

MULTIPLE WIRE DRAINAGE PROTECTION

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1. GENERAL

1.01 This section covers the description, use, and installation of 104-type and 108-type protectors when used on 6- or 12-pair rural wire. They provide drainage for multiple wire circuits which are subject to induced voltages from adjacent power circuits.

1.02 This section combines information formerly contained in Sections 638-425-200 and 638-430-200 which are cancelled.

1.03 Install 104-type or 108-type protectors only when directed by detail plans or other specific instructions.

2. PURPOSE AND USES

2.01 The 104-type and 108-type protectors are designed to reduce the voltages that may be induced in multiple wire circuits as a result of close exposure to power circuits. By providing balanced drainage paths from the two sides of the telephone circuit to ground, the 104- or 108-type protector reduces the induced voltages to safe values without interfering with the normal operation of the circuit.

2.02 The voltage induced in the telephone circuit depends principally on the voltage of the power circuit to ground, the separation between the telephone wires and the power wires, and the height of telephone wires aboveground.

2.03 On short multiple wire circuits, the 104-type protector provides adequate drainage when properly spaced. However, on long circuits, carrier circuits, etc, the shunting impedance of the 104-type protectors becomes low enough to affect ringing and speech transmission. Each 104-type protector provides drainage for two circuits.

2.04 The 108-type protector is designed for use on multiple wire used for long circuits or carrier circuits. The 108-type protector is designed to present a low impedance to ground for power line frequencies while maintaining high impedance at voice, ringing, and carrier frequencies in the telephone circuit.

2.05 The 108B and 108C Protectors may be used on multiple wire operating at voice and/or carrier frequencies. The 108A Protector should be used only on multiple wire operating at voice frequency. The 108C Protector should be used where moisture and snow cause maintenance problems due to the shorting out of the exposed protector blocks furnished with the older 108-type protectors. Each 108-type protector provides drainage for one circuit.

3. DESCRIPTION OF 104-TYPE PROTECTORS

3.01 The 104B Protector consists of a galvanized steel housing, about 8-3/16 inches high, 5-1/4 inches wide, and 2-7/8 inches deep, equipped for crossarm or pole mounting. It contains four resistors, four capacitors, and four 2B1B Protector Units (6 mil) in a 128A1A-2 Protector. There are grommets in the bottom of the housing for the entrance of bridle wires and ground wires.

3.02 Fig. 1 shows the inside of a 104B Protector, and indicates the ground binding post and the binding posts for the two telephone lines.

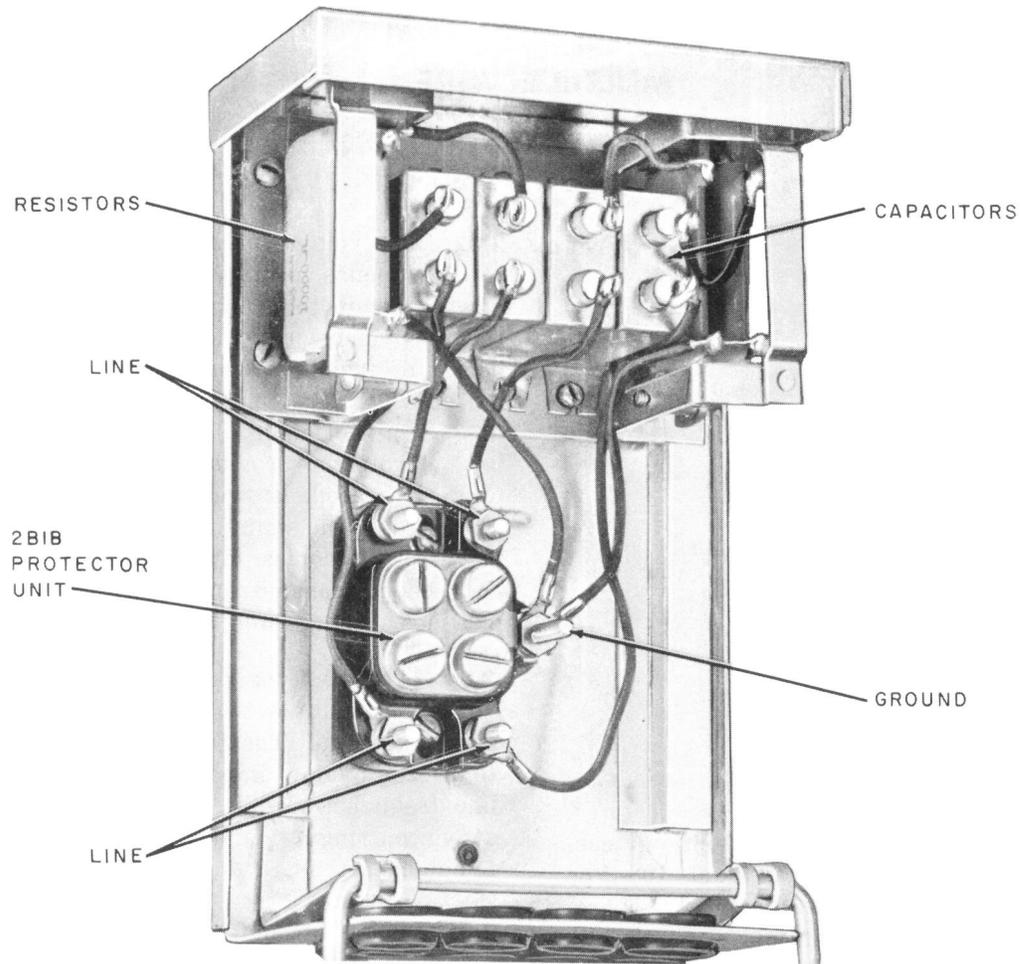


Fig. 1—104B Protector

3.03 The housing cover is opened by grasping the sides near the bottom, and pulling the cover out, away from the back of the housing. This releases the cover and permits it to be swung down, thus giving access to the equipment. To close the housing, swing the cover up, and insert the top end of the cover under the hood at the upper end of the housing, then force the lower end of the cover toward the back of the housing until it snaps into place.

3.04 The 104A Protector has been superseded by the 104B Protector. The 104A Protector has four sets of No. 26 and No. 30 Protector Blocks mounted in a 79B Protector Mounting instead of the enclosed protector unit in the 104B Protector.

The operation and appearance of the 104A Protector is otherwise the same as the 104B Protector.

3.05 Fig. 2 shows the inside of a 104A Protector, and indicates the ground binding post and the binding posts for the two telephone lines.

4. DESCRIPTION OF 108-TYPE PROTECTORS

4.01 The 108-type protector consists of an assembly of inductors, capacitors, and protector units mounted in a galvanized steel housing as shown in Fig. 3. Wire entrance holes in the bottom of the housing have temporary putty fillings or rubber grommets.

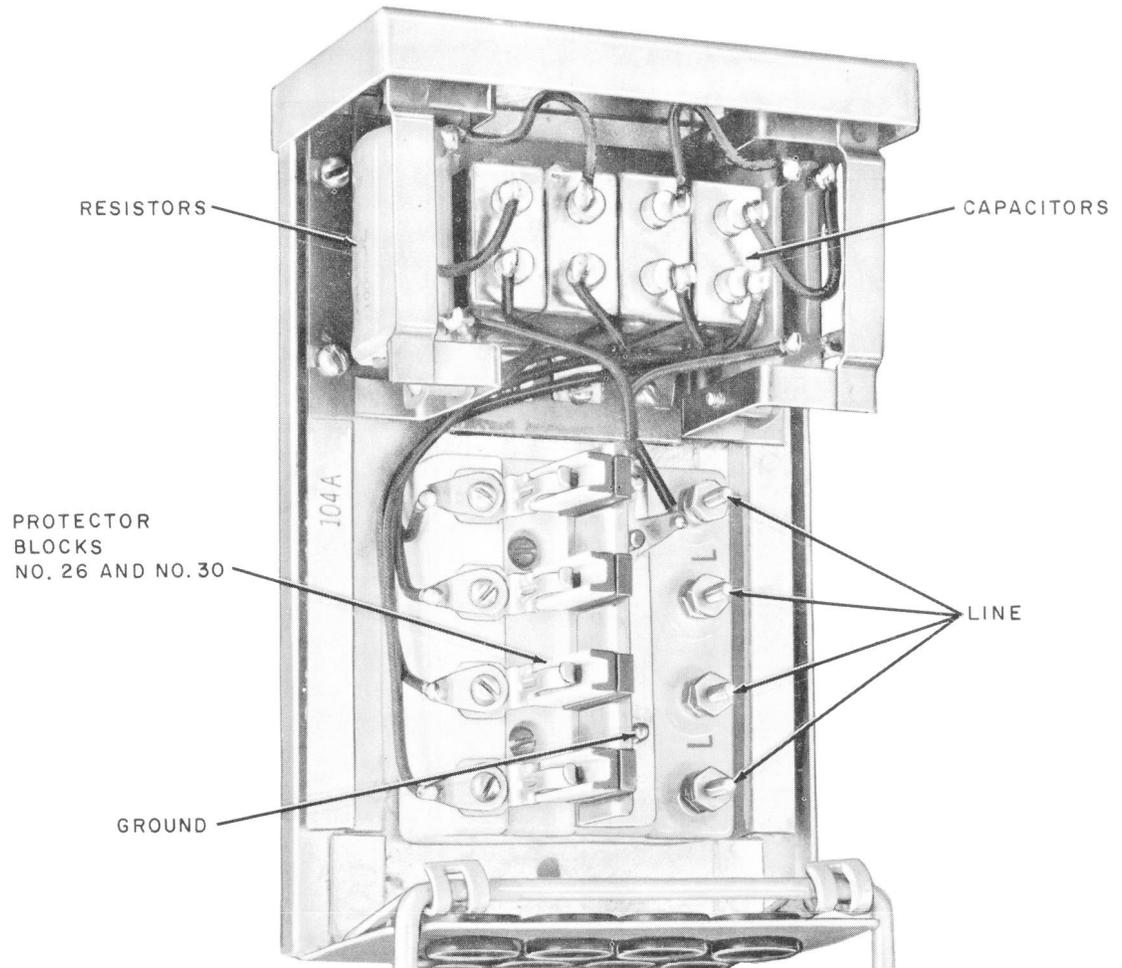


Fig. 2—104A Protector

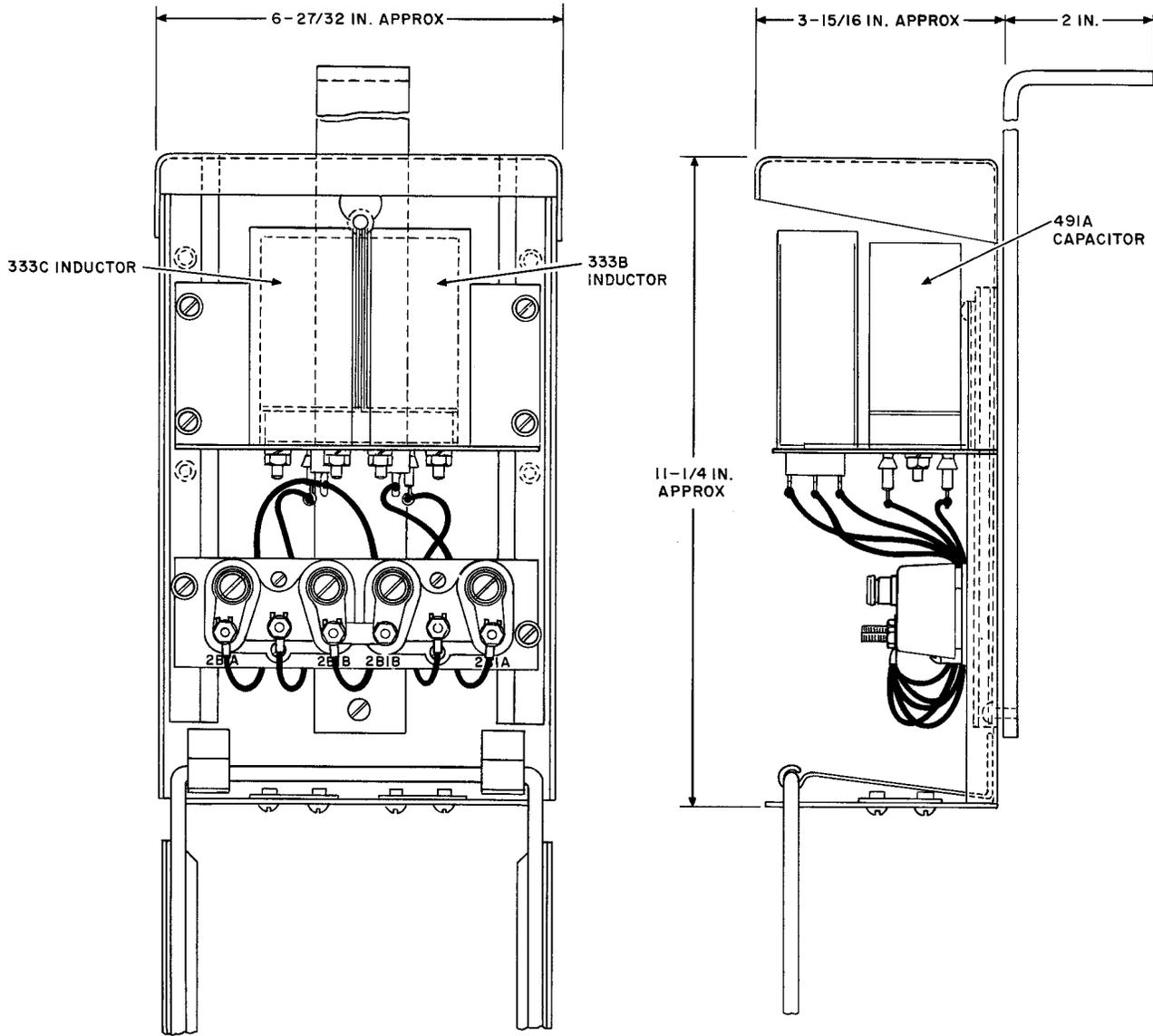


Fig. 3—108C Protector

4.02 Fig. 4 and 5 illustrate the circuit arrangements of the 108-type protectors.

4.03 The 108A Protector can be converted to a 108B Protector by replacing the 333A Inductor with a 333C Inductor, following the wiring diagram in Fig. 4.

4.04 The 108B Protector can be converted to a 108C Protector by replacing the carbon block protector strip with a P-46C941 Conversion Kit. (Fig. 6). This kit should be ordered separately and contains one P-16E980 Protector Mounting Assembly, including the protector units with five leads attached to the proper terminals and two screws and washers for mounting. The replacement is made as follows:

(a) Remove the line leads and the ground lead from their binding posts and bend them back out of the way.

(b) Cut the five wires on the lugs at the top of the protector strip.

(c) Remove the four screws holding the strip in place and lift the strip out.

(d) Remove the old strip and replace it with the P-16E980 Protector Mounting from the P46C941 Conversion Kit, using the two mounting screws and washers furnished.

(e) Run the leads attached to the protector mounting to the capacitors and inductors as shown in Fig. 6. The attachments to the inductor and to the capacitor lugs should be soldered.

(f) Replace the ground lead and tighten the nut with the 216B Tool. Replace the two line leads and tighten the nuts.

4.05 See 3.03 for opening housing cover.

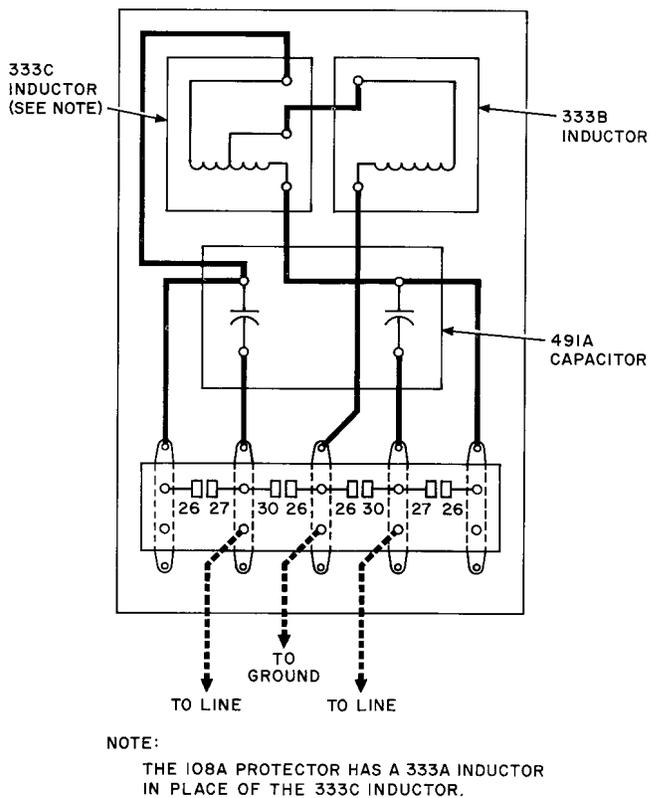


Fig. 4—Wiring Diagram of 108A and 108B Protectors

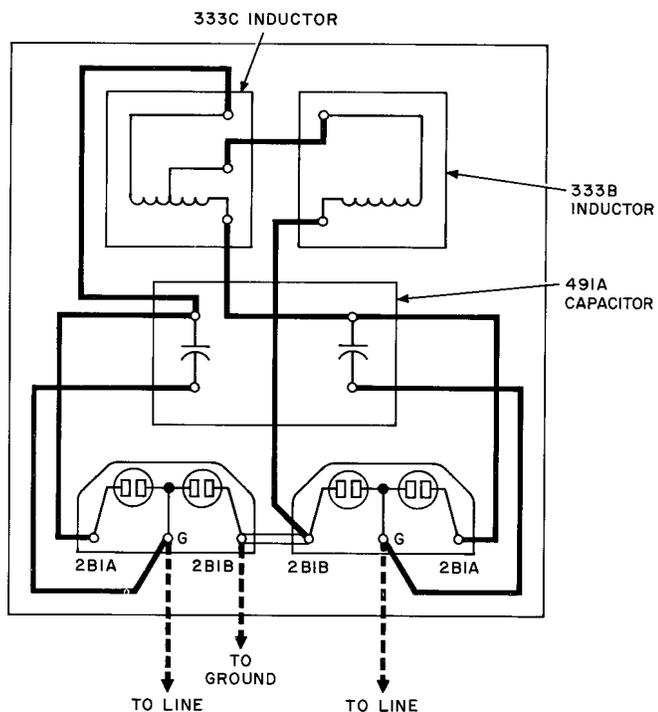


Fig. 5—Wiring Diagram of 108C Protector

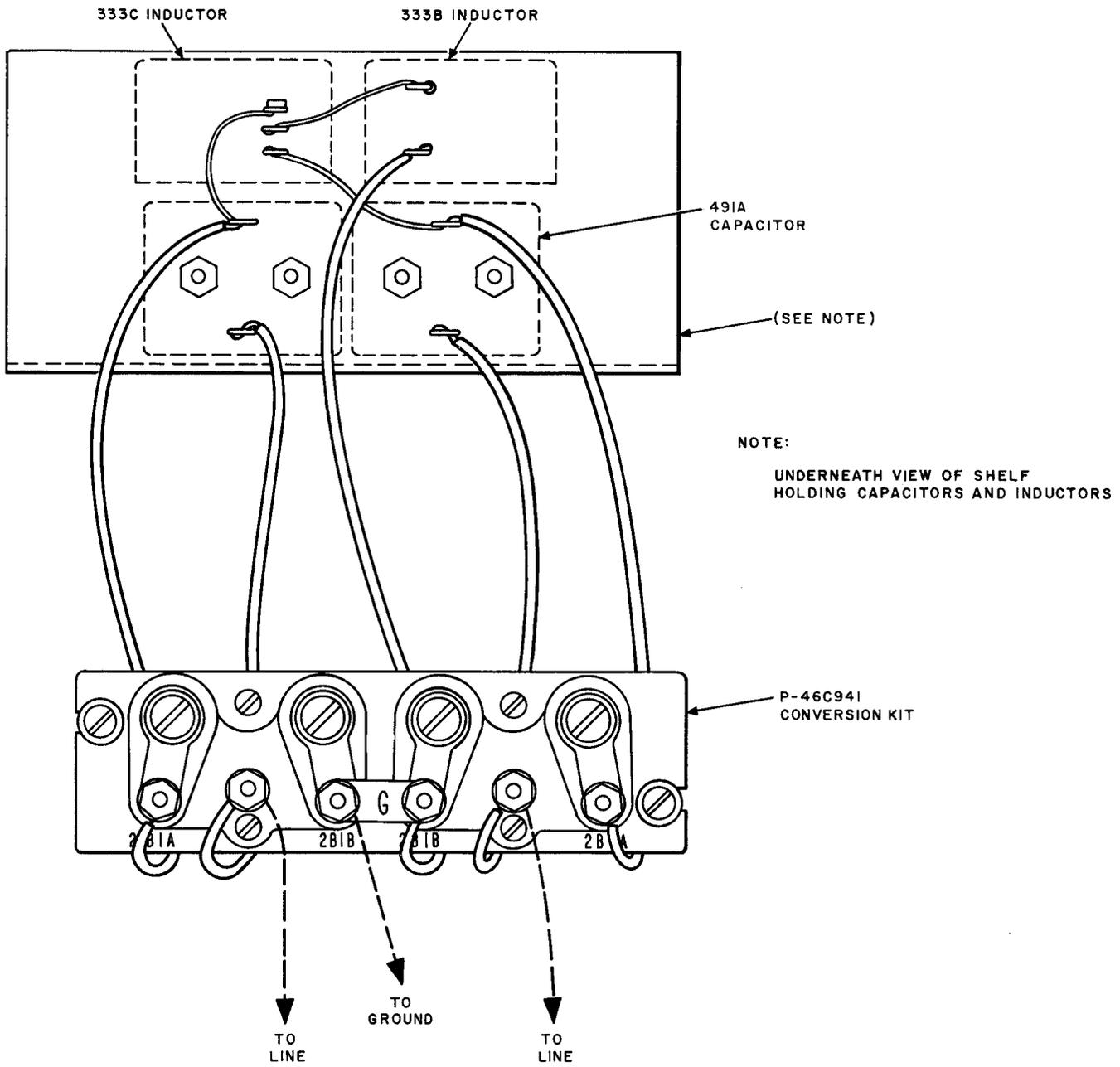


Fig. 6—Installation of P-46C941 Conversion Kit

5. GROUNDING

5.01 If 104- or 108-type protectors are installed on multiple wire circuits that are carried on joint-use poles with a power circuit which includes a multigrounded neutral wire, the ground wire from each protector should, wherever possible, be connected to the power system vertical grounding conductor that is connected to the neutral wire and to a ground rod. Grounding conductors which are connected to the multigrounded neutral power wire and to a ground rod, and are located on transformer poles or lightning arrester poles are satisfactory for grounding 104-type protectors. Be sure to **test** the power system vertical grounding conductor with a **B Voltage Tester** as instructed in 620-105-010 before attaching the protector ground wire to it.

5.02 If 104- and 108-type protectors are to be installed at a pole that is not equipped with a grounding conductor that meets the requirements of 5.01, it will be necessary to install a B Ground Wire and connect it to one or more D Ground Rods driven in the earth near the base of the pole. Connect the B Ground Wire directly to the ground rod with a B Ground Clamp. The ground wire should be fastened to the pole at 18-inch intervals with galvanized staples and where required by local regulations, should be covered with wood molding. Fasten the molding with No. 16 cable straps and 1-1/2 inch strap nails at 4-foot intervals. Fig. 7 illustrates the method of connecting the vertical grounding conductor to one or more ground rods.

5.03 *Do not perform any work in the power company space on the pole.*

6. INSTALLATION

6.01 To remove the protector housing from the mounting bracket, proceed as follows:

- (a) Open the cover.
- (b) Remove the round-head machine screw located below the protector equipment inside the housing.
- (c) Move the housing up a short distance, thus releasing the knob in the back of the housing from the keyhole slot in the mounting bracket.

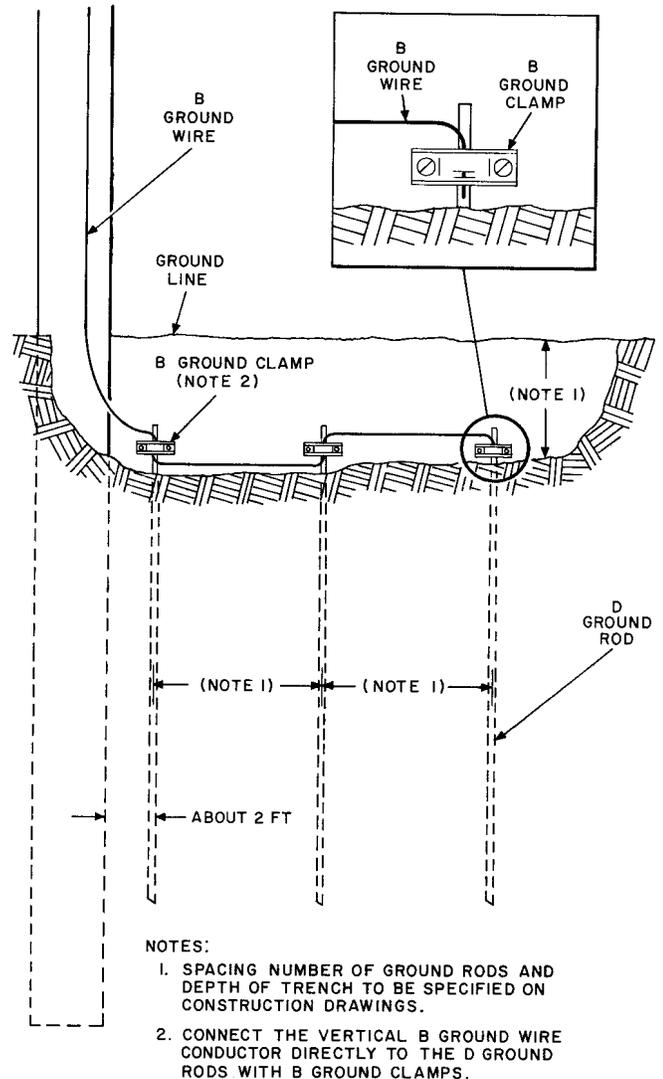


Fig. 7—Connection to Ground Rods

6.02 Mounting the 104-type protectors and wiring them to 6-pair and 12-pair multiple wires is shown in Fig. 8 and Fig. 9.

6.03 Mounting the 108-type protectors and wiring them to 6-pair or 12-pair multiple wire is shown in Fig. 10 and Fig. 11.

6.04 Use C Bridle Wire for making the connections to wire terminals and to the vertical grounding conductor.

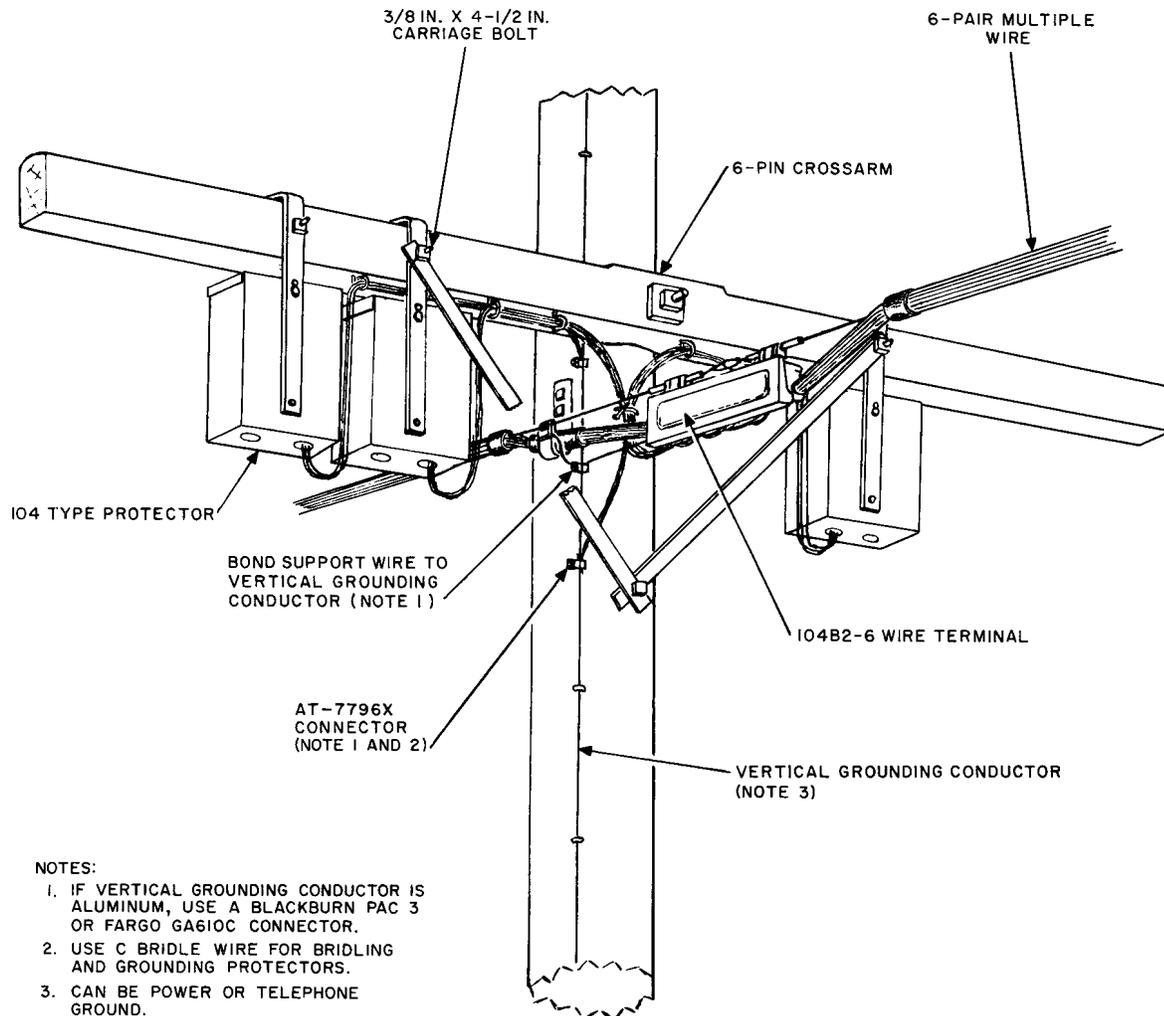


Fig. 8—104-Type Protectors Mounted with 6-Pair Multiple Wire

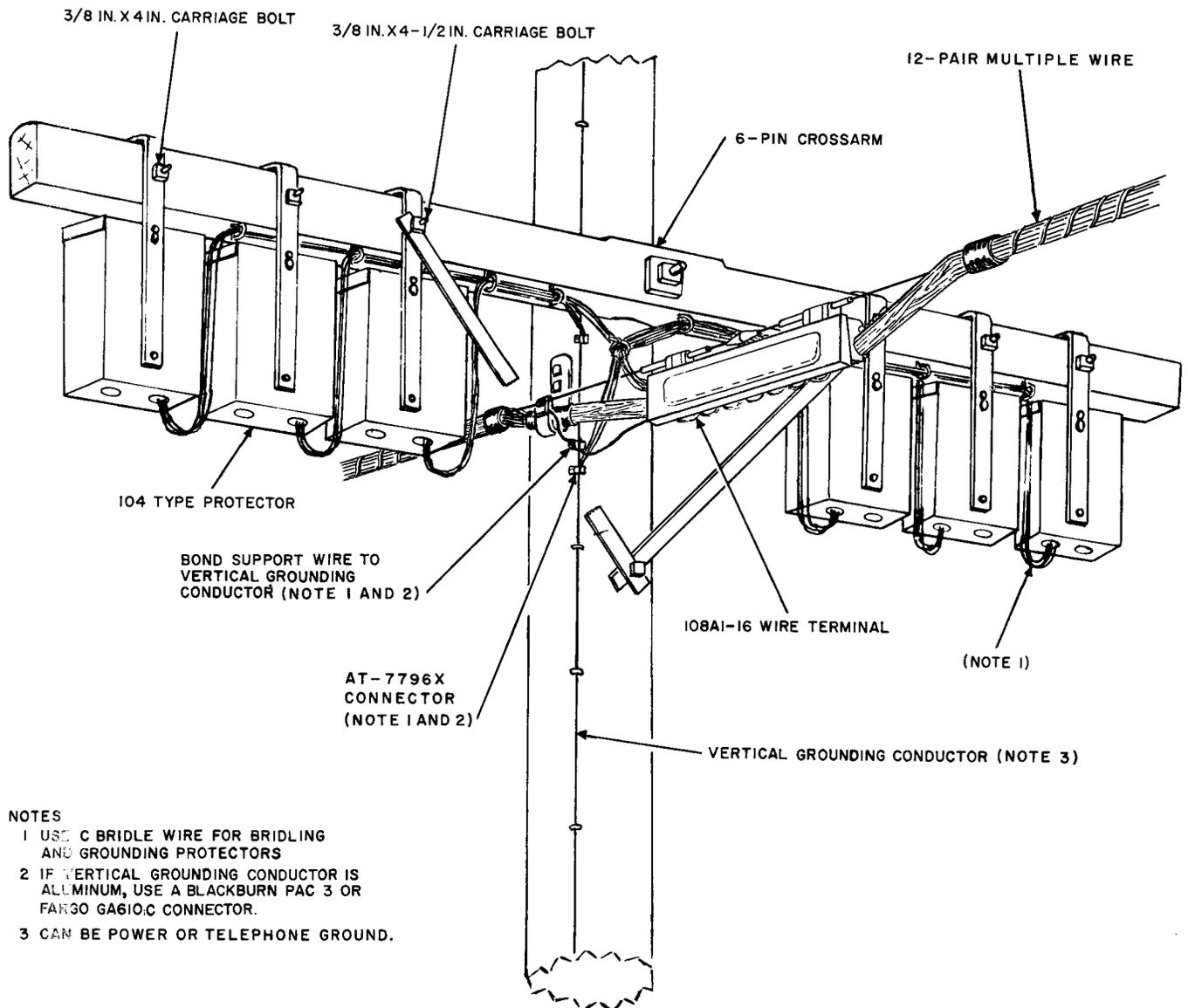


Fig. 9—104-Type Protectors Mounted with 12-Pair Multiple Wires

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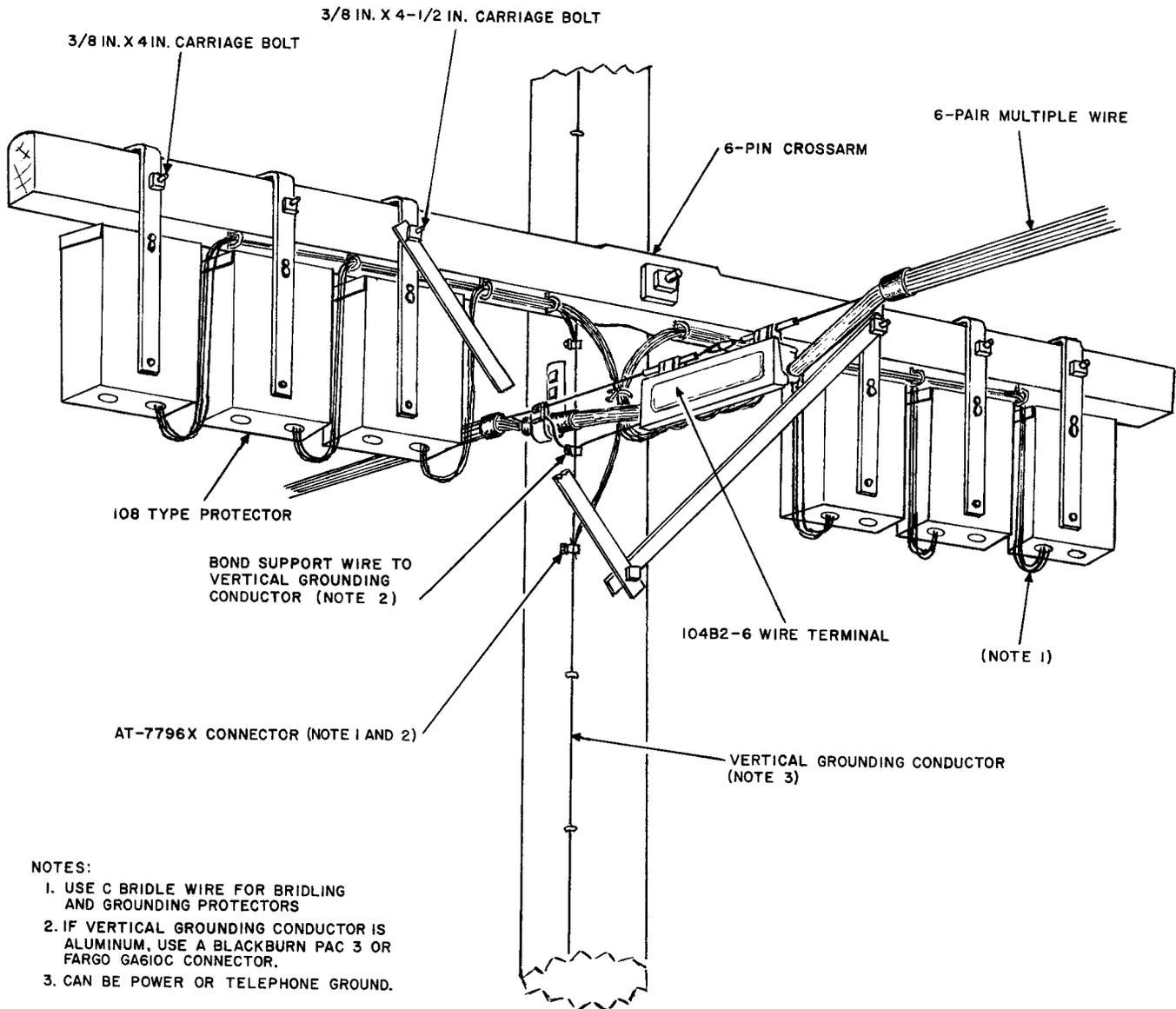


Fig. 10—108-Type Protectors Mounted with 6-Pair Multiple Wire

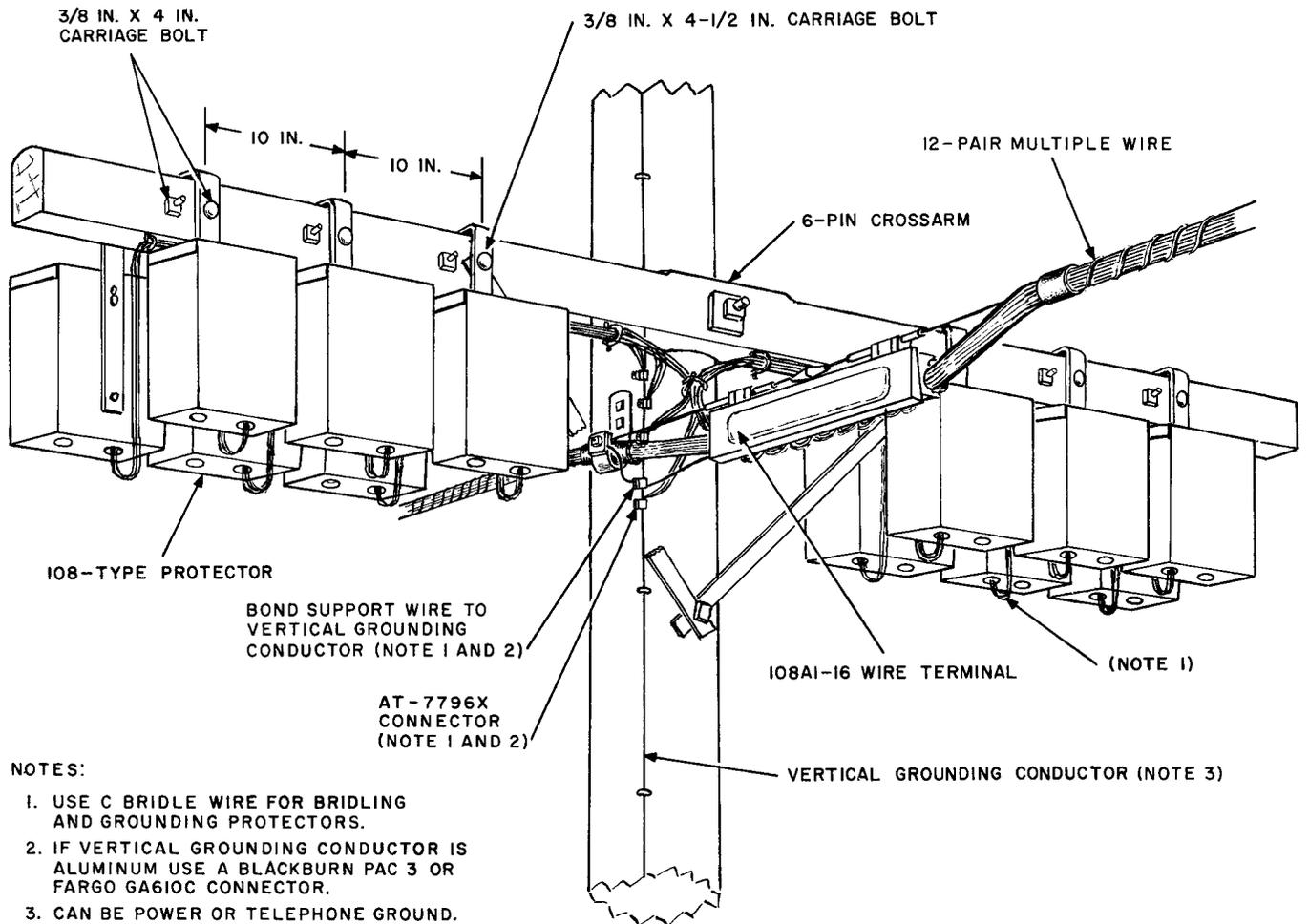


Fig. 11—108-Type Protectors Mounted with 12-Pair Multiple Wire

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6.05 Before a power system vertical grounding conductor is contacted, it should be *tested with a B Voltage Tester* (5.01). Remove about 1-1/2 inches of insulation from the C Bridle Wire connected to the ground binding post of the protector and connect it to the vertical grounding conductor by means of the proper connector shown in Table A.

the bridle wires together before inserting them in the AT-7796X Connector.

6.07 Where the power company has installed an aluminum vertical grounding conductor, do not use an AT-7796X Connector because of the corrosive chemical reaction between copper and aluminum. Make the grounding connection to the aluminum vertical grounding conductor with a Blackburn PAC 3 or a Fargo GA610C Connector.

6.08 Where copper bridle wire and steel grounding conductors are exposed next to each other, cover the AT-7796X Connector and all exposed wire as follows:

TABLE A — CONNECTING DEVICES					
NUMBER OF PROTECTOR GROUND WIRES	GROUNDING CONDUCTOR				
	109 GALV STEEL	104 COPPER OR 104 COPPER-STEEL	B GROUND WIRE	NO. 4 COPPER	NO. 2 OR NO. 4 ALUMI-NUM
1	6C Brdg Conn	104 x 064S Cop Slv or 3B Brdg Conn	#6	#4	#2
2	#6	#6	#6	#4	#2
3	#6	#6	#6	#4	#2
4	#6	#6	#4	#2	#2
5	#6	#6	#4	#2	#2

(a) Start DR Tape close to connector and wrap all the copper conductors and the steel wire as a unit, with a half-lapped layer to extend about 1 inch on the insulation of the bridle wires.

(b) Reverse the tape direction and wrap steel wire, copper conductors, and the AT-7796X Connector with a half-lapped layer of DR Tape, to extend on the steel wire about 3/4 inch beyond end of the copper conductors.

(c) Reverse direction and cover with second half-lapped layer of DR Tape, extending about 1 inch beyond connector.

(d) Cover DR Tape with one half-lapped layer of vinyl tape.

Note 1: #6, #4, or #2 refers to size of AT-7796X Connector.

Note 2: Use Blackburn PAC 3 or Fargo GA610C Connector.

6.06 Where two or more bridle wires are connected to the vertical grounding conductor, twist