# CHAPTER 6.--INSTALLATION TECHNIQUES

## 6.1 The Basic Philosophy

The investment involved in any communication system represents a considerable sum. Even though it is desirable that the system work properly each and every time it is called into use, some failures are bound to occur. Most failures, however, and especially those that occur most frequently, are due to poor installation techniques. An extra hour spent at an installation site can save many maintenance trips and many frustrating hours of system troubleshooting.

Typical faults likely to cause communication outrage are

Pager phone systems

Poor splices aggravated by corrosion.

Strain relief not provided.

Drip loop not provided.

Incorrect branch connections.

Overloading the circuit.

Poor battery connections.

Improper wire size or type.

Lightning strikes.

Improper placement of wire runs.

Carrier phones

Mounting transceiver near load resistors or other sources of heat.

Tracks not electrically bonded.

Cable abrasion due to poor mounting location.

Disconnected battery.

Poor mechanical installation.

Each installation should be well planned. After an installation is completed, the technician should ask the question, "What can go wrong with this unit or line?" Remember the adage, "Whatever can go wrong, will." Preventive measures taken during installation will pay off in the long run.

## 6.2 Pager Phone Installation

The pager phones used in many underground coal mines are battery-operated, party-line telephones with provisions for loudspeaker paging. The system is usually two-wire, nonpolarized, and operated by self-contained batteries. Many of the individual units are certified as permissible.

### 6.2.1 Mounting

Pager phones are designed to be mounted on an upright support at the desired location. For convenience, the phone should be mounted 5 feet above the floor where there is no obstruction to using the handset or removing the cabinet front cover for servicing or battery replacement. In low-coal situations, a suitable height for installation should be selected convenient to the normal operator's position at the site selected. About 12 inches of free space on each side of the phone should be provided for cabinet access. The phone should be protected against direct exposure to dripping water and should not be allowed to rest in a puddle of water. The mounting location should be convenient to a work location and have a safe, unobstructed area for a worker to stand and use the phone. The phone must be in a location where the worker will not be in the path of moving vehicles or falling debris. Each telephone is normally well insulated, but it is still good practice to provide an insulating mat or dry planking for the user to stand on.

6.2.2 Connections

For handling convenience, the branch line or connecting cable to each individual telephone can be a lighter wire gage than the main cable. Each connection to the main line should be a good electrical and mechanical joint, protected by a careful double wrap of plastic electrical tape.

Special care should be taken to insure that each splice is a good electrical and mechanical connection. Connections that are of poor or marginal quality, or that are not adequately protected from moisture, will contribute to poor performance. During periods when humidity levels are high, especially during the summer months, corrosion will form on all exposed splices. As this corrosion builds, audio levels decrease and line noise increases until eventually the entire system becomes useless.

Connections at the phone depend on each manufacturer's design and on individual state or local requirements. A majority of the phones provide two exposed spring-loaded terminals for attaching the wires. For proper connection, it is necessary to strip the installation away from each conductor in the pair, seal off the exposed area of the cable with plastic electrical tape to keep out moisture, and then insert one of the exposed conductors into each of the cabinet terminals. Some states, such as Pennsylvania, do not allow the use of exposed terminals at the face area of gassy mines. For these applications, some phones are equipped with twist-lock connectors at the end of a short cable. Each connector is mated with a similar connector on the drop or branch line to complete the installation. In either type of installation, there should be a drip loop below the cabinet to prevent condensate from running down the cable into the cabinet.

6.2.3 Batteries

Pager phones are usually operated by one (or two) 12-volt, dry-cell batteries, NEDA No. 923 or No. 926 (National Electronic Distributors Association). To install batteries, it is necessary to open the pager phone cabinet and inspect the battery compartment. Remove the old battery by loosening the retaining clamp, and either unscrew the battery terminals to release the battery wires or remove the battery plug, depending on the battery type. Remove the battery, and carefully wipe out the battery compartment to remove dirt and moisture. Place a fresh battery in the compartment, and secure the retaining clamps tight enough to restrain the battery without crushing or bending the battery case. Reconnect the battery wires, being careful to observe the polarity markings noted on the case. If the plug-connector type is used, do not force the connector. Correct polarity is maintained when the larger connector pin fits in the larger hole. The difference in pin sizes is not great, so a mismatch can be forced. If the connector does not mate easily, reverse it and try again without forcing. After replacing the battery, close the cabinet and mark the date of battery replacement either on the outside of the cabinet or in a log book.

CAUTION

Pager phone circuits are normally designed to provide sufficient current limiting with the specified battery. If other battery types are used, such as the nickel-cadmium rechargeable type or one of the alkaline, long-life, high-current varieties, the circuit may not be able to limit the available current to a safe value. REPLACE WITH RECOMMENDED BATTERY ONLY.

Battery life is not easy to predict, because of the many operating variables that affect the average current drain. In general, the batteries in a telephone system that is used many times a day may have to be replaced every 4 to 6 weeks, while a telephone system that is seldom used may keep its batteries at usable strength for 4 to 6 months.

Each battery change should be recorded, either on the telephone cabinet or in a central log. Experience gained over a period of time will help predict when a battery in a particular phone is reaching the end of its useful life. Periodic verification of battery status at each phone should be made with a voltmeter and recorded in the log. (Measure battery voltage while under load; that is, during paging.) When the battery voltage drops to a value that is 75% to 80% of the installed level, it should be replaced. For example, for a 12-volt battery, the replacement level is about 8 to 9 volts.

### 6.2.4 Fuses

Fuses are provided in pager telephones as an added precaution against excessive current in the external circuit. Current-limiting circuitry is normally provided in the telephone, but the fuse is an additional safeguard. No provision is made in most phones to store a spare fuse. It is good practice to tape two additional spare fuses to the inside of the cabinet when the phone is first installed. Then, the correct fuse will be available at the phone if it is needed. Make sure the fuses do not and cannot short circuit any circuitry.

### 6.2.5 Amplifier Loudness

Each pager phone has a loudspeaker, powered by its own internal amplifier, that is switched on by the dc paging signal. The available audio power is about 5 watts, which is adequate to be heard above most mine noises. Many telephones have a volume control for the speaker. During installation, the speaker should be oriented, and the volume set, to insure adequate coverage in the area.

During setup, someone should page from another location to the phone being installed. The volume control should be set to the desired level during the paging. The telephone cabinet should be positioned to direct maximum sound to the work area.

## 6.3 Phone Lines and Transmission Cables

### 6.3.1 Phone Lines

The cable used to interconnect underground pager phones must be rugged enough to withstand the underground environment and also have the proper electrical characteristics for requirements of the pager system. Generally, the cable used for this purpose is a twisted pair of solid-conductor wires that has a nonwater-absorbing, flame-retardant insulation with a rating of 600 volts dc and an outer abrasion-resistant covering. The conductor used depends on the installation; recommended sizes are 19 AWG to 14 AWG.

Many telephones used underground, particularly those used at the working face, are subject to periodic relocation. To allow for this, and to reduce the problems associated with repeated cable splicing, some convenient length of wire (say, 500 feet) can be included as part of the branch line. This extra wire can be kept reeled, or neatly coiled in a bundle and secured with a few wraps of plastic electrical tape. The extra wire should be hung near the telephone in a place free of dripping water or water accumulation, and should be supported by an insulated hanger that is isolated from power or trolley wires. The practice of coiling the cable is recommended, but with certain restrictions. If the cable is used to transmit monitor signals via an RF (radio frequency) carrier imposed on the two-wire pager phone line, the coiled cable becomes an inductor that will impede the proper transmission of the RF signal.[1]

Methods and recommended techniques for the permanent installation of phone lines are presented in a Bureau of Mines

[1]The addition of equipment to a phone system could violate intrinsic safety standards; check with MSHA for detailed application information.

handbook (2),[2] including installation, lightning protection, cable selection, and splicing methods. Note that 30 CFR specifies certain requirements for cable installation.

6.3.2 Leaky Feeder Cable

Installation of leaky feeder cable requires some special techniques. A typical installation of leaky feeder cable is shown in figure 6-1. For installation of the repeaters, refer to the manufacturer's installation guide. Hanging the leaky feeder cable requires clamps such as those used for conduits or other power cables. In areas where corrosion may be a problem, stainless steel or plastic clamps should be used. Typical hangers are shown in figure 6-2. The type of insulated hanger shown supports the leaky feeder cable from the messenger cable. Leaky feeder cable should be supported at intervals of 5 feet and is usually terminated with an antenna.

6.4 Carrier Phone Installation

The primary function of the carrier phone system is to provide a reliable communication network over which the dispatcher can direct all tracked vehicle traffic in the mine. The safety and productivity of the mine depend, to a large measure, on the ability of the dispatcher to maintain direct contact with all motormen via the carrier phone system. For this reason, the carrier phone installation should be carefully thought out, and the workmanship should be of the highest caliber.

[2]Underlined numbers in parentheses refer to items in the bibliography at the end of this chapter.

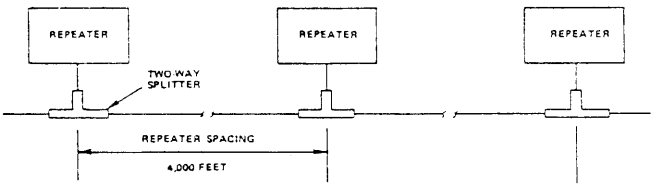


FIGURE 6-1. - Typical installation.

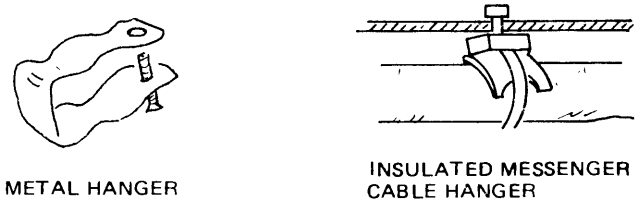


FIGURE 6-2. - Hanger hardware.

> CAUTION
>
> Installation procedures in this section are guidelines and not comprehensive technical instructions. Procedures described in this section must be performed by people thoroughly qualified to do such work. Installations should comply with manufacturer's recommendations, good safety procedures, and all applicable codes and regulations.

6.4.1 The Dispatcher Location

The trend in modern coal mining is to locate the dispatcher aboveground in a separate building or a separate room in the mine office complex. This location provides a continuously manned communications center even if the mine must be evacuated owing to emergencies or ventilation failures. Since 1974 the mining laws of West Virginia have required that the dispatcher be located on the surface in all new mines and for existing mines if the dispatcher is relocated (Article 22-2-37, Part T5).

Underground dispatchers' locations vary greatly, depending on the mine layout and growth. The two most common locations chosen are at the bottom of the main shaft or near the physical center of the mine.

The carrier phone equipment is usually installed on a panel which is mounted on a wall adjacent to the dispatchers' desk. This panel provides one convenient location for all the subassemblies that make up a carrier phone and protects the interconnecting cables from unnecessary flexing and stretching. The panel should be made from at least

1/8-inch-thick steel plate if the carrier phone uses a power-conditioning unit or resistor box that contains series-dropping resistors.

> CAUTION
>
> Remove the electronic subassemblies from the mounting plate during welding operations. Keep all electrical cables and other nonmetallic materials away from the welding area. This will prevent the carrier phone components from being damaged by heat during welding operations.

The microphone-speaker assembly is the only part of the carrier phone that interfaces directly with the dispatcher; therefore, it must be located within easy reach. The speaker volume control should also be within easy reach.

Locate the transceiver on the panel at either side of the speaker assembly, taking into consideration the location of the interconnecting cables. Leave room for the excess cable to be coiled up and secured to the panel.

Temperature-sensitive electronic circuits are located inside the transceiver assembly. Therefore, it should be protected from the temperature extremes produced by load resistor banks and room heaters. For reliable operation, the ambient operating temperature range that the transceiver is exposed to should be restricted to -40° to +140° F.

Approximately 6 inches of clearance should be left around all surfaces on which the connectors and/or fuses are mounted. If possible, the connector-mounting surfaces should be protected from dirt and moisture. Sufficient clearance should be allowed to remove access covers and open-hinged panels so that adjustments can be reached and plug-in modules can be changed.

The power-conditioning unit is used to convert the trolley voltage (typically 300 or 600 volts dc) or the local ac power to 12-volt dc power for the transceiver electronics and to recharge the battery. The circuit generally used in this unit contains a large series-dropping resistor that under normal operating conditions dissipates several hundred watts. The high temperature associated with this power dissipation would be harmful to the sensitive transceiver circuitry; therefore, it is a separate unit that can be located where it will not heat up the transceiver. When only the series-dropping resistor is contained in this unit, it is called a resistor box. It is also referred to as the battery charger by some manufacturers; in this case, it would contain the dropping resistors and the charging circuits.

The main consideration when locating this unit is its heat dissipation and its relationship to the heat-sensitive transceiver. The heat is dissipated into the ambient air and into the structure on which it is fastened; therefore, it is important to follow the manufacturer's mounting instructions carefully.

The power unit should never be mounted below the transceiver (heat rises) or the speaker enclosure. Keep the power unit a minimum of 6 inches away from either side or the top of the transceiver. If mine personnel can come in contact with the hot surfaces of the power-conditioning unit, a protective grille should be added. This grille should be open at the top and bottom to allow for proper air circulation.

A 12-volt lead-acid automotive-type storage battery is most often used as an external emergency power source with carrier phones. When locating this type of battery, the prime considerations should be the accessibility of the fill caps for servicing and proper room ventilation to handle the outgassing of hydrogen. The battery should also be kept away from materials that are susceptible to corrosion by sulfuric acid.

The ideal temperature range for the battery is 60° to 80° F. Low temperatures reduce capacity but prolong battery

life; high temperatures give some additional capacity but reduce total battery life. Temperatures above 125° F can actually damage some of the battery components and cause early failure.

Once the various subassemblies have been physically mounted to the panel, the final installation task is to make the electrical interconnections. This procedure consists primarily of inserting cable-mounted connectors into the proper receptacles on the subassemblies and connecting the signal and power cords into the proper mine ectrical systems.

A block diagram of a typical carrier phone interconnecting cable system is shown in figure 6-3. The cable connected to the trolley power and/or building power should be installed last. The other cables may be installed in any order that is convenient.

> CAUTION
>
> Clean and inspect all connectors before mating. Study the keying arrangement or polarization to prevent jamming and misalinement.

Before connecting power, verify that the RF signal common and the case and chassis grounds are all connected. The RF signal common should be an all-metallic connection to the rail system, even if the dispatcher is located aboveground. Often the rails are bonded to the steel structural members of the main shaft to help establish a good earth

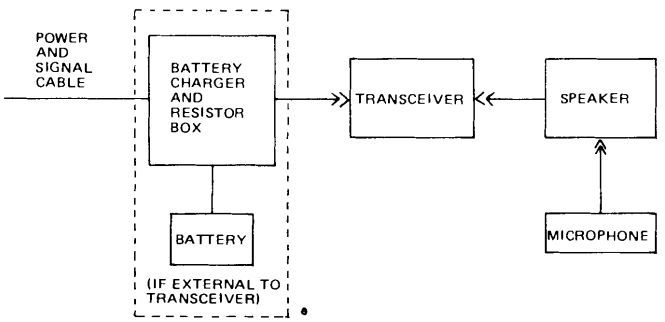


FIGURE 6-3. - Typical carrier phone interconnecting cable system.

ground for the mine. If this is the case, the RF signal common can be wired to the shaft structure at the surface or the hoist house structure. A minimum 14 AWG insulated copper wire should be used for this purpose. If the input power is supplied by the trolley wire, then the RF signal common and the power common should be jumpered together.

Connect all chassis and case grounds from the lugs or studs provided by the manufacturer to earth ground. Do not rely on the mechanical mounting of the case for a ground connection; always run a separate ground wire to the earth ground. Refer to the Code of Federal Regulations, Title 30, Part 75, Subpart H, for explicit grounding requirements.

The earth ground connection or building is generally made to a metallic water supply pipe or to the structural ironwork of the building. In either case, the connection should be made close to where the pipe or structure enters the earth to insure a minimum resistance between the connection and the earth.

The input power to the dispatcher's phone is supplied from either the trolley wire (typically 300 to 600 volts dc) or the local 115-volt ac power. If trolley wire input power is to be used with the dedicated line coupling method, then the in-line fuse holder cable is connected to only the hot input power terminal on the phone. The other end of the cable is connected to the trolley wire. Whenever trolley wire input power is used, the common power connection and the common signal connection are jumpered together and wired to the rails.

If the carrier phone is not located adjacent to the haulageway, then a wall-mounted fuse box should be used instead of the in-line fuse. Terminate the wire on the line side of the fuse block. Using the same type of wire, make a welded connection to the rail and run this back to the fuse box. Now, two-wire neoprene-jacketed-type portable cable may be used to supply power to the dispatcher's phone.

NOTE

The manufacturer's detailed installation instructions should be carefully followed to make certain the carrier phone is compatible with the polarity of the mine trolley power.

The 12-volt power fuse and the trolley power fuse should be removed to permit making the battery connections without a load immediately being placed across the battery. The grounded side of the battery should be connected first. If the mine has a positive trolley system, then the negative side of the battery should be grounded. The battery post is made of lead, as are the internal connections between the post and the battery plates. If too great a torque is applied to the clamping bolt, the internal connections can develop hairline fractures that can cause an intermittent connection. To avoid this condition, a second wrench should be used to steady the bolthead while tightening the nut.

Fuses provide an intentionally weakened part of an electric circuit and thereby act as a safety valve in the event of dangerous overloads. This protects both personnel and equipment from potential fire hazards due to overheating of the carrier phone.

NOTE

Fuses do not provide protection from dangerous high-voltage shocks.

Fuses come in many sizes, types, and electrical ratings. Always use a replacement fuse that has the same rating as specified by the carrier phone manufacturers.

The last step in installation is to connect the power wire. Two commonly used installation methods are direct coupling to the trolley wire, and single dedicated line coupling. For the installer's safety, the input power should be connected last.

Direct coupling involves wiring the hot RF signal connecting point directly to the trolley wire with the in-line holder cable provided with the phone. If the dispatcher's office is remotely located, then a fuse box adjacent to the trolley wire should be used. If the input power to the phone is to be supplied by the trolley wire typically (300 to 600 volts dc), then the hot power connection is jumpered to the hot RF signal connection with a length of 14 AWG insulated copper wire. Do not install the 3-ampere in-line power fuse until all ground connections are made up.

A second method of signal coupling is to connect the dispatcher's phone to a single conductor dedicated wire. This wire would originate at the hot RF signal connecting point.

### 6.4.2 Vehicle Installations

The carrier phone typically consists of a transceiver assembly, a microphone-speaker assembly, and power conditioning units; these are sometimes an integral part of the transceivers (fig. 6-4). Carrier phone equipment is installed on all types of tracked vehicles. Three commonly used vehicles found on coal haulage systems are locomotives, portal buses, and utility cars. Each of these vehicles has a different seating arrangement for the driver (fig. 6-5).

The microphone-speaker assembly is the only part of the carrier phone that interfaces directly with the vehicle operator. Thus, it must be located so that it can be easily reached. If the microphone hanger is not conveniently located, it will not be used by the operator, and the microphone and cord will suffer unnecessary damage from mistreatment. The speaker volume control should also be within easy reach, and the speaker should be pointed directly at the operator to provide the best reception.

Vehicles without dual controls require the operator to assume two different positions in front of the same

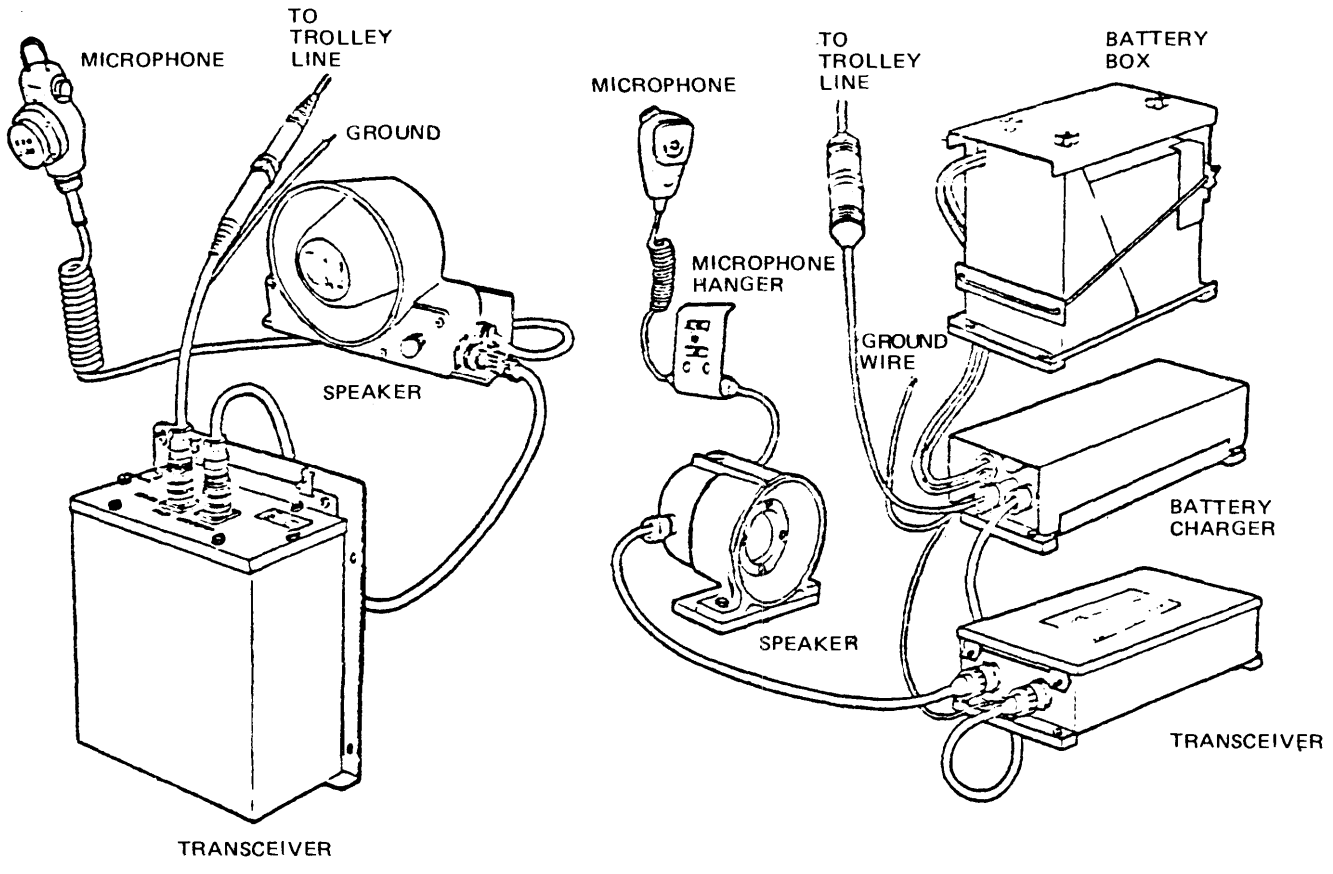


FIGURE 6-4. - Typical carrier phones.

controls so that he can observe the track ahead of him. This further complicates the positioning of the microphone-speaker assembly. It is sometimes helpful to use two microphone hangers for this type of installation so that the microphone is convenient no matter which way the vehicle is traveling.

Entanglement of the microphone cord with other vehicle controls, causing an unsafe operating condition, should also be considered when locating the microphone-speaker assembly. The microphone should also be mounted in an area that will protect it from falling debris and/or dripping water.

Once a suitable place for the microphone-speaker assembly has been determined, the transceiver location can be considered. The first restriction on its location is the length of the cables running between the different assemblies. Temperature-sensitive electronic circuits are located inside the transceiver assembly. Therefore, it should be protected from temperature extremes such as those produced by load resistor banks and the vehicle's drive motors.

It is important that installation of the transceiver does not reduce the minimum roof clearance of the vehicle. Approximately 6 inches of clearance should be left between the vehicle and the surfaces on which the connectors and/or fuses are mounted. If possible, the connectors should be protected from dirt and moisture. Sufficient clearance should be allowed to permit removal of access covers and open-hinged panels so that adjustments can be reached and plug-in modules can be changed.

The main consideration when locating the power conditioning unit is its heat dissipation and its relationship to the heat-sensitive transceiver. The heat is dissipated into the ambient air and into

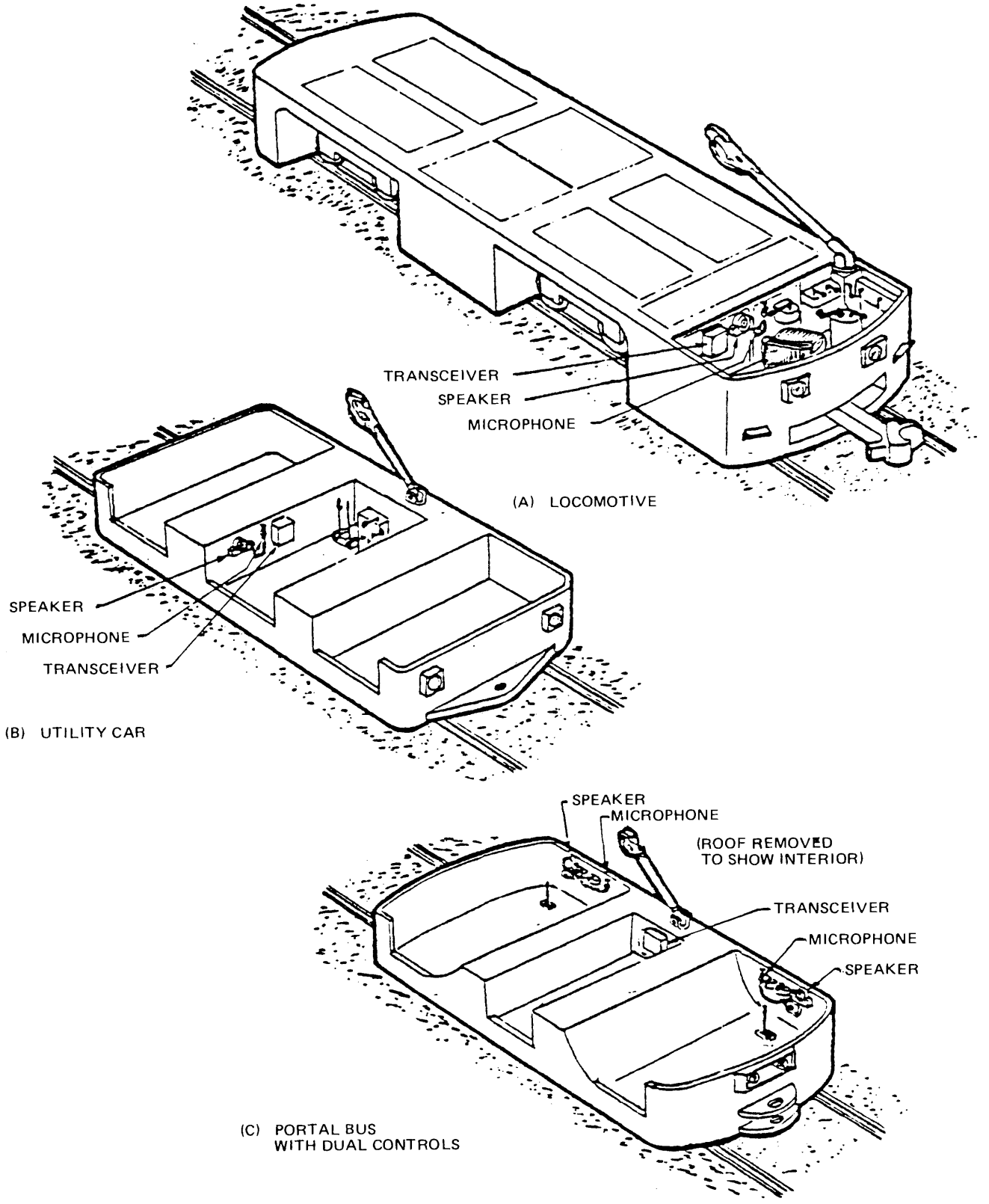


FIGURE 6-5. - Typical mine vehicles.

the structure on which it is fastened; therefore, it is important to follow the manufacturer's mounting instructions carefully. The mounting surface should be a massive structural part of the vehicle that can absorb the heat transferred from the unit.

If it is a horizontal surface, a minimum of 3 inches should be allowed on all sides; if possible, nothing should be mounted above the unit. If it is a verticle surface, a minimum clearance of 3 inches above and below the unit should be provided for proper air circulation. The power unit should never be mounted below the transceiver; if possible, a minimum separation of 1 foot in all other directions should be provided.

A 12-volt lead-acid automotive-type storage battery is most often used as an external emergency power source with carrier phones. When locating this type of battery, the prime considerations should be the accessibility of the fill caps for servicing and proper room ventilation to handle the outgassing of hydrogen. The battery should also be kept away from materials that are susceptible to corrosion by sulfuric acid.

The ideal temperature range for the battery is 60° to 80° F. Low temperatures reduce capacity but prolong battery life; high temperatures give some additional capacity but reduce total battery life. Temperatures above 125° F can actually damage some of the battery components and cause early failure.

Most carrier phone components are supplied with mounting plates that can be tack-welded to the vehicle. This provides a permanent mounting surface with tapped holes or threaded studs onto which the subassemblies are fastened. This arrangement also provides an easy means of interchanging subassemblies for maintenance purposes.

| CAUTION |
| --- |
| Remove the subassembly from the mounting plate during the welding operation. Keep all electrical cables and other nonmetallic materials away from the welding area. This will prevent the carrier phone components from being damaged by the heat generated from the welding operation. |

Procedures for making the electrical connections between carrier system components are similar to those for the dispatcher's installation (paragraph 6.4.1). For the installer's safety, the trolley shoe should be removed from the trolley line.

Proper cable protection will reduce the downtime of the communication system and prevent accidents, such as loose cables tripping up mine personnel when entering or leaving the vehicle. The interconnecting cables should be located, if possible, away from areas occupied by mine personnel or supplies. This will prevent cutting and crushing of the cables caused by shifting loads.

Heavy-duty plastic ties or cable clamps should be used to lash the cord to the frame of the vehicle. If possible, the cable should be run under overhanging parts of the frame to protect it from falling debris and/or dripping water. Enough slack should be left to form a drip loop to prevent condensate from running down the cord and into the rear of the connector. All holes in the frame through which the cable runs should be grommeted. The cable should not be run over sharp edges that might abrade it. Excess cable should be neatly coiled and secured with plastic electrical tape or cable ties and then clamped to the frame. The cable should never be stretched between clamps; this will leave it in tension, causing an elongation of the insulation and the conductor. In addition,

the jacket will lose a considerable part of its resistance to mechanical damage, making it vulnerable to cutting, tearing, and abrasion.

## 6.5 Carrier Current Hoist Phone

Carrier current hoist phones utilize existing physical conductors (the hoist rope) for a transmission medium. Typical hoist radio hardware is shown in figure 6-6.

### 6.5.1 Cage

The cage equipment consists of the transceiver, which contains a speaker, microphone, and push-to-talk switch, a battery, generally of the lead-acid type, a cage coupler, and the connecting cables. The transceiver is the only unit that must be mounted within the cage, where space is usually at a premium. For that reason, it should be recessed in the cage wall. The battery must be mounted

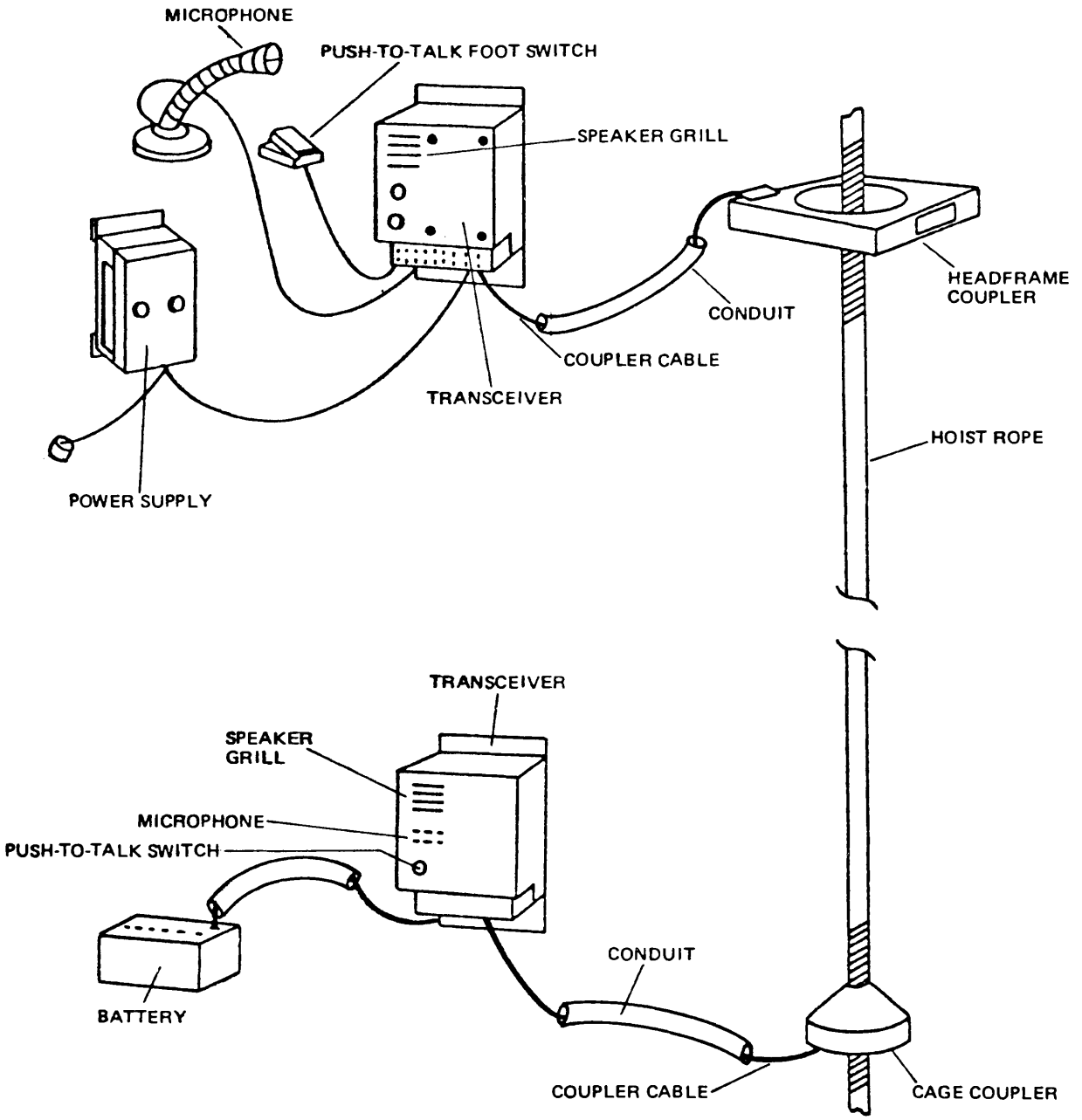


FIGURE 6-6. - Hoist radio hardware.

in an upright position either inside the cage or on top. Mounting the battery on the top of the cage provides early access for charging or replacement. The cage coupler is bolted to the hoist rope above the cage with the conical section up to act as a rock shield. It is suggested that the battery be placed within a protective enclosure to prevent a short circuit which could be caused by debris. Be sure the cable and unit connectors are clean before mating them. Conductive dust in a connector interface may cause the equipment to malfunction. Cables between the battery, transceiver, and coupler should be strategically placed to avoid damage. Cable clamps should be used to take up slack; a loose cable is a hazard to personnel and equipment. It is suggested that cables be run through heavy-gage conduit.

### 6.5.2 Hoistroom and Headframe

The hoistroom equipment is shown in the upper part of figure 6-6. The hoistroom will contain the power supply, transceiver, push-to-talk foot switch, and microphone. The power supply and transceiver may be wall mounted. It is best to leave at least 6 inches between the power supply and transceiver, and the power supply should not be mounted below the transceiver. The microphone should be placed so that it can be within 2 inches of the operator's mouth while the operator has both hands on the hoist conrols. The foot switch should be in easy reach of the operator's foot while the operator is at the controls.

The headframe coupler is located at the top of the shaft. It may be clamped to or suspended from the headframe structure. The coupler cable from the headframe coupler to the transceiver should be run through conduit.

## 6.6 Summary

Tables 6-1 through 6-4 are basic checklists for four types of installation: Pager phone, carrier phone, hoist phone, and cable. It is evident that not all criteria are covered in these basic checklists. Additional items that are peculiar to a specific installation may be added.

There are some procedures associated with any installation. They are

READ INSTRUCTIONS BEFORE STARTING!

DO IT SAFELY!

DO IT CAREFULLY!

CHECK IT THOROUGHLY!

SEEK HELP IF NECESSARY!

Short cuts in installation will probably lead to equipment malfunction or damage. All communications equipment should be tested with transmissions to and from another unit after installation.

A little extra time spent in the installation phase of a communication system can mean the difference between a reliable, well-managed system and an undependable system requiring frequent maintenance.

TABLE 6-1. - Pager phone installation basic checklist

| | Item | Yes | No | Comments |
|---|---|---|---|---|
| 1. | Has the exposed area of the cable been sealed with electrical tape to keep out moisture? | | | |
| 2. | Is the drip loop positioned properly to keep condensate from getting into phone? | | | |
| 3. | Is the tension in the spring terminals sufficient for a good connection between the wire and phone? | | | |
| 4. | Is the twist-to-lock connector in the locked position? | | | |
| 5. | Has the battery been tested? | | | |
| 6. | Have spare fuses been provided? | | | |
| 7. | Has the phone been called from a distant phone and been found operable? | | | |
| 8. | Is the volume satisfactory or has the amplifier been adjusted for proper loudness? | | | |
| 9. | Is the phone mounted at a proper height for convenience? | | | |
| 10. | Is an insulating mat or dry planking provided on which the user may stand? | | | |
| 11. | Is all cabling secured and protected from passing machinery? | | | |
| 12. | Are all splices QUALITY splices? | | | |
| 13. | Are the cables heavy enough? | | | |

TABLE 6-2. - Carrier phone installation basic checklist

| | Item | Yes | No | Comments |
|---|---|---|---|---|
| 1. | Is the microphone-speaker assembly within easy reach? | | | |
| 2. | Is the transceiver protected from temperature extremes (away from power conditioning unit)? | | | |
| 3. | Is the power conditioning unit mounted so personnel will not come in contact with it? | | | |
| 4. | Is the power conditioning unit covered by a protective grille? | | | |
| 5. | Has the battery been tested under load? | | | |
| 6. | Have mating surfaces of connectors been inspected and cleaned? | | | |
| 7. | Have all cable connectors been firmly joined to the units? | | | |
| 8. | Are threaded connectors tightened? | | | |
| 9. | Have all chassis and case grounds been wired to earth ground? | | | |
| 10. | Can the microphone cord become entangled in the vehicle controls? | | | |
| 11. | Are cables protected from abrasion? | | | |
| 12. | Are all components mounted low enough so that minimum roof clearance has not increased? | | | |
| 13. | Has sufficient clearance been given to allow easy removal of access covers, hinged panels, etc.? | | | |
| 14. | Are the bridging capacitors in place on all sectionalized trolley lines? | | | |

TABLE 6-3. - Hoist phone installation basic checklist

| | Item | Yes | No | Comments |
|---|---|---|---|---|
| 1. | Is the microphone of the transceiver at a proper height (mouth level) for average person? | | | |
| 2. | Is the battery accessible for charging or replacement? | | | |
| 3. | Is the cage coupler firmly mounted? | | | |
| 4. | Have mating surfaces of connectors been inspected and cleaned? | | | |
| 5. | Have cable connectors been firmly joined to the units? | | | |
| 6. | Are threaded connectors tightened? | | | |
| 7. | Are cables protected from damage? | | | |
| 8. | Have any slack cables been tied down (clamped)? | | | |
| 9. | Is headframe coupler firmly connected to or suspended from headframe? | | | |
| 10. | Are microphone and push-to-talk switch near hoist controls? | | | |
| 11. | Is the transceiver frame firmly attached to the cage? | | | |
| 12. | Have all completed connections been sprayed with silicone or other moisture-inhibiting spray? | | | |

TABLE 6-4. - Telephone cable installation basic checklist

| | Item | Yes | No | Comments |
|---|---|---|---|---|
| 1. | Has proper cable been selected according to system plan (type and gage)? | | | |
| 2. | Is the cable supported at the proper interval (approximately 10 feet for twisted pair or figure-8 cable and 5 feet for leaky feeder)? | | | |
| 3. | Do droplines have strain relief on main line and tap line? | | | |
| 4. | Are splices mechanically sound and protected from moisture? | | | |
| 5. | Is strain relief used at splices? | | | |
| 6. | Have lightning arrestors been used according to code? | | | |
| 7. | Has extra insullation been provided where the cable crosses the trolley or other high-voltage lines? | | | |
| 8. | Is the cable positioned out of the way of machinery and secured in place? | | | |
| 9. | Are all splices QUALITY splices? | | | |

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