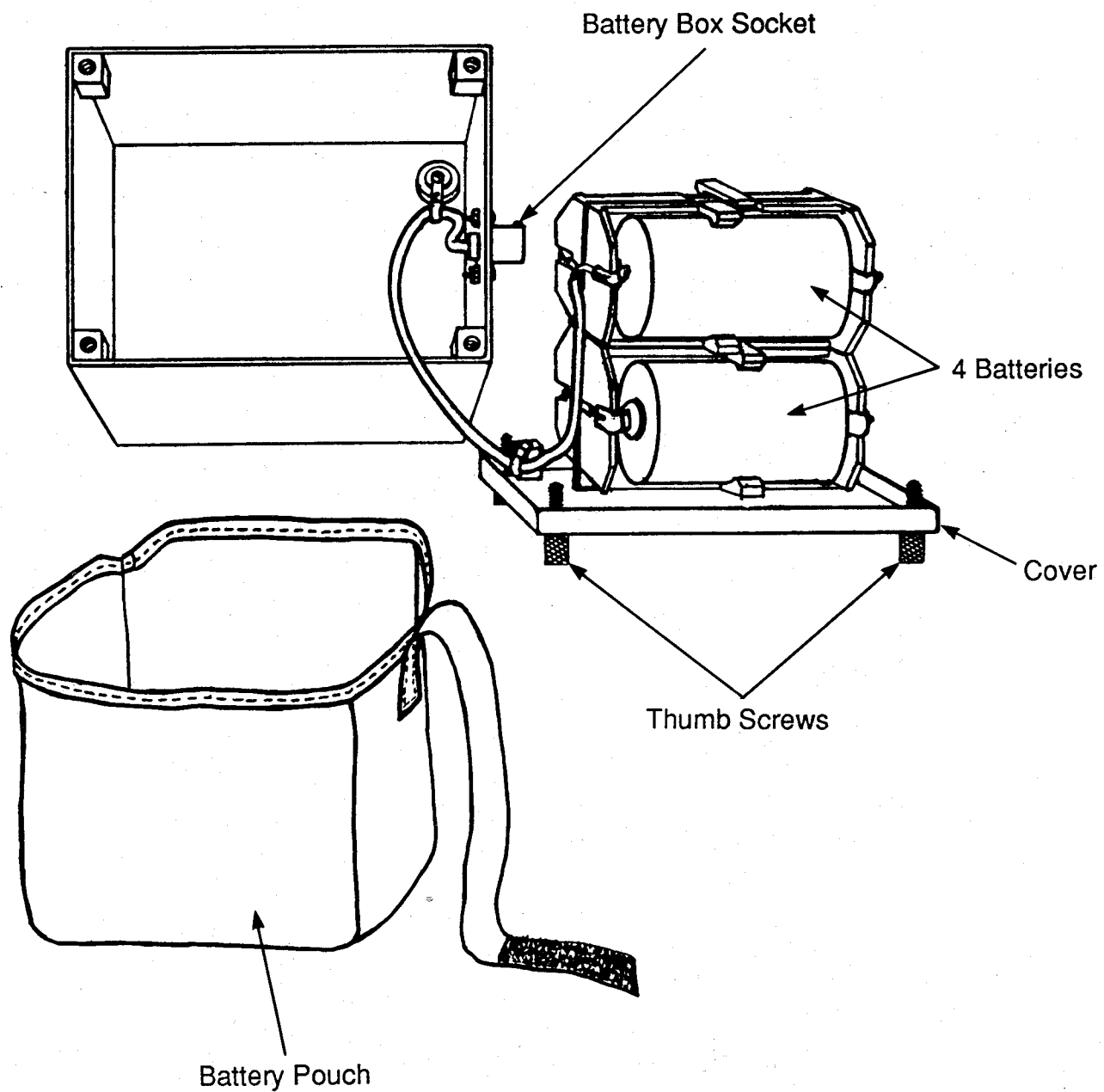


FIGURE 4 BATTERY BOX

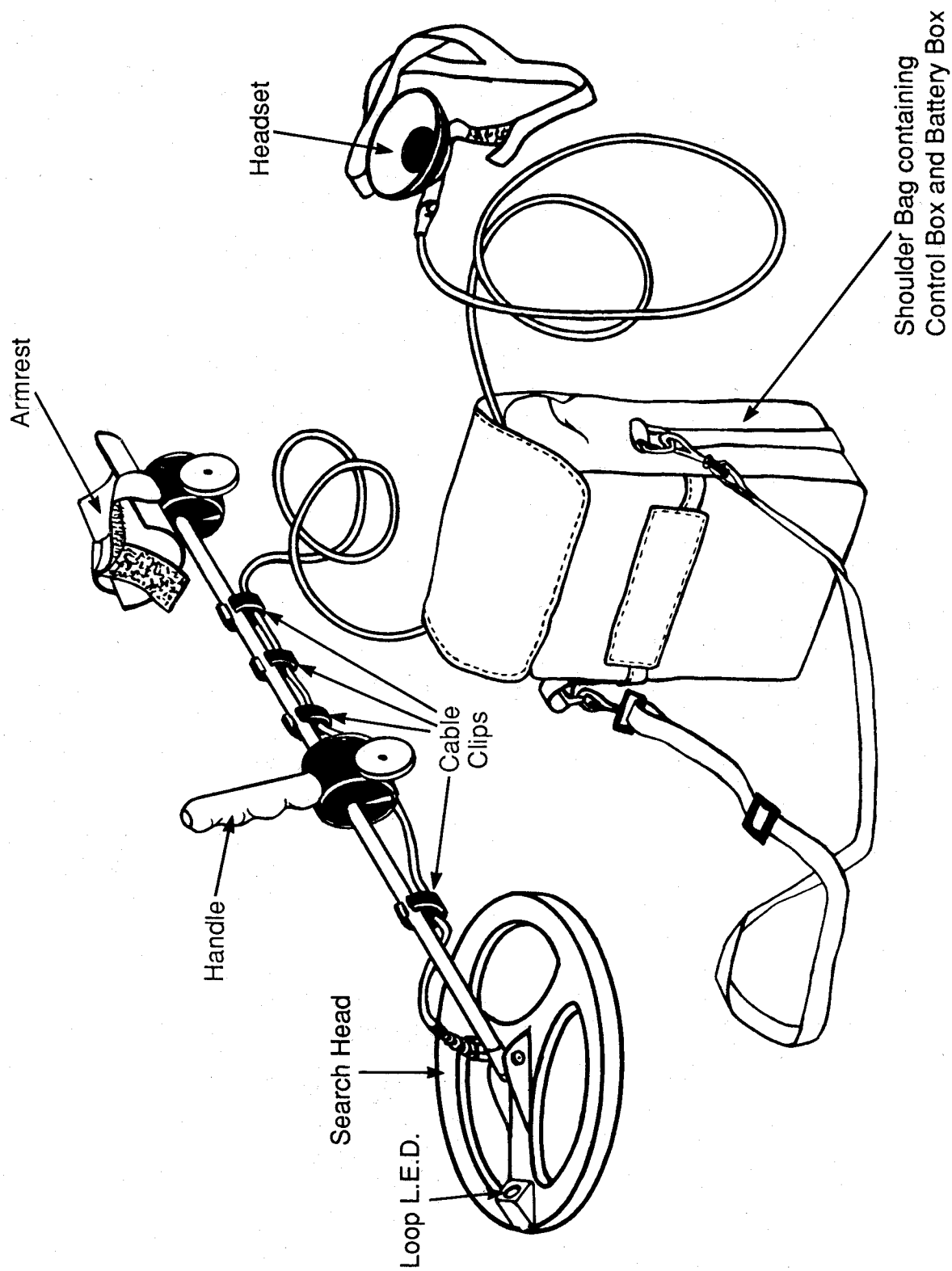


FIGURE 5 MINE DETECTOR USED IN PRONE POSITION

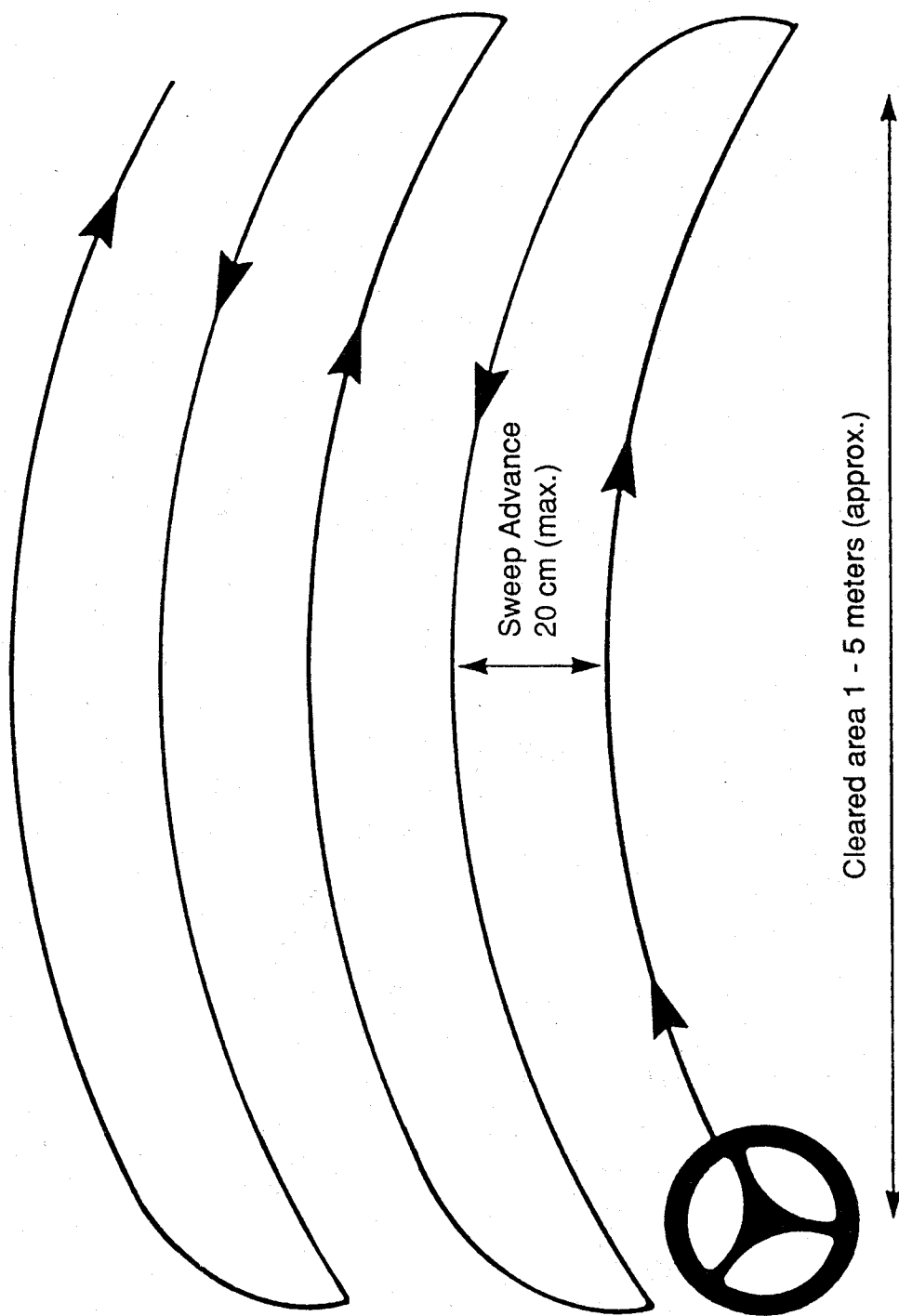


FIGURE 6 TYPICAL SWEEP PATTERN (Standing)

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