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PRESSURE TESTING

ULTRASONIC LEAK LOCATING EQUIPMENT

CONTENTS PAGE

1. GENERAL

1.01 This section describes the Hewlett-Packard Delcon Divisi- ı, Lumidor, and Malor types of ultrasonic leak locating equipment.

1.02 This section is reissued to include information on the B Ultrasonic Reflector, which increases the effective gain of ultrasonic leak locators and reduces the necessity of the use of poles and trolleys in leak locating work on aerial cables.

1.03 These devices are used to locate leaks by detecting the high-frequency sound generated by air, nitrogen, or any gas escaping from pressurized cable or equipment. The leak locators may be used on aerial cable or on that portion of underground cable that is accessible in manholes.

1.04 The method of using each leak locator is basically the same. Differences in the description and use of each type are covered in this section.

2. DESCRIPTION OF HEWLETT-PACKARD DELCON DIVISION EQUIPMENT

2.01 ***The Hewlett-Packard Delcon Division 4916A Ultrasonic Translator Detector*** replaces the superseded 112B Ultrasonic Translator. The 4916A is similar to the 112B with the following exceptions:

- The 4916A has a blue finish (112B is olive green).
- The 4916A is available with either a 18029A Lapel Speaker or a 18017A Headset.
- A 25-ft straight cord is not furnished with the 4916A.
- The 4916A includes a leather 18019A Utility Carrying Case.

**Reprinted to comply with modified final judgment.

2.02 ***The Hewlett-Packard 4916A Ultrasonic Translator Detector*** (Fig. 1) consists of the following components:

(a) ***80027 Ultrasonic Translator:*** A transistorized device designed to translate ultrasonic sounds into the audible range. It is housed in an aluminum case 3-7/8 inches wide, 6-1/4 inches long, 1-1/8 inches thick, weighing 28 ounces and equipped with metal loops for the carrying strap. The translator is designed to operate with three mercury batteries (Mallory RM-12R, 1.4 volts) but can also be operated with standard AA penlight zinc carbon dry batteries. It is equipped with a HEADSET jack, a PROBE jack for engaging the probe cord connector, and a combination ON-OFF switch with volume control.

(b) ***18020A Probe:*** A crystal detector designed to pick up tones in the range of approximately 35,000 to 45,000 Hz. The crystal and circuitry are housed in an aluminum cylinder 1-3/4 inches in diameter and 6-1/4 inches long. The probe is directional and has a directional pattern of approximately 20 degrees.

(c) ***18017A Headset:*** A 600-ohm headset with cord and plug for inserting into jack on translator.

(d) ***18015A Coiled Cord:*** A 6-foot retractile cord terminated in plug fittings for connecting between translator and probe, where the mobile reflector is not required.

(e) ***18029A Lapel Speaker:*** A small speaker in a plastic housing equipped with a clip for fastening the speaker to the clothing. The speaker is equipped with a cord and plug for inserting into the translator jack.

(f) ***18019A Utility Carrying Case:*** A leather case for carrying and storing the 4916A or 4905A Ultrasonic Translator Detectors.

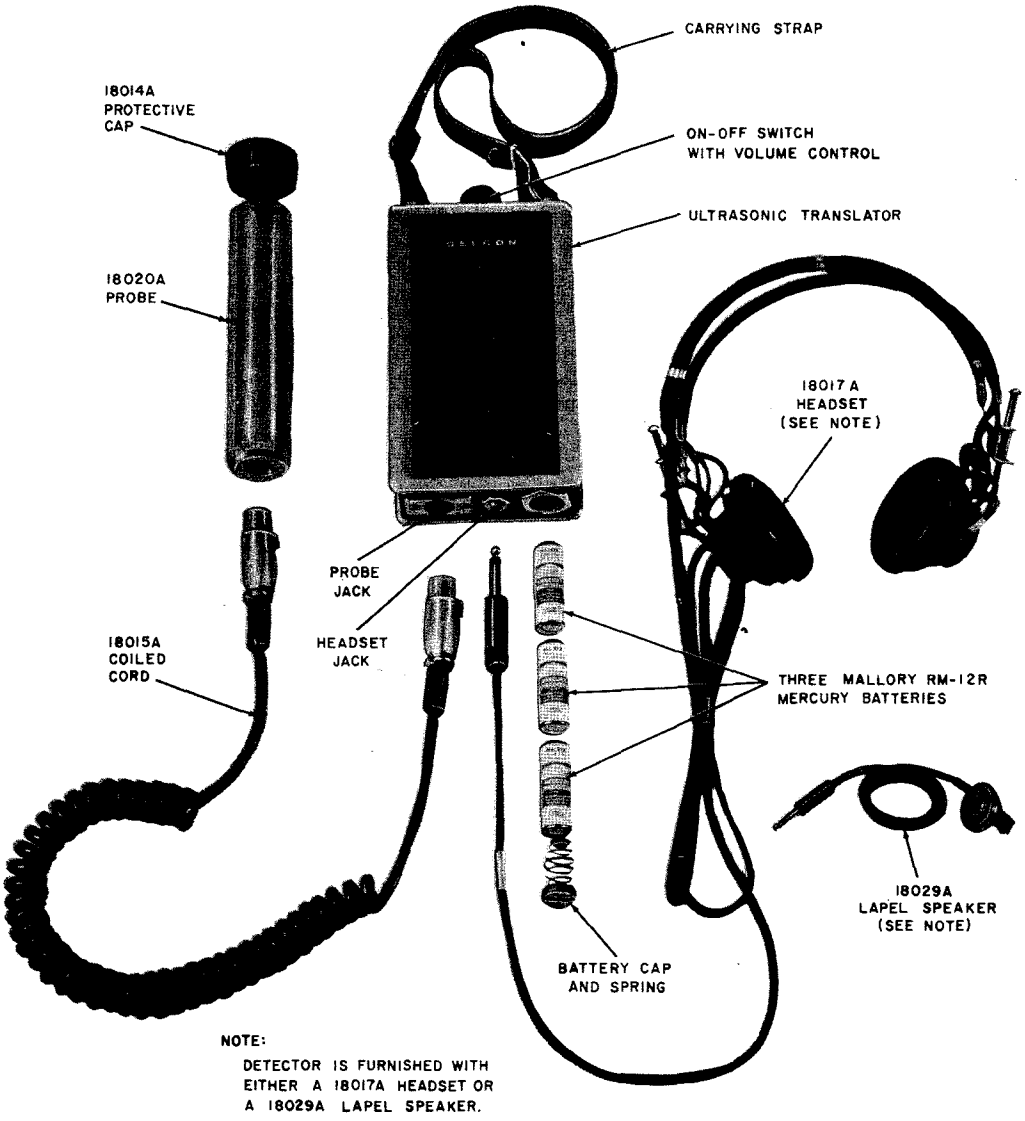

Fig. 1—Hewlett-Packard Delcon Division 4916A Ultrasonic Translator Detector

2.03 ***The Hewlett-Packard Delcon Division 4905A Ultrasonic Translator Detector*** (Fig. 2) is electrically equivalent to the 4916A (2.01) except that it includes a built-in speaker and output reference meter.

2.04 ***The Hewlett-Packard Delcon Division 18003A Mobile Reflector,*** illustrated in Fig. 3, consists of the following components:

(a) ***18003-63867 Pole Section:*** A 5-foot reinforced plastic pole equipped at the top with a crystal detector probe designed to operate with a single mercury battery (see Note) and equipped at the bottom with a metal ferrule to fit the ferrule on the small tree pruner handle extension section. The housing for the probe and mercury battery is fitted with movable brackets to support the two-wheeled bridge assembly. Electrical wiring inside the pole connects the probe and battery to the input side of a transformer mounted directly above the ferrule. The output side of the transformer is terminated in a receptacle to fit the plug of the 25-foot straight cord. The circuitry and construction provide a minimum dielectric strength of 10,000 volts. The ferrule of each unit is stamped with a Western Electric Company, Inc, inspection number and dated to show when the pole section is to be returned for retest.

Note: Pole sections having an ON-OFF switch mounted in the top housing have high-gain circuitry and require a single 5.6-volt mercury battery (Mallory TR-164 or EVEREADY® E-164). Early model pole sections were not equipped with an ON-OFF switch and operate from a single 1.4-volt Mallory RM-12R mercury

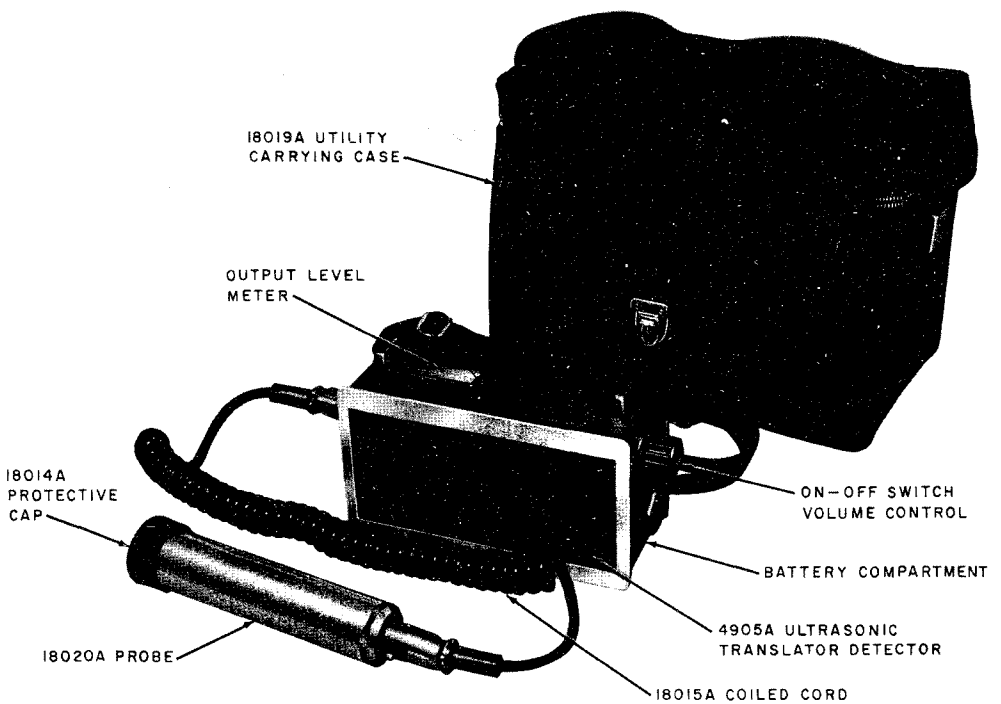

Fig. 2—Hewlett-Packard Delcon Division 4905A Ultrasonic Translator Detector

battery under the control of a mercury switch which closes the battery circuit when the pole section is in the vertical position.

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(b) ***18003-63812 Bridge Assembly:*** An aluminum frame equipped with two rubber lined rollers and arranged to fit on the two brackets on the underside of the pole section probe housing. The assembly is designed to be pushed along the suspension strand and cable so that the probe can detect the presence of ultrasonic energy resulting from pressurized gas escaping from the cable. Overall dimensions are 21 inches by 4-3/4 inches by 5 inches.

(c) ***18003-63813 Reflector Assembly:*** An aluminum sheet formed into a trough and arranged for clamping to the pole section. This device, normally clamped on the pole section about 6 to 8 inches below the wheels of the bridge assembly, is designed to reflect to the probe any ultrasonic energy resulting from pressurized gas escaping from the underside of the cable.

(d) ***18016A Straight Cord:*** A 25-ft, 2-conductor cord terminated in plug fittings for connecting between the translator and the mobile reflector.

2.05 ***The Hewlett-Packard Delcon Division 18002A Quik-Search* Wand,*** illustrated in Fig. 4, consists of a 6-foot reinforced plastic pole equipped at the top with a crystal detector probe designed to operate with a single 5.6-volt mercury battery (Mallory TR-164 or Eveready E-164) and

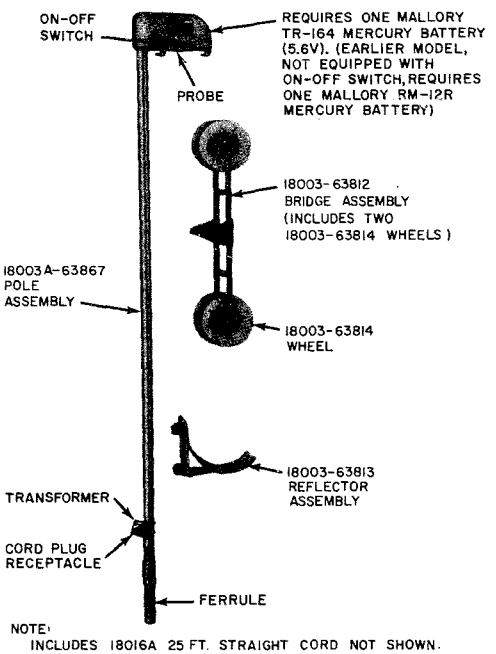


Fig. 3—Hewlett-Packard Delcon Division 18003A Mobile Reflector

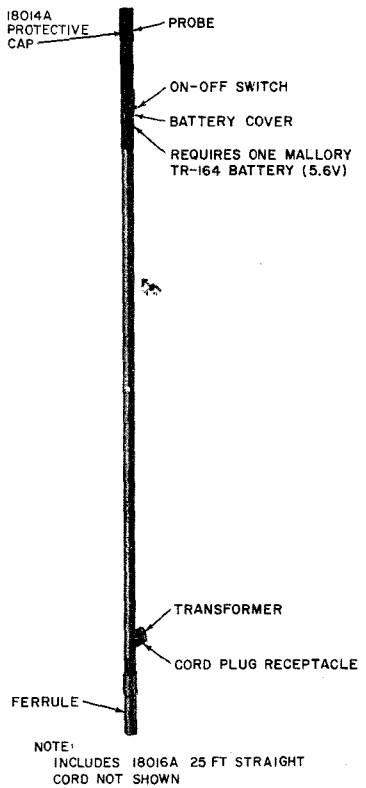


Fig. 4—Hewlett-Packard Delcon Division 18002A Quik-Search Wand

an ON-OFF switch. It is equipped at the bottom with a metal ferrule to fit the ferrule on the small tree pruner handle extension section. Electrical wiring inside the pole connects the probe and battery to the input side of a transformer mounted directly above the ferrule. The output side of the transformer is terminated in a jack to fit the plug of the 18016A 25-foot straight cord. The circuitry and construction provide a minimum dielectric strength of 10,000 volts. The ferrule of each unit is stamped with a Western Electric inspection number and dated to show when the pole section is to be returned for retest.

*Trade Name of Hewlett-Packard Company
H.P. Delcon Division

3. DESCRIPTION OF LUMIDOR EQUIPMENT

3.01 ***The Lumidor LP-500 Leak Detector*** (Fig. 5) supersedes the LP-400 Leak Detector. The improved features of the LP-500 Detector are as follows:

(a) Ultrasonic signals are converted to a constant volume 1200 Hz tone at the headset or lapel speaker.

(b) Improved sensitivity.

(c) Increased battery life.

(d) Separate battery compartment for easier battery replacement.

(e) Probe element insulated from housing to reduce false signals.

(f) Lapel speaker in addition to a headset. The lapel speaker is advantageous where a headset would cover up traffic noise and audible warning signals.

(g) Anodized aluminum case for greater mechanical strength.

3.02 ***The Lumidor LP-500 Leak Detector*** consists of the following components:

(a) ***LP-511 Detector:*** A transistorized device that translates ultrasonic sound waves (35,000 to 45,000 Hz) into an audible 1200 Hz constant volume tone. The detector is housed in an anodized aluminum case approximately 4-1/2 inches wide, 7-1/4 inches high, and 1-3/4 inches deep. It operates on a single 9-volt battery (Eveready 216 or equivalent). The detector is equipped with a HEADSET and speaker jack, PROBE jack, and a combination ON-OFF switch and volume control knob. Removal of the headset or speaker plug disconnects the battery.

(b) ***LP-501 Hand Probe:*** A crystal detector used to pick up sound waves in the 35,000 to 45,000 Hz range. The detector is housed in a black PVC cylinder, 1-5/16 inches in diameter and 6 inches long. The hand probe is directional and has a directional pattern of approximately 20 degrees.

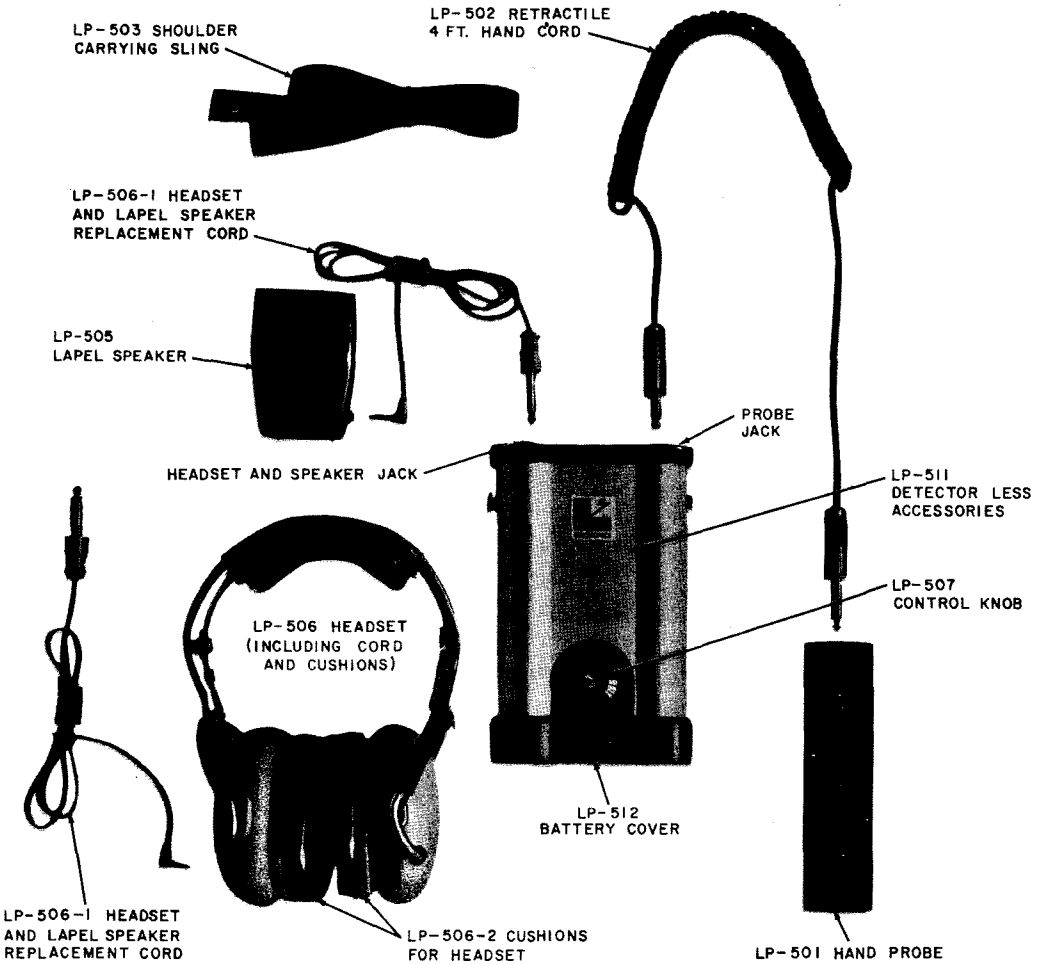
(c) ***LP-506 Headset:*** A 600-ohm headset including cushions and cord for plugging into the headset jack on the LP-511 Detector.

(d) ***LP-505 Lapel Speaker:*** A small speaker enclosed in a plastic housing that is equipped with a clip for fastening the speaker to the clothing.

(e) ***LP-502 Retractile Hand Cord:*** A 4-foot retractile cord terminated in plug fittings to interconnect the hand probe and detector.

(f) ***LP-503 Shoulder Carrying Sling:*** A black leather harness for convenience in carrying the LP-511 Detector during leak locating work.

(g) ***LP-504 Carrying Case:*** A black leather bag with shoulder strap. It is used for storing the hand probe, detector, headset, lapel speaker, and cords.



NOTE:

THE LP-504 CARRYING CASE AND THE 9-VOLT EVEREADY 216 BATTERY, FURNISHED WITH THE LP-500 LEAK DETECTOR ARE NOT SHOWN.

Fig. 5—Lumidor LP-500 Leak Detector

3.03 ***The Lumidor LP-550 Overhead Trolley and Pole Probe*** (Fig. 6) consists of following components:

(a) ***LP-550-21 Pole Section:*** A reinforced plastic pole 5 feet, 2 inches long. It is equipped at the upper end with a receptacle for either the LP-550-22 Trolley or the LP-550-27 Adapter Probe. At the lower end it is equipped with a jack (for the LP-550-26 Transformer Extension Cord) and a ferrule for attaching the pole to a small tree pruner handle extension section. With this arrangement, only the extension cord, rather than the pole section, need be returned for annual electrical retest (9.05).

(b) ***LP-550-22 Trolley with Wheels:*** A metal frame equipped with two plastic wheels and a fixed probe. It also contains a jack for the cord of the LP-550-25 Detachable Probe which may be attached to the pole section by two spring clips. The trolley fits into the receptacle in the pole section and is rolled along the suspension strand and cable so that the fixed and/or detachable probes can detect ultrasonic sound waves of pressurized gas escaping from the cable.

(c) ***LP-550-25 Detachable Probe with Cord:*** A probe equipped with two spring clips for attaching to the pole section, and an extension cord for plugging into the jack on the trolley. The detachable probe can be used in conjunction with the trolley fixed probe to completely scan the cable surface for leaks.

(d) ***LP-550-27 Adapter Probe:*** A probe similar to the hand probe for attaching to the pole section for use on aerial cable where tree interference prevents using the trolley, or on cables on building walls. Under favorable circumstances it can be used to search for cable leaks in manholes without entering the manholes.

(e) ***LP-550-26 Transformer Extension Cord:*** A 25-foot retractile cord equipped with a build-in isolation transformer and two plugs for connecting to the jacks in the LP-500 Detector and the LP-550-21 pole section. Each extension cord is tested to withstand 10,000 volts RMS at 60 Hz. The transformer housing is stamped with a Western Electric inspection number and date when the cord is to be returned for annual electrical retest (9.05).

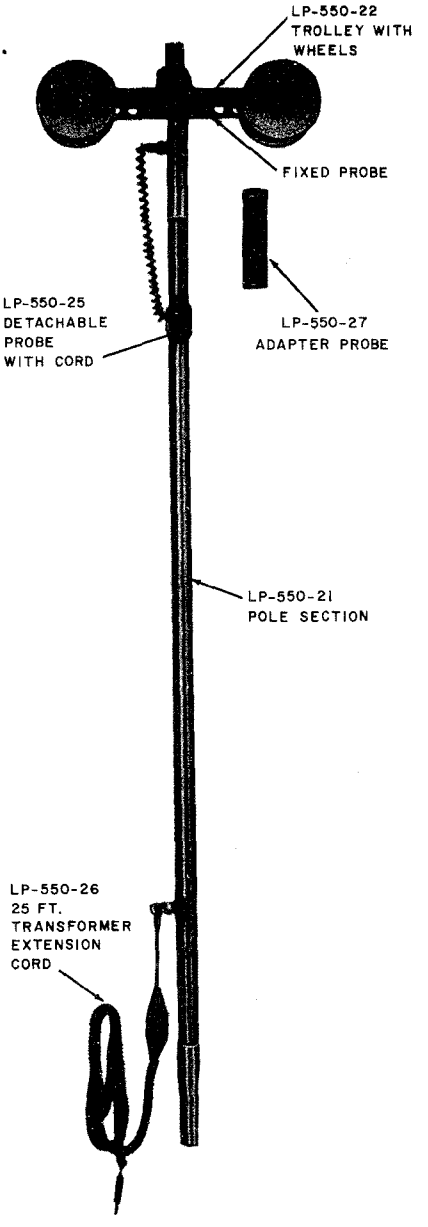


Fig. 6—Lumidor LP-550 Overhead Trolley and Pole Probe

3.04 ***LP-560 Overhead Trolley*** *(*Fig. 7*):* This is similar to the LP-550 except that it is not equipped with an adapter probe.

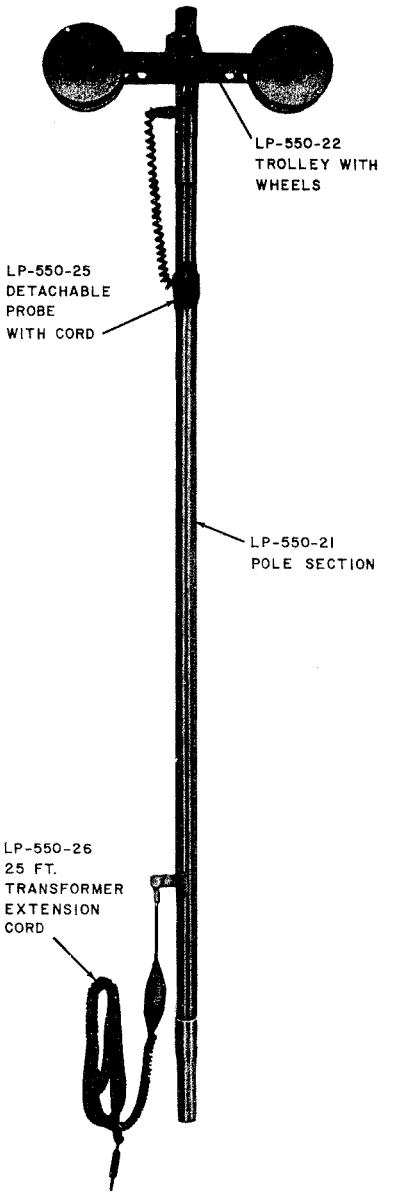


Fig. 7—Lumidor LP-560 Overhead Trolley

3.05 ***LP-570 Pole Probe*** (Fig. 8)**:** This is similar to the LP-550 except that it is not equipped with a trolley or detachable probe.

SUPERSEDED LUMIDOR LP-400-SERIES EQUIPMENT

3.06 ***The Lumidor LP-400 Leak Detector*** (Fig. 9) consists of the following components:

(a) ***LP-410 Leak Detector:*** A transistorized device designed to translate ultrasonic sounds into the audible range. The detector is housed in a black plastic case approximately 3 inches wide, 6 inches long, and 2-1/4 inches deep. It is designed to operate with one Eveready 216 (9 volts) battery or equivalent, and is equipped with a HEADSET jack, a PROBE jack for engaging the probe cord plug, and a combination ON-OFF switch with volume control. Removal of headset plug from HEADSET jack will also disconnect the battery.

(b) ***LP-401 Hand Probe:*** A crystal detector designed to pick up frequencies in the range of approximately 34,000 to 44,000 Hz. The crystal and circuitry are housed in a black PVC cylinder, 1-5/16 inches in diameter and 6 inches long, having a jack for the probe cord plug. The probe is directional and has a directional pattern of approximately 20 degrees.

(c) ***LP-406 Headset:*** A 600-ohm headset with cord and a plug for inserting into the jack on the detector.

(d) ***LP-402 Retractile Cord:*** A 4-foot retractile cord terminated in plug fittings for connecting between the detector and the hand probe where the overhead trolley or pole probe is not required.

(e) ***LP-403 Shoulder Carrying Sling:*** A black leather harness for convenience in carrying the LP-410 Leak Detector during leak locating work.

(f) ***LP-404 Carrying Case:*** A plastic coated leather bag with shoulder strap. It is used for storing the hand probe, headset, and cords. It is approximately 12 by 6 by 9 inches.

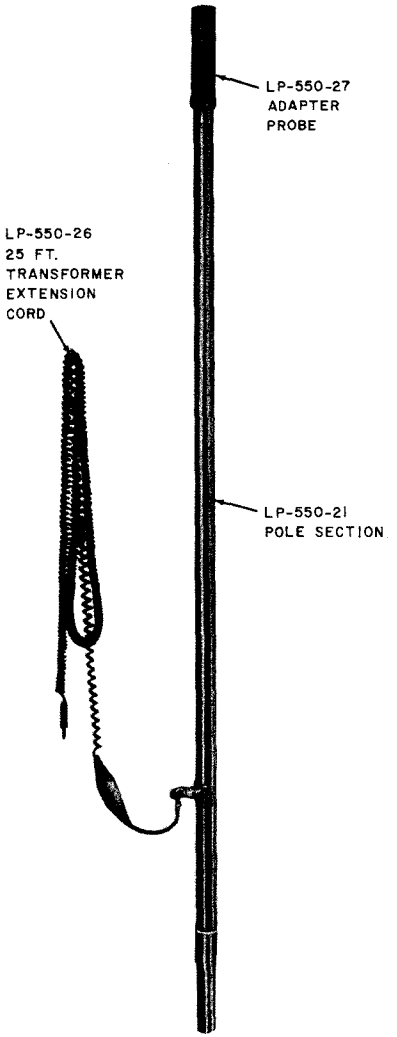


Fig. 8—Lumidor LP-570 Pole Probe

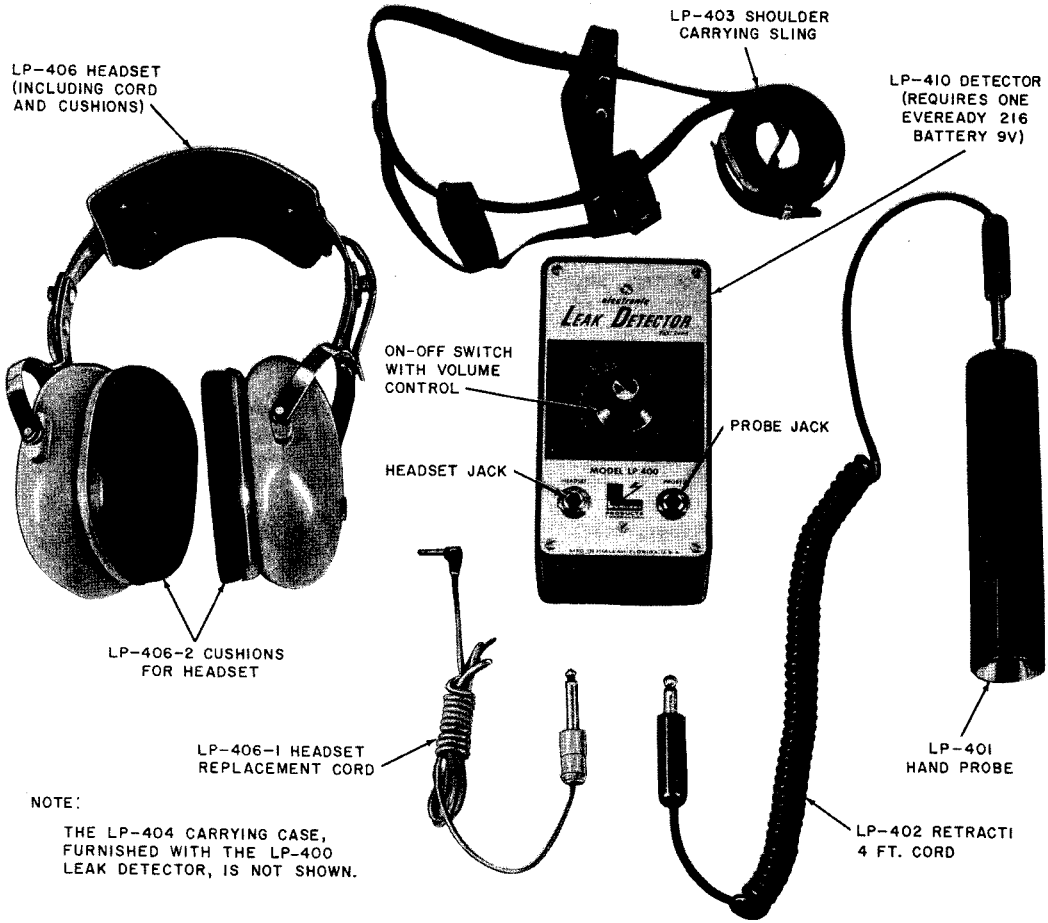


Fig. 9—Lumidor LP-400 Leak Detector

3.07 ***The Lumidor LP-450 Overhead Trolley (Fig. 10) consists of the following components:***

(a) ***LP-450-21 Pole Section:*** A 5-foot reinforced plastic pole equipped at the top with a permanently attached crystal detector probe and an aluminum support for the trolley, at the midsection with a removable crystal detector probe which can be plugged into one of the three jacks which are spaced on 6-inch centers, and at the lower end with a transformer mounted directly above the metal ferrule which is designed to fit the ferrule of the small tree pruner handle extension section. Electrical wiring inside the pole connects the two probes in series to the input side of the transformer. The output side of the transformer is connected to a jack for the plug of the 25-foot extension cord. The circuitry and construction are such as to provide a minimum dielectric strength of 10,000 volts. The ferrule of each unit is stamped with a Western Electric inspection number and dated to show when the pole section is to be returned for annual electrical retest (9.05).

(b) ***LP-450-22 Trolley:*** A metal frame equipped with two plastic rollers and arranged for swivel attachment to the top of the pole. The frame is designed to be rolled along the suspension strand and cable so that the upper and/or lower probes on the pole section can detect the presence of ultrasonic energy resulting from pressurized gas escaping from the cable.

(c) ***LP-450-26 Extension Cord:*** A 25-foot, 2-conductor cord terminated in plug fittings for connecting between the detector and the receptacle at the base of the pole section.

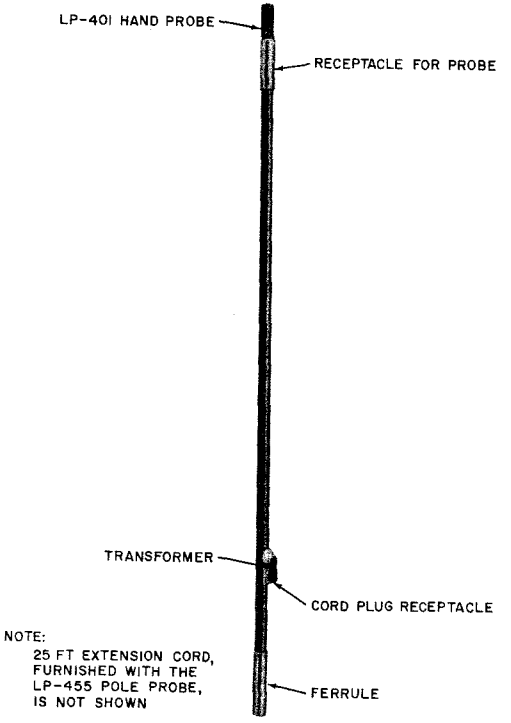


Fig. 10—Lumidor LP-450 Overhead Trolley

3.08 ***The Lumidor LP-455 Pole Probe*** (Fig. 11) consists of a 6-foot reinforced plastic pole equipped at the top with a crystal detector probe and at the lower end with a transformer mounted directly above the metal ferrule which is designed to fit the ferrule of the small tree pruner handle extension section. Electrical wiring inside the pole connects the probe and battery to the input side of a transformer mounted directly above the ferrule. The output side of the transformer is terminated in a jack to fit the plug of the 25-foot straight cord. The circuitry and construction provide a minimum dielectric strength of 10,000 volts. The ferrule of each unit is stamped with a Western Electric inspection number and dated to show when the pole section is to be returned for retest.

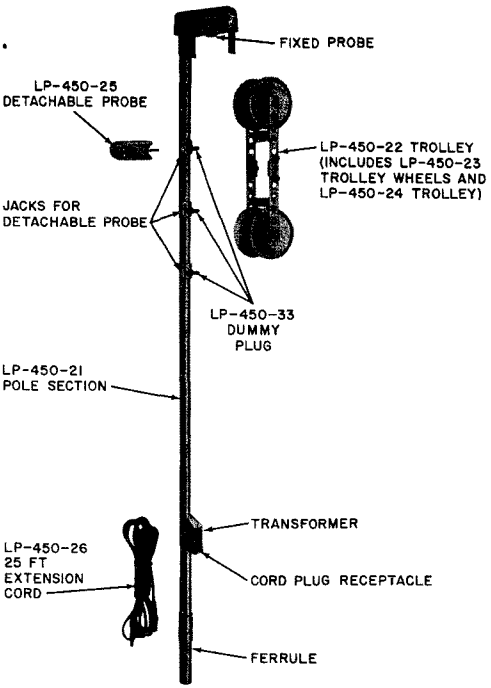


Fig. 11—Lumidor LP-455 Pole Probe

4. DESCRIPTION OF MALOR EQUIPMENT

4.01 ***The Malor Group A ULT 2000 Ultrasonic Leak Locator*** (Fig. 12) consists of the following components:

(a) ***2000-1 Control Box:*** A transistorized device designed to translate ultrasonic sounds into the audible range. The control box is contained in an aluminum housing approximately 3 inches wide, 6-5/8 inches long, and 1-3/4 inches deep. It is designed to operate with one Mallory 302437, 9.4-volt mercury battery, or equivalent. It is equipped with a PHONE jack, a PROBE jack, and a combination ON-OFF switch with volume control.

(b) ***2000-2 Hand Probe:*** A crystal detector designed to pick up frequencies in the range of approximately 35,000 to 45,000 Hz. The crystal and circuitry are housed in an aluminum cylinder approximately 1-3/8 inches in diameter by 6-1/4 inches long. The probe is directional and has a directional pattern of approximately 20 degrees.

(c) ***2000-3 Headset:*** A 600-ohm headset with cord and a plug for inserting into the jack on the control box.

(d) ***2000-4 Coiled Extension Cord:*** An 8-foot retractile cord terminated in plug fittings for connecting between the hand probe and the control box.

(e) ***2000-8 Hand Probe Cover:*** A screen cover for protecting the open end of the hand probe.

(f) ***2000-10 Canvas Storage Bag:*** Used for storing the control box, probe, headset, and cords.

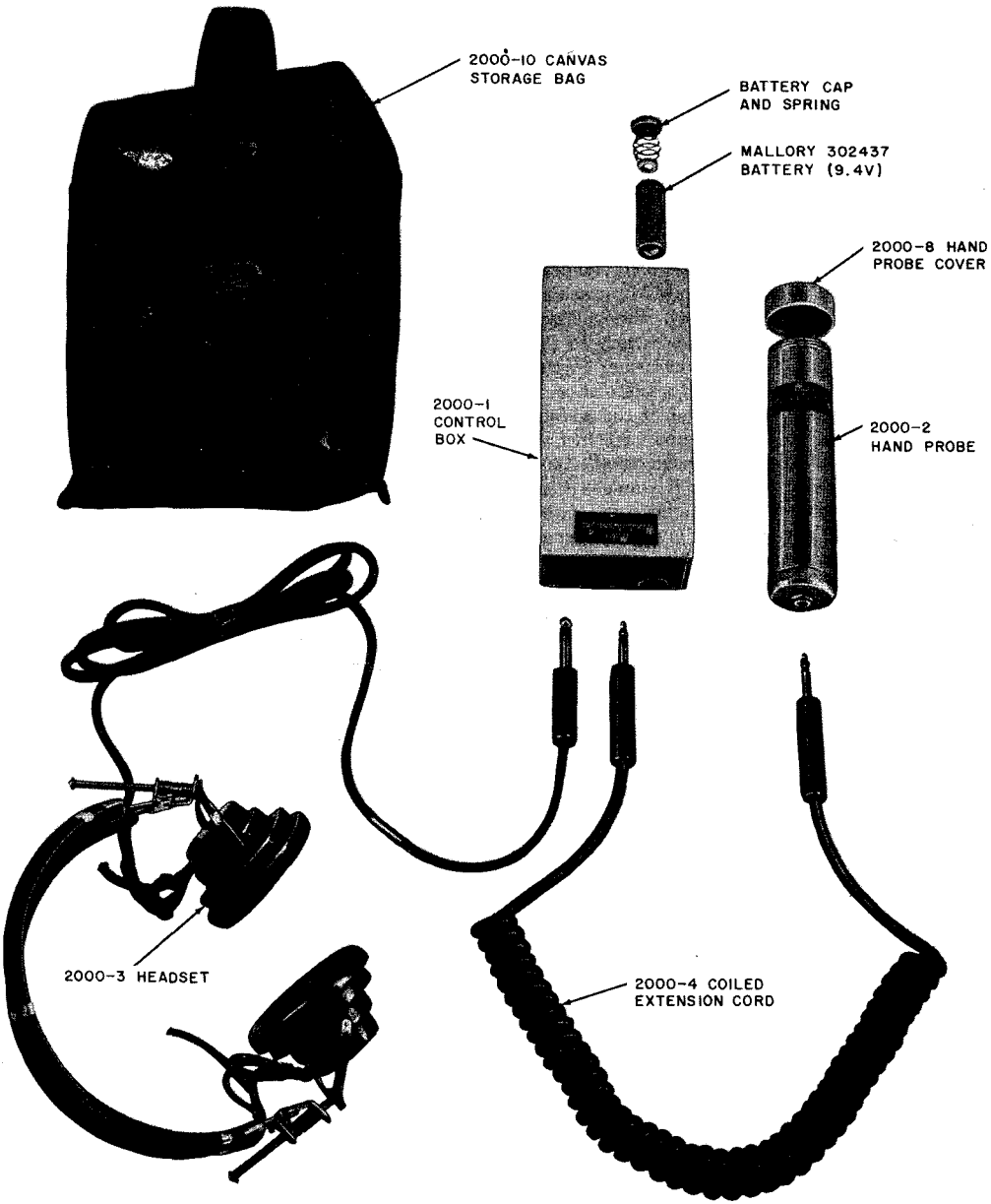


Fig. 12—Major Group A ULT 2000 Ultrasonic Leak Locator

4.02 ***The Malor Group B ULT 2000 Aerial Carriage Assembly,*** illustrated in Fig. 13, consists of the following components:

(a) ***2000-6 Isolation Mounting Pole Assembly:*** A 5-foot reinforced plastic pole equipped at the top end with the hand probe/battery housing assembly to receive the 2000-2 Hand Probe (supplied with the ULT 2000 Ultrasonic Leak Locator). It is designed to operate with one Mallory 302437, 9.4-volt mercury battery or equivalent. The pole assembly is also equipped with a device with a locking screw for attaching the detachable carriage assembly. Wiring inside the pole connects the probe and battery to the input side of the isolation transformer in the pole. The output side of the transformer is terminated in a jack for one end of the 25-foot extension cord. The circuitry and construction provide a minimum dielectric strength of 10,000 volts. The ferrule of each unit is stamped with a Western Electric inspection number and dated to show when the pole assembly is to be returned for annual electrical retest (9.05).

(b) ***2000-5 Detachable Carriage Assembly:*** An aluminum arm assembly with an attached wheel assembly. The carriage assembly is designed to be pushed along the suspension strand and cable so that the probe can detect the presence of ultrasonic energy generated by pressurized gas escaping from the cable.

(c) ***2000-7 Extension Cord:*** A 25-foot, 2-conductor cord terminated in plug fittings for connecting between the control box and the jack at the base of the pole section.

5. ▶DESCRIPTION OF B ULTRASONIC REFLECTOR◀

5.01 The B Ultrasonic Reflector (Fig. 14) consists of a 10-inch primary parabolic reflector, a secondary hyperbolic reflector, a receiving collar to mount an ultransonic hand probe, a detachable pistol-grip handle with wrist strap, aiming sights, and a carrying case.

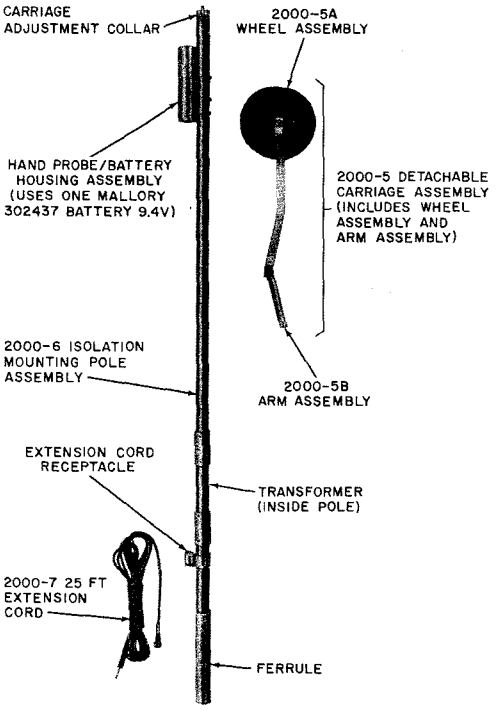


Fig. 13—Malor Group B ULT 2000 Aerial Assembly

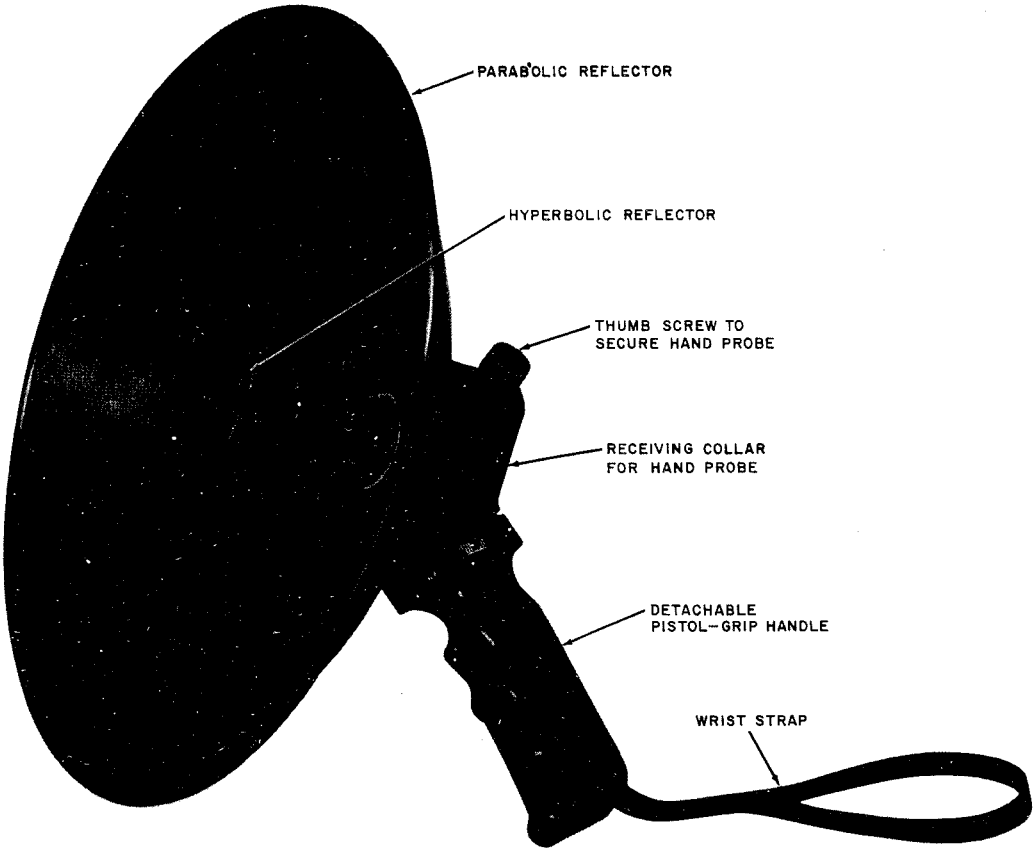


Fig. 14—B Ultrasonic Reflector

5.02 ▶The primary parabolic reflector concentrates ultrasonic energy produced by leaks in pressurized cable and focuses that energy onto the smaller secondary hyperbolic reflector. From the hyperbolic reflector the ultrasonic energy is directed through a screened hole at the center of the parabolic reflector onto the microphone of the hand probe of any ultrasonic detector covered in this section (Fig. 15). By aligning the front and rear aiming sights, the exact location of the leak can be determined.◀

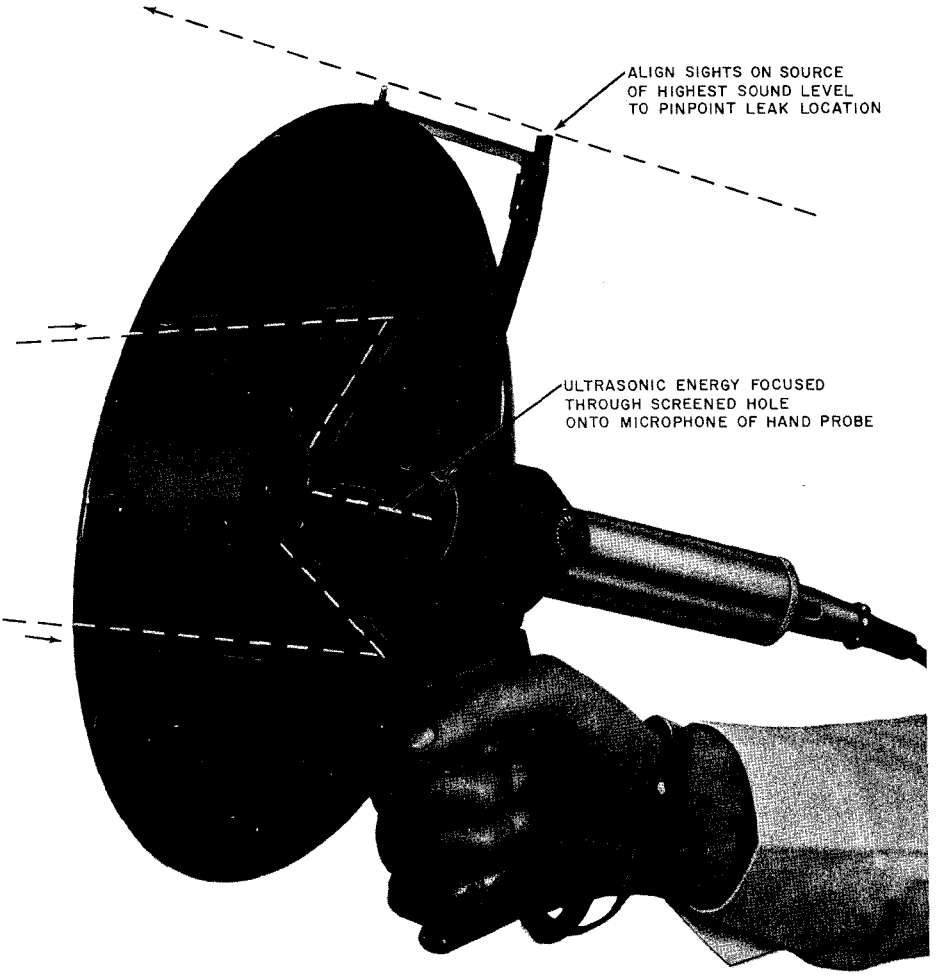


Fig. 15—B Ultrasonic Reflector—Principle of Operation

6. ASSEMBLY OF EQUIPMENT

6.01 ***Hewlett-Packard Delcon Division 4916A Ultrasonic Translator Detector*** (Hand Probe Operations):

(1) Connect the probe to the translator with the 6-foot coiled cord. Connect the headset plug to the translator. Turn the power switch on by pulling out on the volume control knob of the translator. Adjust the control knob until a low but steady background noise is heard in the headset. Verify the proper functioning of the equipment by rubbing the fingertips together, close to the open end of the probe. An amplified hissing tone from the headset indicates that the equipment is functioning properly.

(2) Three Mallory RM-12R 1.4-volt batteries are required in the translator.

6.02 ***Hewlett-Packard Delcon Division 18003A Mobile Reflector*** (Aerial Cable Operations):

(1) Connect one end of the 25-foot straight cord to the translator and the other end to the transformer jack on the pole section. Connect the headset plug to the translator. Turn the power switch on by pulling out on the volume control knob of the translator. Turn the ON-OFF switch in the top housing of the pole section to the ON position. (Early model mobile reflectors have no ON-OFF switch; a mercury switch within the top housing closes the circuit when the pole section is vertical.) Adjust the volume knob until a low but steady background noise is heard in the headset. Verify the proper functioning of the equipment by rubbing the fingertips together, close to the open end of the probe in the top housing. An amplified hissing tone from the headset indicates that the equipment is functioning properly.

(2) One Mallory TR-164 or Eveready E-164 mercury battery, 5.6 volts, is required on mobile reflectors having an ON-OFF switch. One Mallory RM-12R mercury battery, (1.4 volts) is required on mobile reflectors without an ON-OFF switch.

(3) Attach the bridge assembly to the top housing on the pole section, making certain that it is secured by the brackets on the underside of the top housing.

(4) Attach the reflector assembly to the pole section so that it will provide adequate clearance for positioning the mobile reflector on the strand. Generally the reflector should be positioned 6 to 8 inches below the wheels of the bridge assembly. Make certain that the two locks on the reflector assembly are secured.

6.03 ***Hewlett-Packard Delcon Division 18002A Quik-Search Wand*** (Aerial and Block Cable and UG Cable Exposed in Manholes):

(1) Connect one end of the 25-foot straight cord to the translator and the other end to the transformer jack on the pole section. Connect the headset plug to the translator. Turn the power switch on by pulling out on the volume control knob of the translator. Turn the ON-OFF switch on the wand to the ON position. Adjust the volume knob until a low but steady background noise is heard in the headset. Verify the proper functioning of the equipment by rubbing the fingertips together, close to the open end of the probe at the top of the pole section. An amplified hissing tone from the headset indicates that the equipment is functioning properly.

(2) One Mallory TR-164 or Eveready E-164 mercury battery (5.6 volts) is required in the Quik-Search Wand.

6.04 ***Lumidor LP-500 Leak Detector*** (Hand Probe Operations):

(1) Connect the hand probe to the detector with the 4-foot retractile cord. Connect the LP-506-1 Cord to the headset (or lapel speaker) and to the detector. Turn the control knob from the OFF position and increase the volume until the 1200 Hz tone is heard, then decrease the volume slowly until the tone stops. Almost no background noise will be heard when the set is properly adjusted. Verify that the equipment is operating properly by rubbing the fingertips together near the open end of the probe. If the equipment is functioning properly, the 1200 Hz tone will be heard.

(2) One Eveready 216 battery (9 volts) or equivalent is required in the detector.

6.05 ***Lumidor LP-550 Overhead Trolley and Pole Probe***

AERIAL CABLE

(1) Connect the 25-foot transformer extension cord between the pole section and the detector, plugging the end of the cord containing the transformer into the jack at the lower end of the pole section.

(2) Insert the trolley into the receptacle in the top of the pole section making sure the locking pin is securely fastened.

(3) Clip the detachable probe to the pole section and insert the probe cord into the jack in the trolley section.

(4) Adjust the detector control knob and verify that ***both*** probes are functioning properly as described in 6.04 (1).

AERIAL CABLE WITH TREE INTERFERENCE, BLOCK CABLE, AND UG CABLE IN MANHOLES

(5) Connect the transformer extension cord between the detector and the pole section as in (1).

(6) Insert the adapter probe into the receptacle in the top of the pole section. Adjust the detector control knob and verify that the equipment is functioning properly as described in 6.04 (1).

6.06 ***Lumidor LP-560 Overhead Trolley*** (Aerial Cable Operations): This unit is assembled the same as the LP-550 as described in 6.05 (1) through (4).

6.07 ***Lumidor LP-570 Pole Probe*** (Aerial Cable with tree interference, Block Cable, and UG Cable in Manholes): This unit is assembled the same as the LP-550 as described in 6.05 (5) and (6).

6.08 ***Lumidor LP-400 Leak Detector*** (Hand Probe Operations):

(1) Connect the probe to the detector with the 4-foot retractile cord. Connect the headset cord to the headset and to the detector. Turn the control knob from the OFF position and then adjust the volume until a low but steady background tone is heard in the headset. Verify the proper functioning of the equipment by rubbing the fingertips together close to the open end of the probe. An amplified hissing tone from the headset indicates that the equipment is functioning properly.

(2) One Eveready 216 battery (9 volts) or equivalent is required in the detector.

6.09 ***Lumidor LP-450 Overhead Trolley*** (Aerial Cable Operations):

(1) Connect one end of the 25-foot extension cord to the detector and the other end to the transformer jack on the pole section. Connect the headset cord to the headset and to the detector. Turn the control knob from the OFF position and then adjust the volume until a low but steady background tone is heard in the headset.

(2) Plug the detachable (lower) probe into one of the three jacks on the pole section. On single cable runs and wherever else possible, the detachable probe should be in its top position.

(3) Verify the proper functioning of the equipment by rubbing the fingertips together, close to the open end of ***each*** probe. Cover one probe opening while checking the other. An amplified hissing tone from the headset indicates that the equipment is functioning properly.

(4) Attach the trolley to the bracket in the top of the pole section, ***making certain that both locking pins are tight and are secured in the bracket.***

(5) Insert dummy jack plugs in the two unused jack positions to protect the contacts from dirt, etc.

6.10 ***Lumidor LP-455 Pole Probe*** (Aerial and Block Cable and UG Cable Exposed in Manholes): Connect one end of the 25-foot extension cord to the detector and the other end to the transformer jack on the pole section. Connect the headset cord to the headset and to the detector. Turn the control knob from the OFF position and then adjust the volume until a low but steady background tone is heard in the headset. Verify the proper functioning of the equipment by rubbing

the fingertips together close to the open end of the probe at the top of the pole section. An amplified hissing tone from the headset indicates that the equipment is functioning properly.

6.11 ***Malor Group A ULT 2000 Ultrasonic Leak Locator*** (Hand Probe Operations):

(1) Connect the probe to the control box with the 8-foot retractile cord. Connect the headset plug to the control box. Turn the control knob from the OFF position and adjust the volume until a low but steady background tone is heard in the headset. Verify the proper functioning of the equipment by rubbing the fingertips together close to the open end of the probe. An amplified hissing tone from the headset indicates that the equipment is functioning properly.

(2) One Mallory 302437, 9.4-volt mercury battery or its equivalent is required in the control box.

6.12 ***Malor Group B ULT 2000 Aerial Assembly:*** Connect one end of the 25-foot extension cord to the control box and the other end to the extension cord jack on the pole assembly. Connect the headset to the control box. Insert the probe into the hand probe/battery housing assembly at the top of the pole. Turn the control knob from the OFF position and adjust the volume until a low but steady background tone is heard in the headset. Verify the proper functioning of the equipment by rubbing the fingertips together close to the open end of the probe. An amplified hissing tone from the headset indicates that the equipment is functioning properly.

(a) ***For Trolleying Operations on Aerial Cable,*** insert the cylindrical end of the detachable carriage assembly into the ferrule at the top of the pole. Make certain to secure it in place with the locking screw on the ferrule.

(b) ***For Probing Operations on Aerial and Block Cable and on UG Cable Exposed in Manholes,*** no additional assembly is required.

6.13 ***B Ultransonic Reflector:***

(1) Attach the pistol-grip handle to the reflector by means of the thumbwheel and threaded bolt.

(2) Insert the hand probe of any approved ultrasonic detector into the receiving collar at the rear of the reflector and tighten the thumbscrew finger-tight.

(3) Connect the probe, translator, and headset in the usual manner.

7. USE

7.01 Ultrasonic leak locating equipment is designed to detect sound energy that is generated as gas escapes from pressurized cable or equipment. While the equipment screens out the normal audible sounds such as from vehicular traffic, conversation, etc, it will detect certain inaudible sound waves of the type generated by the scraping of shoes on snow, gravel, or dried grass and leaves. These extraneous sounds can interfere with leak locating and it is important that the workman should be aware of their effects.

7.02 The generation of detectable sound waves, and therefore the usefulness of the equipment is dependent upon the pressure existing in the cable at the fault and the type of fault. A pin-hole type opening will result in gas escaping at a higher velocity than at a ring cut and accordingly can be more readily detected.

7.03 In general a pressure of at least 5 psi is desirable for leak locating purposes. Pressures in excess of 10 psi are not recommended.

7.04 The distance of the probe from the fault is also significant in detecting leaks; the shorter the distance the better the leak detecting capability. This becomes particularly significant on aerial cable work where trees or obstructions may make it more difficult to bring the probe close to the leak.

7.05 ***Aerial Cable Leak Locating:*** When the leak has been localized by flow or gradient analysis, if the cable pressure at the leak area is not at least 5 psi, it will be advisable to raise the pressure temporarily to 10 psi with nitrogen gas, regulator, and pressure hose.

(a) ***B Ultrasonic Reflector Method:***

(1) This method, in most instances, should replace the trolley method, 7.05(b), and the pole probe method, 7.05(c).

(2) At selected locations, dependent upon pneumatic resistance, condition of sheath, etc, increased air pressure may be applied.

(3) With the equipment assembled (6.13), slowly scan segments of the cable (Fig. 16). Overlapping adjoining segments will decrease the possibility of missing the leak.

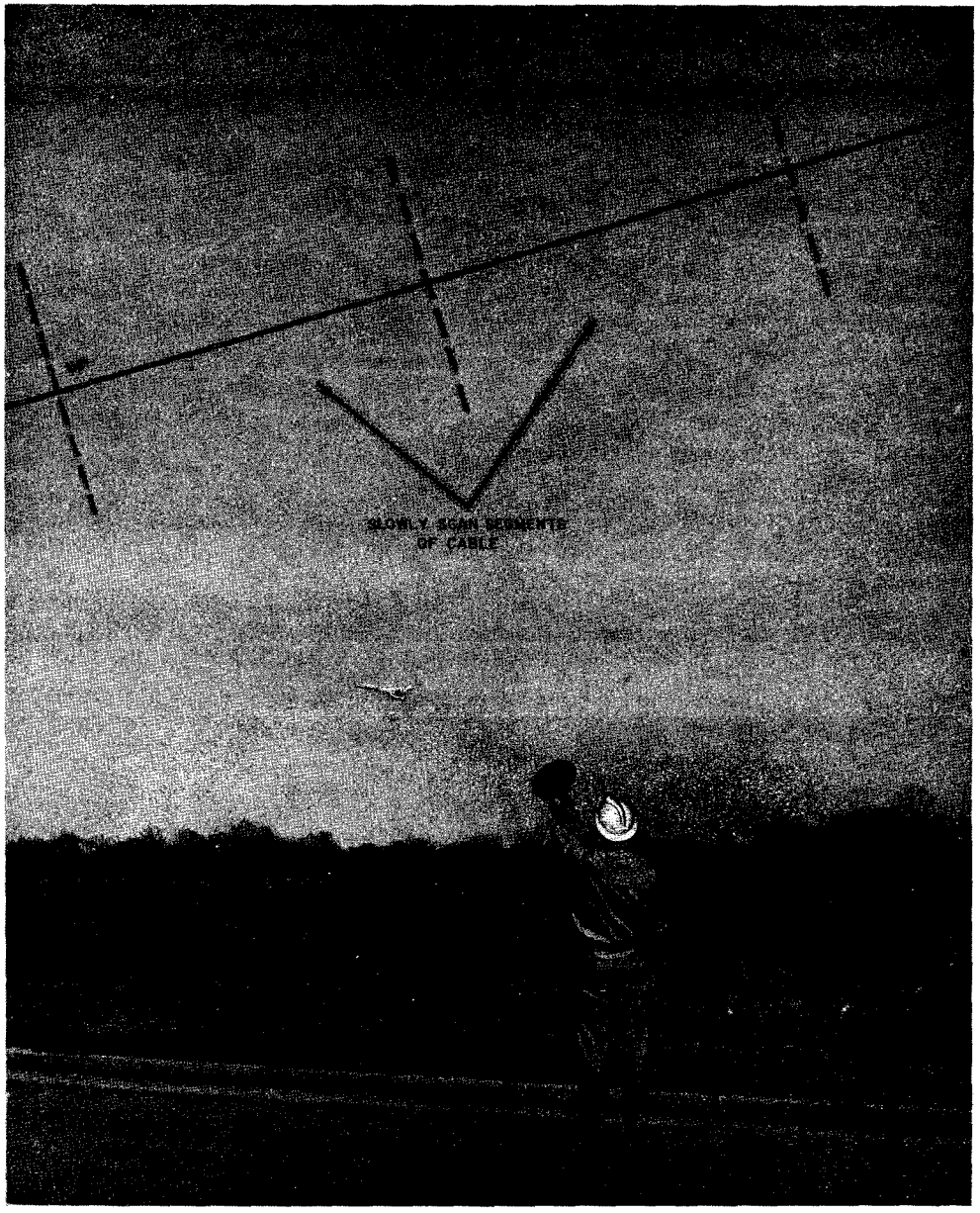


Fig. 16—Scanning Cable Segments with B Ultrasonic Reflector

(4) The leak can be pinpointed by aligning the sights with the location on the cable from which the highest level of ultransonic energy is heard (Fig. 17).

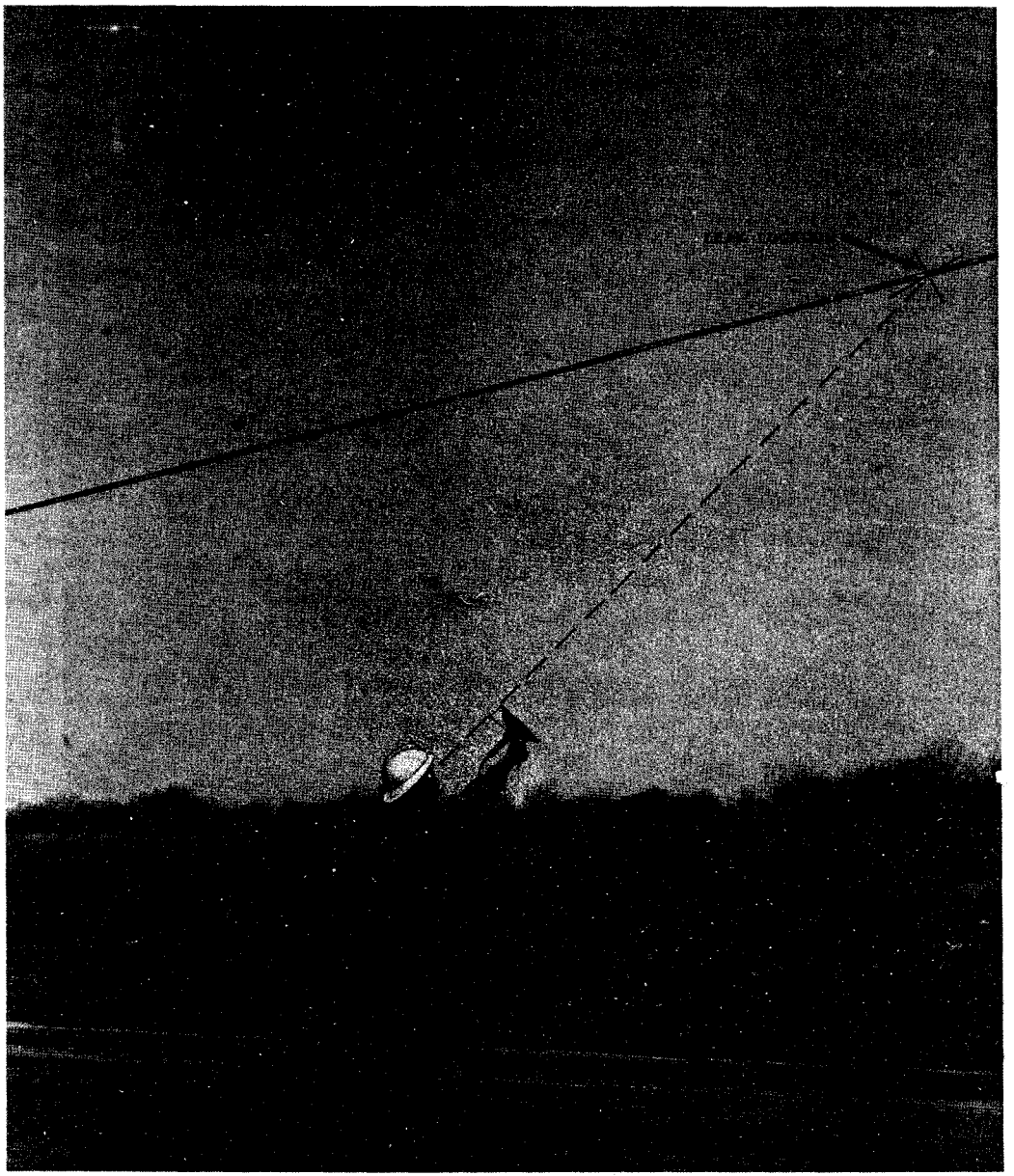


Fig. 17—Pinpointing Leak Location

Note: When using the B Ultrasonic Reflector and probe, the effect produced in the headphones at a distance of 20-25 feet from the leak is equivalent to that produced when using only the probe at a distance of 1-2 feet from the leak.

(b) ***Trolley Method*** (Fig. 18):

(1) This method is best suited to use in cable sections clear of trees or other obstructions. It has the advantage of positioning the probe consistently close to the cable.

(2) With the equipment assembled and connected as described in Part 6, insert a small tree pruner handle extension section into the ferrule of the plastic pole section. Add other extension sections as necessary to permit placing the trolley wheels on the suspension strand.

(3) Using the extension sections, push the trolley slowly along the strand, paying particular attention to wiped joints, splice cases, valves, and the entire T-zone at the pole.

(4) It may be necessary in some cases, such as at guard arm locations or where drop wires or occasional trees interfere, to remove the trolley temporarily and scan the cable with the probe mounted on the pole section.

(c) ***Wand or Pole Probe Method*** (Fig. 19):

Fig. 18—Locating a Leak Using Trolley Method

Fig. 19—Locating a Leak Using Wand or Pole Probe Method

(1) This method is best suited for use where there is considerable tree interference or for checking cable on the walls of buildings.

(2) With the equipment assembled and connected as described in Part 6, insert a small tree pruner handle extension section into the ferrule of the plastic pole section. Add other extension sections as necessary to permit bringing the probe to within 1 or 2 feet of the cable.

(3) Walk slowly below or to the side of the cable, keeping the probe aimed at the cable. It should be kept in mind that the probe is directional and that a leak can be missed unless the probe is consistently pointed at the cable. Pay particular attention to wiped joints, splice cases, valves, and the entire T-zone at the pole.

(d) ***Hand Probe Method:***

(1) This method can be used to advantage in the final pinpointing of the leak or in checking for leaks at terminals, load coils, apparatus cases, etc.

(2) With the equipment assembled and connected as described in Part 6, bring the probe close to the cable, terminal, etc, pointing the open end of the probe to the pressurized facility being checked.

7.06 ***Leak Locating on Cables in Manholes and Cable Vaults:*** The general location of the leak should first be determined by flow or gradient analysis.

(a) ***Hand Probe Method*** (Fig. 20):

(1) This is the standard method for use when working in a manhole or a cable vault.

(2) With the equipment assembled and connected as described in Part 6, point the open end of the probe toward the cable and scan the entire length of exposed cable paying particular attention to wiped joints, splice cases, valves, etc. Keep in mind that with relatively low pressure in the cable or at large leaks where the gas is escaping at low velocity, it is important to keep the open end of the probe within a few inches of the cable. When the tone indicates the presence of a leak, it may be advantageous to lower the volume for greater precision.

(3) It will often be found that reflections of the escaping pressurized air, as it strikes adjacent cables, walls, floor, etc, may give false indications of the leak location. With experience, the workman will be able to distinguish the variations in tone signal strength and compensate for these effects.

(4) When the leak has been located it should be temporarily sealed with a piece of vinyl tape so that all cables in the manhole or vault can be scanned for additional leaks without interference while the workman is at the location.

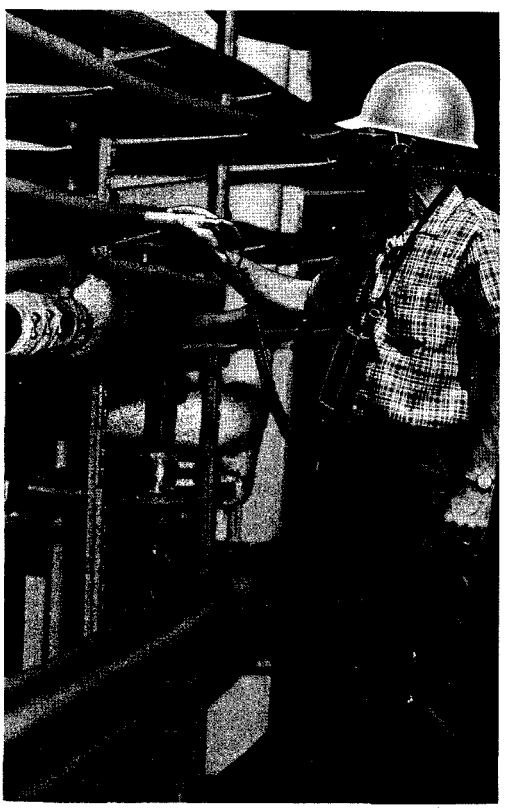


Fig. 20—Locating a Leak Using Hand Probe Method

(b) ***Wand or Pole Probe Method:***

(1) This method is particularly advantageous in that, under favorable conditions, a leak test can be made without the workman entering the manhole.

(2) With the equipment assembled and connected as described in Part 6, and while standing at street level, lower the plastic pole section into the manhole and manipulate it so that the open end of the probe points toward the cables. Scan the entire length of exposed cable.

(3) If a leak is detected, the workman should then, after following the safety precautions in Section 620-140-501, enter the manhole and pinpoint the leak by the hand probe method.

8. PRECAUTIONS

8.01 The soft rubber caps on the earphones of the headset reduce the ability of the workman to hear the normal outside noises. Accordingly it is particularly important, when wearing the headset, to be continuously alert to traffic conditions.

8.02 ***Do not use probes attached to tree pruner handles for aerial work.*** Specially designed pole sections, tested to a minimum dielectric strength of 10,000 volts and described in Parts 2, 3, and 4, are available for aerial work.

8.03 Ultrasonic leak locating equipment should be handled with care to ensure efficient and dependable operation. The probe, headset, ▶B Ultrasonic Reflector,◀ translator (or detector, or control box), and associated cords should be kept in the carrying case when not in use.

8.04 Do not apply high pressure to cable with the thought of simplifying leak locating. Sustained pressure in excess of 10 psi can cause leaks at joints, wrappings, etc. Such pressure can also result in bulging faceplates on unplugged cross-connecting terminals. Best overall results will be obtained by:

- Determining the general leak area from flow or gradient analysis.
- Raising the cable pressure where necessary to obtain a test pressure of 5 to 10 psi.
- Using the B Ultrasonic Reflector or equipment that will bring the probe close to the cable under test.

8.05 Gain or volume of the translator generally should be adjusted to less than maximum to decrease operator fatigue and to make the signal produced by the leak more easily distinguishable from the noise produced in the set itself. Pinpointing the leak is easier if the volume is reduced still further as the leak is approached.

9. MAINTENANCE

9.01 When preparing to use the equipment and no tone or a weak tone is heard, check that cord plugs are properly engaged in the receptacles and that the headset plug is properly engaged in its associated jack. Also check cords for damage.

9.02 If a check of the cords and plugs fails to disclose the trouble, the fault is probably due to a weak battery or batteries. When replacing batteries, be sure that proper polarity is maintained and that the battery cap screw is securely in place.

9.03 If a satisfactory tone cannot be obtained, return the equipment for repair. Repairs to the electronic components of this equipment should not be attempted in the field.

9.04 When ultransonic equipment requires repair, it shall be tagged ***For Repair by Manufacturer*** before being returned to Western Electric.

9.05 A retest date (month and year, as 6-71) is stamped on each of the following pieces of equipment. This signifies the date that the equipment is to be returned to Western Electric for annual electrical retest. Equipment returned for retest should be tagged ***For Electrical Retest*** before being returned to Western Electric.

Note: Return the specified piece part only, and not the entire assembly.

- Hewlett-Packard Delcon Division 18003-63867 Pole Section (Part of 18003A Mobile Reflector)
- Hewlett-Packard Delcon Division 18002A Quik-Search Wand
- Lumidor LP-550-26 Transformer Extension Cord (25-ft.)

- Lumidor LP-450-21 Pole Section (Part of LP-450 Overhead Trolley)
- Lumidor LP-455 Pole Probe
- Malor 2000-6 Isolation Mounting Pole Assembly (Part of Group B ULT-2000 Aerial Assembly)

10. REPLACEMENT PARTS

10.01 The following are available as replacement parts for equipment manufactured by the ***H. P. Delcon Division:***

PART NUMBER	NAME OF PART
80027	Ultrasonic Translator
80027.6	Carrying Strap
18014A	Protective Cap
18015A	Coiled Cord (6 ft)
18016A	Straight Cord (25 ft)
18017A	Headset
18019A	Utility Carrying Case
18020A	Probe
18029A	Lapel Speaker
18003-63867	Pole Assembly
18003-63812	Bridge Assembly (Includes Two Wheels)
18003-63813	Reflector Assembly
18003-63814	Wheel

10.02 The following are available as replacement parts for equipment manufactured by the ***Lumidor Products Corp:***

LP-400-Series:

PART NUMBER	NAME OF PART
LP-401	Hand Probe
LP-402	Retractile Cord (4 ft.)
LP-403	Shoulder Carrying Sling
LP-404	Carrying Case
LP-406	Headset (Includes Cord and Cushions)
LP-406-1	Headset Cord
LP-406-2	Cushions for Headset
LP-407	Control Knob
LP-408	Plastic Case
LP-410	Leak Detector
LP-450-21	Pole Section
LP-450-22	Trolley (Includes Two Wheels)
LP-450-23	Trolley Wheel
LP-450-24	Trolley (Without Wheels)
LP-450-25	Detachable Probe
LP-450-26	Extension Cord (25 ft.)
LP-450-33	Dummy Plug
LP-455	Pole Probe, Less LP-401 Hand Probe

LP-500-Series

PART NUMBER	NAME OF PART
LP-501	Hand Probe
*LP-502	Retractile Cord (4 ft.)
LP-503	Shoulder Carrying Sling
*LP-504	Carrying Case
LP-505	Lapel Speaker
*LP-506	Headset
*LP-506-1	Headset and Lapel Speaker Replacement Cord
*LP-506-2	Cushions (2) for Headset
LP-507	Control Knob
LP-511	Detector (Less Accessories)
LP-512	Battery Cover
LP-550-21	Pole Section
LP-550-22	Trolley (Includes Two Wheels)
*LP-550-23	Trolley Wheel
LP-550-24	Trolley
LP-550-25	Detachable Probe with Cord
LP-550-26	Transformer Extension Cord (25 ft.)
LP-550-27	Adapter Probe

* Interchangeable with LP-400 parts

10.03 The following are available as replacement parts for equipment manufactured by ***Malor Manufacturing, Inc:***

PART NUMBER	NAME OF PART
2000-1	Control Box
2000-2	Hand Probe
2000-3	Headset
2000-4	Coiled Extension Cord (8 ft.)
2000-5	Detachable Carriage Assembly
2000-5A	Wheel Assembly
2000-5B	Arm Assembly
2000-6	Isolation Mounting Pole Assembly
2000-7	Extension Cord (25 ft.)
2000-8	Hand Probe Cover
2000-10	Canvas Storage Bag

10.04 The following are available as replacement parts for the B Ultrasonic Reflector:

Screen Assembly

Thumb Screw

Rear Sight

Pistol-Grip Handle

Carrying Case

10.05 Orders for replacement parts should specify the part name, manufacturer, and part number, as shown in the following typical examples:

(Quantity) Set, Head, H. P. Delcon Div., 18017A

(Quantity) Probe, Detachable, Lumidor Products Corp., LP-450-25

(Quantity) Box, Control, Malor Mfg. Inc., 2000-1