

ELECTRICAL PROTECTION WHEN USING PORTABLE A.C. OPERATED EQUIPMENT

1. GENERAL

1.01 This section contains information for protection when using portable A.C. operated equipment, inspecting and testing this equipment, and the use of grounded A.C. receptacle adapters.

1.02 Two methods of protection are normally used: grounding the case and insulating all current carriers.

1.03 Grounding portable A.C. operated equipment protects the operator from electrical shock caused by insulation breakdown on current carrying parts within the housing. Grounding limits the magnitude of voltage on the frame of the equipment and facilitates the operation of the over-current device. Special care should be taken to ensure that grounding is adequate.

1.04 Rubber insulated extension lamps and other system approved insulated equipment with 2-wire plugs do not require grounding. All A.C. operated equipment equipped with a metal housing shall be grounded.

Note: Soldering coppers used in central offices **must not** be grounded due to probable damage to apparatus such as repeating coils and transistors or temporary interference to service by unwanted operation of relays. The usual design of circuits has battery standing on the apparatus awaiting a ground for operation.

1.05 Grounding as described in this section is accomplished by a third conductor in the cord used to connect the equipment housing to the local power grounding system or to other equivalent grounds.

2. CAUTIONS

2.01 Use only electrical equipment, cords, and adapters provided or approved by the Bell System.

2.02 Make certain that the proper grounding connections are made and that they do not become disengaged during operation.

2.03 Care should be taken to ensure that the cord between the electrical outlet and portable equipment, including grounding wires, are placed where they will not cause tripping or other hazards to personnel.

2.04 Before connecting equipment to a commercial power source, make certain that the proper voltage and frequency are available.

2.05 Do not handle electrical equipment while standing in water.

2.06 Never use electrical equipment having damaged or worn power cords.

3. PROVISIONS FOR AND METHODS OF GROUNDING

3.01 The most satisfactory method of providing an effective ground is by connecting a 3-blade plug to a compatible 3-wire receptacle.

A. Standard 3-Wire Receptacle and Plug

3.02 The standard plug (Fig. 1) consists of three blades which fit into a 3-slot receptacle. The three blades include a copper-colored blade for the hot connection, a silver-colored blade for the neutral connection, and a round or U-shaped blade for grounding. The cord is connected to the plug with the black wire to the hot terminal, white wire to the neutral terminal, and green wire to the ground terminal.

3.03 The standard 3-blade plug and receptacle supersede other types such as the 3-blade crowfoot, the 2-blade parallel, the 2-blade parallel polarized, and the 2-blade radial.

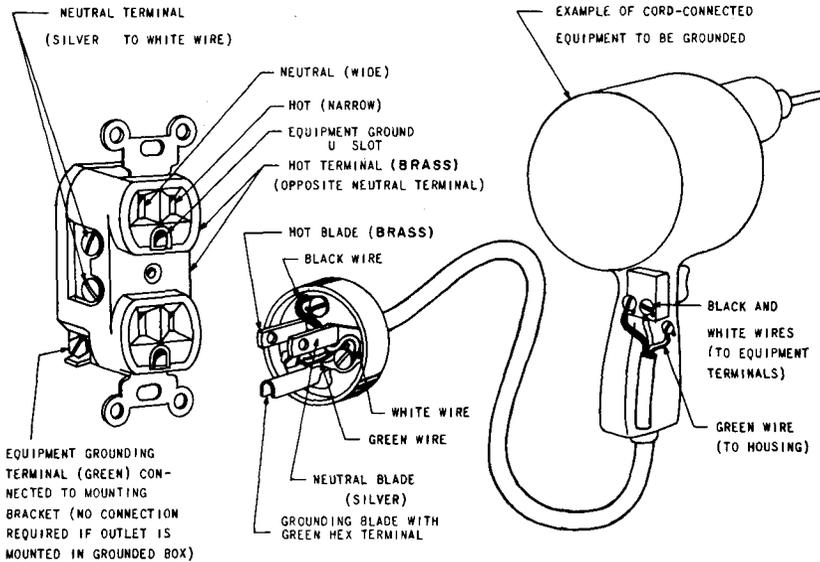


Fig. 1 — Wiring of 120-Volt Standard Plug and Receptacle

Note: The superseded plugs may continue to be used until replacement is necessary. At that time, the standard plug and 3-wire cord should be used when grounding is required.

3.04 All electrical equipment requiring grounding should be equipped with a 3-conductor cord terminating in a 3-blade plug. The 3-blade plug may be plugged into a compatible 3-wire receptacle, or one of the adapter systems described in 3.05 through 3.07 may be utilized.

B. Crowfoot Receptacle

3.05 The crowfoot receptacle has three slots. Figure 2 designates the function of each slot. The cord connecting to a crowfoot plug also uses the same white, black, and green coding as the standard plug. When only the crowfoot receptacle is available and the tool cord has a standard plug, a standard-to-crowfoot adapter (Fig. 7) must be used.

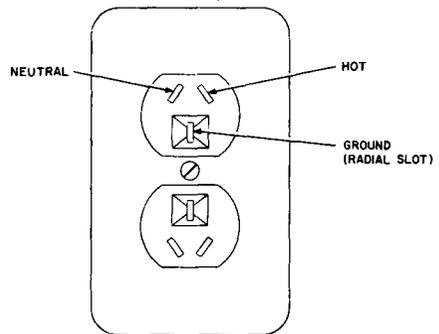


Fig. 2 — Crowfoot Receptacle

C. Parallel Receptacles — Grounded Outlet Box (See Fig. 3 and 4.)

3.06 Where a building is wired with metallic conduit, armored cable, or nonmetallic sheath cable with a grounding conductor, the

outlet boxes should be grounded. The pigtail of the adapter shown in Figure 3 makes a ground connection to the center screw. The center screw of the adapter shown in Figure 4 makes a ground connection and a pigtail is not required when the adapter is used with grounded outlet boxes.

Note: Be sure that good electrical contact is obtained with the coverplate screw.

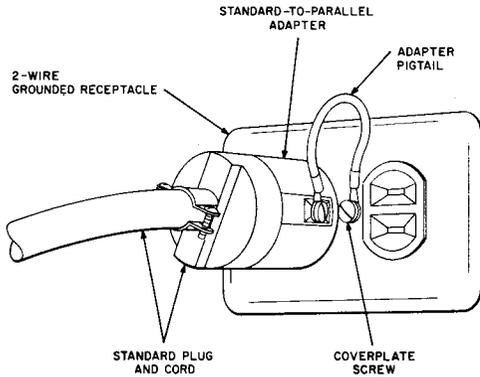


Fig. 3 — Grounded Outlet Box

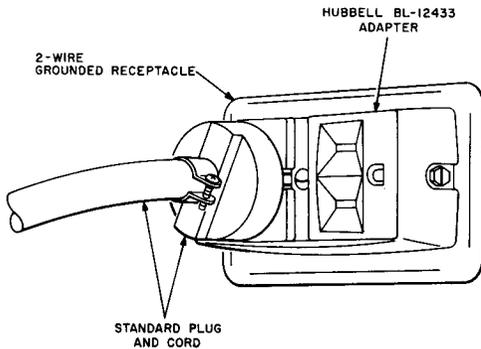


Fig. 4 — Grounded Outlet Box

D. Parallel Receptacles — Ungrounded Outlet Box (See Fig. 5 and 6.)

3.07 Where electrical connections are to be made at 2-wire parallel receptacles with ungrounded outlet boxes, locate a nearby grounded object to which the ground wire may be attached. Attach ground wire to ground terminal on the adapter and to the grounded object selected, making certain good electrical connection is made at both ends.

Caution: Connections to ground rods or to other grounds which are not connected to the power service grounds are not suitable for this purpose. Where cold water pipes are used, ensure that a connection to the power service ground exists.

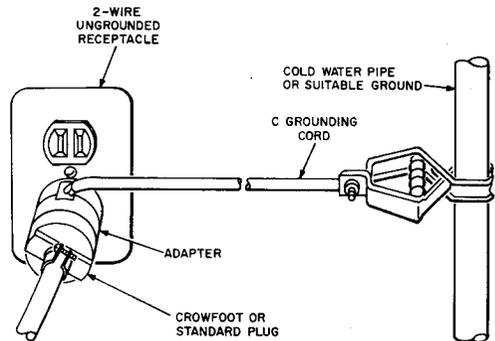


Fig. 5 — Ungrounded Outlet Box

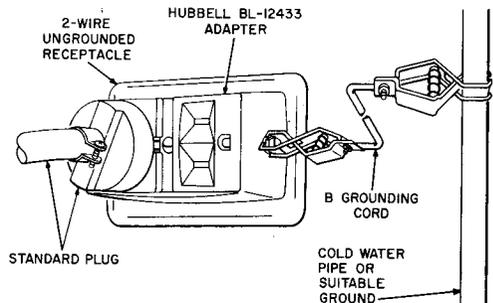


Fig. 6 — Ungrounded Outlet Box

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Note: A length of 14-gauge ground wire and a station ground clamp may be used in place of the pigtail and the B grounding cord.

3.08 The receptacle adapters shown in Figure 7 permit connections when the outlet receptacle is not the same type as the plug.

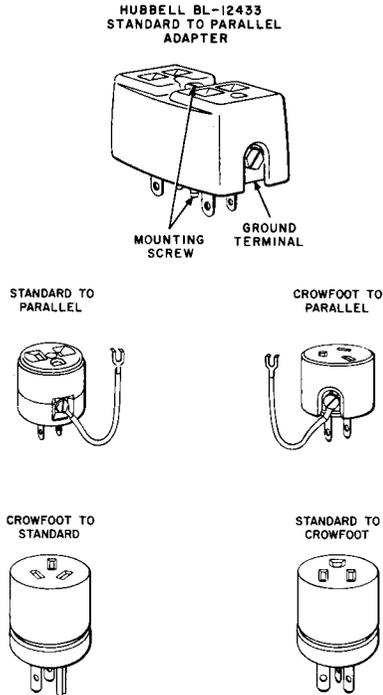


Fig. 7 — Adapters

3.09 The pigtail grounding terminal on the adapters should be connected as specified in 3.06 or 3.07.

E. Grounding Cords (See Fig. 8.)

3.10 The B and C grounding cords are used as described in 3.07 to ground power equipment at 2-wire parallel receptacles which have ungrounded receptacle boxes. A description of each is as follows:

(a) The B grounding cord is a 15-foot, 18-gauge, single-conductor cord with clips at both ends.

(b) The C grounding cord is similar to the B cord except that it has a clip on one end and a standard-to-parallel adapter on the other end.

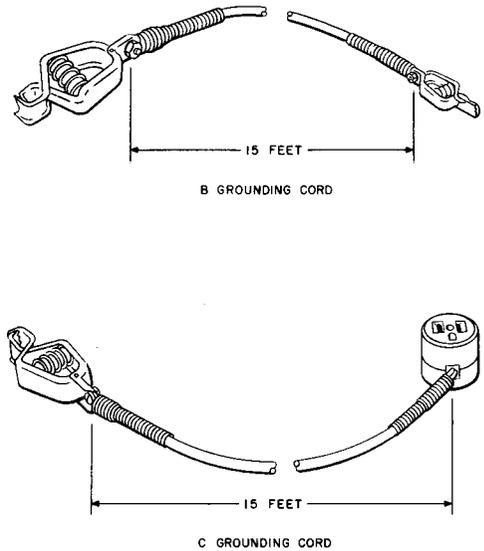


Fig. 8 — Grounding Cords

F. C and D Extension Cords (See Fig. 9.)

3.11 Extension cords such as the C or D extension cord are required for connecting power tools to outlet receptacles located away from the work area. These cords are 30 feet long with a standard plug at one end and a standard connector body at the other.

4. INSPECTION AND TESTING

4.01 The connections for a standard 3-wire system are illustrated in Figure 1.

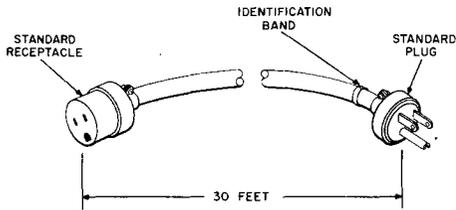


Fig. 9 — C or D Extension Cord

4.02 The cord and plug of a piece of equipment should be visually inspected for damage before use. Particular attention should be given to the point at which the cord enters the equipment housing.

Tool and Equipment Test

4.03 Using a KS-14510 meter, or equivalent, test the cord of a tool or instrument while removed from the outlet. Check for continuity between the grounding blade of the plug and the case and check that the hot and neutral blades are not shorted to the case. The resistance between the hot and neutral blades and the case should be at least several megohms. For items such as power tools, make the hot and neutral blade short test with the power switch operated.