

STATION SERVICE MANUAL

VOLUME II



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STATION SERVICE MANUAL VOL II

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STATION
SERVICE
MAGAZINE
VOL. II

The information in this manual expands coverage to those Telephone Sets that are seldom used and are not included in the Station Service Manual Volume 1.

The 502-XXX-XXX BSP's with the exception of 502-531-404, which are listed in Volume II of the Station Service Manual under "Telephone Sets (MD)", have been removed from this issue of Volume II. If you have a need for them retain your 1980 Volume II of the Station Service Manual.

ISSUE 7, NOVEMBER 1982

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NEW COMPANY 7-1-10

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ELECTRICAL PROTECTION WHEN USING PORTABLE AC OPERATED TOOLS AND EQUIPMENT

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1. GENERAL

1.01 This section contains information on the safe work practices to be followed when using ac operated tools and equipment. This practice also applies to the ac operated equipment or test gear.

1.02 This section is reissued to:

- Include information that was previously contained in Section 080-120-101.
- Include identical information in Section 620-103-010.
- Update illustrations to conform with the revised National Electrical Code.
- Provide information on double-insulated tools and ground fault interrupter units.
- Require tools equipped with 3-conductor cords be tested for ground continuity upon receipt, after maintenance, and at monthly intervals.

Since this is a general revision, arrows ordinarily used to indicate changes have been omitted.

1.03 The operator of portable electric equipment is protected from electric shock by:

- (a) Providing a continuous effective low resistance ground return to the power system from the device equipped with a 3-conductor cord.
- (b) Using a double insulated Underwriters Laboratories (UL) approved tool.

Note: Tools operated from ungrounded portable electric generators (circuit isolated from ground) do not require grounding. The grounded type 3-wire type receptacle has been provided to accommodate the connection of various portable tools to the generator.

1.04 Grounding as described in this section is accomplished by a third conductor in the cord that is used to connect the tool housing to the local power grounding system or to other equivalent grounds such as a continuous metallic cold water pipe which is covered by a minimum of 10 feet of earth.

1.05 Grounding the metal framework on portable electric tools protects the operator from electrical shock caused by insulation breakdown of current carrying parts within the housing. Grounding prevents a hazardous voltage on the metal framework of the tool.

1.06 Bell System approved soldering coppers used in central offices and PBXs and approved double insulated power tools do not require grounding. All other portable power tools equipped with a metal housing and not designated "double insulated" shall be effectively grounded. (Tools operated by ungrounded portable generators do not require grounding.)

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If grounding cannot be accomplished as outlined in this section, the electric tool must not be operated. Nonelectric tools should be used to complete the job.

1.07 Additional electric shock protection is provided on aerial lift, electrified vehicles, and power trailers, by equipping the 120 volt, 15 and 20 ampere grounding type 3-wire interrupter. (See Part 6.)

1.08 In wet locations, a ground fault interrupter may be used in lieu of running a grounding cord to a suitable ground.

2. PRECAUTIONS

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

2.02 Check that proper grounding connections are made and will not become disengaged during operation.

2.03 Do not connect to receptacles of unknown configuration or voltage.

2.04 Check to ensure that the cordage between the electrical outlet and power tool and any grounding wires are placed and protected so they will not interfere with the movement of, or create a hazard to, the public or employees.

2.05 Electric power tools shall not be operated while the user is standing in water.

2.06 Never use electric tools or lamps having damaged or worn cords, damaged plugs, defective switches, or other defective parts that might give the user an electric shock.

2.07 All power tools and equipment shall be removed from service immediately when found defective. They shall be tagged **DEFECTIVE** if the defect is not corrected when found.

2.08 Replacement cords shall have equal or larger gauge wire than original. Extension cords shall be used only in continuous lengths without splices.

2.09 When repairing or replacing stranded power conductors, it is advisable to twist the

strands together and tin with solder before securing at screw terminals. This action will minimize fraying and possible shorting.

2.10 All 3-conductor cords assembled or repaired locally, including those serviced by outside agencies, shall be tested for ground continuity before connected to a power supply.

2.11 Test the ground conductor with a buzzer or ohmmeter for continuity from the case of the tool to the grounding blade of the plug. Test the other conductors for lack of continuity from the case of the tool to the other blades. These tests should be performed with the "ON-OFF" switch in both positions.



All applicable tests outlined in 2.10 and 2.11 shall be performed upon initial receipt of a tool, after any maintenance, and at monthly intervals.

3. PROVISIONS FOR GROUNDING

3.01 All electric power tools requiring grounding as covered in 1.04 should be equipped with a 3-conductor cord which terminates in a standard 3-blade plug (Fig. 1).

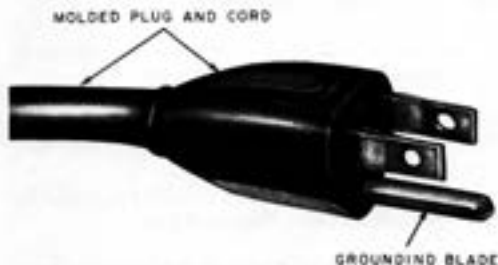


Fig. 1—Standard 3-Blade Plug

3.02 The adapter shown in Fig. 2 is used at a grounded convenience outlet to extend the power service ground for a 3-conductor device.

3.03 The grounding terminal of the adapter (Fig. 2) has a green-colored rigid tab (ear, leg, or similar device) which must be turned to the center of the convenience outlet and secured



Fig. 2—Adapter

to the grounded, uninsulated, metal face plate. The pigtail, wire type, adapters are now considered obsolete but may remain in service until there is cause for replacement with the updated model.

Note: When using a Hubbell BL12433 (Fig. 3) adapter with a 2-conductor ungrounded receptacle, a ground screw is provided for the external ground termination.



Fig. 3—Hubbell BL-12433 Adapter

3.04 When it is not possible to obtain a ground source at the convenience outlet, either the B (Fig. 4) or C (Fig. 5) grounding cords or a length of grounding wire (14-gauge) may be used.

- (a) The B grounding cord (Fig. 4) is a 15-foot, 18-gauge, single-conductor cord with clips at both ends.
- (b) The C grounding cord (Fig. 5) is identical to the B cord except that it has a clip on one end and a 3-conductor plug adapter on the other end.



Fig. 4—B Grounding Cord



Fig. 5—C Grounding Cord

3.05 C and D extension cords shown in Fig. 6 are available for connecting power tools to outlet receptacles remotely located from the work area. These cords, 30 feet in length, have a standard molded male plug at one end and a standard molded female connector body at the other. The C extension cord is wired with 18-gauge conductors while the D cord uses 14-gauge conductors.



Fig. 6—Extension Cord

3.06 The D extension cord is used for connecting heavy duty electric tools such as a 1/2-inch drill or an electric soldering pot to a power outlet. The D extension cord is rated for 15 amperes at 120 volts or 1.875 kW. The C extension cord is rated at 7.5 amperes at 120 volts or 937 watts. Figure 7 gives a typical cord makeup using an extension cord and adapter.

Warning: Do not connect an electrical device in a C or D extension cord if its rated load exceeds that of the cord.

4. METHOD OF GROUNDING

4.01 Three-Wire Grounding Type Receptacles:

The most satisfactory method of providing an effective ground is through the connection of a 3-blade plug to a compatible 3-wire receptacle (Fig. 8).

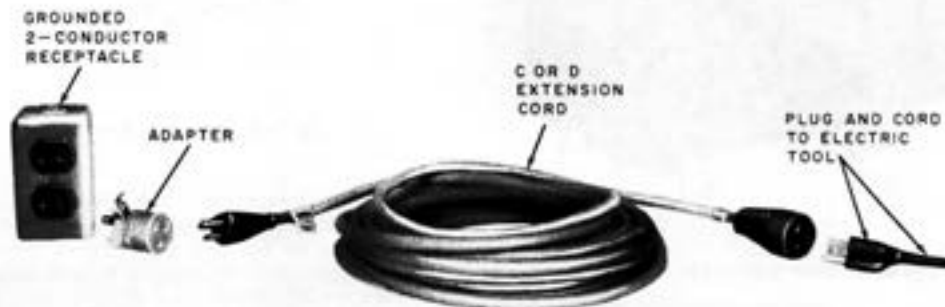


Fig. 7—Typical Cord Makeup

4.02 Two-Wire Receptacles—Ungrounded Outlet

Box: Where electrical connections are to be made at ungrounded 2-wire parallel receptacles, proceed as follows:

- (a) Locate a nearby grounded object, which has a continuity to the electric service ground, such as a continuous cold water pipe, faucets, radiators, metallic power conduit, etc., a grounding cord may be attached.

Caution: Do not use an isolated metallic object or ground rod which is not bonded to the electric power service ground.

- (b) Extend and attach the grounding cord (Fig. 9) to the grounded object, making certain that a good solid metallic connection is made on both ends.

4.03 Two-Wire Receptacles—Grounded Outlet

Box: Where a building is wired with metallic conduit, armored cable, or nonmetallic sheath cables with a grounding conductor, the outlet boxes should be grounded. When it is known that the outlet is grounded, an approved, properly placed adapter (Fig. 10) shall be used to extend the ground medium to the electrical device.

5. DOUBLE INSULATED TOOLS

5.01 Protection from electrical shock when using a tool equipped with a 3-conductor cord is dependent upon the metallic case being effectively grounded by means of the green wire in the power cord.

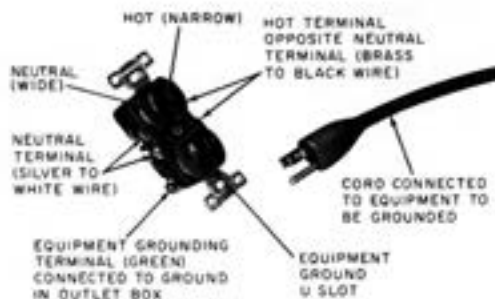


Fig. 8—Wiring of 125V Standard Plug and Receptacle

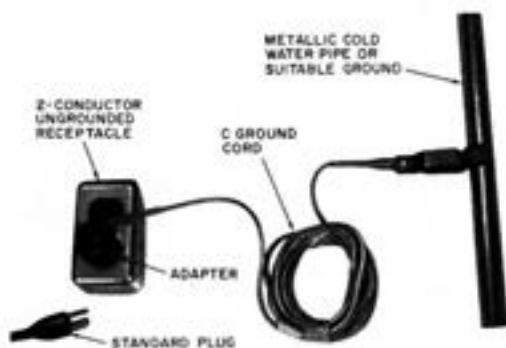


Fig. 9—Ungrounded Outlet Box

5.02 Double insulated tools provide reliable shock protection without the third wire ground in the form of reinforced insulation. In addition to the functional insulation, a reinforced or protective insulation is incorporated into the tool. The extra or reinforced insulation is physically separated from the functional and is arranged so that deteriorating influences such as wear, temperature, and contaminants will not affect both insulations at the same time. Double insulation does not take the place of normal safety precautions employed when operating electrical tools. The added insulation only protects the user from injury resulting from internal electrical failure.

5.03 A double insulated tool does not require a separate ground wire connection. Double



Fig. 10—Grounded 2-Conductor Receptacle

insulated tools can be identified by the words "double insulated" stamped on the tool. If the tool does not have the identification, it must be grounded in accordance with Parts 3 and 4 of this practice.

6. GROUND FAULT INTERRUPTER

6.01 Definition: A ground fault interrupter is a device which acts to interrupt the electrical circuit when leakage current to ground exceeds a predetermined and safe value (about 5 milliamperes). This value is considerably less than that required to operate the conventional over current devices, such as fuses and circuit breakers.

6.02 All "electrified" aerial lift vehicles and power trailers shall have the 120 volt single phase, 15 and 20 ampere convenience outlets protected with ground fault interrupters. A ground fault interrupter is a supplement to grounded 3-wire systems and double insulated tools, not a substitute.

6.03 If the ground fault interrupter trips, proceed as follows:

- (1) Remove tool(s) from receptacle.

(2) Reset the circuit breaker. (If the breaker will not reset, the trouble is internal and a qualified technician should be consulted.)

(3) If the breaker resets, the tool (or cord) is faulty and should be taken out of service. Other tools may be used to complete the job.

6.04 Older plugs with fiber face discs often absorb sufficient moisture during wet weather to cause leakage between the blades that will be corrected by substituting a molded plug for the older plug.

B-VOLTAGE TESTER

USE ON JOINT-USE POLES AND OTHER EQUIPMENT

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| 1. | GENERAL | 1 | —Include information on the testing of other equipment which could carry a foreign potential, including closures used in joint buried plant. |
| 2. | DESCRIPTION OF B-VOLTAGE TESTER AND RELATED COMPONENTS | 1 | —Require insulating gloves be tested and worn when conducting the monthly test of the B-Voltage Tester and related equipment. |
| 3. | TESTING THE B-VOLTAGE TESTER AND B-TEMPORARY BOND | 3 | —Delete reference to the KS-16990L1 Test Set (MD) as an alternate method to test the B-Voltage Tester. |
| 4. | FIELD REPAIR OF B-VOLTAGE TESTER | 4 | |
| 5. | PRECAUTIONS | 5 | —Introduce the "gunsight method" of positioning the indicator and probe when testing for a foreign potential. |
| 6. | OBSERVATIONS TO BE MADE BEFORE CLIMBING | 5 | —Include a monthly test of the B-Temporary Bond. |
| 7. | VOLTAGES TESTS AND SAFEGUARDS—AT GROUND LEVEL, AT BASE OF POLE, TESTING OTHER EQUIPMENT, AND TESTING DAMAGED JOINT CABLE CLOSURE | 6 | 1.03 These instructions supplement those given in Sections 620-131-010, 620-132-010, and 620-133-010 which cover precautions involving hazards other than electrical. |
| 8. | VOLTAGE TESTS AND SAFEGUARDS ALOFT | 9 | |
| 9. | CARE AND STORAGE | 11 | |

1. GENERAL

1.01 This section covers observations, safeguards, and testing for a potential electrical hazard before climbing or working on joint-use plant. It is imperative that employees recognize, test, and eliminate the possibility of an electrical shock before exposing themselves to a potential electrical hazard.

1.02 This section has been reissued to:

—Change the testing interval of the B-Voltage Tester from once a week to once a month.

—Provide identical information in Section 620-105-010 and cancels Section 460-300-109.

2. DESCRIPTION OF B-VOLTAGE TESTER AND RELATED COMPONENTS

2.01 B-Voltage Tester: The B-Voltage Tester (Fig. 1) is designed to detect the presence of voltages from 60 to 7200 volts. It consists of an indicator assembly with a small neon globe unit and reflector, and a plastic-insulated probe. The probe is equipped with a toothed metal disk on one end for making contact to a conductor, conduit, street light fixture, or any other object to be tested. The probe is designed to limit the amount of current which can pass through the device.

2.02 At 60 to 70 volts, the indicator of the B-Voltage Tester glows dimly. Higher voltages will produce a brighter glow. Because higher voltages can damage the tester (7200 volts will burn it out in approximately one minute), employees must observe the indicator as the probe is touched to the facility being tested. A B-Voltage

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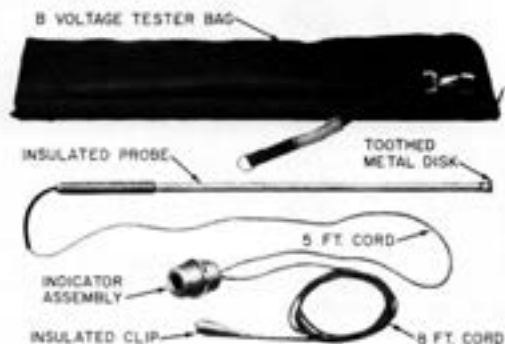


Fig. 1—B-Voltage Tester

Tester is not to be left connected after it has been determined that a facility is energized.

2.03 Canvas Bag: The canvas bag has been provided to carry and store the B-Voltage Tester, B-Temporary Bond (Fig. 2), B-Shunting Capacitor (Fig. 3), and a test date card.

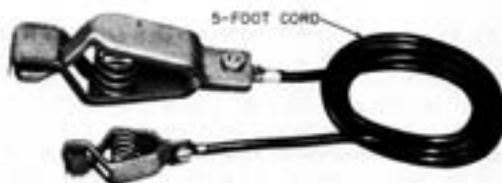


Fig. 2—B-Temporary Bond



Fig. 3—B-Shunting Capacitor

2.04 Voltage Plug: A voltage plug is to be made up locally (Fig. 4) to provide a safe and convenient means to verify that the B-Voltage Tester is in good working order. When plugged into a standard 110-120 volt convenience outlet, it provides a voltage in series with a current-limiting resistor. As illustrated, the resistor is connected to only one prong of the plug which must be inserted into the hot side of the outlet. Normally, the hot side may be identified as being the smaller of the two parallel slots in the outlet.

2.05 Shunting Capacitor: The B-Shunting Capacitor (Fig. 3) is used to distinguish dangerously energized equipment from weakly energized equipment which is not dangerous. This is necessary in some localities to avoid unjustified investigations by the responsible electric utility.

2.06 Because the B-Voltage Tester is extremely sensitive and operates with very small currents, the indicator may glow when testing a street light fixture even though energized by leakage across damp cobwebs or induction between the fixture and its wiring.

2.07 The B-Shunting Capacitor will drain off harmless voltages such as those described in 2.06. It will not interfere with the operation of the B-Voltage Tester if the fixture is dangerously energized (as it would be if the wiring insulation in the fixture broke down).

2.08 The B-Shunting Capacitor is not to be used for any other purpose except as described in 8.02.

2.09 The B-Shunting Capacitor should not be dropped and is to be kept clean and dry. It does not require testing or any special maintenance.

2.10 B-Temporary Bond: The B-Temporary Bond (Fig. 2) is used to temporarily ground a light fixture, metallic conduit, power company hardware power ground wire, or other metallic objects in the telephone company work space which could become energized if a fault developed. The B-Temporary Bond is placed on such attachments only after the metallic object has first been tested with the B-Voltage Tester and found to be free of a voltage potential. When placed, the bond is first attached (small clamp) to a reliable ground source and then to the metallic object. When the

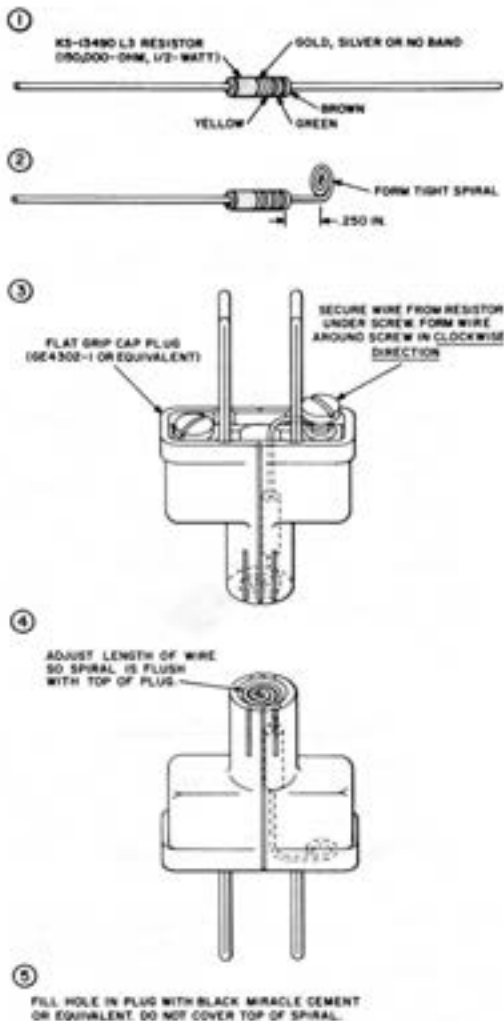


Fig. 4—Voltage Test Plug

work is completed, the bond is removed from the metallic object and then the ground source.

Should a fault develop when the B-Temporary Bond is in place, the insulation will overheat and smoke which should alert the employee to descend the pole immediately and avoid contact with the bond.

3. TESTING THE B-VOLTAGE TESTER AND B-TEMPORARY BOND

3.01 The reliability of the B-Voltage Tester and B-Temporary Bond are to be verified monthly to insure satisfactory operation. The insulating gloves are to be tested at least once each month and worn when using the B-Voltage Tester; also test and use insulating gloves when testing the B-Voltage Tester. The date on which these units are checked should be recorded on the test date card provided for that purpose.

3.02 Test the B-Voltage Tester in the following manner:

- (a) Locate an energized standard 110-120 volt convenience outlet.
- (b) Insert the voltage test plug into the outlet to energize the resistor.
- (c) Visually inspect the B-Voltage Tester for:
 - (1) Loose connections at each end of cord
 - (2) Loose ferrule
 - (3) Broken probe
 - (4) Defective clip
 - (5) Damaged cord.
- (d) Visually inspect the B-Temporary Bond for:
 - (1) Loose connection or broken wire at either clamp
 - (2) Damaged wire
 - (3) Defective clamp
 - (4) Evidence of cold solder joint.
- (e) Insulating gloves shall be worn while testing the B-Voltage Tester and B-Temporary Bond. (Insulating gloves are to be tested before and after each use.)
- (f) Attach the small clamp of the B-Temporary Bond to a suitable ground medium such as a water pipe, radiator, metallic power conduit, etc. Then attach the insulated clip of the

B-Voltage Tester to the large clamp of the B-Temporary Bond.

(g) Touch the toothed metal disk of the voltage tester probe to the metal spiral of the voltage plug. The indicator should glow; if it does not, see (j) below.

(h) Verify that an intermittent connection does not exist by placing a slight strain on the cord at the probe handle while touching the voltage plug. The indicator should continue to glow.

(i) With the indicator glowing, verify the continuity of the B-Temporary Bond by touching the large clamp of the B-Temporary Bond to the ground source. The brilliance of the indicator should *not* change. If the indicator glows brighter, the B-Temporary Bond is defective and must be replaced.

(j) If the indicator does not glow, reverse the voltage plug and repeat the tests. If the indicator fails to glow after the plug is reversed and the tests are repeated, replace the B-Voltage Tester.

4. FIELD REPAIR OF B-VOLTAGE TESTER

4.01 Certain limited field repairs of a B-Voltage Tester are permitted. Testers which cannot be repaired, using the method described in this practice, should be disposed of in accordance with local instructions.

4.02 The cord of the B-Voltage Tester may be spliced under the following conditions:

- (a) Between the probe and indicator assembly:
- (1) A maximum of two splices permitted.
 - (2) No splice permitted if the open is within 4 inches of the indicator or grip of the probe.
- (b) Between the indicator assembly and grounding clip:
- (1) A maximum of three splices permitted.
 - (2) No splice permitted if the open is within four inches of the indicator assembly.

(3) The overall length of the cord between the ground clip and indicator assembly shall not be less than 7 feet, 6 inches.

4.03 Open cords are spliced as follows (Fig. 5):

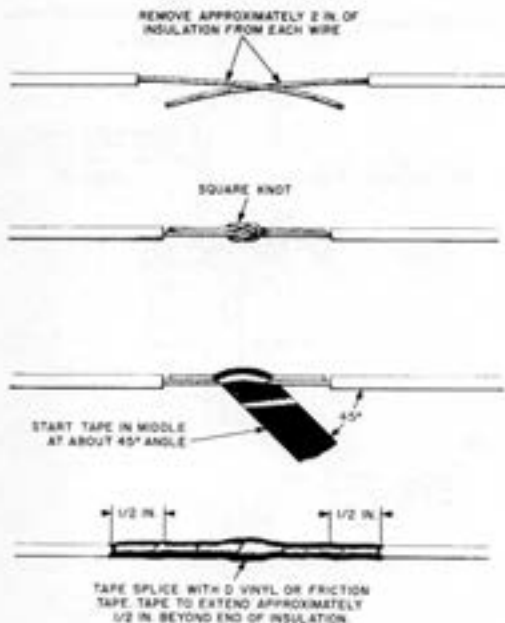


Fig. 5—Repairing Broken Cord

- (a) Remove 2 inches of insulation from the wire on each side of the open using the standard 6-inch diagonal pliers.
- (b) Clean the wire to insure a reliable connection.
- (c) Tie a square knot in the middle of the exposed wire so the ends will lie parallel and extend approximately to the beginning on the insulation.
- (d) Tape the splice with 3/4 inch D vinyl or friction tape. Apply the tape at a 45-degree angle, beginning at the knot and continue until about 1/2 inch of the rubber insulation has been covered. Apply two layers of tape.

5. PRECAUTIONS

5.01 Protective equipment (ie, insulating gloves, eye protection, hard hats when required, etc) must be worn when using the B-Voltage Tester or any of its related equipment.

5.02 When using the B-Voltage Tester, the employee is to grasp the probe at the handle.

5.03 When using the B-Shunting Capacitor, maintain at least one foot separation between the cord of the voltage tester and conductors associated with the capacitor.

5.04 An employee, testing for a foreign potential, is to observe the indicator as the probe touches the object being tested. This can be best accomplished by using the "gunsight method." Both the indicator and probe are held in the same hand and in the line of sight between the workman and the object being tested. Figures 10, 11, and 12 illustrate this technique.

5.05 The B-Voltage Tester should be touched to the facility being tested only long enough to determine whether or not the indicator glows.

5.06 Before ascending a pole, make a visual observation for potential hazards described in 6.01.

6. OBSERVATIONS TO BE MADE BEFORE CLIMBING

6.01 Examine the pole for potential electrical hazards (Fig. 6) such as a vertical power ground wire, vertical metallic power conduit, street light fixture, power company primary disconnect hardware, or other foreign metal objects. Also, observe the pole and adjacent spans for such hazards as improper clearance from power conductors or equipment, dangling power wires, inadequate clearance on pole-to-pole guys from power wires or energized attachments, etc. If none of these are present, the pole may be ascended providing no other hazard is evident.

6.02 If a vertical power ground wire is present, make a voltage test in accordance with Part 7 before climbing or working on the pole

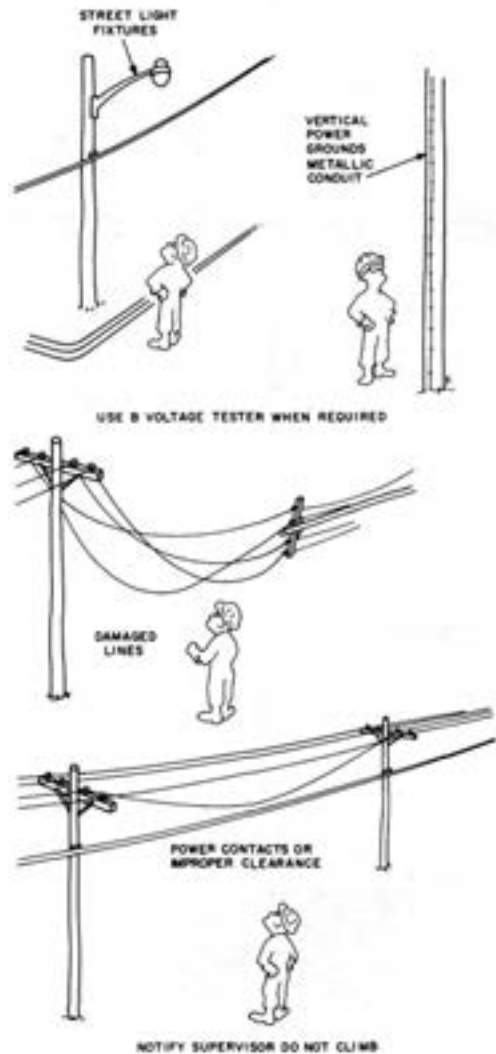
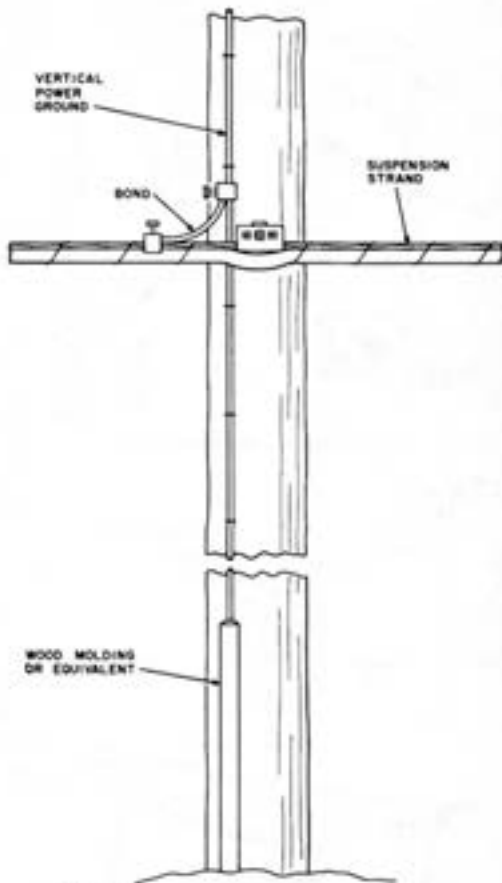


Fig. 6—Visual Inspection for Potential Electrical Hazards

unless it meets any one of the following conditions (Fig. 7):

- (a) The ground wire is securely bonded to a telephone cable strand.



NOTES:

1. NO B-VOLTAGE TESTER TEST REQUIRED IF:
 - A. VERTICAL GROUND IS BONDED TO SUSPENSION STRAND
 - B. COVERED BY UNDAMAGED INSULATION
 - C. WOOD MOLDING EXTENDS THROUGH TELEPHONE COMPANY SPACE.
2. IN ALL OTHER CASES B-VOLTAGE TESTER MUST BE USED.

Fig. 7—Vertical Power Ground—Conditions Not Requiring Use of B-Voltage Tester

- (b) The ground wire is covered with wood moulding, or equivalent, up through the telephone space.
- (c) The ground wire is of the insulated type and the insulation is in good condition.

6.03 If a vertical metallic power conduit or other power company hardware extends to the base of the pole, make a voltage test in accordance with Part 7 before climbing or working on the pole unless it can be clearly seen that the conduit or hardware is bonded to telephone cable strand.

6.04 When a pole carries multiple line wire, telephone cable, or a bare vertical power ground wire and a street light fixture (Fig. 8), plan to make a voltage test in accordance with Part 8.

6.05 If a street light fixture is present in the telephone space on a pole not carrying a telephone cable or a bare vertical power ground wire, wear insulating gloves and avoid contact with it or its wiring since it is not possible to place a temporary bond to an effective ground.

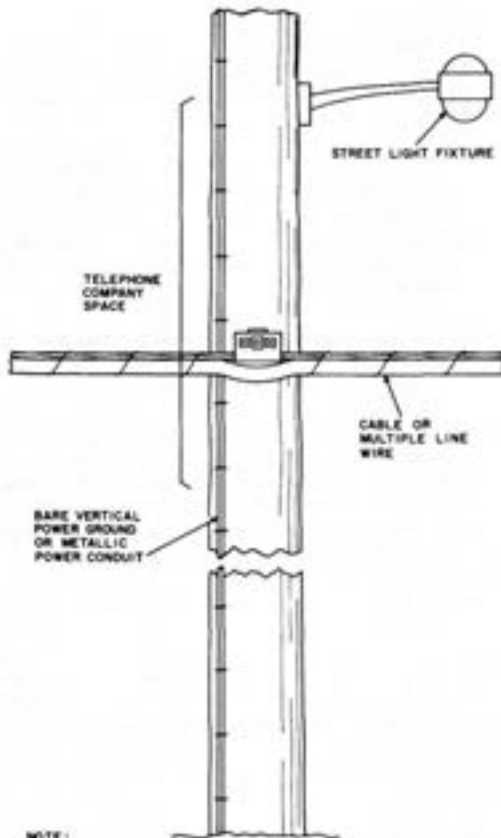
6.06 Poles carrying street light fixtures may be worked on without making a voltage test under any one of the following conditions (Fig. 9):

- (a) The fixture is located in the power company's space.
- (b) The fixture is located above telephone attachments and it is clearly evident that it is securely bonded to the telephone cable strand.
- (c) The fixture is located below telephone cable and it can be clearly seen that it is securely bonded to the telephone cable strand. However, insulating gloves must be worn in climbing the pole unless the fixture wiring through and below the telephone space is 40 inches from the pole surface or otherwise made inaccessible.

Warning: Care must be exercised when securing oneself to the pole by avoiding contact with supply wires going to the fixture.

7. VOLTAGE TESTS AND SAFEGUARDS—AT GROUND LEVEL, AT BASE OF POLE, TESTING OTHER EQUIPMENT, AND TESTING DAMAGED JOINT CABLE CLOSURE

7.01 At Pole—Vertical Ground Wire, Metallic Conduit, or Other Hardware—When a voltage test is required in accordance with 6.02 or 6.03,

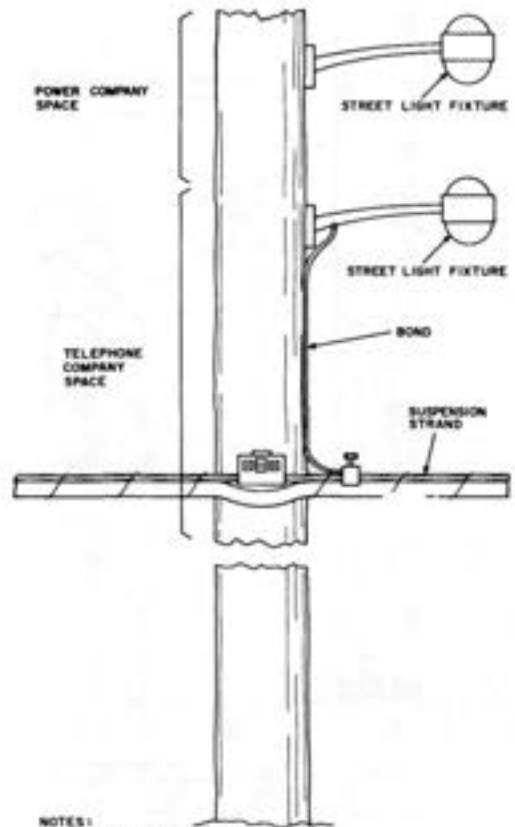


NOTE:
 B VOLTAGE TESTER
 TEST REQUIRED IF
 POLE ALSO CARRIES:
 A. TELEPHONE CABLE
 B. MULTIPLE LINE WIRE
 C. BARE VERTICAL POWER GROUND
 D. METALLIC POWER CONDUIT

Fig. 8—Street Light Fixture—Conditions Requiring Use of B-Voltage Tester

proceed as follows before climbing or working on the pole:

- (a) Attach the insulated clip of the B-Voltage Tester (Fig. 10) to one of the following:
- (1) A 5-inch screwdriver blade pushed into the earth about 5 feet from the pole.



NOTES:
 1. NO B VOLTAGE TESTER
 TEST REQUIRED IF:
 A. FIXTURE IS IN
 POWER COMPANY
 SPACE
 B. FIXTURE IS BONDED
 TO SUSPENSION STRAND
 2. IF FIXTURE IS BELOW TELEPHONE CABLE AND BONDED TO
 STRAND, INSULATING GLOVES MUST BE WORN.

Fig. 9—Street Light Fixture—Conditions Not Requiring Use of B-Voltage Tester

- (2) A projection on a manhole cover or a metallic curb box.
- (3) A guy rod or a noninsulated anchor guy.
- (4) A substantial metal object such as a piece of lead sleeving, a metal crossarm brace, a lag wrench, or a 1/2 pound bar of D Seam



Fig. 10—Testing Vertical Power Ground

Solder, drop wire reel, etc; laid on the ground or pavement about 5 feet from the pole.

- (b) Standing about 3 feet from the pole, grasp the red handle of the insulated probe and indicator assembly with the same hand. Using the "gunsight method," observe the neon indicator while touching the toothed probe firmly against the metal object being tested.

Warning: Insure that a reliable contact is made.

- (c) If the indicator glows, the object is energized.

Immediately remove the probe from the contact and notify the supervisor. **DO NOT CLIMB OR CONTACT THE POLE IF THE INDICATOR GLOWS.**

- (d) If the ground wire is broken, test the portion going up the pole unless the break exists above the telephone space. Do not attempt to test a broken ground wire or fixture in the power company's space. Report any broken wire to the supervisor.

- (e) If a ground wire requires testing and is protected with wood moulding to a height of about 8 feet, test above the moulding.

7.02 If the voltage tester does not glow in making the test described in 7.01, poles carrying vertical power ground wires may be climbed. Care should be exercised to avoid simultaneous contact between power ground wires and telephone cable or guys since a small voltage (60 volts or less) may be present. This is recommended to avoid the possibility of a surprise shock which might cause a fall from the pole.

7.03 After making the voltage test on the pole carrying a vertical metallic power conduit and telephone cable, ascend the pole wearing insulating gloves, safety glasses, hard hat, etc, and place the B-Temporary Bond as described in 8.03.

7.04 Testing Other Equipment—Mobile homes, trailers, homes with metallic siding, exposed ends of temporary or abandoned electrical wiring in the immediate work area, joint-use pedestals, etc, could present a potential electrical hazard and are to be tested in accordance with 7.01. If a voltage is detected on this foreign equipment, the property owner is to be notified so corrective action can be taken. The employee is to notify his supervisor of the detected fault on the foreign equipment or on any joint-used pedestal found energized before making physical contact with the potential hazard.

7.05 Voltage Test—Cable Sheath: When sheath continuity is to be interrupted in joint buried plant for the purpose of locating plant, locating faults, or making splices, it is necessary to test the sheath prior to and after opening it with the B-Voltage Tester in accordance with 7.07.

7.06 Voltage Test—Damaged Cable Closure

Used in Joint-Buried Plant: When a telephone or power pedestal closure (this applies to all closures used in joint-buried plant whether standing alone or mounted back to back with power) has been damaged or disturbed, eg, knocked over or driven into the earth by a motor vehicle or a trouble condition involving power is suspected, both telephone and power representatives shall be present before performing any type of maintenance work. Any power work shall be performed first.

7.07 After the power company has completed its work, the pedestal shall be tested with the B-Voltage Tester before any bodily contact is made with it. To guard against the possibility of serious injury, WEAR INSULATING GLOVES and EYE PROTECTION; then, using B-Voltage Tester, check the cable closure as follows:

- (a) Attach the insulated clip of the voltage tester to a suitable ground, no closer than 5 feet to the closure being tested. A screwdriver with a 5-inch blade or longer driven into the earth can be used as a ground. Standing about 3 feet from the closure, grasp the handle of the insulated probe and indicator assembly with the same hand. Using the "gunsight method," observe the neon indicator while pushing the toothed metal disk against the closure. Push the toothed metal disk of the probe firmly against the closure while looking into the indicator assembly. If the indicator glows, the closure is energized. Immediately remove the probe from contact with the closure and report the conditions at once in accordance with local instruction. No attempt shall be made to correct the condition or proceed with any telephone work. It shall be the responsibility of the power company to clear its trouble. Telephone employees shall not work on the telephone plant until the power company has completed repairs.
- (b) If the indicator assembly of the voltage tester does not glow in making the test described in (a) above, remove the cover from the closure and visually inspect the cable sheath ground. If the cable sheath ground is not intact or is loose, test the cable sheath with the voltage tester as described in (a) above before performing maintenance work.
- (c) If for any reason it becomes necessary to open the bonds between telephone facilities

and power or across cable sheath openings, a temporary bond strap must be placed before the bond is opened. If due to physical conditions the temporary bond cannot be placed, consult with the power company representative. It may be necessary to deenergize the power briefly for repair operations. When temporary or permanent bonds are placed or removed, *insulating gloves and eye protection must be worn.*

Warning: *Electrical continuity of all bonds, including cable shield bonds in closures or at splice locations, must be preserved during the repair process. Until the permanent bond is installed, maintain continuity using a temporary bond strap.*

8. VOLTAGE TESTS AND SAFEGUARDS ALOFT

8.01 Street light fixtures, pole-to-pole guys extending near power company facilities, and power company hardware in the Telephone Company workspace must be tested for a foreign potential as follows:

- (a) Attach B-Voltage Tester bag to the body belt.
- (b) Put on protective equipment including a hard hat, eye protection, and insulating gloves, etc, and climb to a convenient height to make the voltage test. Do not contact the suspected hardware, light fixture, or its wiring.
- (c) Attach the insulated clip of the B-Voltage Tester to the cable suspension strand, support bracket of multiple line wire, or a bare (tested) vertical power ground wire. Using the "gunsight method," touch the toothed metal disk of the voltage tester probe firmly against the fixture while observing the open end of the indicator assembly (Fig. 11).
- (d) If the indicator glows, immediately remove the probe from contact with the fixture, then remove the insulated clip from its attachment. If a B-Shunting Capacitor is not available, descend the pole and notify the supervisor. Avoid contact with the fixture or its wiring. If a B-Shunting Capacitor is available, make a second test as specified in 8.02.
- (e) If the indicator does not glow, contact the fixture with the probe again to be sure that

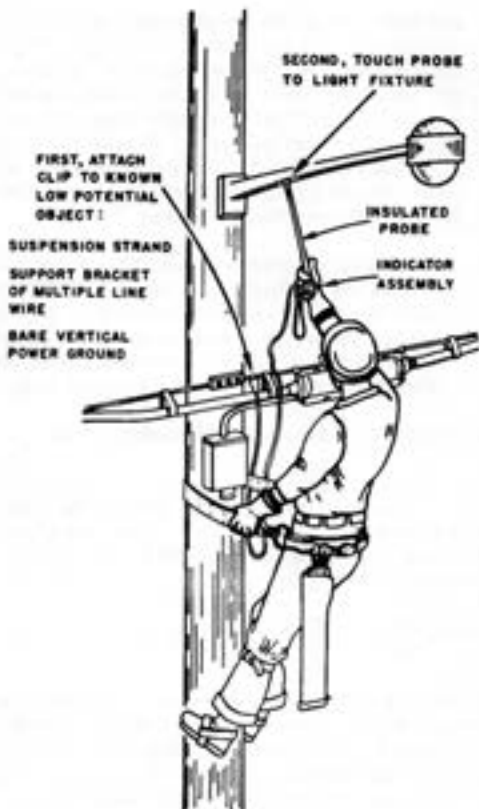


Fig. 11—Testing Street Light Fixture

good contact has been made. If the indicator still does not glow, place a temporary bond as specified in 8.03.

8.02 Use of B-Shunting Capacitor—If a foreign voltage is detected when performing the test described in 8.01, make a second test wearing insulating gloves with the aid of a B-Shunting Capacitor as follows (Fig. 12):

- (a) Attach the clip of the voltage tester and the clip of the shunting capacitor to the cable suspension strand.
- (b) Attach the small clip of the temporary bond to the metal terminal of the capacitor and

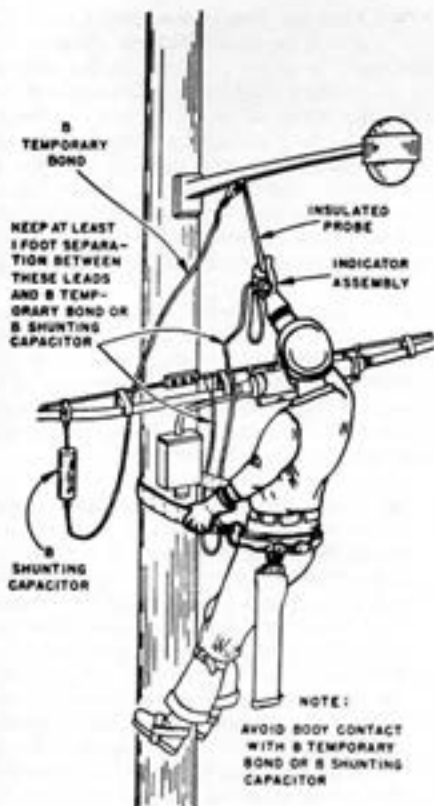


Fig. 12—Use of B-Shunting Capacitor

the large clip to the metal cap behind the toothed metal disk of the insulated probe of the voltage tester. If the metal cap or ferrule of the probe has been tape reinforced, attach the small clip of the temporary bond to the toothed metal disk of the voltage tester and the large clip to the capacitor terminal.

- (c) Make attachments so that at least one foot of separation is maintained between the leads of the voltage tester and the temporary bond or shunting capacitor.
- (d) While observing the open end of the indicator assembly, touch the toothed metal disk to

the fixture being tested. Avoid bodily contact with temporary bond or capacitor during test.

(e) If the indicator glows, the fixture is energized. Immediately remove the probe from contact with the fixture, replace testing equipment in the carrying case, descend the pole, and notify the supervisor. Avoid contact with the fixture or its wiring.

(f) If the indicator does not glow, contact the fixture with the probe again to be sure that good contact has been made. If the indicator still does not glow, place a temporary bond as described in 8.03.

8.03 Use of the B-Temporary Bond—A

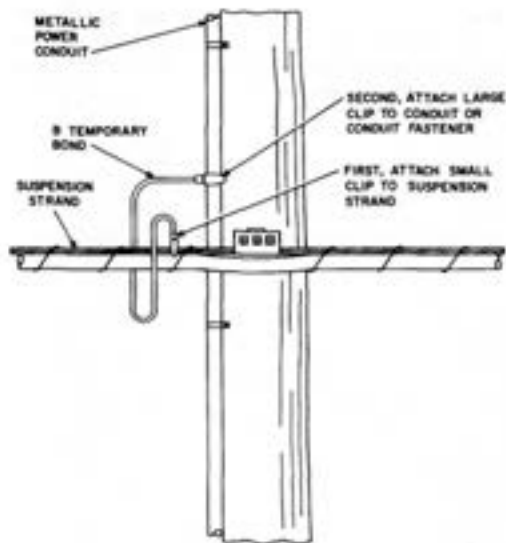
B-Temporary Bond is used to temporarily ground a fixture, conduit, or bare vertical ground wire (Fig. 13) which has been tested for and found to be free from a voltage potential while working aloft. Should a fault develop, the B-Temporary Bond will provide a direct path to ground for the foreign potential. The insulation on the bond will overheat and smoke which should alert the employee to descend the pole. Using insulating gloves, attach the bond in the following manner:

Attach the small clip of the B-Temporary Bond to the cable suspension strand in such a manner that it will not be in the way of work operations; then attach the large clip of the bond wire to the fixture, conduit, or bare vertical ground wire. Do not bond to a support bracket of multiple line wire or the suspension strand of isolated cable. Never attach to any street light wires or terminals to which they are attached or to a fixture which causes the indicator to glow.

8.04 The insulating gloves may be removed only after the temporary bond is in place, and then only if other protection requirements permit. Leave the B-Temporary Bond in place until all work operations have been completed at this pole for the day. If the bond starts smoking, put on insulating gloves and descend the pole immediately. Avoid contact with the bond, the fixture, or its wiring. Notify your supervisor.

8.05 Upon completion of work operations on a pole, remove the B-Temporary Bond as follows:

- (a) Put on insulating gloves.



NOTE:
WEAR INSULATING GLOVES

Fig. 13—B-Temporary Bond Attachment to Metallic Power Conduit

- (b) First remove the clip from the fixture, metallic conduit, or bare vertical ground wire.
- (c) Remove the other clip which was attached to the strand. If a spark is detected when removing the bond, descend the pole immediately and notify the supervisor.

9. CARE AND STORAGE

9.01 The B-Voltage Tester should be handled and stored with reasonable care. Store the bag and its contents so the instrument will not be subjected to any pressure from other tools or material.

9.02 Remove any dampness or dirt with a clean cloth before using or storing. Keep the instrument free of grease or oil to prevent deterioration of insulation.

9.03 Avoid exposing the instrument to excessive heat such as may be encountered near radiators, etc, as the plastic rod may deform under these temperatures.

9.04 The instrument is to be carried down or lowered from poles, not dropped, as the impact may short circuit the element in the neon glow unit of the indicator.

188A TEST SET
(STOP LITE)
DESCRIPTION AND USE

1. GENERAL

1.001 This addendum supplements Section 081-705-102, Issue 2. Place this pink sheet ahead of Page 1 of the section.

1.002 This addendum is issued to:

- Add comcode number to the W1BU cord and conductive probe cap
- Add description of the W1BU cord
- Change paragraphs 3.03, 3.04, and 7.01(d)(2).

2. CHANGES TO SECTION

2.001 On Page 4, Part 3, change paragraph 3.03 to read:

3.03 W1BU Ground Cord (Comcode Number 103637237): The W1BU ground cord is a black retractile single conductor cord equipped at each end with a Mueller No. 27 clip and a black Mueller No. 29 insulator. The usable length of the cord is approximately 20 feet. The ground cord is used to provide a ground to the conductive end cap when the 188A test

set is being used while working aloft, or in an insulated bucket truck.

2.002 On Page 4, Part 3, change paragraph 3.04 to read:

3.04 Conductive Probe Cap (Comcode Number 843477779): The conductive probe cap (Fig. 1) provides protection from the sharp tip of the probe. When placed on the handle (clip end) of the 188A test set, it provides the attachment knob for the W1BU ground cord and the contact surface for the hand of the user.

2.003 On Page 10, Part 7, change paragraph 7.01(d)(2) to read:

7.01 (d)(2) Obtain a W1BU ground cord. First test the W1BU ground cord. Connect one clip end to the 188A probe tip. Press and hold the 188A trigger switch. Touch the other clip end to the check contact. The red indicator should flash. Do not use the W1BU ground cord for testing if it does not pass this test. Attach one end to a known earth ground such as a screwdriver blade pushed into the ground.

NOTICE

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Bell System except under written agreement

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Page 1
1 Page

Dear Sir,
I have the pleasure to inform you that your order for [illegible] has been received and is being processed.

The goods are expected to arrive in the next few days and will be dispatched to you as soon as possible.

If you have any queries regarding your order, please do not hesitate to contact our customer service team.

Yours faithfully,
[illegible signature]

[illegible company name]

[illegible address]

[illegible contact information]

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188A TEST SET
(STOP LITE)
DESCRIPTION AND USE

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- Metal frameworks
- Metallic conduit
- Pedestals
- Newly driven ground rods
- Homes covered with metallic siding.

1.02 This section is reissued to:

- Add theory of operation
- Change Fig. 1, 2, 5 and 6.

Since this reissue is a general revision, no revision arrows have been used to denote significant changes.

1.03 The 188A test set is designed to test for hazardous voltage in the range of 50 to 20,000 volts, 60 Hz ac, and 6 to 2000 volts dc. At frequencies other than 60 Hz, the test set is less sensitive to lower frequencies and more sensitive to higher frequencies. The test set indicates when a hazardous voltage is present by means of a flashing red indicator (LED). It does not indicate the actual voltage. When the test set indicates that a hazardous voltage is present, the employee should notify his supervisor immediately. **Do not touch the energized plant or equipment.**

1.04 When testing ac voltage, the test set measures the voltage between the body of the user and the object being tested. The capacitance between the test set handle and the hand of the user is part of the measuring circuit and affects the sensitivity of the test set. Special testing procedures are required to insure accurate measurements when the user is working aloft on a pole or in an insulated bucket truck. (See paragraph 7.01 for details.)

1. GENERAL

1.01 This section covers the description and use of the 188A test set (Stop Lite). The test set is used to test the following hazardous voltages:

- Power ground wires
- Street light fixtures
- Mobile homes

NOTICE

Not for use or disclosure outside the Bell System except under written agreement

1.05 When testing dc voltages, a B temporary bond must be established between the ground terminal of the test set and a **known earth ground**. If there is any doubt as to the continuity of the B temporary bond, test the bond before the bond is used to test for hazardous voltages. (See paragraph 8.03 for details.) **Do not use the B temporary bond for bonding if it does not pass this test.**

1.06 Protective gloves are not required while testing for hazardous voltages with the 188A test set. The test set has been designed and tested to protect the user from all hazardous voltages below 20,000 volts, 60 Hz ac. Voltages above 20,000 Vac may be present in areas such as power substations. [See paragraph 6.01 (e).] The use of protective gloves while testing should be avoided since gloves reduce the sensitivity of the test set and may cause erroneous indications of hazardous voltage.

1.07 If protective gloves are being used to perform other work operations and testing, and a hazardous voltage is indicated by the test set, **do not retest without gloves. Contact your supervisor before making additional tests.** However, if a safe condition is indicated while using protective gloves, a second test must be performed **without gloves** to verify the initial test result. Protective gloves reduce the sensitivity of the test set.

2. PRECAUTIONS

2.01 Do not drop the 188A test set because the shock may damage the protective insulation or the internal circuitry. Return the test set immediately for testing and repair if it appears to be damaged or fails to meet the self-check test described in paragraph 6.01.

2.02 Keep the conductive probe cap over the probe end of the test set when not in use to avoid damage to the probe tip. Keep the test

set clean at all times. Dirt, water, or other foreign matter can affect the insulating properties of the test set. (See paragraph 9.02.)

2.03 Before climbing a pole, make a visual observation for potential hazards. (See paragraph 5.01.)

2.04 Perform a self-check before using the set to verify that the test set is working properly. (See paragraph 6.01.)

2.05 When using the probe, keep fingers behind the flash guard at all times.



Do not take unnecessary risks when potential electrical hazards are present.

2.06 The flashguard and handle of the 188A test set are designed and tested to protect the user while testing hazardous voltage below 20,000 volts. **Do not drill, scratch, etch, use adhesive labels, or otherwise modify or deface the handle and flashguard.** Defacing or altering the 188A test set may lower or destroy the 20,000 volt ac protection afforded by the test set when testing for hazardous voltages.

2.07 If no danger is indicated when protective gloves are worn to make a test, a second test must always be performed with a bare hand holding the test set.

2.08 The 188A test set should be tested annually for dielectric strength integrity of the handle. Also test when handle integrity is in doubt, such as cracks or deep scratches in the handle area. See Section 081-705-103 for testing procedures using 188A test set.

3. DESCRIPTION

3.01 The 188A test set (Fig. 1) is a yellow plastic two-piece unit that weighs approximately 1 pound. The front housing contains the carbide probe tip and the light emitting diode (LED) voltage probe indicators (one green and one red), Fig. 2.

3.02 C Canvas Bag: An AT-8924 canvas bag is available to carry and store the 188A test set and B temporary bond.

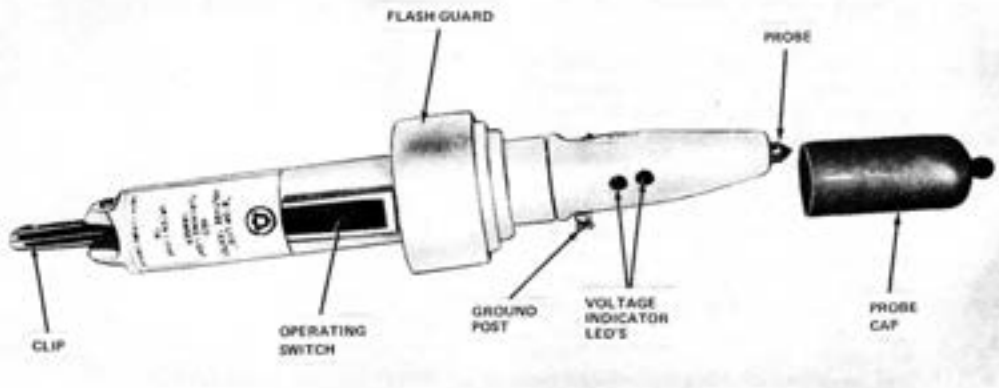


Fig. 1—188A Test Set

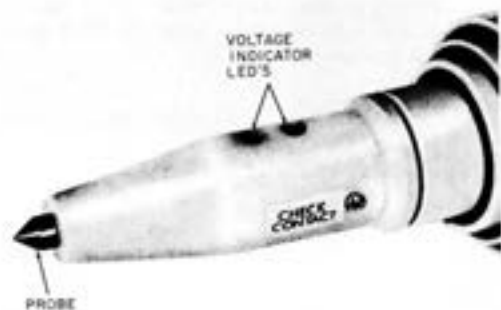


Fig. 2—Voltage Indicators



B Temporary Bond: The B temporary bond (Fig. 3) is used to temporarily ground a light fixture, metallic conduit, power company hardware power ground wire, or other metallic objects in the telephone company work space which could become energized if a fault developed. The B temporary bond is placed on such attachments only after the metallic object has first been tested with the 188A test set and found to be free of a voltage potential. When placed, the bond is first attached (small clamp) to a reliable ground source and then to the metallic object. When the work is completed, the bond is removed from the metallic object and then the ground source. Should a fault develop when the B temporary bond is in place, the insulation may overheat and smoke which should alert the employee to descend the pole immediately and avoid contact with the bond.

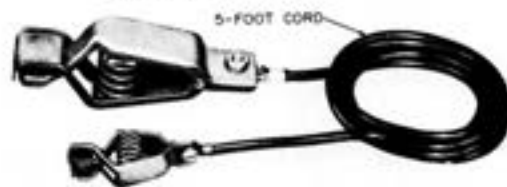


Fig. 3—B Temporary Bond

3.03 188A Ground Cord (W1BU): The 188A ground cord is used to provide a ground to the conductive end cap when the 188A test set is being used while working aloft, or in an insulated bucket truck. (See paragraph 7.01 for details.)

3.04 Conductive Probe Cap: The conductive probe cap (Fig. 1) provides protection from the sharp tip of the probe. When placed on the handle (clip end) of the 188A test set, it provides the attachment knob for the 188A ground cord and the contact surface for the hand of the user as required in paragraph 7.01.

4. THEORY OF OPERATION

4.01 The 188A test set measures the voltage between the body of the user and the object being tested. The capacitance between the test set handle and the hand of the user is part of the measuring circuit and affects the sensitivity of the test set. In addition, any voltage induced on the body of the user through electrostatic coupling from power transmission lines is effectively in series with the voltage being measured and may cause the test set to indicate an unsafe condition when none actually exists. For this reason, special testing procedures are required when the user is working aloft under or near power transmission lines.

4.02 A special testing procedure, described in paragraph 7.01, is necessary in order to eliminate the electrostatic voltage coupled to the user from power lines. Use of the conductive probe cap and 188A ground cord as described in paragraph 7.01 will eliminate the users body voltage. The 188A test set will then measure only the voltage on the object being tested. Without this special procedure, the body voltage of the user may be significant. This voltage is harmless and cannot produce dangerous current. The voltage is often of sufficient amplitude to light the red LED on the 188A test set.

4.03 The protective 20,000 volt insulation provided by the 188A test set is not affected when the conductive probe cap is placed on the handle. The user should observe all precautions listed in Parts 5, 6, and 7 until a safe reading is obtained. **Do not touch potentially energized objects.** The employee should remain clear of **all** potentially hazardous objects.

5. OBSERVATIONS TO BE MADE BEFORE CLIMBING

5.01 Examine the pole for potential electrical hazards (Fig. 4) such as a vertical power ground wire, vertical metallic power conduit, street light fixture, power company primary disconnect hardware, or other foreign metal objects. Also observe the pole and adjacent spans for such hazards as improper clearance from power conductors or equipment, dangling power wires, inadequate clearance between pole-to-pole guys and power wires or energized attachments, etc. If none of these are present, the pole may be climbed providing no other hazard is evident.

5.02 If a vertical power ground wire is present, make a voltage test in accordance with Part 6 before climbing or working on the pole unless it meets any one of the conditions illustrated in Fig. 5.

5.03 If a vertical metallic power conduit or other power company hardware extends to the base of the pole, make a voltage test in accordance with Part 6 before climbing or working on the pole.

5.04 When a pole carries multiple line wire, telephone cable, or a bare vertical power ground wire and a street light fixture (Fig. 6), test in accordance with Part 7.

5.05 If an ungrounded street light fixture is present, and is less than 40 inches above or below telephone attachments, and is on a pole not carrying a telephone cable or a bare vertical power ground wire, wear insulating gloves and avoid contact with it or its wiring since it is not possible to place a temporary bond to an effective ground.

5.06 Voltage tests are not required at poles with street light fixtures as illustrated in Fig. 7.

Danger: Do not contact supply wires going to the fixture.

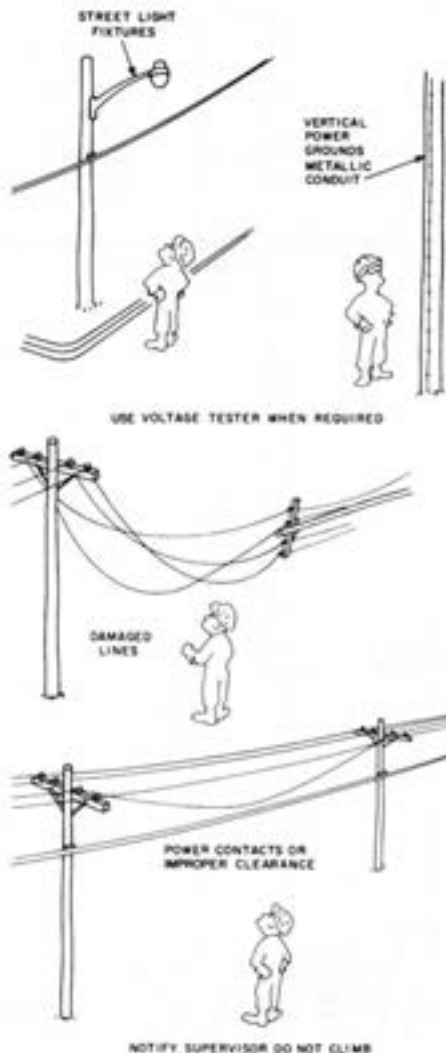
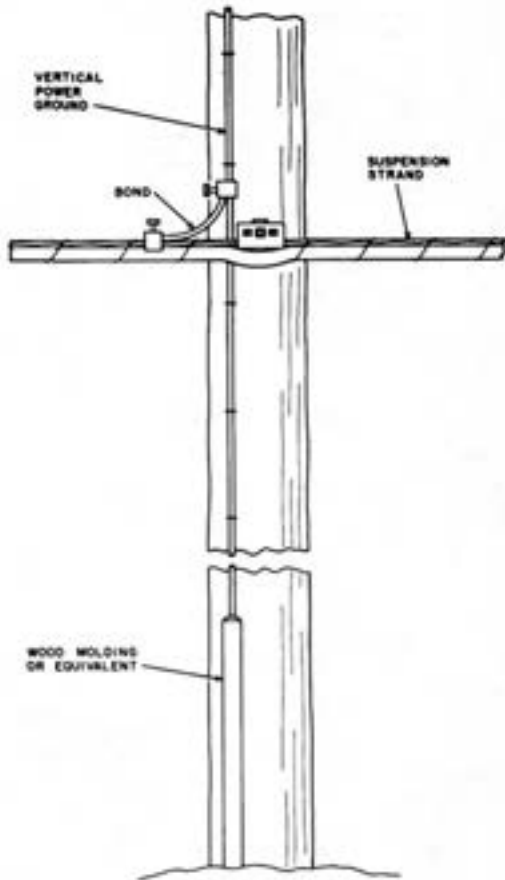


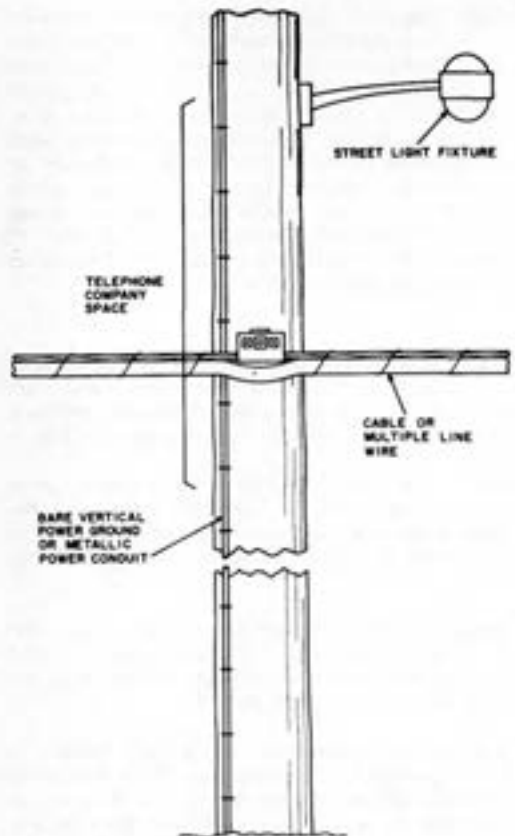
Fig. 4—Visual Inspection for Potential Electrical Hazards



NOTES:

1. NO TEST REQUIRED IF:
 - A. COVERED BY UNDAMAGED INSULATION
 - B. WOOD MOLDING EXTENDS THROUGH TELEPHONE COMPANY SPACE.
2. IN ALL OTHER CASES TESTER MUST BE USED.

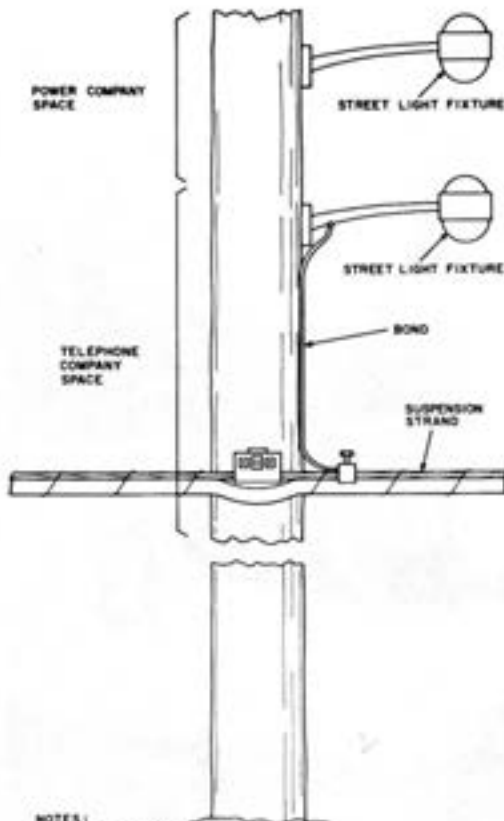
Fig. 5—Vertical Power Ground—Not Requiring Use of 188A Test Set



NOTE:

- VOLTAGE TEST REQUIRED IF POLE ALSO CARRIES:
- A. TELEPHONE CABLE
 - B. MULTIPLE LINE WIRE
 - C. BARE VERTICAL POWER GROUND
 - D. METALLIC POWER CONDUIT
 - E. FIXTURE NOT BONDED TO STRAND

Fig. 6—Street Light Fixtures Requiring Use of 188A Test Set



NOTES:

1. NO TEST REQUIRED IF:
 - A. FIXTURE IS IN POWER COMPANY SPACE
 - B. FIXTURE IS BONDED TO SUSPENSION STRAND
2. IF FIXTURE IS BELOW TELEPHONE CABLE AND BONDED TO STRAND, INSULATING GLOVES MUST BE WORN UNLESS THE WIRES FROM THE LIGHT FIXTURE ARE 40 INCHES FROM THE POLE.

Fig. 7—Street Light Fixture Not Requiring Use of 188A Test Set

6. VOLTAGE TEST AND SAFEGUARD—AT GROUND LEVEL, AT BASE OF POLE, TESTING OTHER EQUIPMENT, AND TESTING DAMAGED JOINT CABLE CLOSURE

6.01 At Pole - Vertical Ground Wire, Metallic Conduit, or Other Hardware—When a voltage test is required in accordance with paragraph 5.02 or 5.03, proceed as follows before climbing or working on the pole:

- (a) Examine the tester for cracks. If there are cracks in the plastic, the tester must not be used but returned for repair.
- (b) Grasp the 188A test set handle using the bare hand. Depress the switch and verify that the green LED is lit. If the green LED does not light, check batteries; replace if needed. Repeat verification check. If the green LED still does not light, do not use.
- (c) With the switch depressed, touch both the probe tip and the "check contact" using the free hand (Fig. 8). Remove the free hand; the red LED should flash. If it does not, **do not use**.

Note: It may be necessary to wet the fingers touching the probe tip and the "check contact".

- (d) Once the red flashing indicator appears, it will be "locked up" as long as the switch is depressed. This allows the employee to remove the test set and read the LED display. The green LED indicates that the object is safe. The flashing red light indicates presence of a hazardous foreign voltage.

- (e) Where the voltage exceeds 20,000 volts such as substations, power stations, etc, protective gloves are worn to test high voltage objects. If a safe condition is indicated with gloves, a second test should be made with a bare hand holding the test set. This will reduce the possibility of a low voltage surprise shock because protective gloves reduce test set sensitivity.

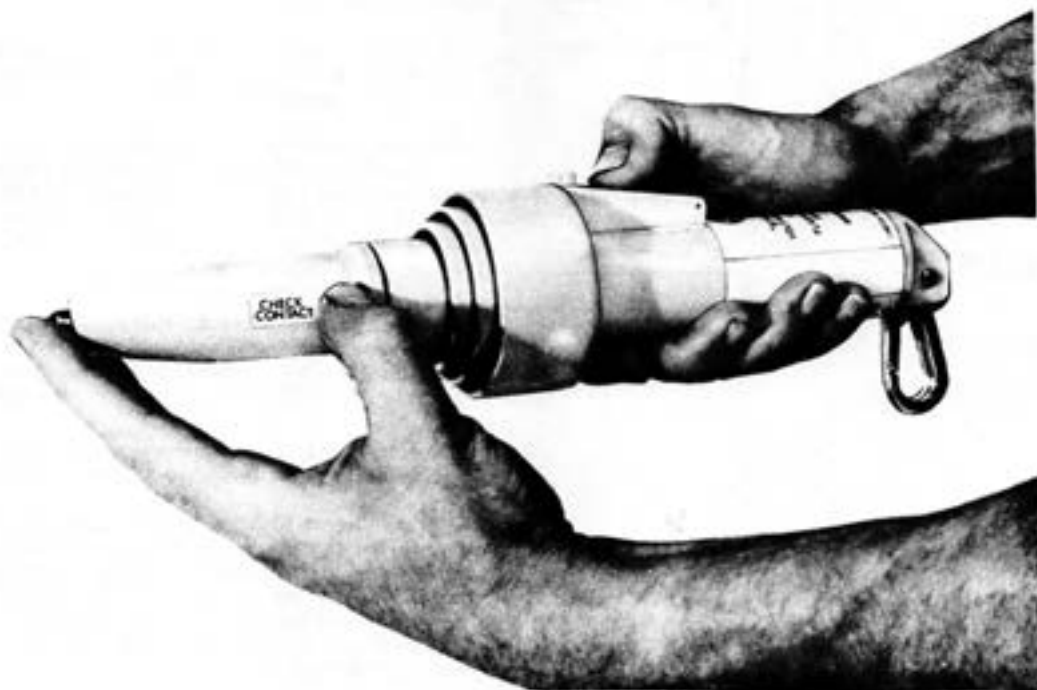


Fig. 8—Checking Test Set Before Use



Hold the handle of the tester and always keep your fingers behind the flash guard rings when testing for voltage.

6.02 Do not touch object suspected of having high voltage (damaged pedestal, or object close to high voltage line). Depress and hold switch down as you approach object. Should test set begin to vibrate, hiss, buzz, or red LED flash, immediately move away from object. Do not touch; call your supervisor. If none of the above occurs, complete test as outlined in paragraphs 6.03, and 6.04.

6.03 If probe LED did not flash red during approach to object, press the probe end of the tester against the object to be checked for voltage. It may be necessary at times to turn the tester from side to side to break through paint or other surface finish. Ensure that a reliable contact is made.

6.04 Depress switch and hold down throughout the test. Still holding switch down, remove tester from object being tested. Green LED is safe; flashing red means danger. Call your supervisor.

6.05 If the ground wire is broken, test the portion going up the pole unless the break exists above the telephone space. Do not attempt to test a broken ground wire or fixture in the power company's space (40 inches or more above highest telephone attachment). Report any broken wire to the supervisor.

6.06 If a ground wire requires testing and is protected with wood molding to a height of about 8 feet, test above the molding.

6.07 If the voltage tester does not indicate a hazardous voltage by the flashing red LED in making the test described in paragraphs 6.03 and 6.04, poles carrying vertical power ground wires may be climbed. Care should be exercised to avoid simultaneous contact between power ground wires and telephone cable or guys since a small voltage may be present. This is recommended to avoid the possibility of a surprise shock which might cause a fall from the pole.

6.08 Voltage Test—Mobile Homes, Trailers, Metal Sheath Buildings, and Newly Driven Ground Rods: These present a potential electrical hazard and always require testing. All employees exposed to mobile homes, trailers, and metal sheath buildings should test the skin and frame, or both frames in the case of double wide mobile homes before starting any work operation. In some cases, the employee may be wearing rubber gloves (driving a ground rod) during the work operation. The final test using the 188A must be done with the bare hand holding the test set. If a voltage is detected on these objects, the property owner is to be notified so corrective action can be taken. The employee is to notify his supervisor of the detected fault on the object or on any joint-used pedestal. Do not contact potential hazard until all hazardous voltage has been removed and the voltage tester indicates a safe condition.

6.09 Voltage Test—Cable Sheath: When sheath continuity is to be interrupted for the purpose of locating plant, locating faults, or making splices, it is necessary to test the sheath prior to and after opening it with the 188A test set in accordance with paragraphs 6.01 through 6.04.

6.10 Voltage Test—Damaged Cable Closure Used in Joint-Buried Plant: When a telephone or power pedestal closure (this applies to all closures used in joint-buried plant whether standing alone or mounted back to back with power) has been damaged or disturbed, eg, knocked over or driven into the earth by a motor vehicle, or a trouble condition involving power is suspected, power work shall be performed first. Then proceed as follows:

- (1) Before any bodily contact is made, test using the 188A test set.
 - If the test indicates the presence of power, immediately remove the test set from contact. Take necessary precautions to protect the public and notify your supervisor.

6.11 Telephone employees shall not work on the telephone plant until the power company has completed repairs. After the power company has completed its work, the pedestal shall be tested with the 188A test set before any bodily contact is made. It shall be the responsibility of the power company to clear its trouble. Telephone employees shall not work on the telephone plant until the power company has completed repairs.

6.12 If the tester indicates a safe condition, remove the cover of the closure and visually inspect the cable bonding and grounding connections. If they are not intact or loose, test the connections with the test set before performing maintenance work.

6.13 If for any reason it becomes necessary to open the bonds between telephone facilities and power or across cable sheath openings, a temporary bond strap must be placed before the bond is opened. If for any reason the temporary bond cannot be placed, consult your supervisor. It may be necessary for the power company to de-energize the power briefly during repair operations to the bonds. When temporary or permanent bonds are placed or removed, rubber insulating gloves and eye protection must be worn. Replace bond after fault has been located.

Warning: *Electrical continuity of all bonds, including cable sheath bonds in closures or at splice locations, must be preserved during the repair process. Until the permanent bond is installed, maintain continuity using a temporary bond strap (Section 644-200-031).*

7. VOLTAGE TESTS AND SAFEGUARD ALOFT, UNDER, OR NEAR POWER TRANSMISSION LINES

7.01 Street light fixtures, pole-to-pole guys extending near power company facilities, and power company hardware in the Telephone Company workspace must be tested for hazardous potential as follows:

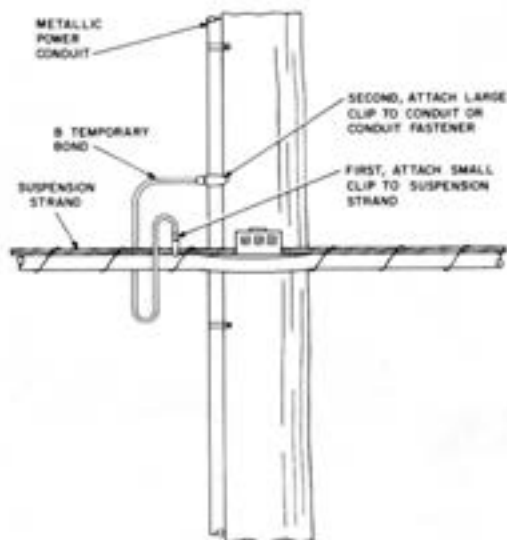
- (a) Put on protective equipment including a hard hat, eye protection, etc, and climb to a convenient height to make the voltage test. Do not contact the suspected hardware, light fixture, or its wiring.
- (b) Test the object in accordance with paragraphs 6.01 through 6.04.

(c) If after depressing the switch and touching the probe tip to the object the green LED lights, you may proceed with your work after placing a temporary bond as specified in paragraph 7.02.

(d) If the red LED is flashing, it may be caused by the electrostatic voltage induced on the body of the user from the power transmission line. In such cases, the procedures described below must be followed:

- (1) Descend immediately.
 - (2) Obtain a 188A ground cord. First test the 188A ground cord. Connect one clip end to the 188A probe tip. Press and hold the 188A trigger switch. Touch the other clip end to the check contact. The red indicator should flash. Do not use the 188A ground cord for testing if it does not pass this test. Attach one end to a known earth ground.
 - (3) Place the conductive probe tip cap on the handle (clip end) of the 188A test set until the metal clip seats itself in the cap.
 - (4) Attach the other end of the ground cord to the contact on the conductive probe tip cap.
- Ascend, and retest the suspected object. If the red indicator continues to flash, a hazardous condition exists. **Do not test the object again. Descend immediately and call your supervisor.**

7.02 Use of the B Temporary Bond—The B temporary bond is used to temporarily ground a fixture, conduit, or bare vertical ground wire (Fig. 9) which has been tested for and found to be free from a voltage potential while working aloft. Should a fault develop, the B temporary bond will provide a direct path to ground for the foreign potential. The insulation on the bond may overheat and smoke which should alert the employees to descend the pole. Using rubber insulating gloves, attach the bond in the following manner: Attach the small clip of the B temporary bond to the cable suspension strand in such a manner that it will not be in the way of work operations; then attach the large clip of the bond wire to the fixture, conduit, or bare vertical ground wire. Do not bond to a support bracket of multiple line wire or the strand of isolated cable. **Never attach to any street light wires or terminals to which they are attached or to a fixture which causes the red LED to flash.**



NOTE:
WEAR INSULATING GLOVES

Fig. 9—B Temporary Bond Attachment to Metallic Power Conduit

7.03 The rubber insulating gloves may be removed only after the temporary bond is in place, and then only if other protection requirements permit. Leave the B temporary bond in place until all work operations have been completed at this pole for the day. If the bond starts smoking, put on insulating gloves and descend the pole immediately. Avoid contact with the bond, the fixture, or its wiring. Notify your supervisor.

7.04 Upon completion of work operations on a pole, remove the B temporary bond as follows:

- Put on rubber insulating gloves.
- First remove the clip from the fixture, metallic conduit, or bare vertical ground wire.
- Remove the other clip which was attached to the strand. If a spark is detected when removing the bond, descend the pole immediately and notify the supervisor.

8. DC VOLTAGE TESTING

8.01 DC voltage hazards may be present in certain locations, such as near electric railway, subway, or trolley car lines or associated equipment.

8.02 To test in these locations, first perform the procedures in Parts 5, 6, and 7. If no ac hazards exist, proceed to paragraph 8.03.

8.03 First test the B temporary bond to be used as a ground cord. Connect the large clip end to the 188A probe tip. Press and hold the 188A trigger switch. Touch the small B bond clip end to the check contact. The red indicator should flash. **Do not use a B bond for testing if it does not pass this test.**

8.04 Connect B bond large clip end to a stand, ground wire, or other conductor **known to be earth grounded** and the small clip to the 188A GND contact.

8.05 Press the probe end of the 188A against the object to be tested for voltage. **Ensure that a reliable contact is made.** Press trigger and hold down. Remove probe from object and observe LED indicators. Green LED is safe; flashing red means danger. **Do not touch the energized object.** Call your supervisor.

9. CARE AND STORAGE

9.01 The 188A test set should be handled and stored with reasonable care. Always store the test set in the AT-8924C storage bag with the B bond wire. Do not subject the test set to possible pressure from other tools or material. Pressure may cause the switch to operate and discharge the battery.

9.02 Remove any dampness or dirt with a clean cloth before using or storing. Keep the instrument free of grease or oil to prevent deterioration of insulation. Use mild soap solution to clean. Do not use solvents on test set.

9.03 Avoid exposing or storing the instrument in a hot area such as may be encountered near radiators, etc.

9.04 The instrument is to be carried down or lowered from poles, not dropped, as the impact may damage the internal wiring.

9.05 When replacing batteries (Fig. 10), always use a 9V alkaline such as Eveready* 522. Other manufacturers' batteries may be physically larger and could damage the test set if used. To prevent damage to internal components, exercise care when replacing the battery.

*Registered trademark of Union Carbide Corp.

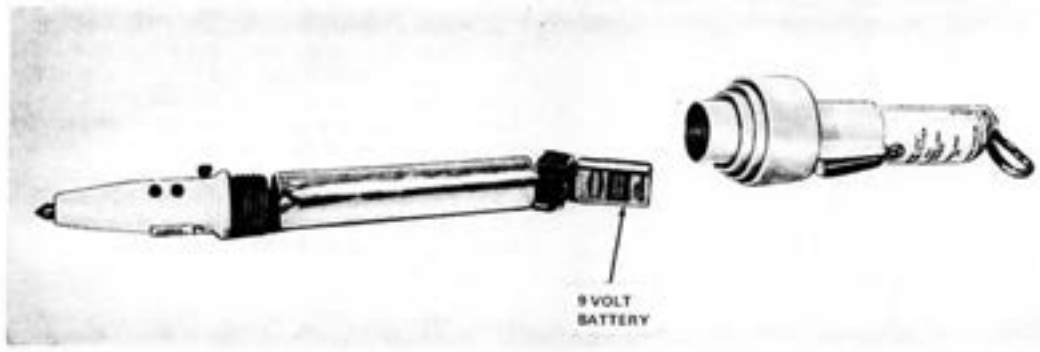


Fig. 10—Battery Location

BODY BELTS AND SAFETY STRAPS

DESCRIPTION AND USE

| CONTENTS | PAGE | CONTENTS | PAGE |
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| 1. GENERAL | 1 | A. Cleaning | 14 |
| 2. DESCRIPTION | 2 | B. Oiling | 14 |
| D AND E BODY BELTS | 2 | C. Disposition | 14 |
| F BODY BELT | 2 | | |
| D SAFETY STRAP | 5 | | |
| 3. PRECAUTIONS | 5 | 1. GENERAL | |
| 4. INSPECTION | 7 | 1.01 This section describes the standard fabric body belts and safety straps, and covers instructions and precautions pertaining to their use and care. | |
| VISUAL INSPECTION OF BODY BELT | 8 | 1.02 This section is reissued to include design changes for the D, E, and F body belts. These changes are as follows: | |
| A. Fabric and Leather Type | 8 | (a) Relocate wrench keeper and tool loops (D and E belts) | |
| B. Leather Belts—Bending Test | 9 | (b) Combine identification and instruction plates into one tag identified as a nameplate (D, E, and F belts) | |
| VISUAL INSPECTION OF SAFETY STRAP | 9 | (c) Relocate tool loops and holster tabs (F belt). | |
| 5. USE | 9 | Revision arrows are used to emphasize the more significant changes. | |
| ON POLE | 9 | 1.03 Although leather belts have been rated Manufacture Discontinued (Mfr Disc.), a large number of belts are still in use and, therefore, the precautions, inspection, and maintenance procedures will still be covered in this section. | |
| ON AN EXTENSION LADDER | 9 | 1.04 The degree of comfort and satisfactory service an employee obtains from a body belt depends to a large extent on the locations of the Dee rings with respect to the prominent portions of the hip bones. The Dee rings should be slightly in front of the prominent portions of the hip bones. To obtain a | |
| ON AN AERIAL PLATFORM | 10 | | |
| ON A TRUCK PLATFORM | 12 | | |
| ON AN AERIAL LIFT | 12 | | |
| POLE-MOUNTED TERMINALS—WITH HANDLES | 12 | | |
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| FABRIC BODY BELTS | 12 | | |
| LEATHER BODY BELTS | 14 | | |

NOTICE

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Bell System except under written agreement

properly fitting belt, measure the distance across the back of an employee to the desired locations of the Dee rings and order a belt of the size nearest to this dimension.

1.05 Information on tool holsters and the handline carrier for use with a body belt is covered in Section 081-720-111.

2. DESCRIPTION

D AND E BODY BELTS

2.01 The D and E body belts have all strength members made of six-ply neoprene-impregnated nylon fabric and are equipped with a leather or leather-substitute cushion, a buckle, Dee rings (for attachment of a safety strap), tape thong, wrench keeper, loops to accommodate tools, and provisions for attaching a holster. The D body belt is illustrated in Fig. 1. The E body belt is identical to the D body belt except it is equipped with four wire rings for use with suspenders or a waist belt.

2.02 These belts are available as a "left" or "right" belt in the sizes, dimensions, and weights listed in Table A. The "right" belt is shown in Fig. 1; for a "left" belt, the position of the buckle, wrench keeper, and tape thong are reversed.

2.03 These belts are constructed with a contrasting colored center marker between the plies of the fabric makeup. **Exposure of the center marker (due to wear or cutting) indicates the belt must be removed from service.**

F BODY BELT

2.04 The F body belt (Fig. 2) is a light-weight belt made of six-ply neoprene-impregnated nylon fabric and is equipped with a buckle, Dee rings (for attachment of safety strap), and loops to accommodate tools. This belt has tabs for attaching holsters. The belt is available in the sizes, dimensions, and weights listed in Table B.

2.05 Like the D and E belts, the F belt is constructed with a contrasting colored center marker between the plies of the fabric makeup. **Exposure of the marker (due to wear or cutting) indicates the belt must be removed from service.**



The F body belt has exposed rivets on the inside of the belt and shall not be worn by a person in line work.

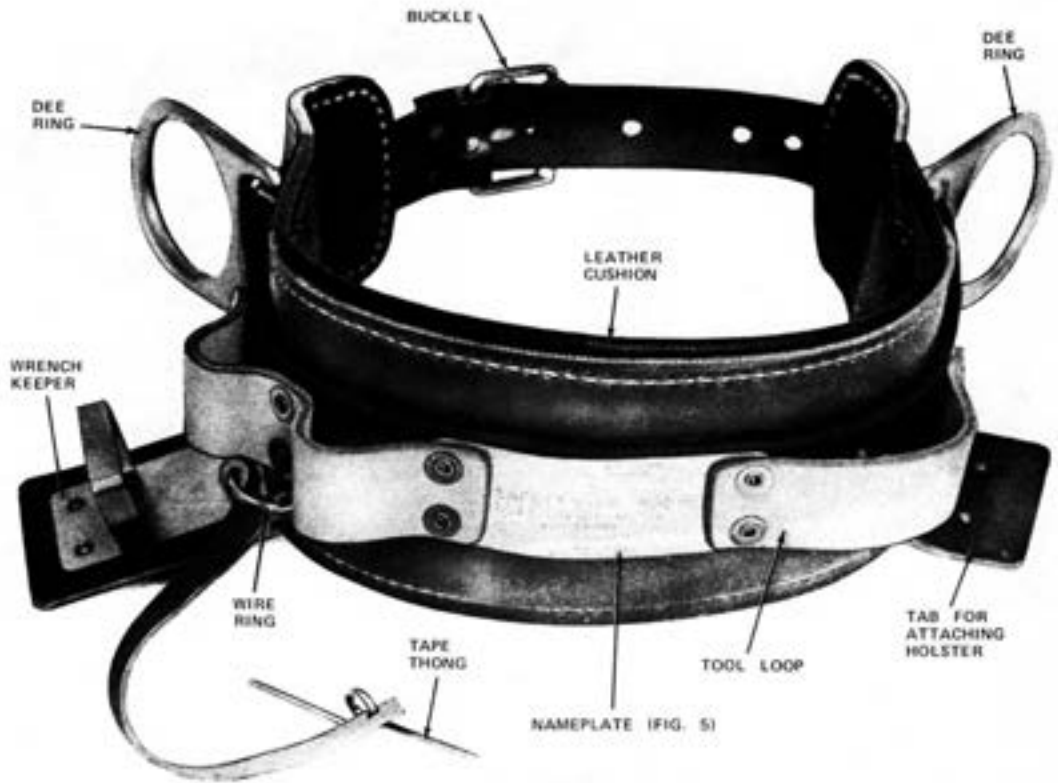


Fig. 1—D Body Belt (Right Belt Shown)

TABLE A#

D AND E BODY BELTS
(SIZES, DIMENSIONS, AND WEIGHT)

| SIZE DESIGNATION (DISTANCE BETWEEN DEE RINGS) (INCHES) | BELT LENGTH EXCLUDING BUCKLE (INCHES) | NUMBER OF TOOL LOOPS | APPROX. WEIGHT (POUNDS) |
|--|---------------------------------------|----------------------|-------------------------|
| 18 | 38.0 | 3 | 3.8 |
| 20 | 42.0 | 3 | 4.0 |
| 22 | 46.0 | 4 | 4.2 |
| 24 | 50.0 | 4 | 4.5 |
| 26 | 52.0 | 4 | 4.8 |
| 28 | 54.0 | 4 | 4.8 |

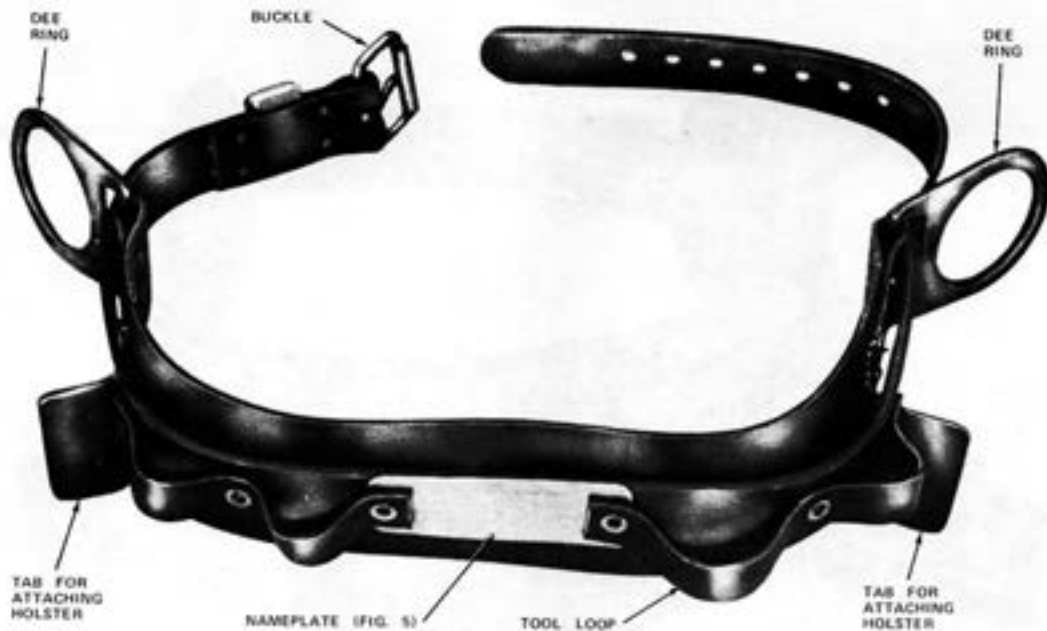


Fig. 2—F Body Belt

TABLE B4

 F BODY BELT
 (SIZES, DIMENSIONS, AND WEIGHT)

| SIZE DESIGNATION (DISTANCE BETWEEN DEE RINGS) (INCHES) | BELT LENGTH EXCLUDING BUCKLE (INCHES) | NUMBER OF TOOL LOOPS | APPROX. WEIGHT (POUNDS) |
|--|---------------------------------------|----------------------|-------------------------|
| 20 | 42.0 | 3 | 2.6 |
| 22 | 46.0 | 4 | 2.9 |
| 24 | 50.0 | 4 | 3.2 |
| 26 | 52.0 | 4 | 3.4 |

D SAFETY STRAP

2.06 The D safety strap is a six-ply neoprene-impregnated nylon fabric strap. Between the center plies is a marker of contrasting color from that of the outer plies. **Exposure of the marker by wear or cutting is cause for the strap to be removed from service.**

2.07 The D safety strap (Fig. 3) is available in one size only. It is adjustable in increments of 1-1/2 inches from 36 inches to 61-1/2 inches.



Fig. 3—D Safety Strap

3. PRECAUTIONS

3.01 A body belt and safety strap must be worn when working more than 4 feet above ground level on:

- (a) Poles (including stepped poles)
- (b) Lashed ladders placed against suspension strand or other support
- (c) Truck ladder platforms
- (d) Ladder platforms
- (e) Aerial platforms
- (f) Pole platforms
- (g) Aerial lift baskets
- (h) Cable car
- (i) Towers
- (j) Terminal balconies.

3.02 The safety strap, when used as a safety line, should be as short as practical to minimize the potential falling distance.

3.03 Before climbing a pole, see that the tongue of the buckle is properly seated in the desired hole in the safety strap.

3.04 Do not allow a body belt or safety strap to be run over by trunks, trailers, rails, or other heavy equipment or be subjected to damage caused by heavy falling objects.

3.05 Never punch extra holes in the tongue of a body belt. If a belt does not fit properly, replace it with one of a correct size.

3.06 Never add any foreign attachment to the body belt and never carry tools or materials in the Dee ring. Tools or materials fastened to a foreign attachment or Dee ring could prevent proper engagement of the snap hooks or give a false indication of a snap hook engagement.

3.07 Never attach two or more safety straps together for additional length. If one safety strap is not long enough, the method of doing the work shall be changed.

3.08 When climbing or working on a pole, do not fasten a handline directly to the body belt or to tools carried in the belt. With the handline fastened to the belt, the employee could be pulled off the pole if the handline should be caught either on an obstruction or a passing vehicle. To allow the handline to pull free of the belt, use one of the following methods to carry a handline aloft:

- (a) Form the end of the handline into a loop and place the loop in the handline carrier.
- (b) Form the end of the handline into a loop and tuck the loop under the belt at the side or back so as not to interfere with climbing.

3.09 Prior to ascending to an elevated level, employees must determine whether any energized power wires or attachments are in the immediate work area. If present, additional protective equipment and precautionary measures are to be used.

Note: Minimum approach distances to exposed energized power conductors are covered in Sections 460-300-115 and 620-100-011.

3.10 An employee may improve one's security by placing the safety strap around the pole at a

point directly above a crossarm, strand, pole step, or other secure attachment which is to remain in place on the pole, provided the attached is one foot or more from the top of the pole. Do not place a strap around an insulator pin, a bolt, or other insecure attachment.

3.11 Never use electric light, power, or foreign signal circuit attachments as supports for the safety strap.

3.12 When "belting in" with the safety strap, do not rely on the feel or click of the snap hook keeper as an indication that the snap hook is secured. See that the snap hook and Dee ring are properly engaged. The employee shall look and **know** that the snap hook is properly engaged before placing weight on the strap. Always have the keeper on the safety strap away from the body when engaged in the Dee ring (Fig. 4).

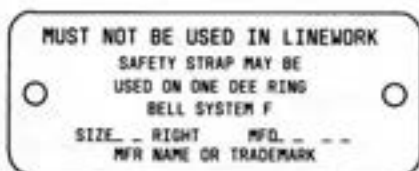


Fig. 4—Method of Using Safety Strap When Working From Ladder

3.13 An employee shall never be secured with a safety strap that is placed around a pole, strand, or other support in such a manner that both snap hooks are engaged in the same Dee ring of the body belt except in specific instances covered in this practice and then only when using the D, E, or F body belts. The D, E, and F belts may be readily identified by a metal nameplate as shown in Fig. 5.



D AND E BODY BELT NAMEPLATE



F BODY BELT NAMEPLATE

Fig. 5—Body Belt Nameplates

3.14 The following additional precautions are to be observed:

- Exercise care when working aloft so the keeper of the snap hook is not depressed accidentally by contact with wires, strand, crossarm braces, guys, and other attachments in the course of performing work operations.
- A safety strap should never be used as a means of riding suspension strand.
- Never use an improvised substitute of rope, wire, etc. for a safety strap or body belt.
- Do not punch extra holes in a safety strap.

(e) While wearing a safety strap which is not in use, both ends of the safety strap must be snapped into the same Dee ring. Care should be exercised to see that the safety strap does not catch on pole steps and other attachments when climbing poles.

(f) When climbing past another employee who has the safety strap around the pole, exercise care to avoid dragging the climber gaff over the safety strap.

(g) Avoid swinging rapidly around the pole in a safety strap.

(h) Do not throw or drop a body belt or safety strap.

(i) Exercise care to prevent damage to a body belt or safety strap from heat by contact with or placing it near a furnace, hot solder pot, torch, or hot soldering iron.

3.15 The following should be observed when storing a body belt and safety strap.

(a) Keep away from radiators, stoves, steam pipes, fires, and other places of excess heat.

(b) Do not store in a locker, box, tool case, or other container until it has been completely dried by wiping and ventilation.

(c) Never store with unprotected edged tools. When stored in the same compartment, edged tools, such as climbers, must be properly protected.

(d) Do not store in a location with excess humidity to prevent mildew.

4. INSPECTION

4.01 Each employee, when receiving a body belt or safety strap and each day prior to use, must inspect the belt and strap for evidence of wear or any defects. If any condition exists that raises any doubt as to its safety, it should be exchanged at once for one in good condition. A body belt or safety strap should never be subjected to proof load tests.

4.02 Employees whose work assignments require the use of a body belt and safety strap shall be responsible to verify that these devices are in good condition.

4.03 Supervisors shall ensure themselves that craft employees perform a visual inspection daily. Body belts and safety straps are to be inspected each quarter by supervision.

VISUAL INSPECTION OF BODY BELT

A. Fabric and Leather Type

4.04 The important conditions to look for are:

- (a) Badly worn or broken reinforcement plates which hold the Dee ring. To check for this condition, refer to Fig. 6 and move the Dee ring from Position 1 to Position 2, using light finger pressure. The rotation of the Dee ring shall not exceed 90 degrees.
- (b) The condition of the loop (leather or nylon) at the Dee ring reinforcement plates, which

could be worn or crushed sufficiently to affect its strength. (Exposure of the contrasting colored marker in a fabric belt is cause for rejection)

- (c) Loose or broken rivets (particularly those in the loops holding the Dee rings)
- (d) Broken or rotted threads in the stitching
- (e) Cracks or cuts that would tend to cause a tear or would affect the strength of the belt
- (f) Broken or defective buckle
- (g) Exposure to excess heat (burn marks, hard spots, etc).

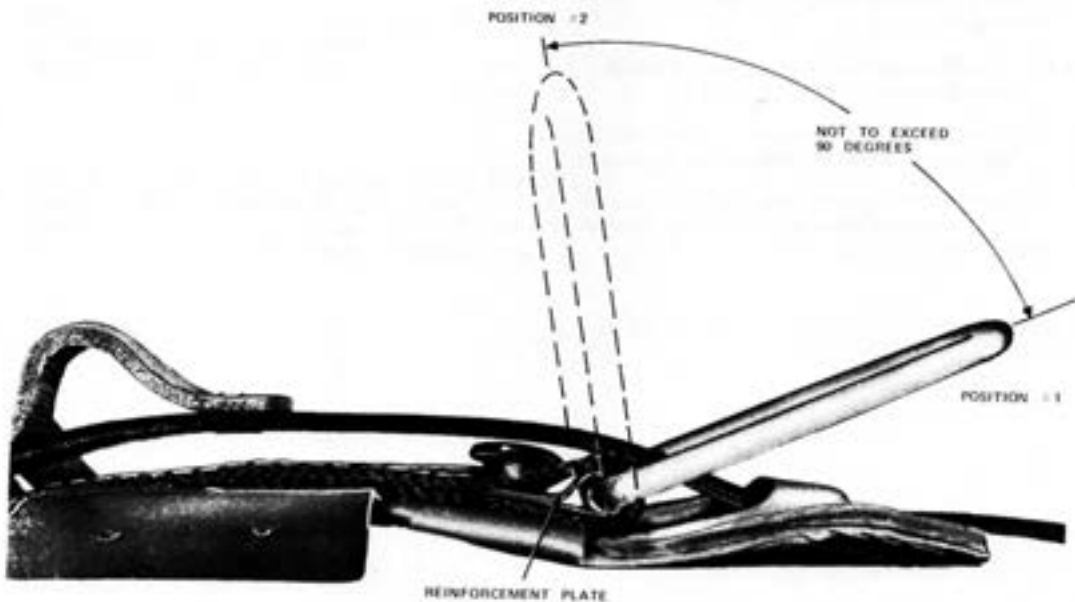


Fig. 6—Checking for Worn or Broken Reinforcement Plates

B. Leather Belts—Bending Test

Leather belts which are not padded and have exposed rivets on the inside of the belt shall not be worn by a person engaged in line work.

4.05 The bending test should be made on leather body belts only when clean and well oiled. The leather should show no cracks other than slight surface cracks. If well-defined cracks appear, the belt must not be used, but should be taken out of service. The test should not be made if the body belt has been stored in an area where the temperature is below 32 degrees F since at low temperatures, the leather may be damaged by bending it around the test mandrel. Place the belt in a warm area until the belt temperature is above 32 degrees F. The bending test should be made as follows:

- (a) Leather should be bent with the grain (smooth) side out, over a mandrel that is not less than 3/4 inch in diameter. (A 3/4 inch guy rod may be used.) In making this test, pull the leather taut and wrap it half way around the mandrel, keeping the leather under tension while the bend is being made. This procedure brings the leather into firm contact with the mandrel while the bend is being made and, thus, avoids bending the leather too sharply. Do not loop the leather first and then pull it over the mandrel. Do not make the bend test at a buckle hole.
- (b) Body belts shall be subjected to the bending test at points where it is possible to bend them, such as under the leather tool loops and at the tongue strap.

4.06 If leather of the thickness used in Bell System standard body belts is subjected to an excessively severe test, such as bending it too sharply (without a mandrel or over too small a mandrel) with the grain side out, even good leather may crack because of excess strain.

VISUAL INSPECTION OF SAFETY STRAP

4.07 The following important conditions to look for are:

- (a) Broken, cut, or torn outer fibers and nicks, punctures, or charred spots, etc, that would affect the strength of the strap. The edges of the strap should be inspected carefully.

- (b) Worn fabric as indicated by the colored marker when three outer layers of fabric are worn through. The strap shall be removed from service as soon as the contrasting colored marker becomes visible.

Note: All leather safety straps are to be removed from service and junked.

- (c) Loose, broken, or missing rivets or rivets with excessive wear. Remove from service.
- (d) Broken or badly worn steel guard on ends of safety strap. Remove from service.
- (e) Defective buckle or binding, or poor action of the keeper on the snap hook. The keeper should work freely without excessive side play and close securely under spring tension. Check for any elongation in the metal at the rivet holding the keeper in place.
- (f) Acid burns—a strap that has been in contact with acid shall be removed from service.
- (g) Holes for tongue of buckle excessively enlarged.
- (h) Broken inner fibers—defects are usually found in the section at which an injury occurred. Breakage of the inner fibers is indicated by limpness and flexibility of the strap. The strap should be examined in short sections and if a soft flexible section is found, the strap should not be used.

5. USE**ON POLE**

5.01 An employee working from a pole shall be secured with a body belt and safety strap. To accomplish this, attach one snap hook to a Dee ring and pass the free end of the strap around the pole. The strap should lay flat against the pole without turns or twists. Engage the snap hook in the other Dee ring.

ON AN EXTENSION LADDER

5.02 An employee working from an extension ladder that is securely lashed to a suspension strand or other support shall use one of the following methods to be secured with a body belt and safety strap.

Attach one snap hook of the safety strap to a Dee ring and pass the free end of the safety strap to either one of the following:

- (a) Between two rungs and around a siderail (Fig. 4), or
- (b) Around a rung, or
- (c) Around the suspension strand and engage the snap hook in the other Dee ring.

5.03 An employee working from an extension ladder which is properly placed and secured to the strand with strand hooks, but not lashed, shall use the following method to be secured with a body belt and safety strap.

Attach one snap hook of the safety strap to a Dee ring and pass the free end around the strand and siderail, between two rungs. Engage the snap hook in the other Dee ring.

5.04 A body belt and safety strap are not to be used on a ladder if:

- (a) The ladder is not secured in the manner described in paragraph 5.02 or 5.03.
- (b) The safety strap cannot be secured in the manner described in paragraph 5.02 or 5.03.

ON AN AERIAL PLATFORM

5.05 An employee working from an aerial platform, supported by a suspension strand and other support, shall be secured with a body belt and safety strap using one of the following methods:

- (a) The straps of the D, E, and F body belt are constructed of material that is of sufficient strength to allow the safety strap to loop the strand and have both snap hooks attached to the

same Dee ring as shown in Fig. 7. The method shown is not to be used with any body belt other than the D, E, or F body belts.



Fig. 7—Method of Using D, E, or F Body Belt With Safety Strap

(b) If a belt other than the D, E, or F is being used, attach one snap hook to a Dee ring and pass the free end across the front of the body, through

the other Dee ring, and engage the snap hook on the suspension strand. Figure 8 shows this method.



Fig. 8—Method of Using Safety Strap When Using Other Than a D, E, or F Belt

ON A TRUCK PLATFORM

5.06 An employee working from a truck platform shall loop the safety strap to the platform framework unless the platform is equipped with safety chains. If safety chains are provided, the chain shall be attached to the Dee rings of the body belt.

ON AN AERIAL LIFT

5.07 An employee working from the basket of an aerial lift shall be secured in the basket. When working from a SERVI-LIFT or SKYWORKER aerial lift, the employee shall be secured by attaching the safety strap to the eye (Fig. 9) provided in the basket. When working from a TELSTA aerial lift, use the method shown in Fig. 10.

POLE-MOUNTED TERMINALS—WITH HANDLES

5.08 Employees shall secure themselves to the handle of pole-mounted terminals, such as B, 101, and 29-type cabinets, prior to stepping from the pole to a pole seat or terminal balcony. Likewise, when stepping from a pole seat or terminal balcony to the pole, the safety strap shall not be removed from the handle until the employee has stepped onto the pole. Figure 11 shows the safety strap secured to one Dee ring, which is possible when using a D, E, or F Body Belt. All other belts must have the snap hook of the safety strap secured to a Dee ring, across the front of the body and through the other Dee ring, and then secured to the terminal handle.

Note: If the work aloft is to be performed from a sitting position on the terminal seat or balcony, it will be necessary to lengthen the safety strap at the ground level prior to ascending the pole.

6. MAINTENANCE

FABRIC BODY BELTS

6.01 Tests indicate that creosote is not injurious to nylon; however, because the creosote may stain clothing, it should be removed as soon as practicable using a cloth moistened with petroleum spirits or other approved cleaner.



Fig. 9—Location of Eyes for Securing Safety Strap in Baskets of SKYWORKER and SERVI-LIFT Aerial Lifts

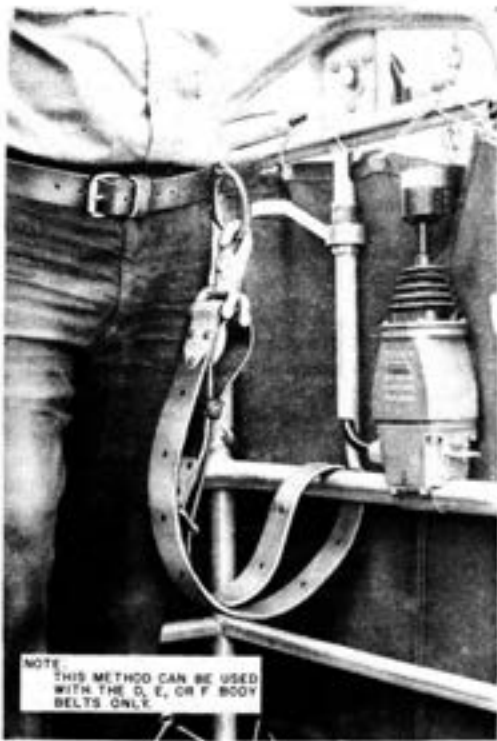


Fig. 10—Method of Using D, E, or F Body Belt With Safety Strap in TELSTA Aerial Lift

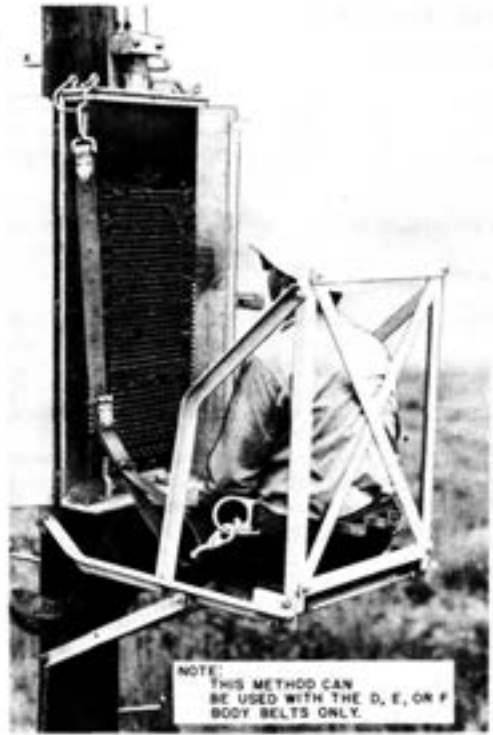


Fig. 11—Method of Using D, E, or F Body Belt With Safety Strap on B-Type Cross-Connecting Terminal

LEATHER BODY BELTS

A. Cleaning

6.02 Leather body belts should be cleaned and dressed at three-month intervals or more often if the belt has been wet from rain or perspiration or has been in contact with wet paint.

6.03 Paint ingredients have a harmful effect on leather. Wet paint must be removed as soon as possible.

6.04 Creosote is not harmful to leather. To avoid clothing stains, it should be removed as soon as possible.

6.05 Leather body belts may be cleaned as follows:

- (1) Remove surface dirt with a sponge dampened, but not wet with water. Do not use gasoline or petroleum products because they will cause the leather to become dry.
- (2) Rinse the sponge in clear water and squeeze partially dry. Work up a thick lather using a neutral soap, such as castile or white toilet soap (free from alkali).
- (3) Thoroughly wash the entire length of the belt with the lathered sponge to remove embedded dirt and perspiration and wipe with a cloth to remove excess moisture.
- (4) Repeat (2) using a good grade of saddle soap.
- (5) Work the saddle soap lather well into all parts of the belt and place in a shaded area to dry.
- (6) When the leather is practically dry, rub vigorously with a soft cloth.

B. Oiling

6.06 Treating the leather in body belts with saddle soap will normally keep the belt soft and pliable; however to keep the leather from drying out and becoming brittle, leather body belts should be oiled approximately every six months as follows:

- (1) Clean the leather with neutral soap as described in paragraph 6.05 (1), (2), and (3). Oil applied to dry or dirty leather has a harmful effect on the leather.
- (2) While the leather is still damp, use about 1/2 ounce (2 teaspoonsful) of Neat's-foot oil and apply the oil gradually with the hands, using long light strokes to work it into the leather. A light, even distribution of oil is desired.
- (3) After oiling, the belt should be set aside in a dry shady place for 24 hours in order to permit the leather to dry slowly. Then, rub vigorously with a soft cloth to remove excess oil.

Note: Do not use mineral oils or greases such as machine oil or vaseline. Leather should never look or feel greasy as this is an indication that too much oil is being used. Leather with too much oil will stretch and is likely to pick up sand or grit which may injure the leather.

C. Disposition

6.07 A body belt or safety strap with major defects shall be withdrawn from service immediately and returned to the storeroom for disposition in accordance with established routine. To prevent any further use, cut off the tongue of a defective body belt and cut the strap of a defective safety strap to remove the snap hook.

CLIMBERS

DESCRIPTION AND USE

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1. GENERAL

1.01 This section describes climbers and associated items such as pads, straps, and gaff guards. Information on the care and maintenance of these items is included.

1.02 This section is being reissued to add the new H climber and the D gaff guard. Revision ar-

rows are used to emphasize the more significant changes.

1.03 When existing D, E, and F climbers with foot straps attached to a solid ring are returned for reconditioning, the solid ring will be replaced with a split steel ring.

1.04 *Under no circumstances should a file or any other tool be used to reshape or sharpen a climber gaff.* Part 7 describes the use of a hone for climber gaff maintenance.

2. PRECAUTIONS

2.01 Observe the following precautions when storing, transporting, and using climbers:

(a) Equip climbers with gaff guards when not in use. Gaff guards protect employees as well as the gaff tips and cutting edges when climbers are carried or are stored in tool boxes or other storage spaces. They also prevent damage to the safety straps and body belts when stored in the same compartments with climbers.

(b) Use climbers adjusted to correct size. (See Part 4.)

(c) Do not bend leg irons. If discomfort exists, use cushion-type pads.

(d) *Never wear climbers on work where they are not required* as when walking between poles, when working on the ground, on a ladder, or an aerial lift, on a stepped pole where the work can be performed safely from the steps, in trees, or while traveling in a motor vehicle or any other type of conveyance.

(e) When climbing past another employee who has their safety strap in place around the pole, special care should be taken to avoid gaffing the other employee, the safety strap, or other equipment.

NOTICE

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Bell System except under written agreement

- (f) When climbing past attachments on poles, care should be taken to avoid dragging climbers or foot against these attachments.
- (g) Do not use the gaff as a pry.
- (h) When climbing, avoid placing the gaff in or near a crack, knot, nail, or tack, etc.
- (i) Inspect climbers in accordance with Part 5.

3. DESCRIPTION

F CLIMBER—AT-8530

3.01 The F climber is an adjustable length climber that consists of a leg iron, an adjustable sleeve, fasteners, and gaff guards. The parts of an F climber are shown in Fig. 1.

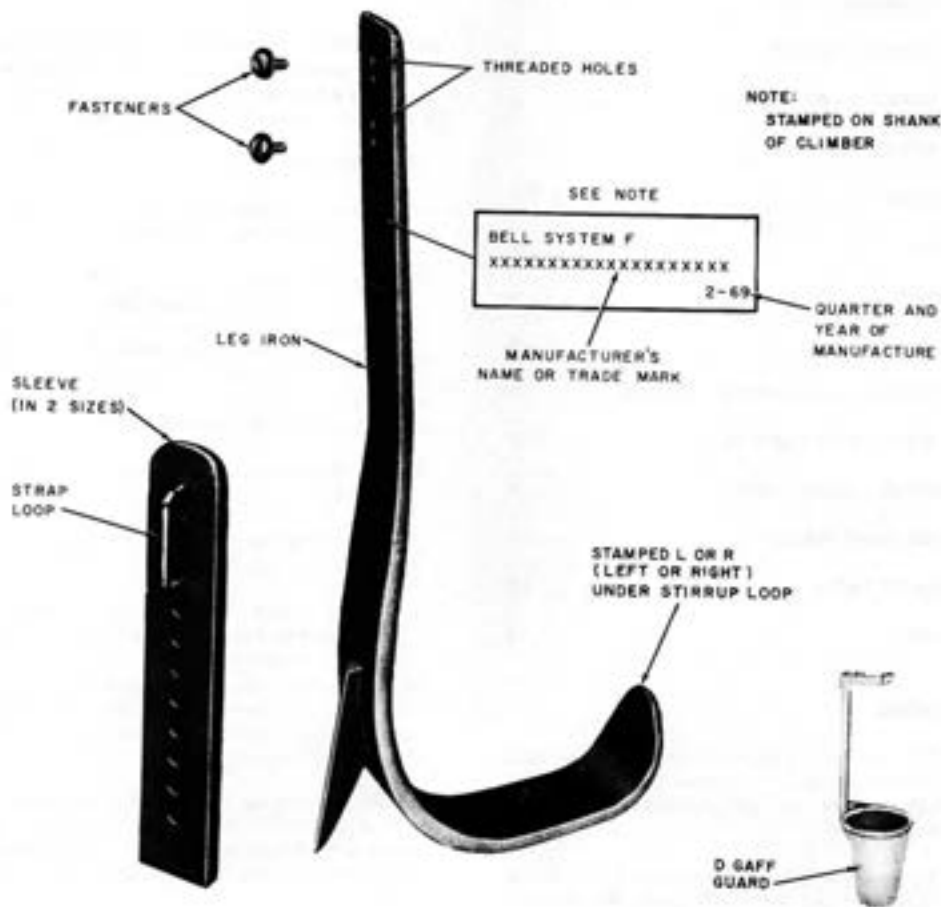


Fig. 1—Parts for F Climber

3.02 The F climber is basically identical in construction to the D or E climber. The foot strap assembly which secures the stirrup of the climber to the arch of the shoe is equipped with a removable split steel ring and is not an integral part of the climber.

3.03 Gaffs of F climbers are fully machine shaped and sharpened. The climber shank is tapped and threaded for adjusting and securing the sleeve at any desired position. The adjustable sleeves are interchangeable. The gaff is designed so it can be machine sharpened without any filing to reshape the outer rounded surfaces or the ridge of the gaff. **Do not use a file on these surfaces at any time.** This would disturb the original design of gaff so that it cannot be machine sharpened satisfactorily.

3.04 Climbers must be ordered by component parts. Climber sleeves and leg irons are ordered separately; however, each pair is furnished with fasteners. The leg irons are provided with gaff guards. Fasteners may be ordered separately. Pads, leg straps, and foot strap assemblies or components must be ordered separately. Factory resharpened climbers are returned with gaff guards installed.

3.05 F climbers have offset stirrups; therefore, they are made for the left or right foot and are marked "L" or "R" just below the ring loop at the end of the stirrup. Some older climbers may not have been marked. Climbers can be identified as left or right by holding the climber with the gaff toward you and pointing up and noting the direction the stirrup is offset. If the offset is to the right as shown in Fig. 2, it is a right climber; conversely, if the offset is to the left, it is a left climber.

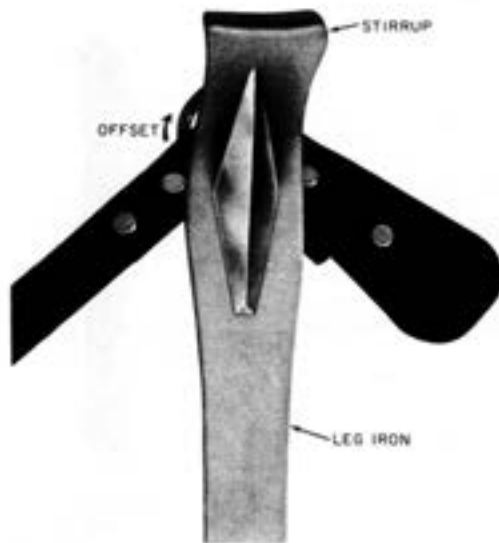


Fig. 2—Stirrup Offset "Right"

H CLIMBERS—AT-8530

3.06 The H climber is identical to the F climber except the leg iron is 1-1/4 inches shorter in length (Fig. 3). The stirrup on the climber is smaller in width and depth to accommodate smaller size work boots. The H climber uses the same adjustable sleeves, foot straps with split rings, and other standard parts used with the F climbers.⚡

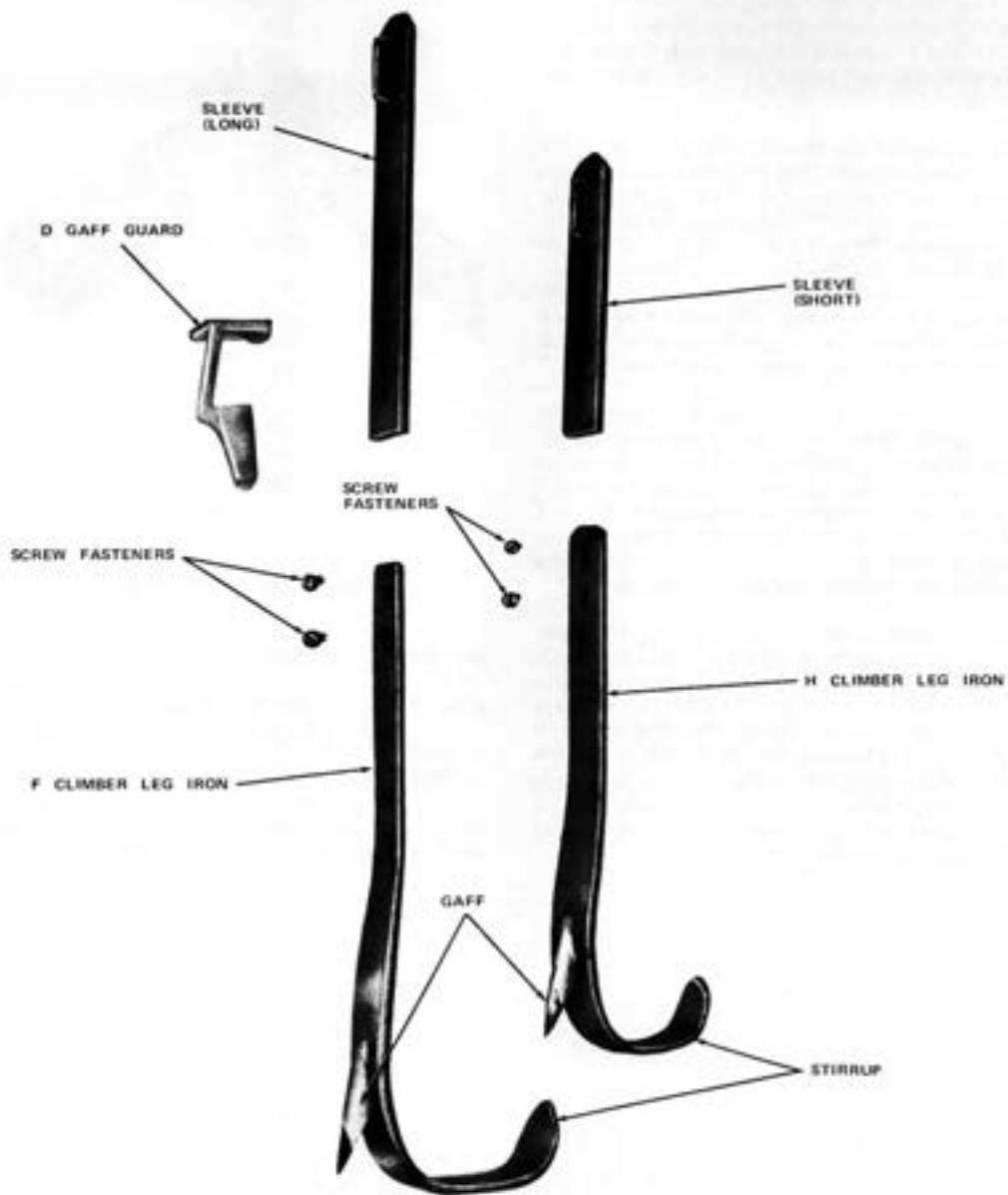


Fig. 3—H Climber

D AND E CLIMBERS

3.07 The superseded D and E climbers are basically identical to the F climber except that on these climbers the C and D foot straps have been replaced by the Mfr Disc. These foot straps have been replaced by the E climber foot strap.

SLEEVES

3.08 The sleeves used on adjustable climbers are designed to fit snugly over the shank of the leg irons and to be securely locked in the desired position by machine screws. The sleeves are available in two lengths and can be adjusted in increments of 1/4 inch. Figure 4 illustrates the sleeves, the lengths available, and the adjustment range of each sleeve.

3.09 ¶The sleeves are attached to the climbers with two hexagon head machine screws. On the short adjustments for the short and long sleeves, only one machine screw is used. For these lengths, the wedging of the sleeve and leg iron provides a sufficiently tight fit on the lower part of the sleeve. Insert the machine screws through the holes in the sleeves from the strap loop side and secure in the threaded holes of the leg irons.¶ The heads of the machine screws are slotted for tightening with a screwdriver. The fasteners are equipped with spring steel lockwashers.

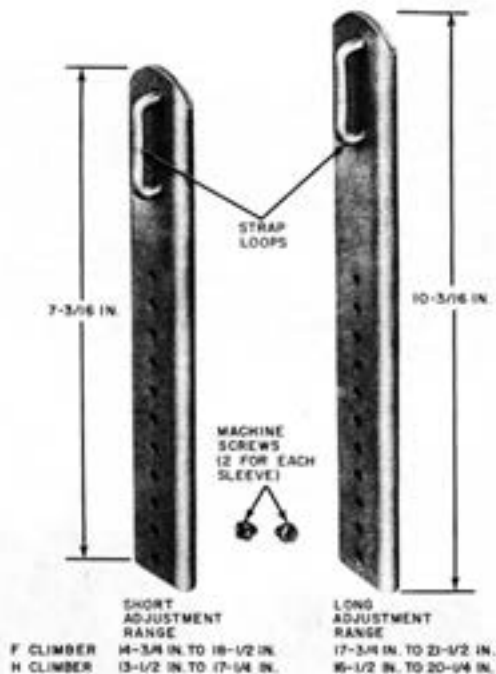


Fig. 4—¶Sleeves for Adjustable Climbers¶

PADS

3.10 Pads are used with climbers to protect the shins and calf of the leg against irritation by rubbing when the climbers are strapped to the legs. Plain leather, felt lined, and cushioned pads are available as shown in Fig. 5. Cushion pads are coded B climber pads (angle) and C climber pads (straight). The plain and felt lined pads are generally used when wearing boots that cover the calf of the leg. The wrap-around design of the B climber pads furnishes additional protection at the shins. Occasionally the top edge of a new pad may initially dig into the leg in use. This can be overcome by dulling the top edge by rubbing with a rounded metal tool.

STRAPS

3.11 The E climber foot straps are attached to the climber so the buckle assembly will be across the foot instep when fastened. Figure 6 shows the foot strap on the climber.

3.12 The B climber strap (Fig. 7) consists of a 22- or 26-inch strap with a buckle permanently attached. The B climber strap is used to hold the pad on the leg iron and to fasten both to the leg of the employee when the climber is worn.

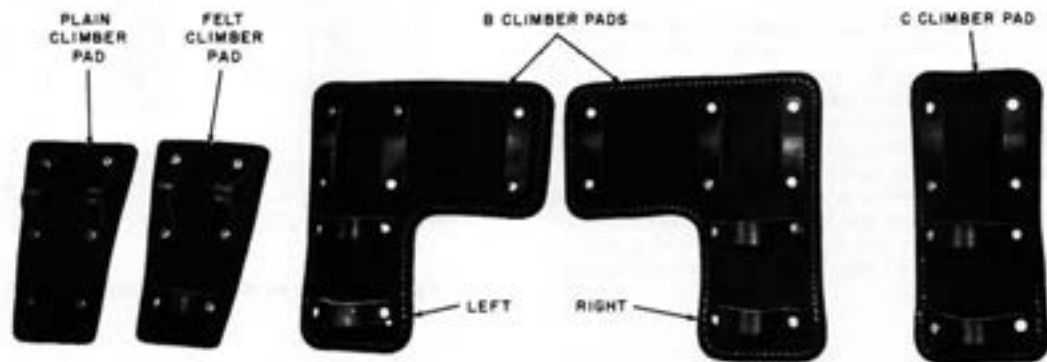


Fig. 5—Pads

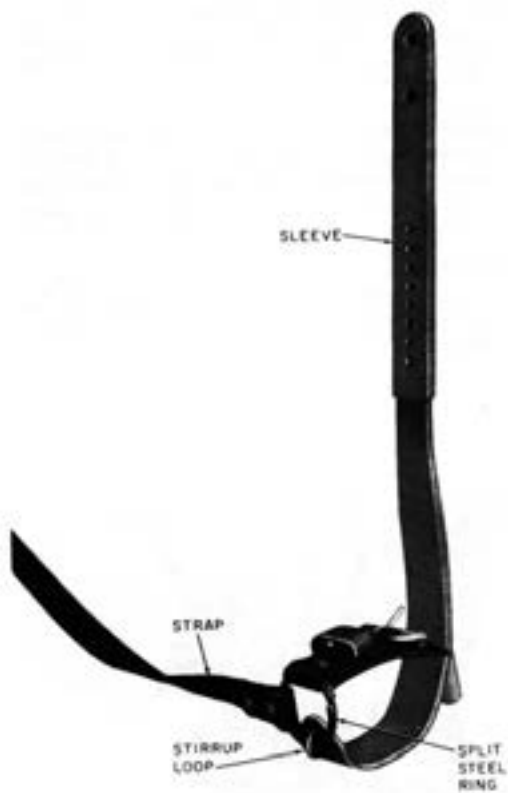


Fig. 6—Foot Straps Attached to Climbers

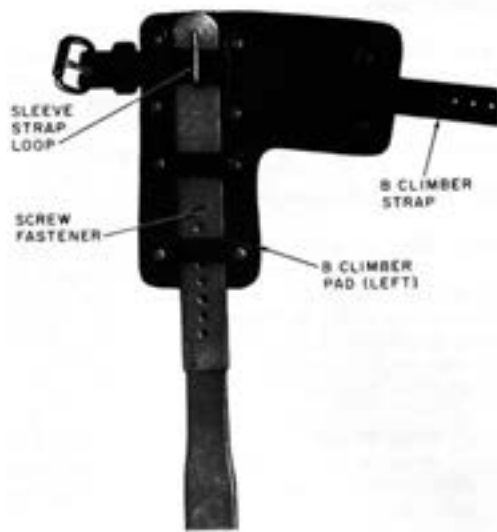


Fig. 7—B Climber Strap and Pad Installed on Climber

5.04 If any of the conditions, paragraph 5.03(a) to (h) inclusive, are found, or if the condition of the climber is such that there is good cause to doubt its safety, it shall not be used but shall be exchanged for climbers in good condition. If any of the conditions (i) to (o) are found, the item should be replaced. If condition (p) is found, the setscrew should be tightened or replaced, or the sleeve replaced.

5.05 Figure 11 illustrates the surfaces, ridge, and point of a properly shaped gaff. **The ridge of the gaff is straight.** Note that the point of the gaff is rounded to meet the ridge.

5.06 Figures 12 and 13 show two of the principal causes of climber cutout due to unsatisfactory gaff conditions. A dull point or dull cutting edges results in insufficient gaff penetration as shown in Fig. 12 causing the resultant cutout. If the straight ridge of the gaff is altered as indicated in Fig. 13, a prying action is produced that will cause climber cutout. Under no circumstances should any part of the gaff be altered by filing. Proper field maintenance of factory shaped gaffs is described in Part 7.

6. TESTING CLIMBER GAFFS

6.01 Climber gaffs shall be tested when received and thereafter any time there is any doubt as to their sharpness and the first time they are used each week. They shall be tested by making the pole cutout test as follows:

(1) Place the climber on the leg and fasten the foot strap in the usual manner. Do not fasten the leg strap.

(2) Remove the gaff guard and put on your gloves.

Place your hand between your leg and the climber pad, palm facing the pole. Place the other hand around the pole to balance yourself. With your leg at about a 30 degree angle, the normal climbing angle, aim the gaff toward the center of the pole about one foot above the ground line. Lightly jab the gaff in the pole, so that it penetrates the wood about 1/4 inch (see Fig. 14). Do this at a location where the pole is free of cuts and knots.

(3) Keeping just enough pressure on the stirrup to keep the gaff in the pole, but not so much as to cause the gaff to penetrate any deeper, push the climber and your hand toward the pole by moving your knee until the strap loop of sleeve is against the pole as shown in Fig. 15.

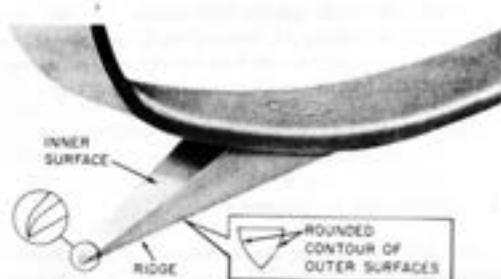


Fig. 11—Gaff Profile and Point



Fig. 12—Dull Gaff

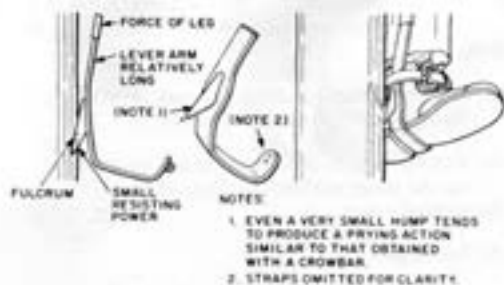


Fig. 13—Gaff Ridge and Point Altered



Fig. 14—Jobbing Gaff in Pole



Fig. 15—Climber Holding

(4) Making certain the strap loop is held against the pole with pressure from your leg, *gradually* exert full pressure straight down on the stirrup without raising your other foot off the ground, so as to maintain balance if the gaff does not hold.

(5) A gaff, which is correctly shaped and is sharp, will cut into the pole and hold in a distance of 2 inches or less. Measure the cut from point the gaff enters the pole to bottom of cut at surface of pole as indicated in Fig. 16. A gaff that is correctly shaped but dull or burred will cut in and hold but the length of the cut will be more than 2 inches. A convenient tool for measuring the length of a cut is the gaff guard. The clasp portion of the gaff guard is 2 inches long and can readily be used as a measuring device. A gaff, which is very dull or deformed in some way, will cut out of the pole or plow through the wood for a distance greater than 2 inches. **Do not use climbers that cut out or plow through the wood for a distance greater than 2 inches.** If the climber gaff is dull, sharpen with a hone, as described in Part 7, and repeat cutout test. If climbers still do not pass the pole cutout test, they are defective and should be replaced.

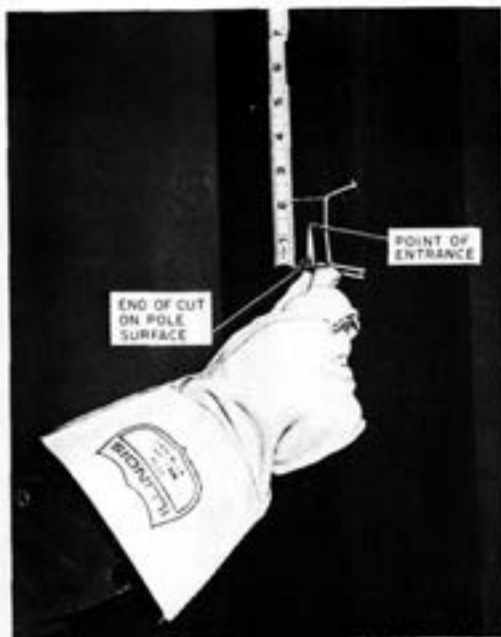


Fig. 16—Measuring Gaff Cut

7. FIELD MAINTENANCE

CLIMBER GAFFS

7.01 During normal use of climbers the edges along inner surface (cutting edges), Fig. 17, may become dull. The honing stone should be used to maintain sharp edges. Remember that even a dull gaff can cut your finger so hone carefully.

7.02 In honing, use a standard honing stone. Keep the stone well oiled with light machine oil while honing to prevent clogging the stone.

7.03 First, if there are any small burrs along the cutting edges, remove them by holding the hone against the side of the gaff and **carefully following the edge around to the tip** as indicated in Fig. 18 and 19.

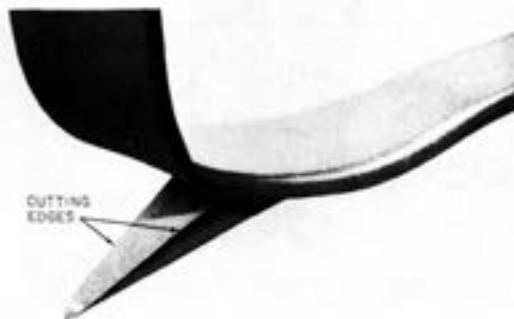


Fig. 17—Gaff Cutting Edges



Fig. 18—Removing Burrs From Top Cutting Edge



Fig. 19—Removing Burrs From Bottom Cutting Edge

7.04 Hone the inner surface of the gaff by starting the stroke near the leg iron and continue over the rounded curve of the tip as indicated in Fig. 20. Stop the honing stroke before the stone slides off the end of the gaff to prevent dulling the tip. About 20 to 25 strokes of the honing stone should be enough. **Do not attempt to reshape the tip of the gaff.**

7.05 Discard the honing stone when its surface becomes covered with grooves due to use. A badly worn hone or one with grooves will round off the gaff cutting edges, thus causing climbers to fail the pole cutout test. The life of the hone can be extended by switching ends and sides.

7.06 When using a vise to hold a climber, always protect the leg iron by placing wood blocks between the vise jaws and the leg irons as shown in Fig. 21. This prevents scoring the leg iron which may weaken it.



Fig. 20—Honing Inner Surface



Fig. 21—Using Vise for Honing Gaff

7.07 When climbers require sharpening and the desired sharpness to pass the cutout test cannot be obtained by honing (paragraphs 7.02 through 7.05), the employee should exchange them for a pair of factory sharpened climbers. Remove the E climber foot strap (paragraph 3.11), the B climber straps (paragraph 3.12), pads, and sleeves and equip the climbers to be returned with gaff guards. Permanently attached foot straps should remain on the returned climbers. The solid ring will then be replaced with a split ring. Tape or otherwise tie them together. Figure 22 illustrates a climber that has been machine sharpened a number of times to the **minimum length that shall be used.**

PADS

7.08 Pads should be maintained clean and pliable for maximum comfort. Maintain this condi-

tion by using saddle soap or neats-foot oil about every 3 months as follows:

- (a) Clean with a damp sponge using a neutral hand soap.
- (b) With sponge and clean water, work up a lather using a good grade of saddle soap. Work lather well into pad and put in shade to dry. When lather is almost dry, rub the leather vigorously with a soft cloth.
- (c) About every 6 months instead of dressing with saddle soap as in (b), clean as in (a), then while leather is still damp apply about 1/2 teaspoon of neats-foot oil on the loop side of the pad, apply oil gradually with hands using long light strokes to work into leather. After oiling, allow pads to dry overnight; then rub vigorously with a soft cloth to remove excess oil.



Fig. 22—Gaff Sharpened to Minimum Length

STATION PROTECTION AND GROUNDS

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| 2. LOCATION OF PROTECTORS | 4 | | |
| 3. SELECTING PROTECTORS, PROTECTOR MOUNTINGS, AND CLOSURES | 4 | 1. GENERAL | |
| PROTECTORS | 4 | 1.01 This section covers the requirements for protection of subscriber stations (including coin telephones), provides information for identification, selection, and installation of station protectors. It identifies signaling grounds, describes bonding procedures, and outlines requirements for protecting PBX circuits. | |
| PROTECTOR MOUNTINGS | 13 | 1.02 This section is reissued to add information on the following: | |
| CUSTOMER SERVICE CLOSURES | 16 | • Suspected energized protectors (DANGER, paragraph 15.03). | |
| PROTECTOR MOUNTING POSTS | 16 | • 142A1A and 191A2 protectors. | |
| 4. INSTALLING PROTECTORS | 18 | • C and D customer service closures. | |
| 5. FUSED PROTECTORS | 23 | • 106C protector in C customer service closure (Fig. 43). | |
| 6. GROUNDING AND BONDING | 24 | • AT-7796X connector. | |
| 7. SIGNALING GROUND | 36 | • 188A test set (Stop Lite), safety glasses, and rubber gloves with leather protectors. | |
| 8. COIN STATION GROUND | 38 | • Restrictions on connections to aluminum conduit and conductors. | |
| 9. LOCATING AND INSTALLING GROUND RODS | 39 | • Conversion from fuse to fuseless operation. | |
| 10. INSTALLING SNEAK CURRENT FUSES | 42 | • Metric equivalents to English units in figure references to dimensions and wire gauge. | |
| 14A FUSE HOLDER | 43 | • Delete text, table, and figure references to No. 14 AWG ground wire, which has been rated manufacture discontinued (MD), and show it replaced by No. 12 wire. | |
| 1094A PROTECTOR | 43 | | |
| 191A1-20 PROTECTOR | 43 | | |
| 11. PBX PROTECTION | 45 | | |
| 12. EXPOSED DROP WIRES CONNECTED TO UNEXPOSED CABLE | 49 | | |
| 13. 118B PROTECTOR | 51 | | |
| 14. CONVERTING PROTECTORS | 54 | | |

NOTICE

Not for use or disclosure outside the Bell System except under written agreement

- Rerate 93C, 93D1, and 305A2 protector mountings and 1293C protectors to MD.
- Rerate 6A3A terminal block to MD.
- Revise Tables A, B, C, D, E, F, and G.
- Change READ to CAUTION, prior to paragraph 14.01.
- Replace Fig. 65 to show current model of B ground clamp.
- Show specific omission of the DIMENSION* PBX in READ statement of paragraph 3.10 and prior to paragraph 11.01.

Revision arrows are used to emphasize the more significant changes.

1.03 Cable, wire, strand, etc, which are subject to disturbance by lightning, possible contact or induction from electric circuits in excess of 300 volts to ground, or ground potential rises from nearby power generating stations, substations, or higher voltage industrial transformers (34 kilovolts and above), are called **exposed** cable, wire, or strand.

1.04 Cable, wire, strand, etc, which are not subject to disturbances by lightning, possible contact or induction from electric circuits in excess of 300 volts to ground, or ground potential rises from nearby power generating stations, substations, or higher voltage industrial transformers, are called **unexposed** cable, wire, or strand.

1.05 In nonlightning areas, the exposure status of cable or wire is based only on power exposure. In lightning areas, protection is required regardless of power exposure.

1.06 Isolated sections of aerial cable are considered as open wire, for the purpose of determining the type of protectors required, unless the cable is effectively grounded to a multigrounded neutral of a power system.

1.07 Station protectors are used in areas where telephone plant is considered exposed as outlined in paragraph 1.03. Station protectors are designed to provide safety to customers and telephone company personnel and to limit damage to telephone equipment from abnormally high

voltages. Protector units limit the magnitude of a foreign voltage at the station by arcing to ground and by shorting permanently to ground when there is excessive follow-through current.

1.08 Nearby lightning strokes can develop large potential (voltage) differences between telephone wiring, power wiring, water pipes, and building steel. Therefore, it is important these systems be bonded together on the telephone premises of the customer and the bonding conductors be as short and as straight as possible (Fig. 1).

1.09 When installing protectors at mobile home locations, refer to Section 461-220-100.

1.10 Grounding and special protection requirements for key telephone systems (KTSs) are covered in Section 518-010-105.

1.11 Stations requiring special protective measures are:

- Stations located at power substations or generating stations.
- Stations located in hazardous atmospheres containing explosive vapors, gas, or dust (Section 502-415-100).
- Customer-owned stations or stations connected to privately-owned circuits or facilities. Interfaces required for connecting to these stations are covered in other sections and will be coded on the service orders. If they are not, consult your supervisor.

1.12 Where stations are served by open wire, rural wire, or drop wire run on the same poles with primary power conductors, a **fusible link, consisting of a 2-foot minimum length of block wire**, must be installed at the pole serving the station as outlined in Section 460-300-121; otherwise, a fused protector must be used.¶

1.13 Stations served by rural wire or drop wire that is run on jointly used poles, supporting power distribution circuits having voltages of more than 2900 volts to ground or more than 5000 volts between conductors and include a multigrounded neutral wire, may require a 118B protector. Refer to Section 624-730-200 and Part 13 of this section for requirements. The 118B protector is designed to protect telephone circuits in the event of a

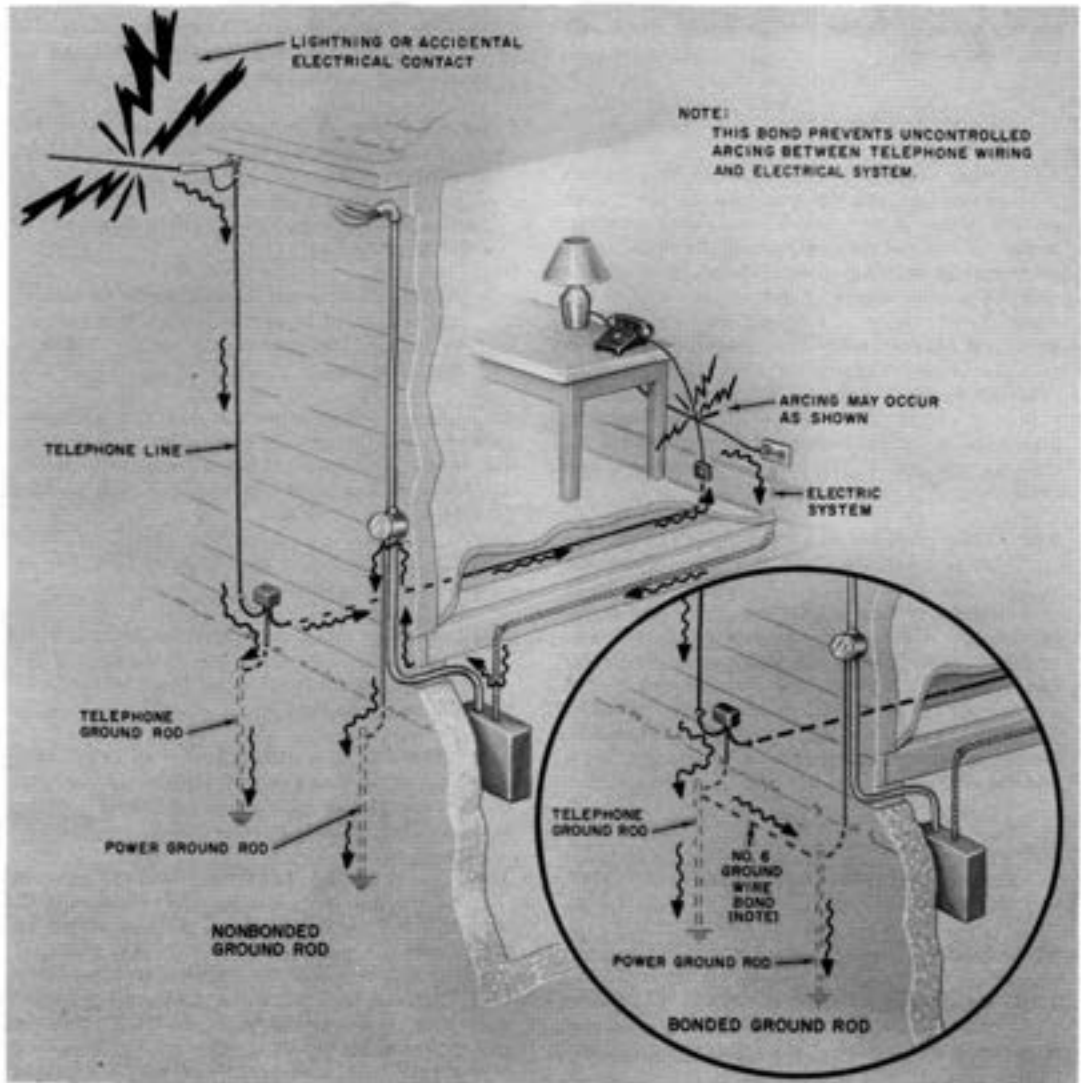


Fig. 1—How Bonding Reduces Differences of Potential Between Telephone Wiring and Electrical Systems That are Grounded to Separate Electrodes

contact between higher voltage power wires and telephone wires.

2. LOCATION OF PROTECTORS

2.01 Plan station installations so the station protectors can be grounded to the power ground wire, power service entrance conduit, power ground rod, acceptable metallic water pipe or acceptable building ground electrode, using the shortest possible length of ground wire run in the most direct route. **Protectors should be mounted outside whenever possible.** Fuseless station protectors installed indoors should be located near the protector ground source so the ground wire can be as short as possible. Fuse-type protectors installed indoors must be located as close as practical to the point of entrance of the drop wire.

2.02 Place protector in an accessible location so as to minimize the possibility of damage or immersion. Do not place protectors on front of buildings where appearance is a significant factor, in living quarters, or where a ladder is necessary for installation and maintenance. Protectors installed indoors without covers must not be located where inadvertent contact by a customer is likely. Mount protectors in a dry, well ventilated location. Mount protection underneath buildings only as a last resort.

3. SELECTING PROTECTORS, PROTECTOR MOUNTINGS, AND CLOSURES

PROTECTORS

3.01 Determine whether a fused or fuseless protector is required. A **fused** protector is required if any one of the following conditions exists:

- (a) The station is served by open wire or rural wire and (1) the power is not multigrounded neutral, and (2) there is no acceptable water pipe for grounding.
- (b) The station is served by open wire or rural wire and no bridle wire fusible link (at least 2 feet of E block wire) has been provided between the aerial wire and the drop wire.

(c) The station is served by multiple drop wire fed by open wire or multiple wire and no bridle wire fusible link has been provided.

(d) Underground service wire is connected via an encapsulated splice (16A2 or 16AA2 closure with D encapsulant) to 19-gauge or 22-gauge cable that is exposed (in the aerial or buried portion) to power circuits in excess of 300 volts to ground.

Note: Where local instructions do not specify use of a fused protector, it may be necessary to consult the engineer to verify if such a condition exists.

An exception to paragraph 3.01(d) is that a fuseless protector can be installed provided it is located **outdoors** and mounted on a **noncombustible surface**. A 9A1A-54 terminal block can be used in a PC6 or PC12 closure.

(e) A battery supply circuit is fed from two or more drop wires.

3.02 If none of the conditions outlined in paragraph 3.01 exist, use Table A to select a fuseless protector. Where a fused protector is required, refer to Part 5.

3.03 The **123A1A protector** (Fig. 2) provides protection for one pair of wires. It consists of a nonconductive base containing three binding posts and two 2B2A protector units.

3.04 The **123B1A protector** (Fig. 3) provides protection for one pair of wires and is recommended for use only at stations served by aerial wire (as described in paragraph 3.08). It consists of a nonconductive base containing three binding posts and two 6B1A gas tube protector units (Fig. 4) in parallel with two 2B2A protector units. The 6B1A protector units are not grounded permanently by lightning surges but may be damaged by power currents. Therefore, carbon protector backup is provided to assure fail-safe protection.

3.05 The **123E1A protector** (Fig. 5) provides protection for one pair of wires and is intended for use at stations served by cable or multiple wire having a high level of lightning activity. It consists of a nonconductive base containing three binding posts and two 11B1A gas tube protector units (Fig. 6). The 123E1A protector

♦TABLE A4

FUSELESS PROTECTOR SELECTION

| NUMBER OF PAIRS PROTECTED | PROTECTOR | TYPE PROTECTOR UNIT USED | SEE FIGURE NUMBER | USE | | PARAGRAPH REFERENCE |
|---------------------------|-----------|--------------------------|-------------------|--------|---------|---------------------|
| | | | | INDOOR | OUTDOOR | |
| 1 | 123A1A | 2B2A | 2 | • | • | 3.03 |
| 1 | 123B1A | 2B2A 6B1A | 3 | • | • | 3.04 |
| 1 | 123E1A | 11B1A | 5 | • | • | 3.05 |
| 2 | 128A1A-2 | 2B2A | 7 | • | • | 3.06 |
| 2 | 128E1A-2 | 11B1A | 8 | • | • | 3.07 |
| 1-3 | 6A3A (MD) | 2A1A or 11A1A | 10 | | † | 3.12 |
| 1-5 | 9A1A-5 | 2A1A or 11A1A | 12 | | † | 3.14 |
| 3-6 | 116C | 2A1A or 11A1A | 13 | | • | 3.15 |
| 3-6 | 117B | 2A1A or 11A1A | 14 | • | | 3.16 |
| 1-5 | 142A1A | 2A1A or 11A1A | 23 | | • | 3.28 |

* Provide a B, C, or D customer service closure, or 150B cover, and 93D1 (MD) protector mounting for outdoor installations.

† Used in PC-type closure.

may be safely used anywhere the 123A1A protector is used.

Note: The 11B1A protector unit (Fig. 6) incorporates a 471A electron (gas) tube which provides nominal 500-volt protection. The ultimate failure mode of the 11B1A protector unit is a short circuit (to ground); therefore, it does not require the use of carbon blocks in parallel. The 471A tube is mounted in a brass cap along with a stainless steel spring, a fusible disc, and a solder tinned brass cage. These parts are arranged so heating of the tube melts the fusible disc and allows the cage to contact the grounded surface of the station protector. This short-circuits the gas tube and provides a path to ground. During

a lightning surge or short duration power surge, the 471A gas tube provides a path to ground through its internal spark gap. The 11B1A protector unit can be substituted for the 2B2A protector units in the 123A1A and 128A1A-2 protectors. Station protectors equipped with 11B1A protector units are preferred over protectors which feature gas tubes in parallel with carbon blocks (eg, 123B1A) where cable or multiple wire plant is involved. The 11B1A protector unit can be identified by a circle machined into the cap and by a dab of white paint on the cap.

3.06 The 128A1A-2 protector (Fig. 7 and 27) provides protection for two pairs of wires. It consists of a nonconductive base containing five

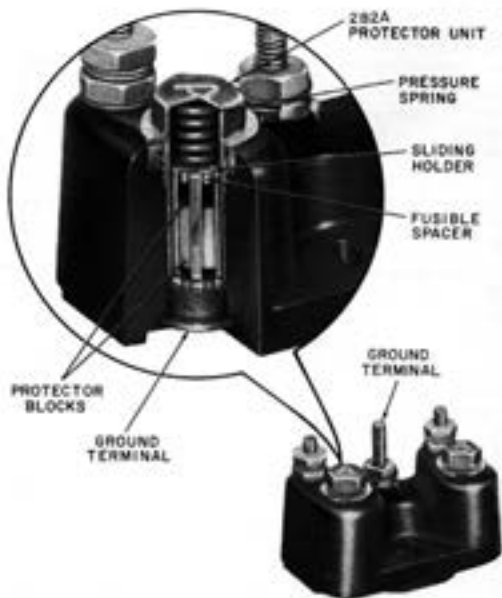


Fig. 2—123A1A Protector

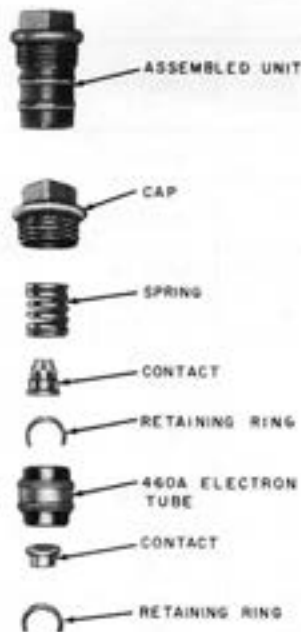


Fig. 4—6B1A Protector Unit



Fig. 3—123B1A Protector



Fig. 5—123E1A Protector

binding posts and four 2B2A protector units. The bottom left and right binding posts are tip and ring for the first line, and the top left and right binding posts are tip and ring for the second line. The two bottom 2B2A protector units protect the first line, and the two top 2B2A protector units

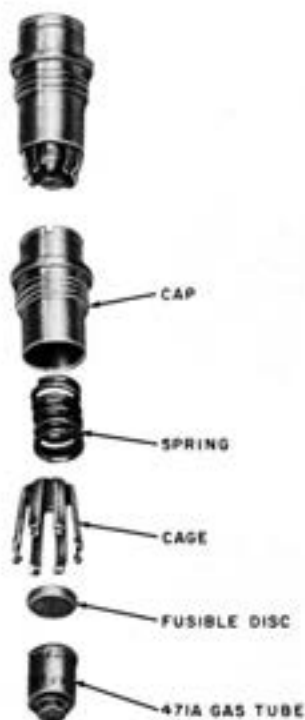


Fig. 6—11B1A Protector Unit

protect the second line. The center binding post is the ground terminal. The 128A1A-2 protector should be grounded with a ground wire no smaller than a No. 12 ground wire (Table B).

3.07 The 128E1A-2 protector (Fig. 8) provides protection for two pairs of wires. It consists of a nonconductive base containing five binding posts and four 11B1A protector units. The bottom left and right binding posts are tip and ring for the first line, and the top left and right binding posts are tip and ring for the second line. The two bottom 11B1A protector units protect the first line and the two 11B1A protector units protect the second line. The center binding post is the ground terminal. The 128E1A-2 protector should be grounded with a No. 12 ground wire (Table B) and may be used anywhere the 128A1A-2 protector is used.



Fig. 7—128A1A Protector

TABLE B

GROUND WIRE CAPACITY

| GROUND WIRE SIZE | MAXIMUM NUMBER OF PROTECTED CIRCUITS | |
|------------------|--------------------------------------|-----------|
| | FUSELESS | FUSED |
| No. 12 (2mm) | 2 | 6 |
| No. 10 (2.5mm) | 6 | 7 |
| No. 6 (4mm) | 7 or more | 8 or more |

Note: The ground wire between protectors shall be the same size as the ground wire between the protector and the grounding electrode.



Fig. 8—128E1A-2 Protector

3.08 The 11B1A protector unit was designed for loops served by grounded shielded cable, multiple rural wire, or urban wire. The 11B1A protector unit and the 123E1A and 128E1A protectors may be used safely on loops served by C-rural wire or open wire, but the trouble reduction over carbon block protection may not be significant, depending on exposure of the loop. In cases where the loop contains a C-rural or open wire segment not exceeding 1/4 mile in length, the presence of the C-rural or open wire should not degrade performance of the gas tube. For loops having longer segments of C-rural or open wire, use the 123B1A protector where gas tube protectors are authorized.

3.09 Because of their higher cost, the 11B1A protector units and the 123E1A and 128E1A protectors should be used only in areas designated by engineering.

3.10 The 11A1A protector unit (Fig. 9) incorporates the same 471A electron (gas) tube as the 11B1A protector unit (see Note following paragraph 3.05) to provide nominal 500-volt protection. The gas tube, along with a fusible disc, is mounted in a machine threaded brass cap. The cap has a screwdriver slot and a recessed circle. The top of the cap is painted white to identify it as satisfactory for use on customer premises.



Neither the 11A1A or 11B1A protector unit should be used with 800A, 801A, and ESS 101 PBXs. †(DIMENSION PBX grounding must be done in accordance with Section 554-101-101.)

3.11 The parts of the 11A1A protector unit are arranged so during a sustained power fault the current causes the gas tube to heat and melt the fusible disc. This allows the spring in the protector base to move the base terminal into contact with the edge of the protector unit cap, providing a ground short. During a lightning surge, the 471A gas tube provides a path for the surge current to ground through its internal spark gap.



The 11A1A protector unit can be used as a direct field replacement for 2A1A protector units in the terminal blocks, protectors, cable terminals, and connecting blocks covered in paragraphs 3.12 through 3.23.



Fig. 9—11A1A Protector Unit

3.12 The 6A3A (MD) terminal block (Fig. 10) can be used in lieu of fuseless station protectors where stations are served by buried cable and the cable closure (such as PC6 or PC12 cable closure) is installed on the premises served. The 6A3A (MD) terminal block mounts inside the

cable closure as shown in Fig. 11. The 6A3A (MD) terminal blocks should not be used for station protectors when a PC6 or PC12 cable closure is used to feed separate buildings and is located remotely from them. Individual 123- or 128-type protectors should be provided at each building.

3.13 The 6A3A (MD) terminal block consists of a nonconductive base containing six binding posts with a 2A1A protector unit associated with each binding post. The terminal block is equipped with six color-coded 24-gauge leads (white-blue, white-orange, white-green), one to each binding post and 2A1A protector unit. Two mounting studs are provided to mount the terminal block in a cable closure and provide for ground connection.

3.14 The 9A1A-5 terminal block (Fig. 12) consists of a nonconductive base containing five pairs of binding posts, ten 2A1A protector units, and replaces the 6A3A (MD) terminal block. One 24-gauge insulated lead is connected internally to each binding post. The 9A1A-5 block provides facilities for protecting subscriber stations and terminating wire service. It is intended for mounting in PC-type cable closures.

3.15 The 116C protector (Fig. 13) consists of a nonconductive base containing twelve binding posts, twelve 2A1A protector units, and two binding posts for signaling ground connections. The base is housed in a metal container with a hinged metal cover. The metal housing is equipped with a clamp for the station ground wire. The wire used to ground the 116C protector should be

no smaller than a No. 10 (Table B). The 116C protector is designed for outdoor or indoor use and generally used with 6-pair multiple drop wire.

3.16 The 117B protector (Fig. 14) consists of a nonconductive base containing twelve binding posts, twelve 2A1A protector units, one binding post for signaling ground, and one binding post (equipped with a pronged washer) for signaling ground and protector ground. The 117B protector should be grounded with a wire no smaller than a No. 10 ground wire (Table B). The 117B protector is designed for indoor use and generally used with 6-pair multiple drop wire.

3.17 Cable terminals, connecting blocks, protectors, or terminal blocks designed to protect 10, 16, 25, 50, or 100 pairs of wires, are used at apartment complexes, commercial or industrial locations. These large capacity (10 pairs or more) protectors may be referred to as multipaired protectors. Multipaired protectors (Table C) used for station protection must be equipped with:

- 2A1A or 11A1A protector unit
- A ground clamp for grounding to an approved ground electrode.

3.18 The NH16 and NH25 cable terminals are equipped with a 24-gauge stub and consists of gastight solid-cast resin blocks containing binding posts and 2A1A protectors installed in metal housings. The metal housings are equipped with a ground clamp, and the cable terminals should be grounded

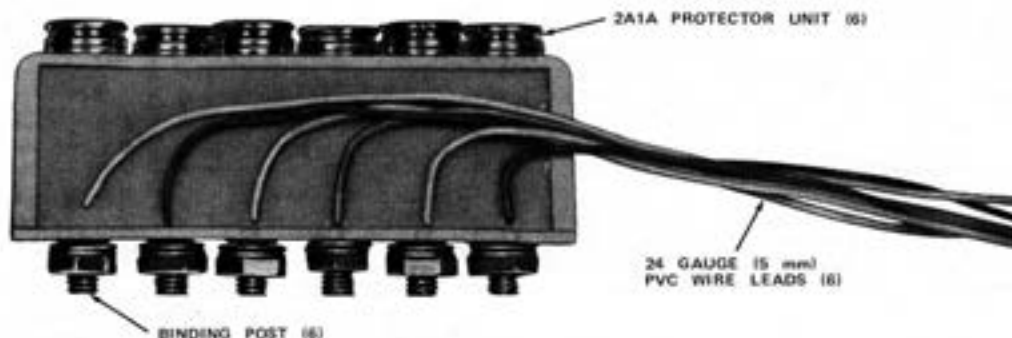


Fig. 10—6A3A (MD) Terminal Block

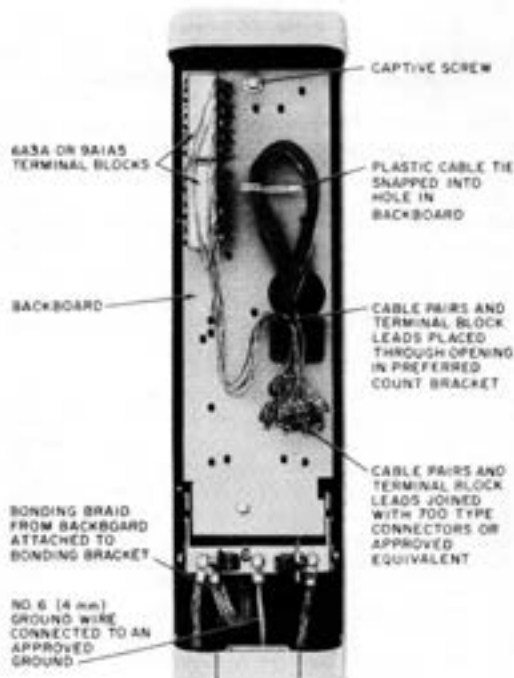


Fig. 11—6A3A or 9A1A5 Terminal Blocks Installed in PC6/48 Closure

with a wire no smaller than a No. 6 ground wire (Table B).

3.19 The NH16 cable terminal has thirty-two binding posts, thirty-two 2A1A protector units, and the housing is equipped with a hinged cover. It may be strand, pole, or wall mounted. Where the NH16 cable terminal is wall mounted on the premise of a customer, it must be bonded (grounded) to an acceptable ground (Table D).

3.20 The NH25 cable terminal (Fig. 15) has fifty binding posts, fifty 2A1A protector units, and the housing is equipped with a drop-type cover. It may be pole or wall mounted. Where the NH25 cable terminal is wall mounted on the premise of a customer, it must be bonded (grounded) to an acceptable ground (Table D).

3.21 The 1A4A-type terminal blocks (Fig. 16) are gastight cast-resin blocks equipped with

binding posts, 2A1A protector units, fanning strip, ground clamp, and a removable linkage feature. The terminal blocks are available in 10-, 16-, 25-, and 50-pair sizes (Table C). The terminal blocks may be mounted in cable terminal boxes or cable terminal sections. The removable ground linkage provides a means of establishing an insulating joint, for corrosion reasons, between the lead stub and the grounds within the terminal block. The fanning strip provides a means of fanning out the connecting wires. The ground clamp permits the connection of a station protector ground. The 1A4A-type terminal blocks should be grounded with a wire no smaller than a No. 6 ground wire (Table B).

3.22 The 57B1A-type (MD) connecting blocks consist of binding posts and 2A1A protector units in injection-molded blocks (Fig. 17). The blocks are equipped with insulation-crushing hardware, fanning strips, and a ground clamp. The ground clamp permits the connection of a station protector ground. The connecting block should be grounded with a wire no smaller than a No. 6 ground wire (Table B). The connecting blocks were made in 10-, 16-, 25-, and 50-pair sizes (Table C). The 57B1A-type connecting block may be installed in G-type terminal boxes, 1A1 or H202 cable terminal sections (see Section 461-603-100).

3.23 The 134-type protectors (Fig. 18) consist of a cast-resin block containing 2A1A protector units, a 26-gauge stub cable (to serve as a fusible link), a 24-gauge terminating stub cable, and two ground lugs. The protectors are available in 16-, 25-, 50-, and 100-pairs sizes (Table C). Either of the ground lugs can be used for a protector ground, and a ground wire no smaller than a No. 6 should be used to ground the protectors (Table B). The 134-type protectors can be installed in cable closures, cable terminal sections, or on B cable terminal frames.

3.24 The 134-type protectors do not have binding posts; therefore, the terminating stub cable must be terminated on connecting blocks or spliced to cables. See Section 631-460-111 for more descriptive information and use of the 134-type protectors.

3.25 Noninsulated drop wire building attachments should be used with fuseless protectors or with fused-type protectors that have been converted to fuseless operation. See Section 460-300-123, Drop and Block Wire, Attaching, and Fastening.

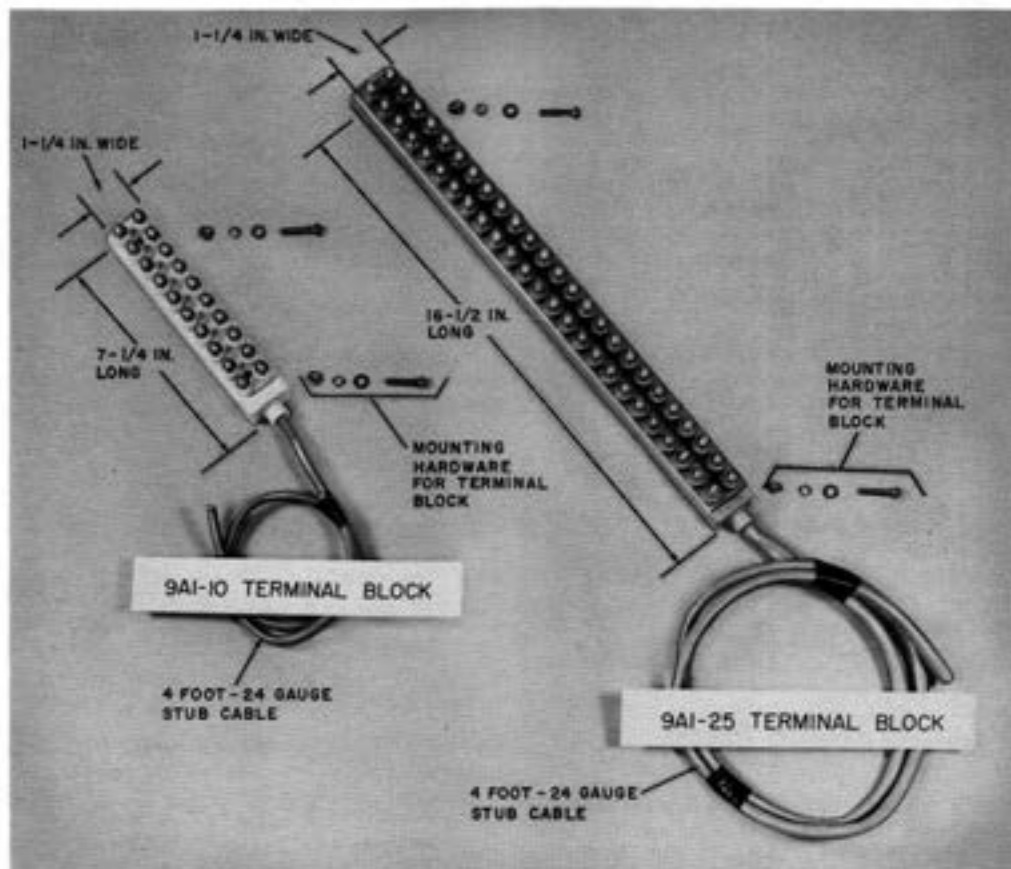


Fig. 12—9A1-Type Terminal Block

3.26 Where the 123- or 128-type protectors are installed outside, a 150B cover (Fig. 19) is installed over the protector, or the protectors may be housed in a 93D1 (MD) (Fig. 20), a 305A2 (Fig. 21) protector mounting, or a B customer service closure (Fig. 22). The 150B cover may be used to cover protectors installed indoors when a protective covering is required.

Caution: *The 150B cover is made of semiflexible plastic and, in extremely hot locations, may become soft and*

not hold over the protector. In extremely cold locations, the 150B cover may become brittle and be difficult to remove from the protector. The B customer service closure or the 305A2 protector mounting is preferred in lieu of the 150B cover for extremely hot or extremely cold locations.

3.27 When using the 150B cover, bring all the wires together under a common clamp. The

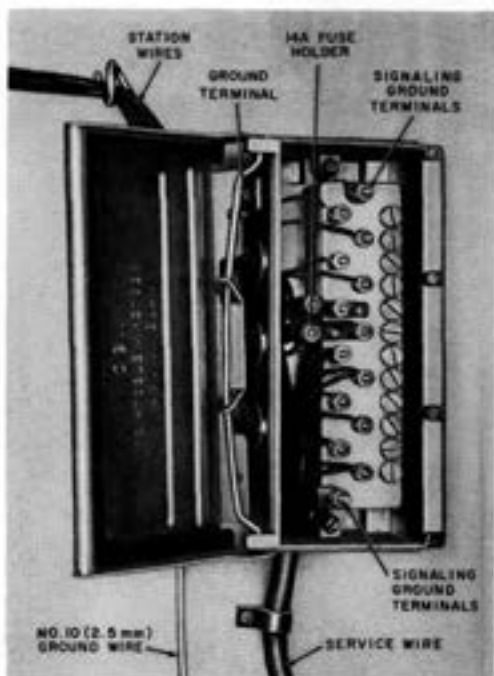


Fig. 13—116C Protector

clamp is the last attachment and is placed about 2 inches below the protector. To remove the 150B cover, grasp the sides of the cover with the thumb and forefinger and, at the same time, apply pressure with the middle finger at the central tapered portion in an upward direction. When the cover lugs clear the base of the protector, the cover may be lifted off.

3.28 The 142A1A protector (Fig. 23) is intended for use where the station is served by 5-pair service or drop wire. It consists of an insulating base with a threaded-stud grounding connector and five pairs of 2A1A protector units, though 11-type (gas filled) protector units may be used, wired to a 5-pair terminal block. It may be mounted in either a C or D customer service closure.

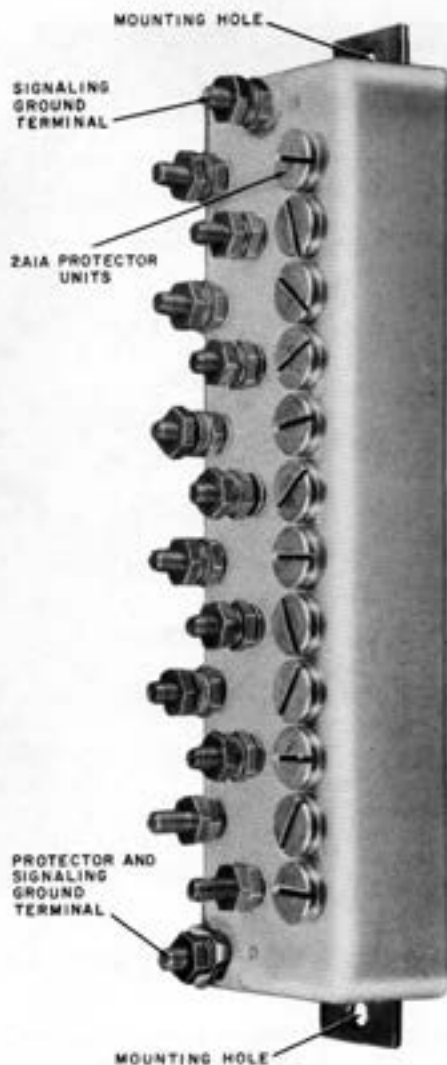


Fig. 14—117B Protector

TABLE C4
MULTIPAIR STATION PROTECTORS

| TYPE PROTECTOR | | PAIRS PROTECTED | SEE FIGURE NUMBER | REFERENCE SECTION |
|-------------------|------------|-----------------|-------------------|-------------------|
| Cable Terminals | NH-16 | 16 | | 631-210-101 |
| | NH-25 | 25 | 15 | |
| Terminal Blocks | 1A4A-10 | 10 | | 631-440-211 |
| | 1A4A-16 | 16 | 16 | |
| | 1A4A-25 | 25 | | |
| | 1A4A-50 | 50 | | |
| Connecting Blocks | 57B1A-10 | 10 | 17 | 461-603-100 |
| | 57B1A-16 | 16 | | |
| | 57B1A-25 | 25 | | |
| | 57B1A-50 | 50 | | |
| Protectors | 134A1A-16 | 16 | | 631-460-111 |
| | 134A1A-25 | 25 | 18 | |
| | 134A1A-50 | 50 | | |
| | 134A1A-100 | 100 | | |

PROTECTOR MOUNTINGS

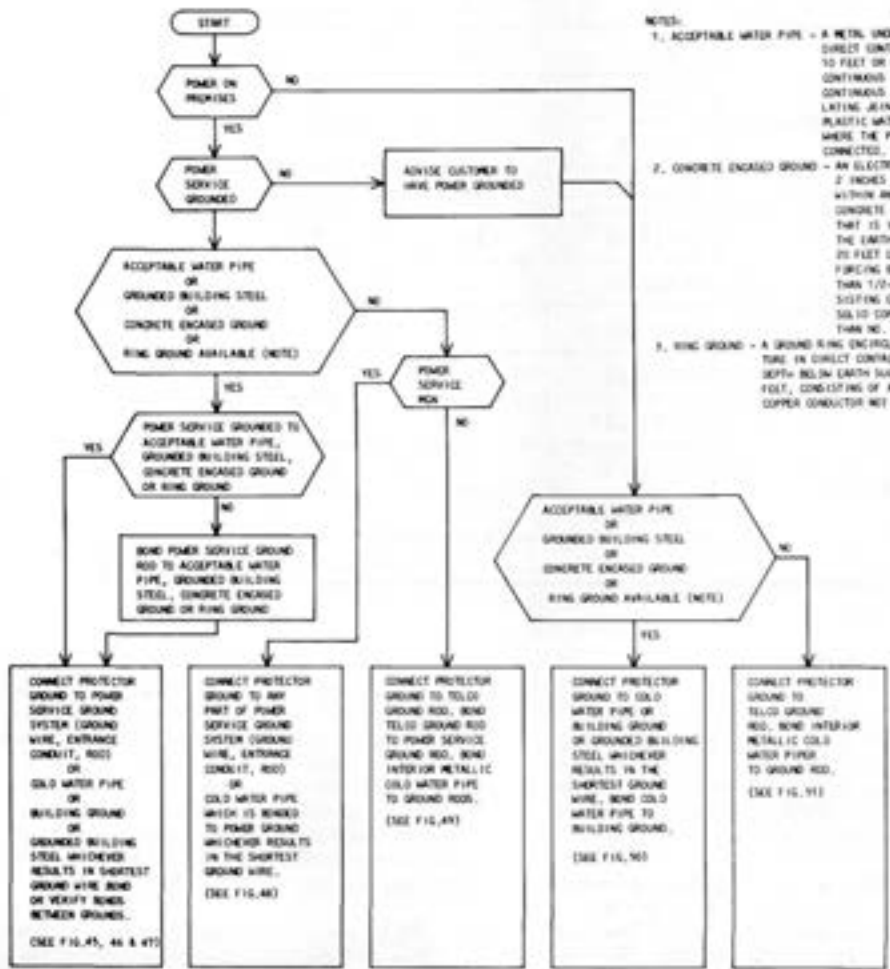
3.29 The 93D1 (MD) protector mounting is designed to house four 123- or 128-type protectors. It is intended to be mounted on a protector mounting post (PMP) where stations are served by buried service wire (Fig. 24) or may be installed on any flat surface.

3.30 The 93D1 (MD) protector mounting consists of a base, an adapter plate, a cover, a grounding connector, and four screws. The back of the base has two slotted mounting holes for installing on a flat surface and two round holes (about 1-3/4 up from the bottom) for mounting on a PMP. Two other holes in the back of the base are provided for attaching the adapter plate. Three openings in the bottom of the base are equipped

with grommets as an entry for service wires, station wires, and ground wire. A knockout is provided in the back of the base. Where it is more practical for station wires to enter the back of the protector mounting, the knockout can be removed and a B plastic tube inserted through the opening. The B plastic tube offers mechanical protection to station wires. Cut the B plastic tube to the desired length and plug it to prevent an open path between the closure and the interior of the building.

3.31 The 123- and 128-type protectors are mounted in a vertical position on the adapter plate of the 93D1 (MD) protector mounting. The ground connector provides a method of connecting the shield of a service wire to the ground terminal of a protector mounted in one of the lower positions on the adapter plate. The ground connector is

TABLE D
SELECTION OF APPROVED GROUND



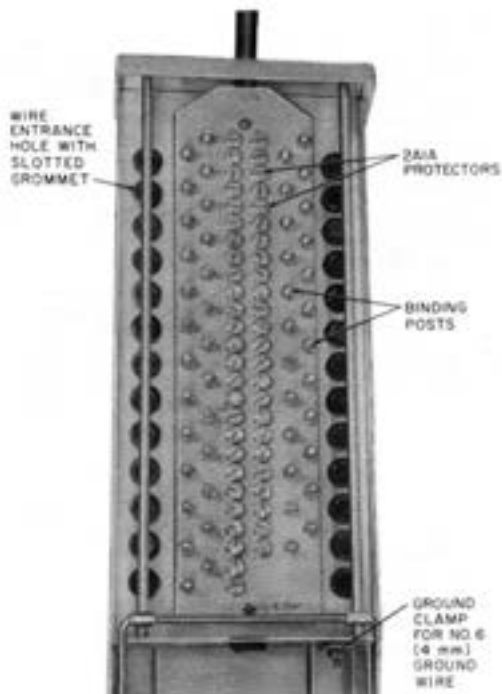


Fig. 15—NH25 Cable Terminal

connected to the shield of a service wire in the same manner as the F connector (Fig. 25).

Note: When installing the 93D1 (MD) protector mounting on a PMP, the adapter plate must be removed to provide access to the mounting holes in the back of the protector mounting base.

3.32 The 305A2 (MD) protector mounting consists of a metal base and a removable metal cover. The base has two slotted mounting holes and four tapped holes, two vertical and two horizontal, for installing 123- and 128-type protectors. Two screws are furnished with the mounting. The 305A2 (MD) protector mounting can be mounted on any flat surface (Fig. 26) or on a PMP (Fig. 27).

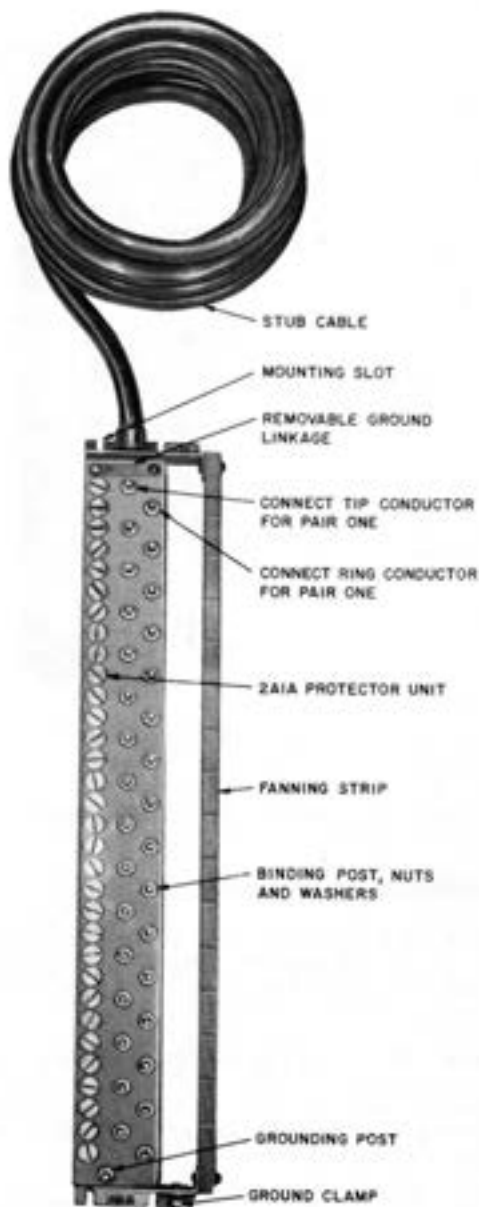


Fig. 16—1A4A-16 Terminal Block

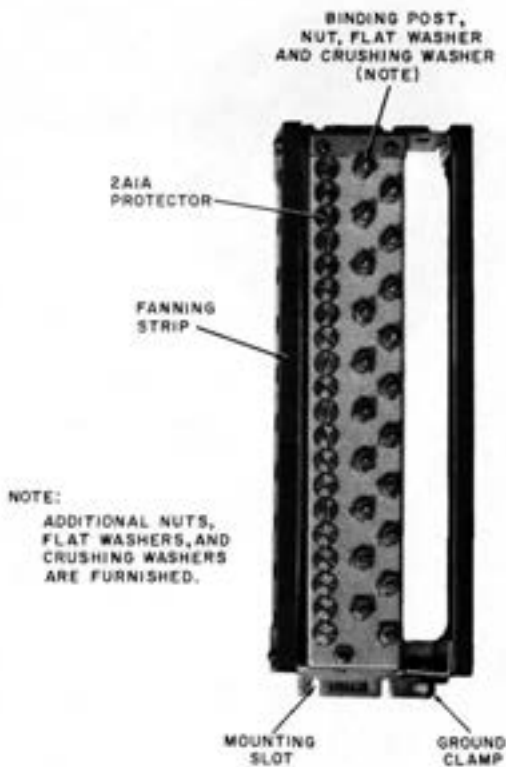


Fig. 17—57B1A-10 (MD) Connecting Block

CUSTOMER SERVICE CLOSURES

3.33 The AT-8813 customer service closures are used as exterior protective housings for protectors, connecting blocks, and various other telephone company devices.

3.34 The AT-8813 customer service closures come in three sizes (B, C, and D) and consists of a plastic base, removable cover, two cable ties for locking the cover to the base, and mounting screws for attaching protectors.

3.35 The B, C, or D closure can be mounted on any suitable flat surface, PMP, or a vertical or horizontal pipe. An adapter at the bottom of the base allows it to be attached to service wire conduit. A typical installation is shown in Fig. 28.4

3.36 Inside wiring (station and ground wire) can be brought into a customer service closure through either the back or bottom grommets only. Since they are constructed entirely of plastic, ground contact cannot be made through the base but must be provided by a separate ground wire. When wires enter through the back grommet, they should be protected by a length of B plastic tube inserted through the hole. Plug the tube to prevent formation of an open path between the closure and the interior of the building.

3.37 When a closure is mounted on a pipe, it should be attached with a C lashed cable support (Fig. 29). It will be necessary to break out either vertical or horizontal openings in the back of the closure with a screwdriver or similar tool.

3.38 Complete instructions for installing B, C, and D customer service closures are printed on a separate sheet and packed with each new unit. More complete information on these closures is contained in Section 463-121-120.

3.39 The AT-8813 customer service closures will accommodate the following:

- B closure—a single 123- or 128-type protector
- C closure—two 123- or 128-type protectors or combination, one 106C protector, or one 142A1A protector, or a combination of protectors, 66B4-3 connecting blocks, 1A termination units, and loop electronic devices.
- D closure—up to four 123- or 128-type protectors or combinations of all previously mentioned devices.4

PROTECTOR MOUNTING POSTS (PMP)

3.40 The protector mounting posts, PMP-38 (Fig. 30) and PMP-50, are designed to mount a 93D1 4(MD)4 protector mounting, a 305A2 4(MD)4 protector mounting, a 123- or 128-type protector, or a B customer service closure, where protectors are served by buried service wire. The PMP is available in 38-inch and 50-inch sizes to suit various conditions. It can be installed freestanding, at the edge of a mobile home, or can be installed on the side of a permanent building or a power service entrance conduit. When used freestanding, the

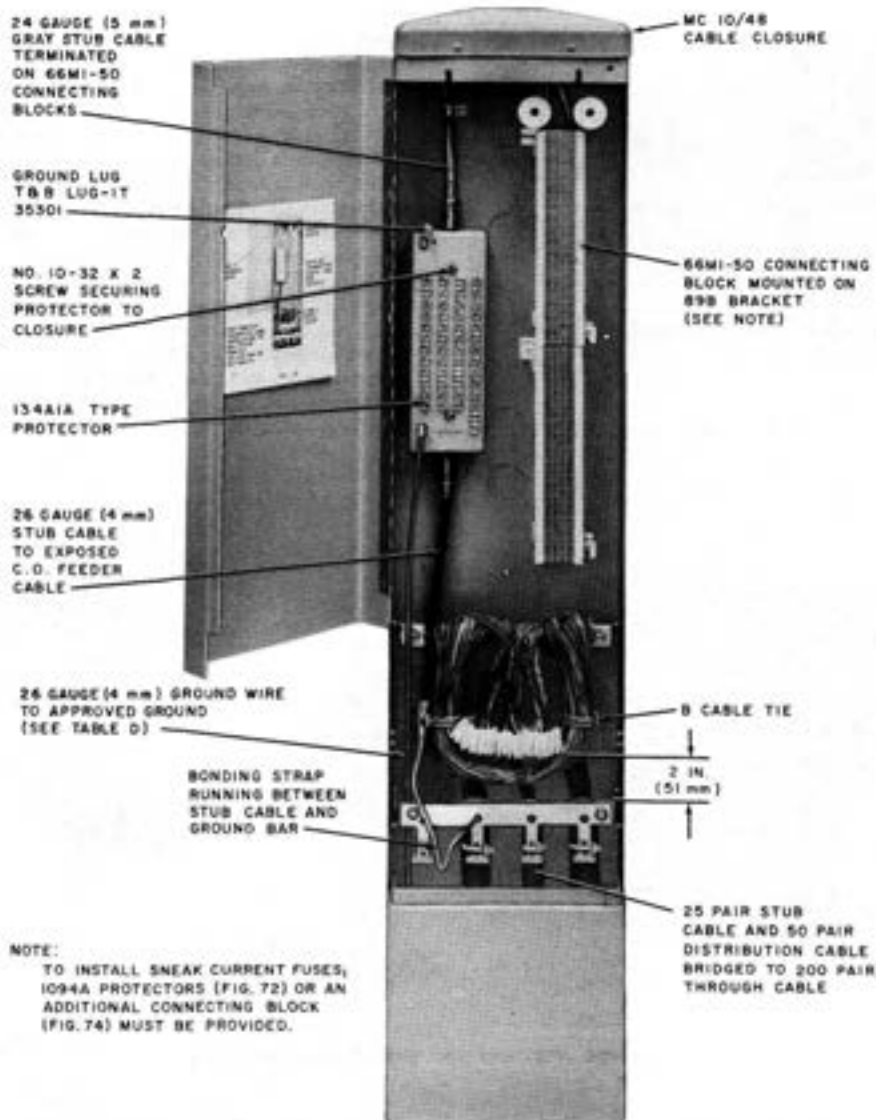


Fig. 18—134A1A-25 Protector Installed in Cable Closure



Fig. 19—150B Cover

PMP must be in the ground a minimum of 12 inches.

3.41 As the mounting plate at the top of the PMP is riveted to the stake portion, the PMP *cannot* be driven into the ground. This necessitates installing the mounting post as the service wire is being buried so it can be placed in the open trench. Installing the PMP as the service wire is being buried eliminates the possibility of damaging the service wire with the stake.

3.42 The PMP has an open channel in the back for the service wire. The slotted holes in the stake permit the service wire to be fastened in the channel by using plastic cable ties or metal sealing clamps. The round holes in the stake permit attachment to structures where required.

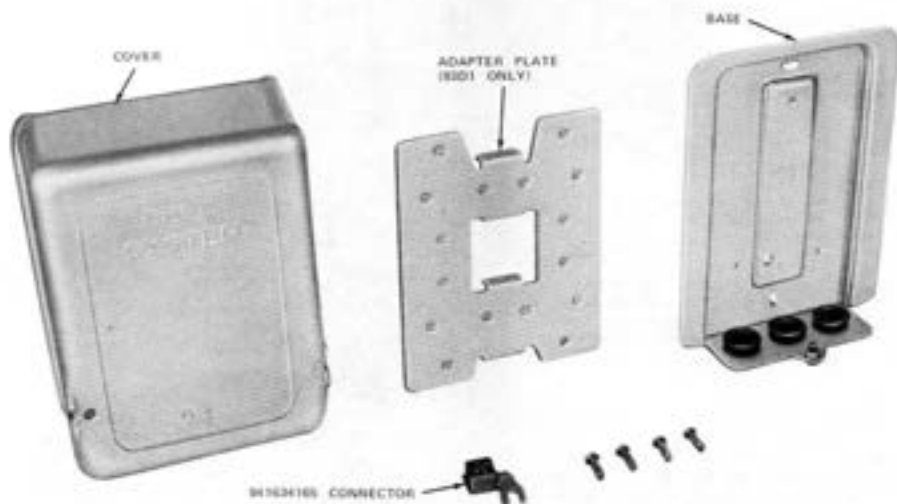


Fig. 20—93C (MD) and 93D (MD) Protector Mounting

See Fig. 24 and 27 for examples of service wire terminations.

3.43 The mounting plate at the top of the PMP has two elongated holes which can be used to attach the mounting post to structures where required. The other five holes in the mounting

plate are for mounting the various protector mountings or closures.

4. INSTALLING PROTECTORS

4.01 All screws and fasteners shall be of sufficient length and size to mount protectors securely. Division 080 contains information concerning the



Fig. 21—305A2 (MD) Protector Mounting

various types of screws, anchors, etc. required. Stainless steel screws should be used for outdoor installations.

4.02 Where more than one protector is installed at the same indoor location, provide a 1-inch separation when protectors are horizontally mounted and a 2-inch separation when protectors are vertically mounted (Fig. 31). When more than one 123- or 128-type protector is installed at the same outdoor location, the protectors may be installed in a C or D customer service closure.

4.03 Where the 150B cover is to be used with 123- or 128-type protectors, mount the protectors in an upright position to permit proper installation of the cover.

4.04 Terminate line input (ie, aerial or buried drop) and station wires on the protector with the ring conductors (single tracer or red wires) connected to the right-hand terminals of the protector. Unused station wire conductors should be looped back and coiled around the station wire jacket or stored in such a manner as to prevent them from coming into contact with protector terminals or bare wires.

4.05 Current production 123- and 128-type protectors are manufactured with two nuts on each line terminal. Terminate line wires under the bottom washer and nut. After tightening the bottom nuts, place station wiring under the top nuts. Use washers between wires when more than one wire is placed under a nut. Use caution when terminating

small gauge station wires on the protector terminals as the wire may catch in the threads of the terminal and be cut or broken when nuts are tightened. Older 123- and 128-type protectors have one nut on each line terminal.

4.06 Make sure all nuts are tight.

4.07 Where an acceptable metallic cold water pipe is used as the ground electrode, it is preferable to install the 123- and 128-type protectors directly on the water pipe. Protectors installed in this manner are grounded with a minimum resistance to ground.

4.08 Install protectors on acceptable metallic cold water pipes using one of the following brackets:

- 72A (MD) bracket (Fig. 32)—use with 123A1A and 128E1A protectors for indoor location

- 90A (MD) bracket (Fig. 33)—use with 123B1A, 128A1A-2, or 128E1A-2 protectors for indoor location

- 114A bracket (Fig. 34)—use with 123- and 128-type protectors for indoor or outdoor locations.

4.09 The 114A bracket can also be used to install the 123- or 128-type protectors directly on power service entrance conduit.

4.10 Use the 150B cover to protect the 123- and 128-type protectors that are installed on a 114A bracket at outdoor locations.

4.11 To install the 72A (MD) or 90A (MD) bracket:

- (1) Place a B station ground clamp through slots in the bracket (Fig. 35).
- (2) Attach the B station ground wire clamp to an acceptable metallic cold water pipe in the usual manner.
- (3) Remove the screw or bolts from the bracket and slide the protector in place, making sure the notched portion of the bracket is under the pronged washer of the ground terminal of the protector.

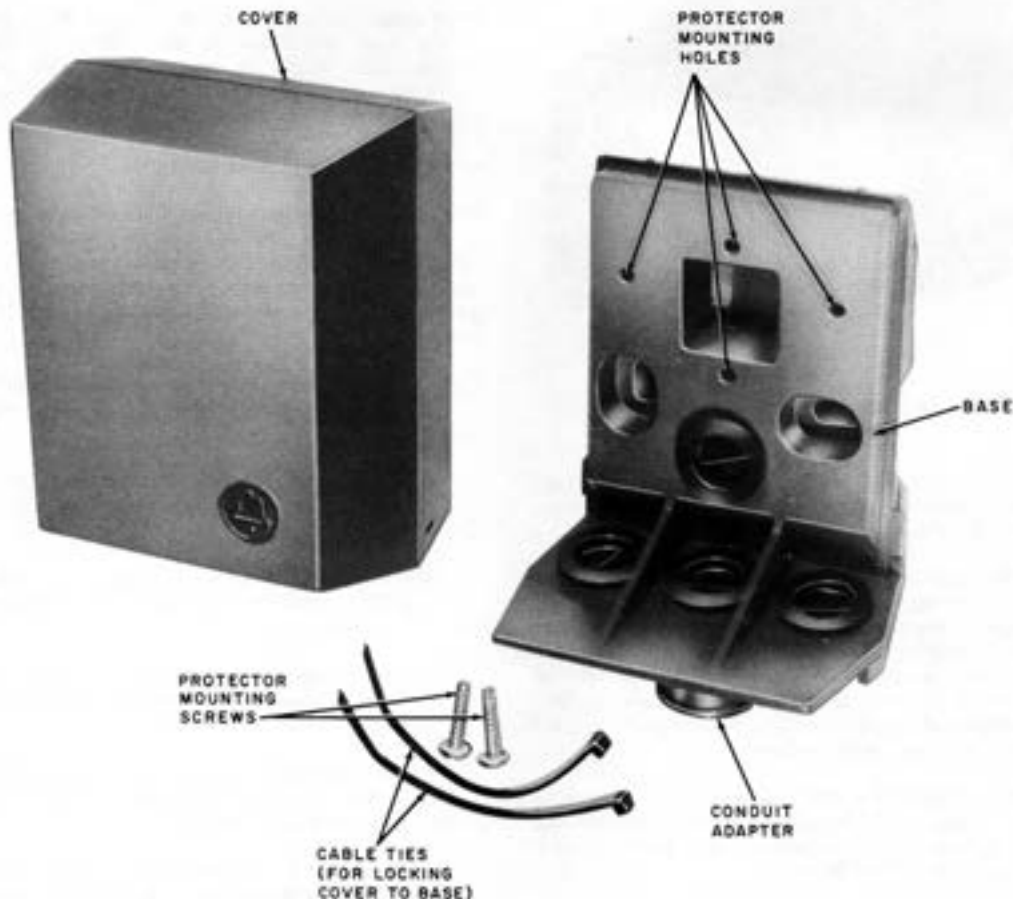


Fig. 22—B Customer Service Closure

(4) Place the mounting screw furnished with the 72A (MD) bracket through the bottom mounting hole of the 123- or 128-type protector and into the threaded hole in the bracket

or

Place the mounting bolts furnished with the 90A bracket through the side mounting holes of the 123- or 128-type protector and through the holes in the bracket. Thread nuts on the mounting bolts.

(5) Tighten mounting screw or bolts (Fig. 36).

(6) Install Form E-3013B. This form may be placed on the B station ground clamp (Step 2).

4.12 To install the 114A bracket:

(1) Place a B station ground clamp through slots in the bracket. Select horizontal or vertical slots in the bracket, whichever will



Fig. 23—142A1A Protector in C Customer Service Closure

permit mounting the bracket in an upright position.

(2) Attach the B station ground clamp to an acceptable metallic cold water pipe or to the power service entrance conduit in the usual manner (Fig. 37).

(3) Mount the 123- or 128-type protector on the 114A bracket using the two No. 8-32 self-tapping screws furnished with the bracket.

(4) Connect the 2-inch length of copper wire (attached to the bracket) under the pronged washer of the protector ground terminal (Fig. 38).

(5) Connect service wire and station wires in the usual manner.

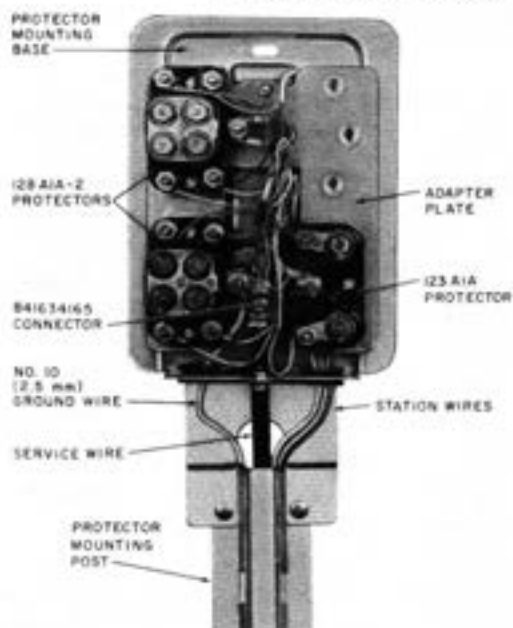


Fig. 24—93D1 (MD) Protector Mounting Installed on Protector Mounting Post

(6) Install Form E-3013B. This form may be placed on the B station ground clamp (Step 2).

(7) Install 150B cover at outdoor locations, where mechanical protection is required, or where appearance is a factor.

4.13 The 6A3A terminal blocks are installed in a PC6 (Fig. 11) or PC12 cable closure as follows:

(1) Remove upper front cover from the cable closure.

(2) Loosen captive screw at top of backboard and tilt backboard forward.

(3) Insert mounting studs of the 6A3A terminal block through the holes in the backboard (starting at the top left).

(4) Thread nuts on mounting studs and tighten.

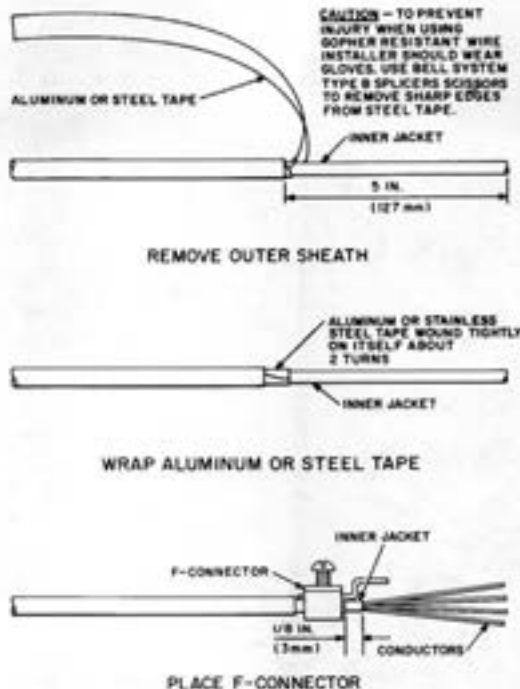


Fig. 25—Preparing B or C Service Wire for Bonding of Metal Shield

- (5) Secure the backboard in the upright position.
- (6) Run a No. 6 ground wire from the ground connector mounted on the grounding and bonding bar to an approved grounding electrode.
- (7) Join the terminal block leads to the cable pairs with approved wire connectors.
- (8) When a signal ground is required and there are no facilities for a signal ground at the telephone location, a 2A ground strip can be mounted on the backboard of the cable closure and used for a signal ground terminal. The 2A ground strip must be provided separately.
- (9) Using plastic cable ties, dress cable closure per Fig. 11.
- (10) Replace upper front cover on the cable closure.

Note: If the station wires are being brought in through the back of the closure, it will be necessary to remove the knockout from the back of the closure. **Seal this opening with duct seal.** If closure is mounted on a combustible wall, place metallic conduit from the knockout through the wall.

- 4.14 The 116C protector is wall mounted via two screws. The protector may be mounted horizontally or vertically. When mounted horizontally, the protector should be positioned so the cover drops down.
- 4.15 The 117B protector is wall mounted via two screws and may be mounted in the horizontal or vertical position.
- 4.16 Multipair protectors are generally placed at the time cable facilities are installed or are installed as specified by detailed plans. When

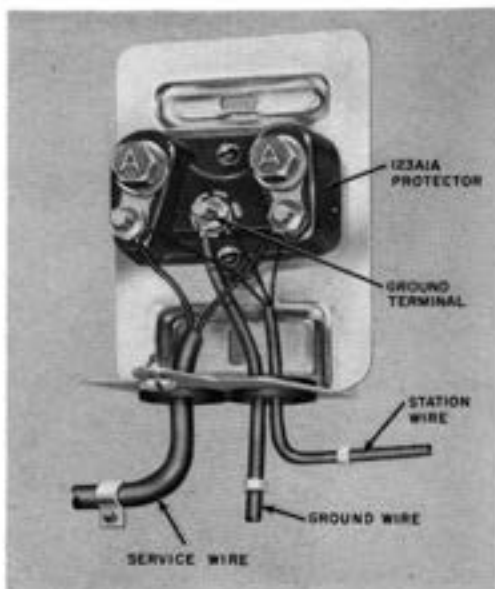


Fig. 26—123A1A Protector Installed in 305A2 (MD) Protector Mounting

multipair protectors are to be otherwise installed, reference should be made to the section pertaining to the particular protector being installed (Table C).

5. FUSED PROTECTORS

5.01 The 1293C (MD) protector (Fig. 39) is used for outdoor installations and the 106C protector (Fig. 40) is used for indoor installations. These protectors are the same except the 1293C (MD) protector is comprised of a 106C protector enclosed in a 93C (MD) protector mounting (Fig. 41).

5.02 The 106C protector consists of a base of nonconductive material containing five binding posts, two 11C fuses (Fig. 42), and two 2A1A protector units.

5.03 Where it is necessary to protect more than one pair of wires with fused-type protectors, additional 1293C (MD) or 106C protectors must be used.

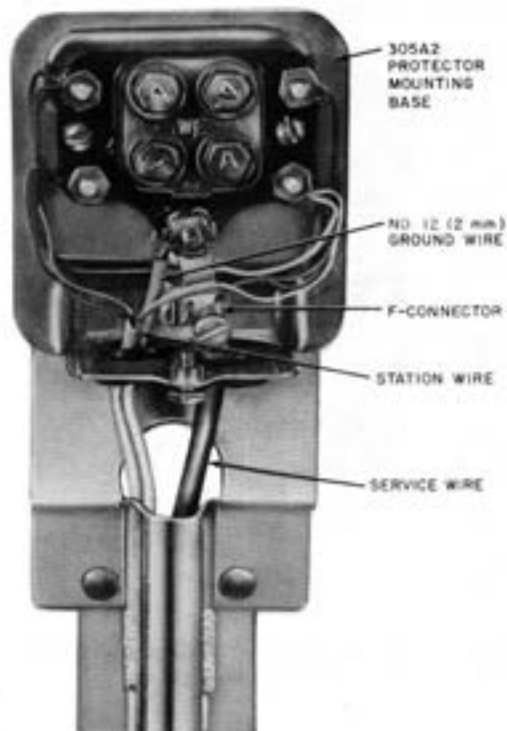


Fig. 27—305A2 (MD) Protector Mounting Installed on a Protector Mounting Post

5.04 Where the 106C protector is installed indoors, it must be mounted where the drop or service wire enters the building, keeping the length of drop or service wire within the building to a minimum.

5.05 Insulated building attachments must be used for attaching drop or service wires to combustible surfaces where fused protectors are used. Also, insulated tubing must be used where drop or service wires are fed through combustible walls.

5.06 When the 106C protector is installed outdoors, use a C (Fig. 43) or D customer service closure. Where this combination is used to terminate buried service wire, mount the protector upside



Fig. 28—Typical Protector Installation Using B Customer Service Closure

down in the closure so the ground terminal is at the bottom. This will facilitate the F connector.

The conductors of the buried service wire must be connected to the line terminals (marked L) at the top of the protector, while the station wiring must be connected to the bottom terminals (marked I).

5.07 At older installations, the 98A (MD) protector may still be in use. The 98A (MD) protector (Fig. 44) consists of a base of nonconductive material containing five binding posts, two 11C fuses, and a carbon block protector well arranged for the use of No. 26 and No. 27 protector blocks. For outside installations, the 98A (MD) protector is mounted in a 93C (MD) protector mounting.

6. GROUNDING AND BONDING



All protector grounds and bonds should be as short and as straight as practical and should be located where future visual inspections can be made. Avoid

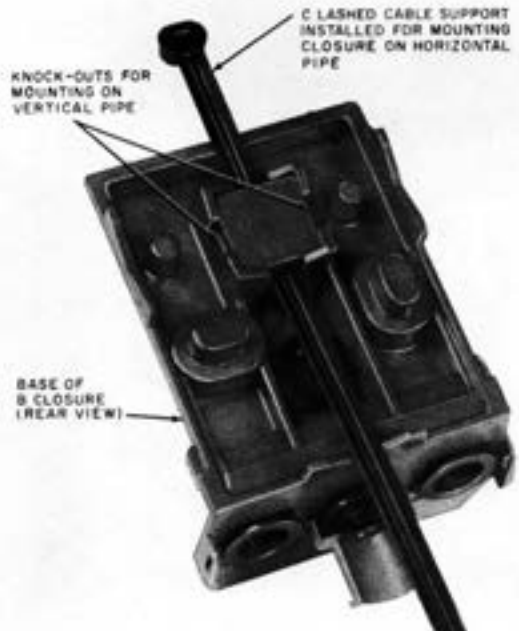


Fig. 29—Installation of C Lashed Cable Support on B Customer Service Closure

making sharp bends in grounding and bonding conductors.

6.01 Before selecting a protector ground, determine how the power service is grounded (Table D). The National Electrical Code (NEC) requires that, where available, an acceptable metal underground water pipe system shall always be used as the grounding electrode for the power system and the telephone protector. (An acceptable water pipe electrode is one that has at least 10 feet of metallic pipe buried in the earth and may be either part of a municipal water system or a private well.) The code also requires that, if an acceptable water pipe is not available, the interior metal cold water pipe of the premises must always be bonded to the power ground. Where an acceptable water pipe system is not available, the power service may be grounded to any of the following:

- The metal frame or steel of a building where effectively grounded

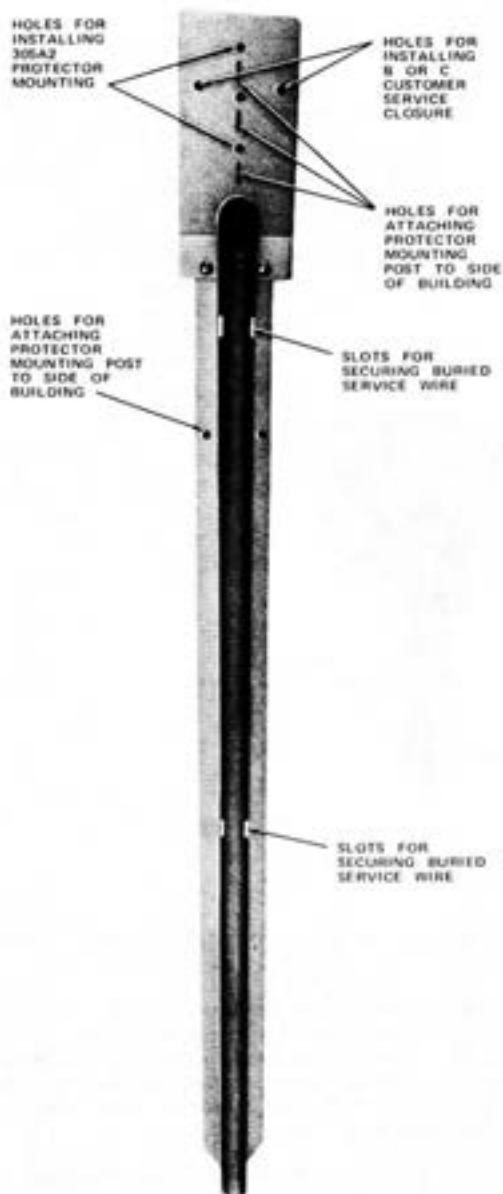


Fig. 30—Protector Mounting Post (PMP)

- Bare No. 4 or larger copper wire or steel reinforcing rod not less than 20 feet in length and encased in the concrete footing of the building

- A ground rod, galvanized pipe or plate buried in the earth.

6.02 Do not connect station protector ground wires to:

- Gas pipes
- Electrical service branch circuit conduit
- Armor of BX cable
- Interior of any electrical box
- Aluminum conductors or conduit.

6.03 Connections may be made to aluminum power service ground conductors only when it is necessary to bond to an interior metallic water pipe. See Table F for proper connector for aluminum attachments.

6.04 Station protectors installed at locations with the power grounded to an acceptable water pipe, as described in paragraph 6.01, should be grounded as shown in Fig. 45 or installed directly on the water pipe.

6.05 Station protectors installed at locations where the power is grounded to a concrete encased electrode or to grounded building steel should be grounded as shown in Fig. 46 and 47.

6.06 Where the power is grounded to a ground rod and an acceptable water pipe or building ground does not exist, it is necessary to know if the power service is MGN (multigrounded neutral). This information should be obtained according to local instructions. Station protectors installed where an MGN power system is grounded to a ground rod should be grounded as shown in Fig. 48. Where a non-MGN power system is grounded to a ground rod, protectors should be grounded as shown in Fig. 49.

6.07 The current NEC stipulates the electric service must use a ground rod in addition to a water pipe ground. Where the power is grounded in this manner, it is unnecessary to install

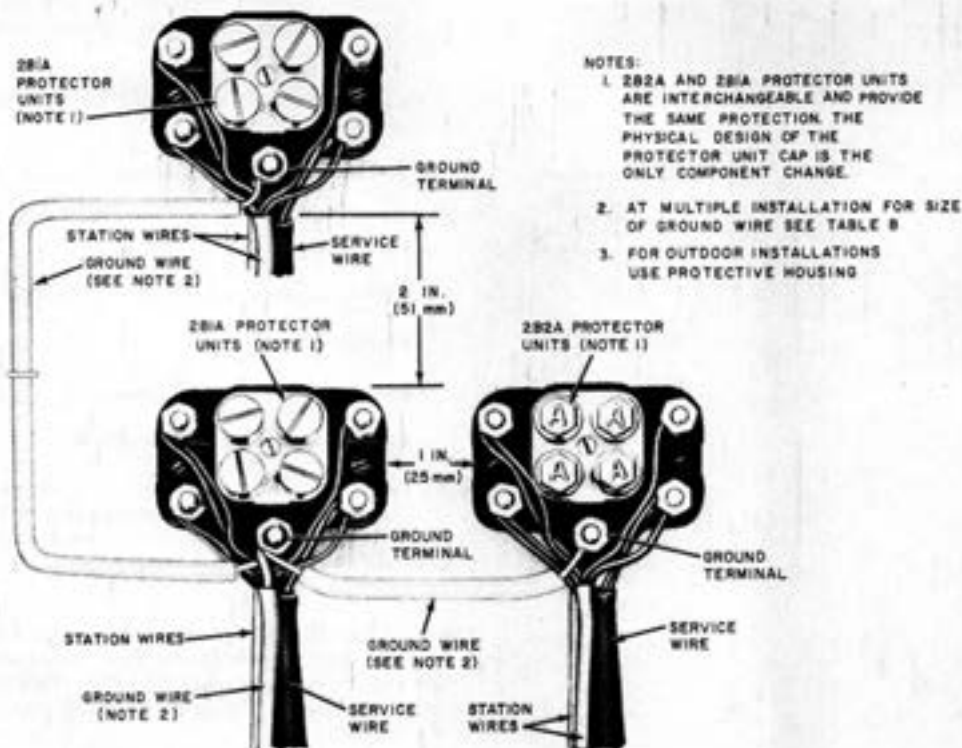


Fig. 31—Installation Protectors in Multiple



Fig. 32—72A Bracket

a separate ground rod, and the protector should be grounded as shown in Fig. 45.

6.08 *Where the power ground is not bonded to the interior metal cold water pipe as described in paragraph 6.01, place a bond between the power service ground and the cold water pipe using a No. 6 ground wire.*

6.09 Telephone service may be installed where a power ground is not provided. However, the customer should be informed immediately of the need for a power ground and be requested to notify the telephone company when the ground has been provided. The procedure for notifying the



Fig. 33—#90A Bracket

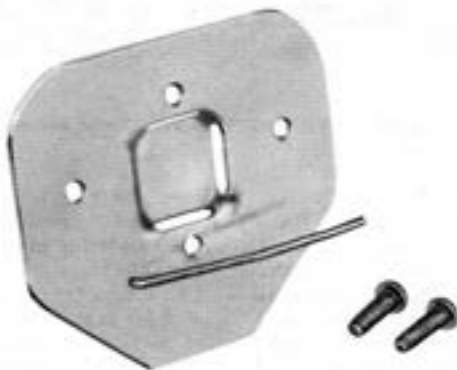


Fig. 34—114A Bracket

customer shall be covered by local instructions. Station protectors installed where there is no power, or the power ground is inaccessible, should be grounded as shown in Fig. 50 or 51.



Caution should be exercised on visits (installation or repair) to locations where structures are under



Fig. 35—B Station Ground Clamp Through Slots in 72A Bracket

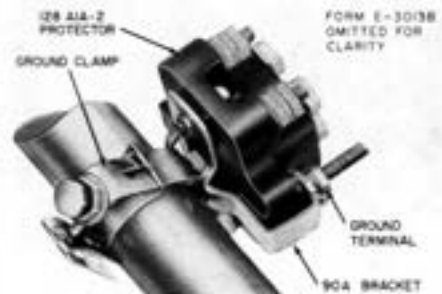
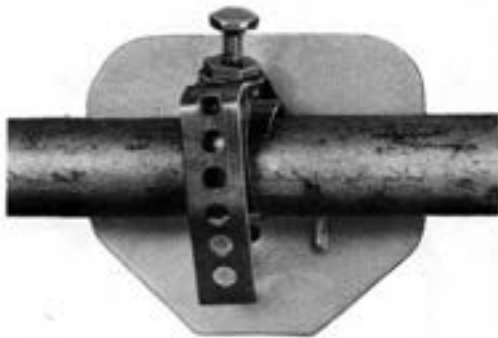


Fig. 36—Protector Installed on Metallic Water Pipe

construction or are being remodeled. At these locations, temporary power and water pipe arrangements are often encountered. Therefore, it is very important to select a ground electrode of a permanent nature. Also, ground wire runs



FORM E-3013B OMITTED FOR CLARITY

Fig. 37—114A Bracket Installed on Water Pipe or Power Entrance Conduit

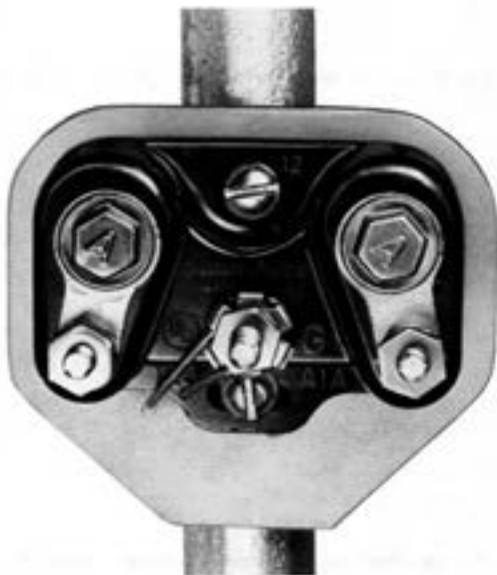


Fig. 38—Ground Wire of 114A Bracket Connected to Protector Ground Terminal

should be made in such a manner they will not be removed, changed, broken, or present a hazard.

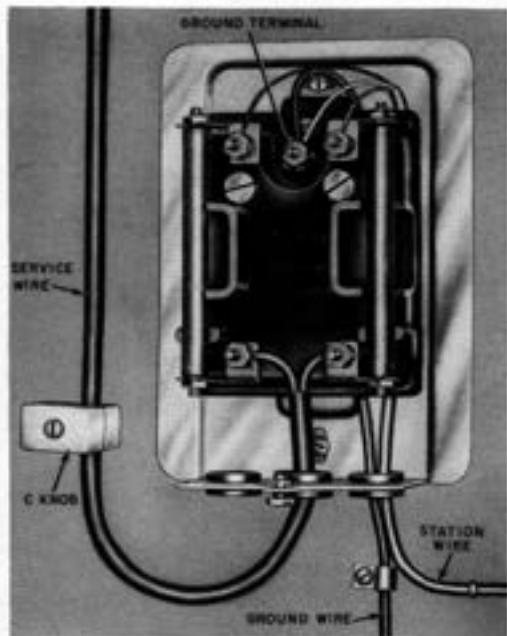


Fig. 39—1293C (MD) Protector, Cover Removed

6.10 Use Table D to select the best protector ground. Table D is designed to help identify the best ground electrode available for most job situations. The decision blocks contain questions regarding the conditions for grounding, the responses to which will lead to the selection of an acceptable ground. The table should be followed until the last block in the path is reached. The referenced notes and figures (Fig. 45 through 51) provide additional information and installation procedures.

6.11 See Table E for ground clamp selection. See Table F and Fig. 25, 52, 53, 54, and 55 for wire connectors. Connections to building steel may be made by using a C or D insulator support (Fig. 56).

6.12 ⚡Do not connect protector grounds to aluminum power ground conductors.⚡

6.13 If the power ground wire is enclosed in metallic armor or conduit, the metallic armor

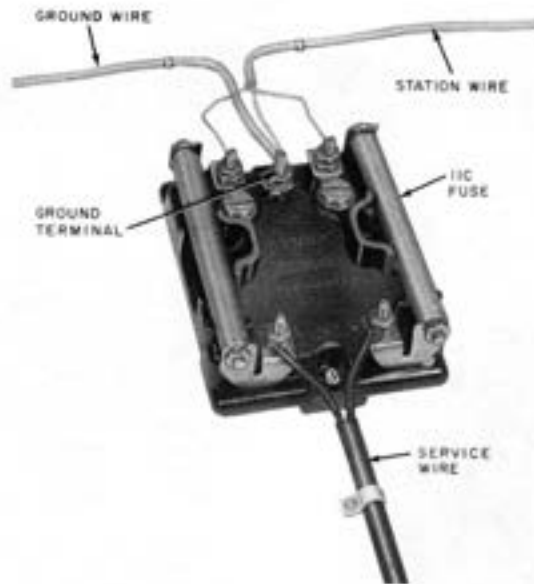


Fig. 40—106C Protector



Fig. 41—93C (MD) Protector Mounting

or conduit may be considered as the grounding conductor when making connections.

6.14 Metallic power service entrance conduit may be used for the protector ground instead of the power ground wire, and the protector can be mounted on the entrance conduit by using a 114A bracket. (Refer to paragraph 4.12 for installation of the 114A bracket.) The power service entrance conduit is the conduit through which the power service conductors feeding the premises enter the box containing the main power breaker or fuse.

6.15 Where protectors are located so that running wire to an acceptable water pipe results in a shorter length of wire than if run to the power ground, the water pipe may be used, *provided the water pipe is bonded to the power ground*. An acceptable metallic water pipe is the preferred ground where the power ground is inaccessible or there is no power.

6.16 When installing a protector directly on a metallic water pipe or when connecting the protector ground wire to a water pipe, *make*

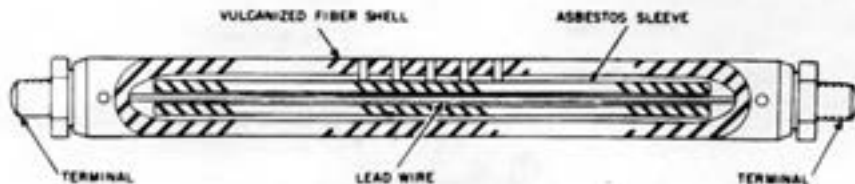


Fig. 42—11-Type Station Line Fuse

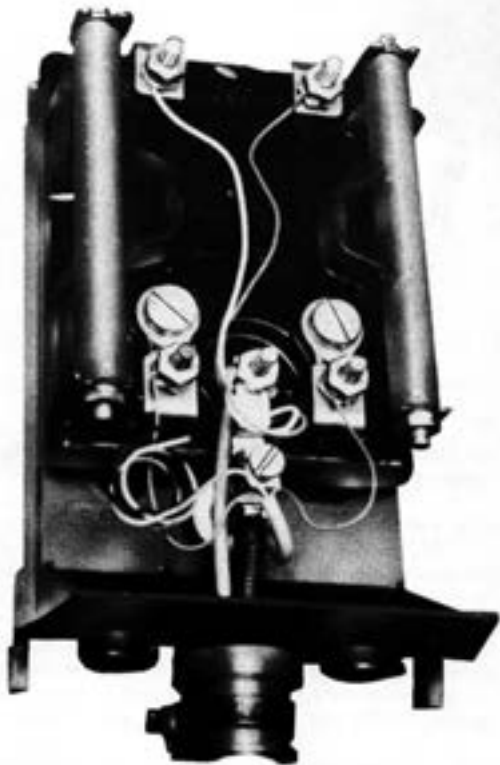


Fig. 43—#106C Protector in C Customer Service Closure

sure the pipe is metallic for at least 10 feet in the earth where it leaves the premises. Determine that there are no insulating joints, plastic sections, or plastic water meters in the water pipe on which a protector is to be

mounted or the ground wire is to be connected. Avoid water pipes having meters, pumps, or valves that may be removed for maintenance. *Where such pipes must be used, install a bond (of No. 6 ground wire) around the meter, pump, or valve, so the continuity to ground will not be broken.* †When these requirements are in doubt or conditions cannot be met, an alternate ground source must be provided (Table D).‡

6.17 Protectors located remotely from the power service may be grounded to an *unacceptable* metallic water pipe or to building steel *provided that the water pipe or building steel is bonded to the power service ground*. This is preferable to making very long ground wire runs to the power service ground or to a remote acceptable water pipe.

6.18 Where it is necessary to multiple protector ground terminals, select the proper size ground wire for the number of protectors to be installed, including anticipated growth (Table B). Where more than one protector is installed, use the same size ground wire between protectors as used between the protector and the grounding electrode.

6.19 A continuous length of ground wire should be used for a protector ground. However, the ground wire may be spliced using a sleeve-type splice. When splicing ground wire, consider the following:

- Do not splice new ground wire runs
- Do not splice existing ground wire runs of less than 10 feet
- When splicing an existing ground wire, do not use a smaller gauge wire to extend a larger gauge wire

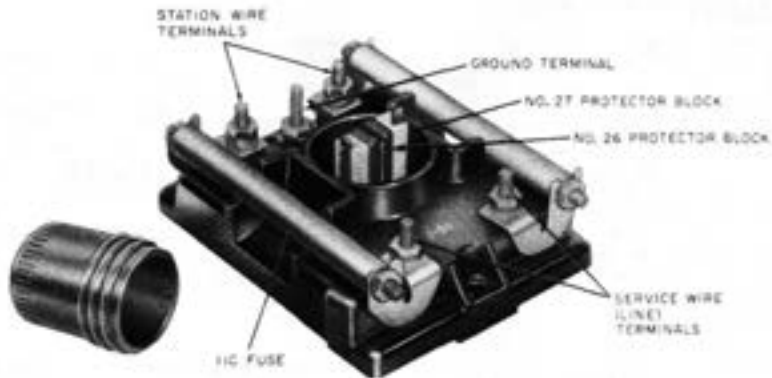
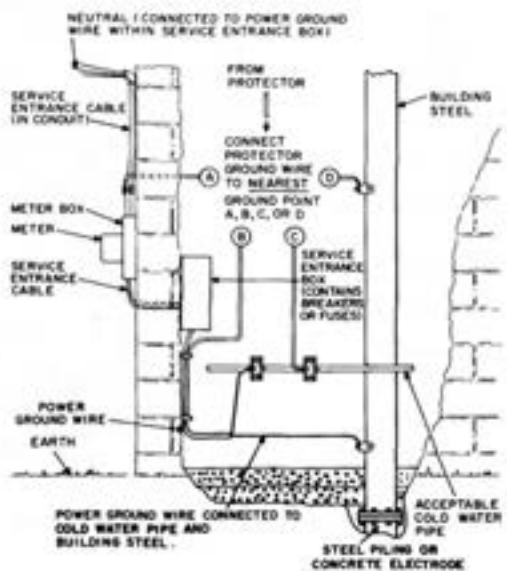
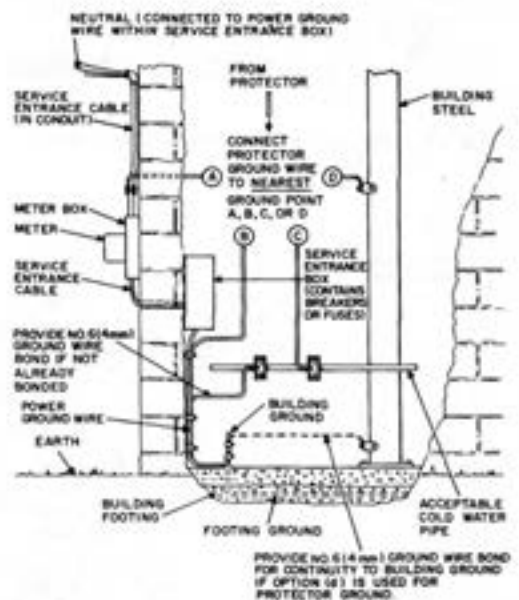


Fig. 44—#98A (MD) Protector

Fig. 45—Acceptable Water System or Building Ground
(Power Service Grounded to Cold Water Pipe
or Building Steel)

- Concealed ground wire runs may be spliced with the proper size sleeve and wire if the continuity of existing wire is checked and the splice will be accessible

Fig. 46—Acceptable Water System or Building Ground
(Power Service Grounded to Footing Ground)

- Do not tape ground wire splices
- Do not locate splice at a corner or turn

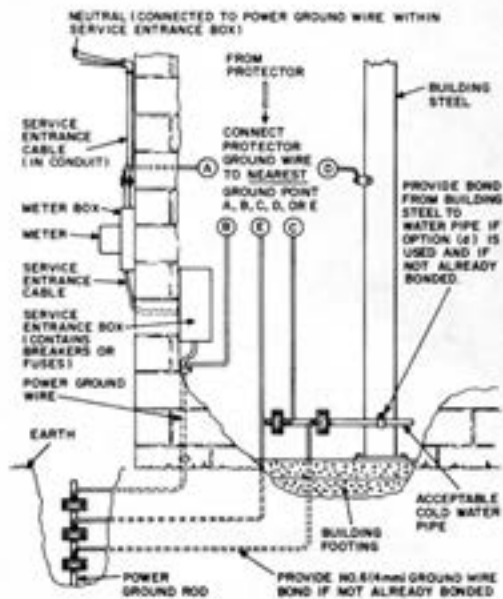


Fig. 47—Acceptable Water System (Power Grounded to Ground Rod)¶

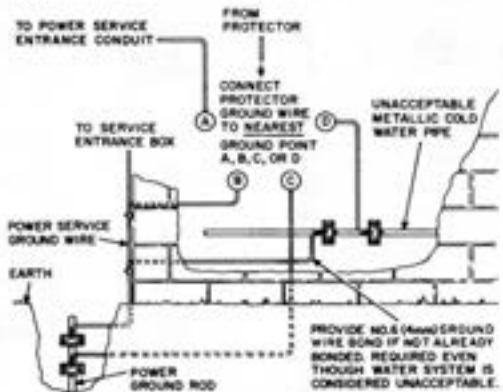


Fig. 48—Unacceptable Water System or Building Ground (Multigrounded Neutral Power System Grounded to Ground Rod)¶

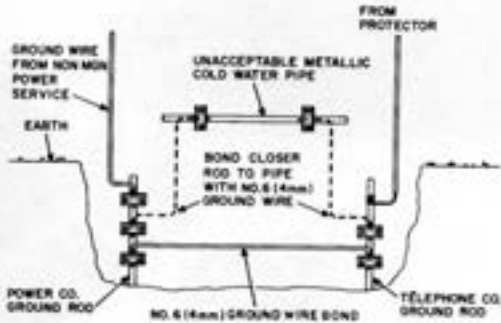


Fig. 49—Unacceptable Water System or Building Ground (Nonmultigrounded Neutral Power System Grounded to Ground Rod)¶

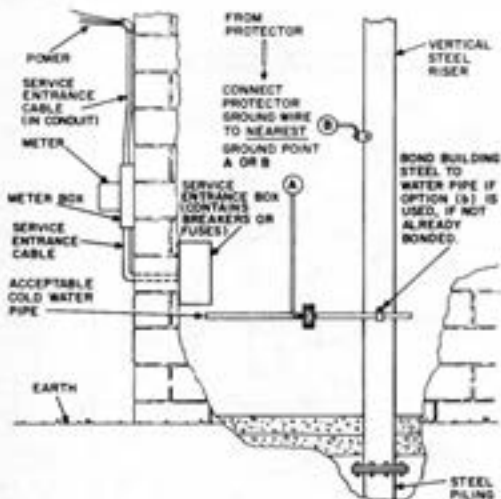


Fig. 50—Acceptable Water System or Building Ground (Power Service Not Grounded)

- A ground wire run shall have no more than one splice.

¶Note: Connection to a protector ground terminal or lug *does not* constitute a splice.¶

6.20 Refer to Section 461-200-205 for sleeves for splicing ground wire and sleeve pressing tools required.

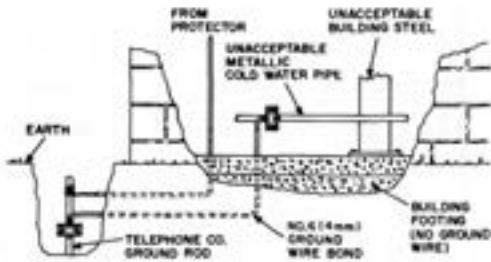


Fig. 51—Unacceptable Water System or Building Ground (Power Service Not Grounded)



Fig. 55—Fargo GA610C Connector



Fig. 52—E Connector



Fig. 53—AT-7796X Connector

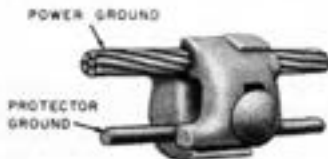


Fig. 54—Blackburn PAC3 Connector

6.21 Form E-3013B (Fig. 57) should be placed at all ground wire terminations to warn people not to disturb clamps or wire.

6.22 The B station ground clamp (Fig. 58) is installed as follows:

- (1) Clean pipe thoroughly.
- (2) Back off locknut to head of set screw.
- (3) Back off set screw until it does not protrude through the soldered nut.
- (4) Place Form E-3013B on strap. Bend strap around pipe and place strap on the rivet using hole in strap that provides the least slack.
- (5) Bend strap sharply at next hole beyond rivet.
- (6) Tighten set screw. If the set screw is tightened excessively, the clamp will break or set screw will slip off center and copper pipe may be dented. When fastening clamp to copper pipe, avoid making a dent in the pipe that is more than barely perceptible.
- (7) Place ground wire under the washer and tighten locknut (Fig. 59).

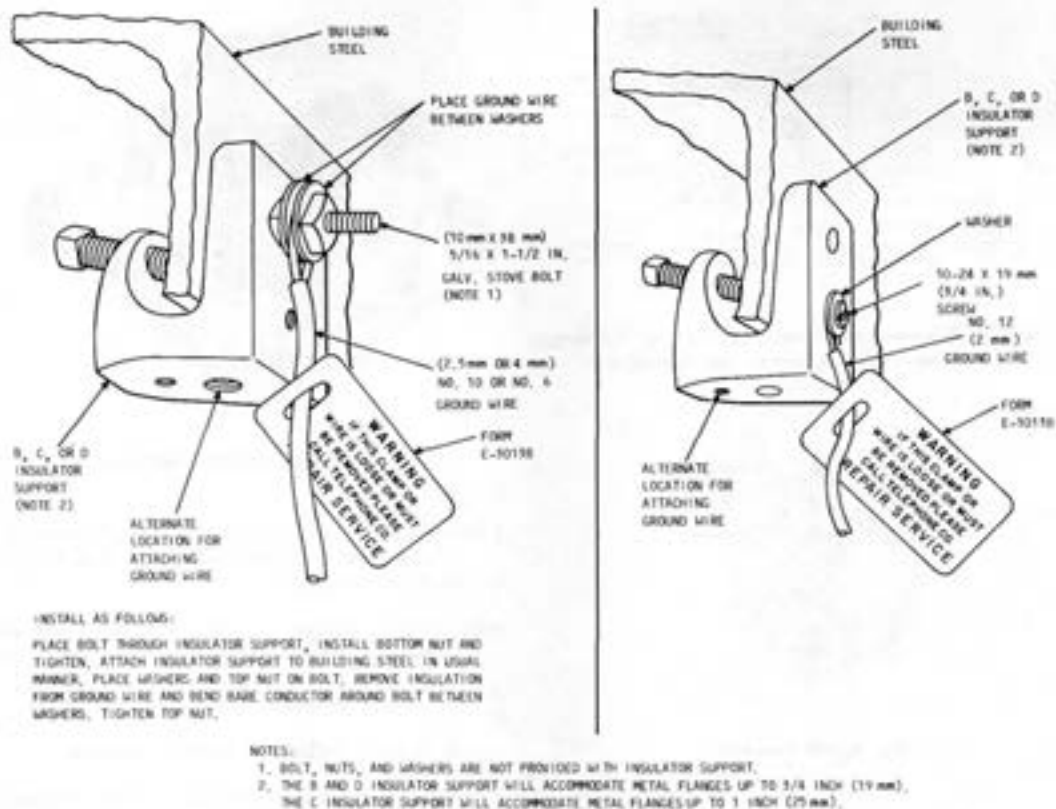


Fig. 56—#Grounding to Building Steel#

6.23 The L ground clamp (Fig. 60) is used to terminate No. 6 ground wire and is installed in the following manner:

- (1) Clean pipe thoroughly.
- (2) Remove approximately 1 inch of insulation from the ground wire and clean conductor.
- (3) Remove the lower nut and the square washer from the bolt of the ground clamp.
- (4) Insert the ground wire conductor into the smaller loop of the ground clamp and secure it by tightening the upper nut on the bolt (Fig. 61).

(5) Bend the strap around the pipe and engage the bolt with the farthest possible hole from the end of the strap. (On pipes larger than 3 inches, fasten two straps together [Fig. 62].)

(6) Mount the square washer and lower nut on the bolt of the initial clamp and tighten nut.

(7) Break off excess strap at the square washer and cut off excess length of bolt if it interferes with the installation of the clamp or projects in a hazardous manner (Fig. 63). (See Fig. 64 for typical installations of L ground clamp.)



PREFERRED METHOD

FORM E-3013B
ATTACHED TO SCREW

Fig. 57—Form E-3013B Attached to B Station Ground Clamp

(8) Attach Form E-3013B.

6.24 The B ground clamp (Fig. 65) is installed as follows:

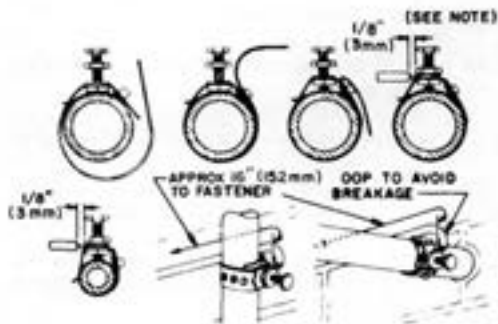
- (1) Clear pipe, conduit, or ground rod thoroughly.
- (2) Remove approximately 1 inch of insulation from ground wire and clean conductor.
- (3) Insert bare end of ground wire under the clamp saddle. Do not place wire directly on the screw.
- (4) Tighten the upper screw snug.
- (5) Place clamp over ground electrode.
- (6) Place Form E-3013B over machine screw, between top and bottom parts of clamp.
- (7) Tighten both screws firmly.

6.25 Locate ground clamps at accessible points where they will not be subject to excessive movement, vibration, or damage. Where a pipe is not firmly secured or is subject to vibration, tape the ground wire to the pipe in close proximity to the ground clamp.

6.26 The shield or armor of a small diameter cable, service wire, or underground wire is connected to the ground terminal of a station protector using an F connector. The F connector has a spade tip which can be placed under the pronged washer of the protector ground terminal.



Fig. 58—B Station Ground Clamp



NOTE: PLACE GROUND WIRE UNDER WASHER AND TIGHTEN LOCK NUT FIRMLY.

FORM E-3013 OMITTED FOR CLARITY

Fig. 59—Installing B Station Ground Clamp

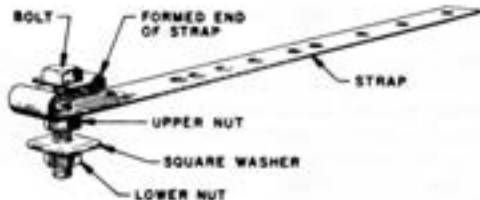


Fig. 60—L Ground Clamp

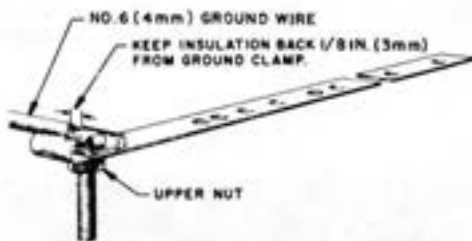


Fig. 61—Attaching No. 6 Ground Wire to L Ground Clamp

The method for installing the F connector on the shield of B or C service wire and connecting service wire to a protector is shown in Fig. 25 and 28.

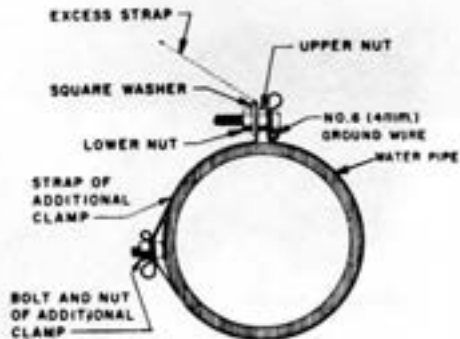


Fig. 62—Attaching L Ground Clamp to Pipes Larger Than 3 Inches

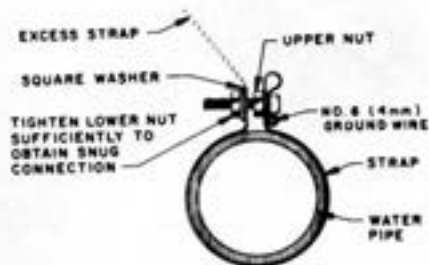


Fig. 63—Attaching L Ground Clamp to 3-Inch and Smaller Pipe

7. SIGNALING GROUND

7.01 Where a signaling ground is required, the protector ground should be used as a first choice. At unexposed stations where there is no protector and telephone apparatus is connected to a telephone company-provided power unit (operated from a commercial power source), the signaling ground should be connected to the power unit ground or to a ground that is bonded to the commercial power ground (Table D). Where there is no protector and the telephone apparatus is not associated with commercial power, any ground suitable for a protector ground should be used (Table D). The shield of a buried service wire or cable may also be used.

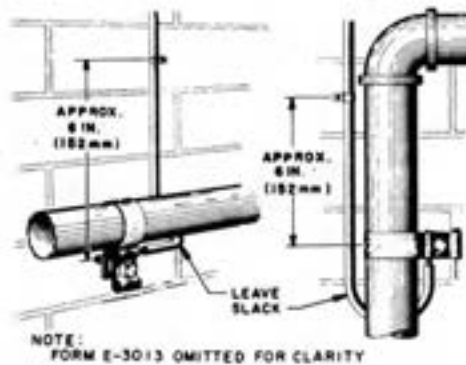


Fig. 64—Typical Installation—L Ground Clamp



Fig. 65—Ground Clamp

7.02 Ground strips are available to provide signal ground terminals (or binding posts) in cable closures, cable terminals, cable terminal sections, or terminal boxes. Where the ground strips are mounted in terminals or on surfaces that are not grounded to a cable sheath or by a separate ground

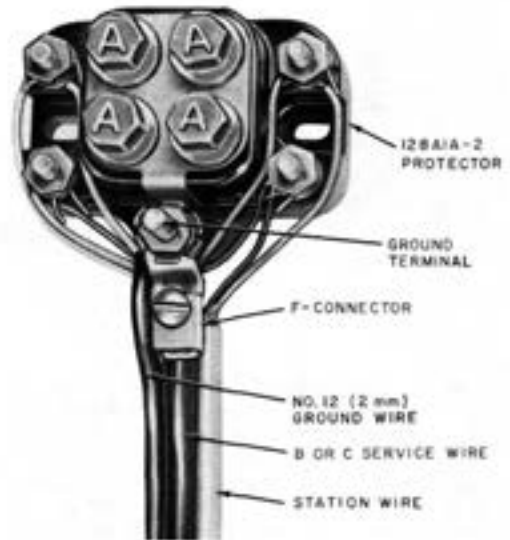


Fig. 66—Service Wire on Protector

wire, it is necessary to install a No. 12 ground wire from the ground strip to an acceptable ground electrode (Table D).

7.03 The 2A ground strip (Fig. 67) consists of a brass plate with two binding posts. The plate has a "U"-shaped slot for a mounting screw and a depressed tab which prevents the ground strip from turning after it is installed. The 2A ground strip has a capacity of 14 wires. The 2A ground strip installed in a GA-type cable terminal is illustrated in Fig. 68. The 2A ground strip can also be installed on the backboard of a PC6 or PC12 cable closure.

7.04 The 2B ground strip (Fig. 69) consists of an assembly of the 2A ground strip and a mounting bracket (Table G). See Fig. 70 for a typical installation of the 2B ground strip.

7.05 The 4-type ground strips are angular-metal brackets equipped with terminal screws and two binding posts. They are used with 102-type adapters when installed with connecting blocks (Table G). See Fig. 71 and 72 for typical 4-type ground-strip installations.



Fig. 67—2A Ground Strip

7.06 The 5A ground strip (Fig. 73) consists of a brass plate with two binding posts. It is intended for use in 10- and 16-pair NC, NE, NF, and NH cable terminals. A hole is provided in the plate of the 5A ground strip for mounting it in a cable terminal using the screw which holds the terminal block in the terminal housing (Fig. 74). The 5A ground strip has a capacity of ten wires.

7.07 The 6A ground strip (Fig. 75) consists of a brass plate with two binding posts. It is intended for use in 26-pair NC, NE, NF, and NH cable terminals and is mounted in the same manner as the 5A strip (Fig. 76). The 6A ground strip has a capacity of ten wires.

Note: The NE cable terminals are not provided with grounded housings; therefore, it is necessary to place a bond between the 5A or 6A ground strip and the cable sheath (or to an acceptable ground as outlined in Table D) using a ground wire no smaller than a No. 12 ground wire.

8. COIN STATION GROUND

8.01 The protector ground should be used as first choice for a coin-station ground.

8.02 At unexposed coin stations where there is no protector, any ground that is suitable for a protector ground may be used as a coin ground (Table D).

8.03 Outdoor coin telephones are installed on metal shelves, metal mountings, or in metal booths. If the associated protector ground terminal

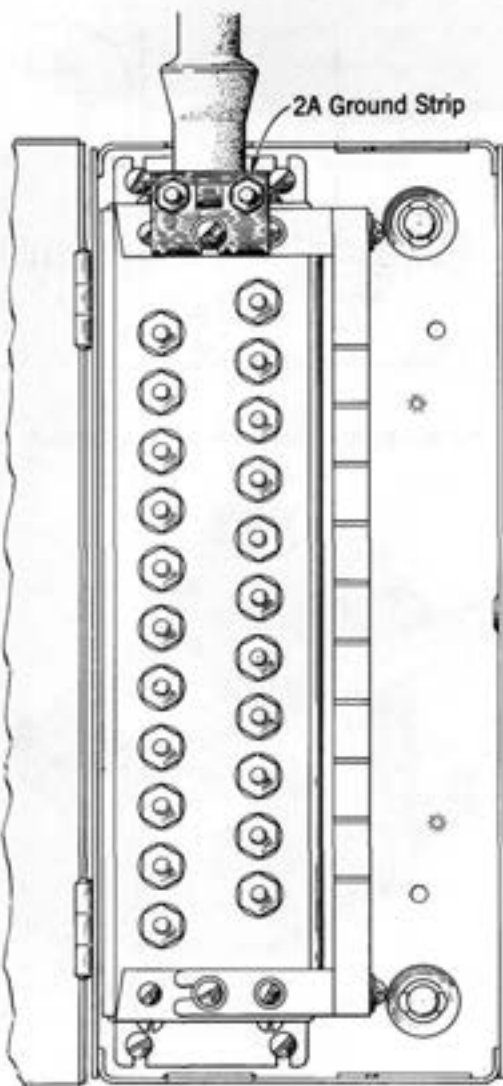


Fig. 68—2A Ground Strip Installed in GA-Type Cable Terminal

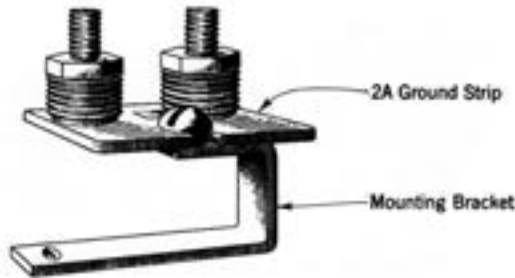


Fig. 69—2B Ground Strip

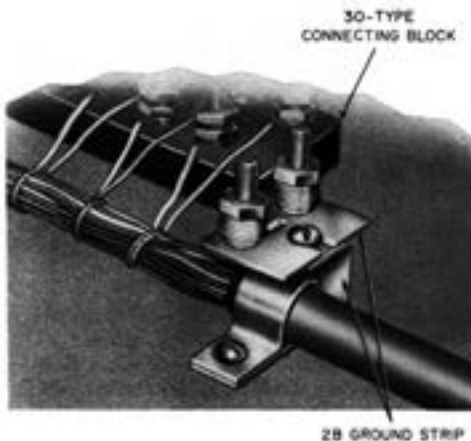


Fig. 70—Typical Installation of 2B Ground Strip

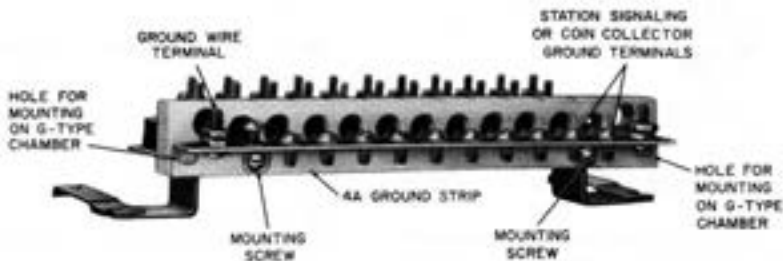


Fig. 71—Typical Installation of 4A Ground Strip

is not already bonded to the shelf, mounting, or booth, this bond must be made using a ground wire no smaller than a No. 12 ground wire.

8.04 When a coin telephone is installed outdoors, a ground rod for protector grounding must be installed unless:

(1) At least 10 feet of metallic conduit buried in permanently moist soil is connected to the coin shelf, mounting, or booth

or

(2) The power ground rod of an MGN power system is bonded to the coin shelf, mounting, or booth with a ground wire no smaller than a No. 6 ground wire

or

(3) An acceptable metal water pipe is bonded to the coin shelf, mounting, or booth with a ground wire no smaller than a No. 6 ground wire.



The grounding conductor (third wire of an electrical wiring system) must never be used as the protector ground.

9. LOCATING AND INSTALLING GROUND RODS

Danger: Avoid personal injury by protecting eyes and hands when driving ground rods. Wear safety glasses and rubber gloves with leather protectors.

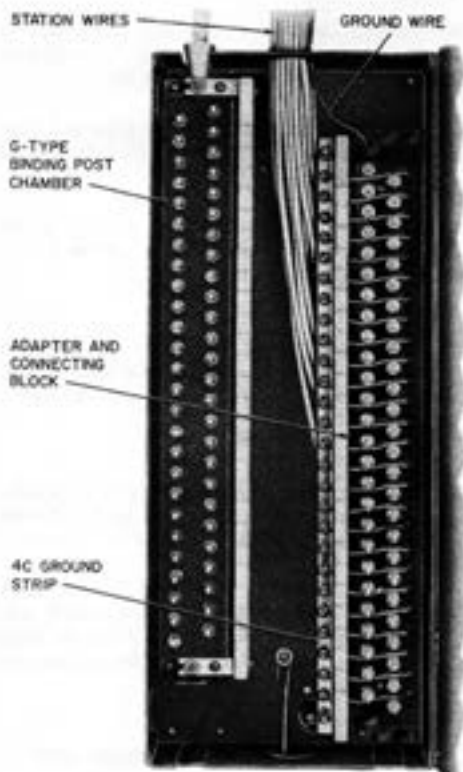


Fig. 72—Typical Installation of 4C Ground Strip



Fig. 73—5A Ground Strip

9.01 Rubber gloves with leather protectors must be worn when driving a ground rod. Avoid bodily contact with the ground rod during this operation. On completion of driving a ground rod, use a voltage tester, eg, 188A test set (Stop Lite) or

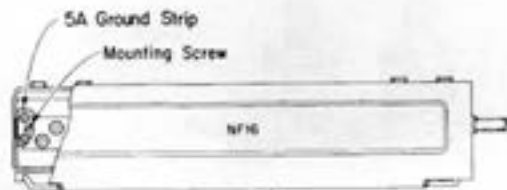


Fig. 74—5A Ground Strip Installed in NF16 Cable Terminal

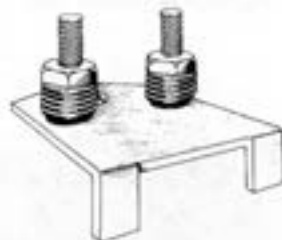


Fig. 75—6A Ground Strip

B-voltage tester, *must* be used to verify that no voltage condition exists on the ground rod. (Rubber gloves must be worn to test ground when B-voltage tester is used.) If voltage is detected, *do not proceed* until the supervisor is notified and the condition corrected.

9.02 Locate and install ground rods as follows:

- (a) Where least likely to be damaged or tampered with
- (b) As near as practical to masonry walls in earth-floor basements
- (c) Approximately 12 inches from outside walls (Fig. 77)
- (d) Approximately 2 feet from base of wooden poles or posts where conditions permit
- (e) At least 6 feet from power or lightning protection ground rods.

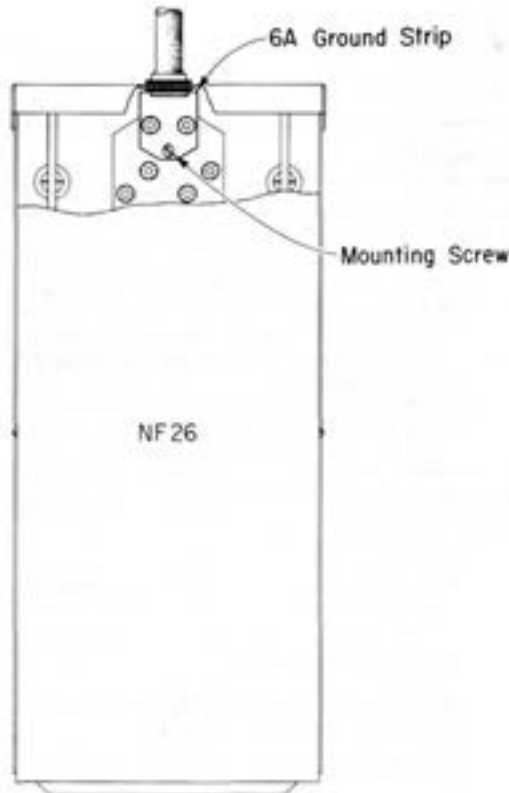


Fig. 76—6A Ground Strip Installed in NF26 Cable Terminal

9.03 Do not unspiral the tail wire attached to the ground rod until just before driving operation is complete. Drive ground rods until the top of the rod is approximately 3 inches below ground level. Increase depth where digging is likely. Use the AT-8911 B trenching tool, or other suitable shovel, to excavate ground to obtain the 3-inch depth.

9.04 Avoid making ground wire runs where the wire may be damaged or tampered with. If such locations cannot be avoided, protect the ground wire with station ground wire molding.



Check with property owner or manager regarding the location of

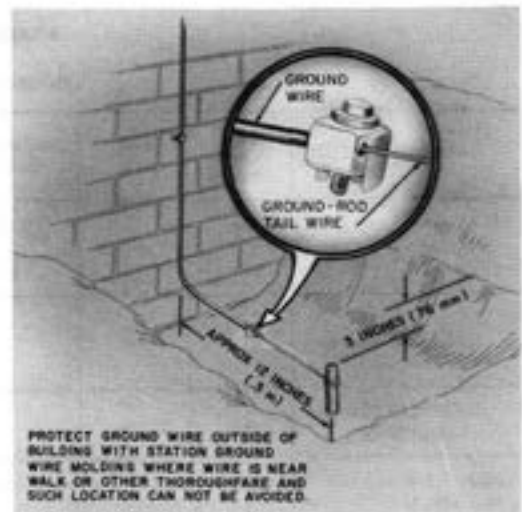


Fig. 77—Ground Rod Installed Near Wall

any underground electric power cable, water, gas, or fuel tank installations before driving a ground rod.

9.05 Inspect ground rods before and after driving to make certain that tail wires are not broken. If the tail wire is broken, replace ground rod or use a suitable ground clamp of size or type as listed in Table E.

9.06 After the No. 10 or No. 12 station ground wire is installed, it is attached to the ground rod tail wire with a size 6 AT-7796X connector (Fig. 77). Tighten the ground rod tail and ground wire securely in the connector; **do not tape this connection**. If a 6-gauge ground wire must be terminated on the ground rod, select the proper ground clamp per Table E.

9.07 When two or more protectors requiring ground rods are installed at the same location, proceed as follows:

Note: Use the proper size station ground wire as listed in Table B.

- (a) If a power ground rod is not available, install a ground rod for each protector. Bond all

TABLE E

GROUND CLAMPS

| GROUND CLAMP | | SEE FIGURE NUMBER | WIRE SIZE | GROUND ELECTRODE (SIZE IN INCHES) | USE |
|------------------------------|---------|-------------------------|------------------------|--------------------------------------|--|
| B Station Ground Clamp | 6-3/4" | 58 | No. 12 or No. 10 | 3/8 - 1-3/4 | Connect protector ground to water pipe or power service entrance conduit or mount 72A, 90A, or 114A bracket. |
| | 12-1/2" | — | | 1-7/8 - 3 | |
| L Ground Clamp | | 60 | No. 6 | 1 - 3 | Connect protector ground or bond to water pipe or power service entrance conduit. |
| B Ground Clamp (See Note) | | 65 | No. 6 | 1/2 - 1 | Connect protector ground or bond to ground rod or water pipe. |

Note: Use caution when attaching the B ground clamp to copper pipes. The pipes can be damaged by the wire loop in the clamp if the clamp is tightened excessively.

protectors together. Select wire connectors from Table F. No more than three ground rods need be placed. Space ground rods at least 6 feet apart (Fig. 78).

(b) If a power ground rod is available, one telephone ground rod is sufficient. Bond all protectors together and bond telephone ground rod to power ground rod (Fig. 48).

9.08 Multiple station protectors, such as the 116- or 117-type, should **not** be connected to a single telephone ground rod unless the rod is bonded to the power system ground rod. If a power system ground rod is not available, a multiple station protector may be connected to an array of three telephone ground rods, spaced at least 6 feet apart, and bonded together with No. 6 ground wire (Fig. 78).

9.09 Always bond ground rods using No. 6 ground wire.

10. INSTALLING SNEAK CURRENT FUSES

10.01 Sneak current fuses are required to provide additional protection for:

- No. 1 and No. 2 ESS Centrex data link cabinet trunks

- No. 1 and No. 2 ESS Centrex attendant trunks

- PBX trunk circuits

- PBX (other than DIMENSION) off-premise stations exposed to power

- PBX battery or ringing feed circuits

- Certain special circuits or leased lines.

10.02 Sneak current is foreign current, caused by a "cross" with or induction from power conductors. The sneak current is too low to burn open fusible links of wire or cable and of insufficient voltage to arc over protector blocks or protector units.

10.03 Sneak current protection is provided by the use of heat coils or 60A and 60D fuses in a variety of mountings.

10.04 The 60A and 60D fuses (Fig. 79) are rated 0.350 ampere and differ only in arrangement for mounting. The 60A fuse has a spade terminal and is used with the 94A protector mounting (Fig. 80). The 60D fuse is mounted in a 14A fuse holder (Fig. 81) or 1094A protector (Fig. 82), or 191A1-20 protector (Fig. 83).

♦TABLE F♦

WIRE CONNECTORS

| CONNECTOR | FIGURE NUMBER | CONDUCTOR SIZE | USE |
|--|---------------|--|--|
| E Connector Size 1 | 52 | No. 12 through 4 | Connect or bond ground wire to bare power ground wire. |
| E Connector Size 2 | | No. 12 through 1/0 and 8 through 4 armored ground wire | Connect or bond ground wire to armored power ground wire. |
| At 7796X Size 6 Size 4 Size 2 | 53 | No. 12 through 6 No. 8 through 4 No. 6 through 2 | (a) Ground station ground wire to ground rod tail wire. (b) Ground shield of cable or buried service wire at terminals or cable closures. |
| Blackburn PAC3 | 54 | No. 6 through 8 copper to No. 2 through 4 aluminum | Connect No. 6 ground wire to aluminum power ground wire for bonding. |
| FARGO GA610C | 55 | | |
| F Connector | 25 — | No. 6 | (a) Connect service wire shield to protector ground terminal. (b) Connect No. 6 ground wire to ground bracket of cable closure housing. |

♦14A FUSE HOLDER♦

10.05 A typical installation of the 14A fuse holder and 60D fuse is shown in Fig. 84. The fuse holder fits on the binding post (under the bottom nut) of a protector, protector terminal, or connecting block. One end of the 60D fuse attaches to the fuse holder and the station wire is connected to the other end. This places the fuse in series with the line. As only one station wire can be attached to a fuse, a connecting block arrangement is required to terminate additional station wires.

10.06 Where 134A1A protectors and 66- or 68-type connecting blocks are employed, it is not possible to mount the 14A fuse holder. Therefore, when sneak current fuses are required, one of the following alternatives must be used:

- (1) Install an additional connecting block, such as a 57A2-10 or 57A2-16 connecting block,

in order to mount the 14A fuse holder as shown in Fig. 85.

- (2) Use the 1094A protector, one for each pair of wires
- (3) Use the 191A1-20 protector for up to 20 exposed pairs.♦

♦1094A PROTECTOR♦

10.07 The 1094A protector consists of a metal base with two No. 94A protector mountings and two 60D fuses (Fig. 82). When installed outdoors, the 1094A protector is mounted in a 93C ♦(MD)♦ protector mounting.

♦191A1-20 PROTECTOR

10.08 The 191A1-20 protector (Fig. 83) is a combination protector and terminating field intended for use with 66-type quick-connect hardware.

TABLE G

GROUND STRIPS

| TYPE | BINDING POSTS | TERMINALS | WIRE CAPACITY (QUANTITY) | USED WITH | FIGURE NUMBER |
|------|---------------|-----------|--------------------------|---|---------------|
| 2A | 2 | — | 14 | GA-type cable terminal, PC6 or PC12 cable closure | 67 |
| 2B | 2 | — | 14 | 30- and 31-type connecting blocks | 69 |
| 4A | 2 | 11 | 11 | 102B adapters when installed with connecting blocks | 71 |
| 4B | 2 | 16 | 16 | 102C adapters when installed with connecting blocks | — |
| 4C | 2 | 26 | 26 | 102D adapters when installed with connecting blocks | 72 |
| 5A | 2 | — | 10 | 10- and 16-pair NC, NE, NF, and NH cable terminals | 73 |
| 6A | 2 | — | 10 | 26-pair NC, NE, NF, and NH cable terminals | 75 |

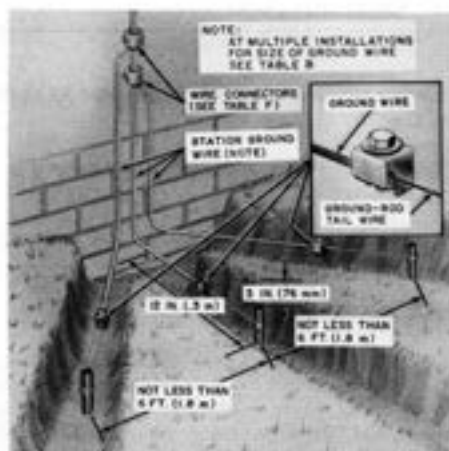
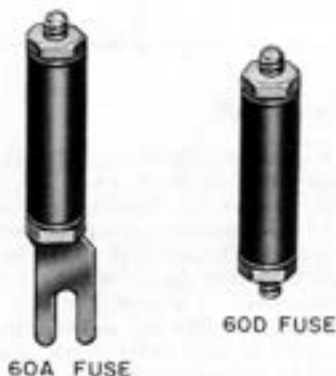


Fig. 78—Three Ground Rods



60A FUSE

60D FUSE

Fig. 79—60A and 60D Fuses

It is factory wired and equipped with forty 60D fuses which will provide sneak current protection for 20 exposed pairs.

10.09 The base of the 191A1-20 protector is identical to the 66-type connecting block

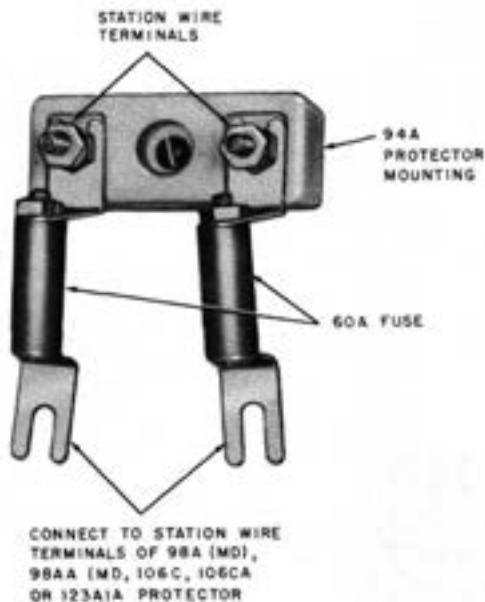


Fig. 80—60A Fuses Connected to 94A Protector Mounting

allowing the protector to be mounted on an 89B bracket.

10.10 A wiring diagram of the 191A1-20 protector is shown in Fig. 86. Pairs requiring sneak current protection are cross-connected to the 191A1-20 protector as indicated (TIP IN, RING IN). Factory wiring is provided through the fuses to TIP OUT and RING OUT connectors.

10.11 To replace a fuse in the 191A1-20 protector, follow the steps indicated in Fig. 87 and 88.

11. PBX PROTECTION



Neither 11A1A or 11B1A protector unit should be used with 800A, 801A, and ESS 101 PBXs. (DIMENSION, PBX grounding must be done in accordance with Section 554-101-101.)

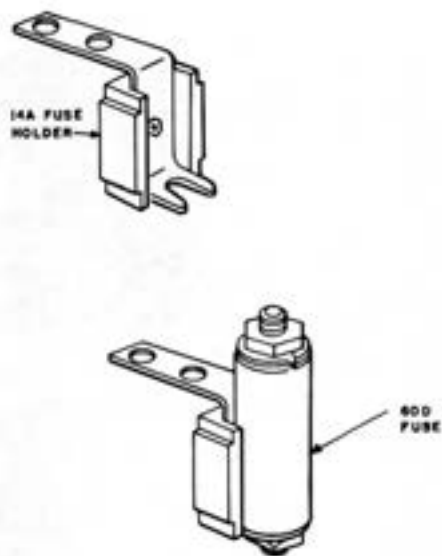
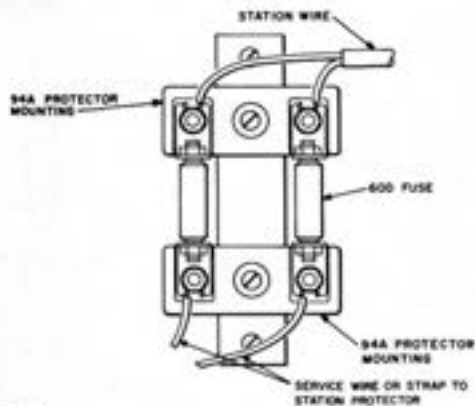


Fig. 81—14A Fuse Holder



NOTE:
USE 94C PROTECTOR MOUNTING FOR OUTDOOR INSTALLATION.

Fig. 82—1094A Protector

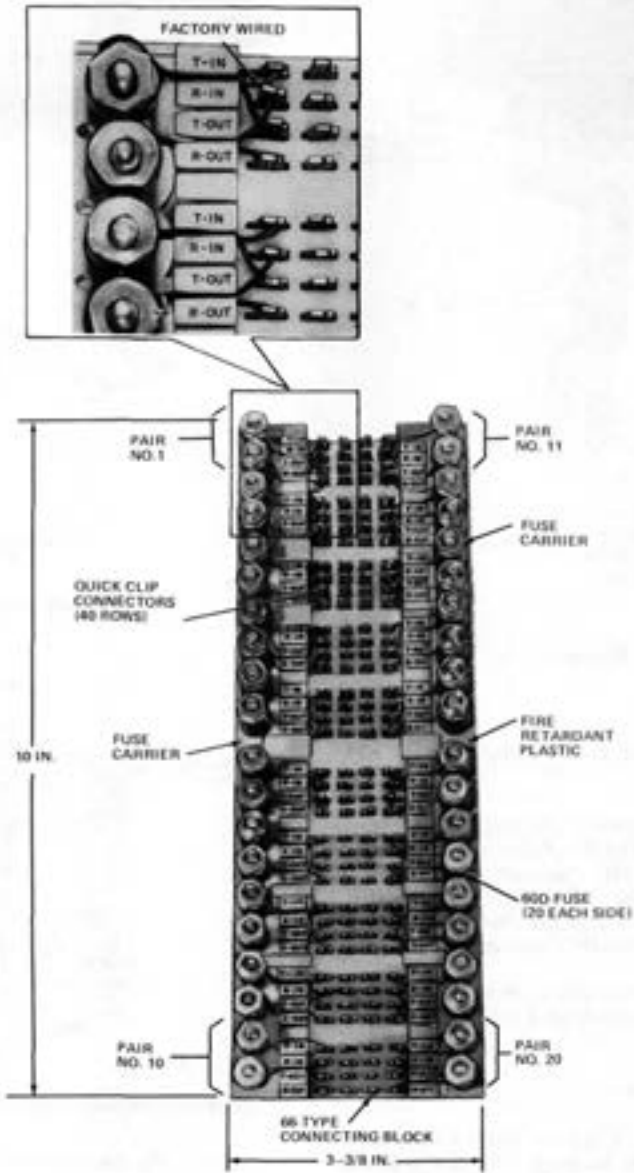


Fig. 83—191A1-20 Protector

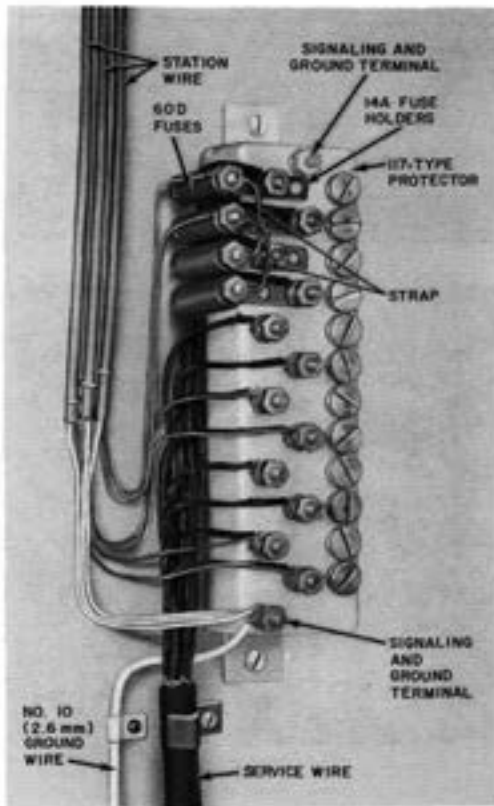


Fig. 84—Method of installing 60D Fuses and 14A Fuse Holder on 117-Type Protector (Battery Feed Circuit Illustrated)

11.01 In addition to the preceding requirements covering bonding, grounding, and sneak current protection, the following protective measures must be applied at PBX locations.

11.02 The shield of building entrance cables must be bonded to an acceptable ground electrode (Table D). Building entrance cables terminating in 1A4A terminal blocks, NH-type cable terminals, or 134A1A protectors, can be grounded by connecting the ground clamp or ground lug of the terminal block, terminal, or protector, to an acceptable grounding electrode with a No. 6 ground wire. This ground wire **must** be installed. The sheath

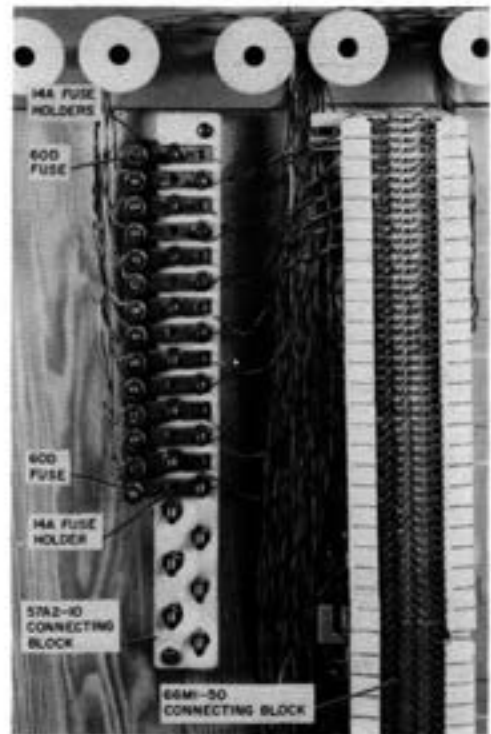


Fig. 85—Sneak Current Fuse Arrangement for 66M1-50 Connecting Block

of a building entrance cable is **not** a grounding electrode.

11.03 The PBX signaling ground must be connected to the protector ground.

11.04 Sneak current fuses must be provided as specified in paragraph 10.01, or heat coils must be used.

11.05 Exposed off-premises extensions must be provided with protectors at the station end as well as at the PBX end. **¶**If exposed to power, sneak current protection is also required.**¶**

11.06 An older type PBX may have battery and ringing voltages supplied from the central

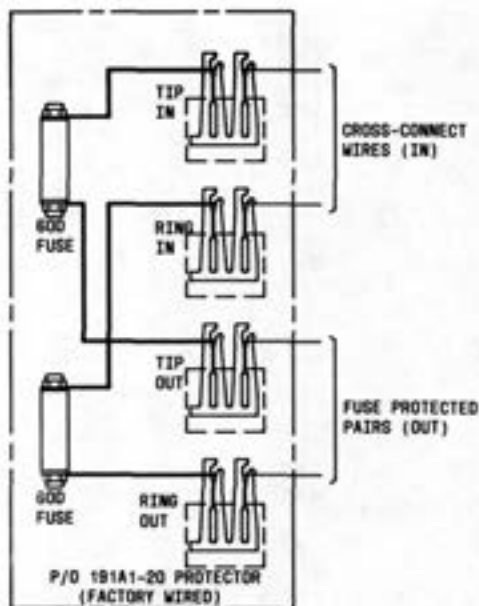


Fig. 86—P/O 191A1-20 Protector—Wiring Diagram

office. Also, some newer type PBXs may have battery and ringing voltages supplied from the central office for reserve power in the event of a commercial power failure. When two or more cable pairs are used to supply battery and these pairs are extended by two or more drop wires, fused-type protectors are required. When the battery supply is extended by a single drop wire, fused protectors are not required. Ringing feeder circuits are fused with 60E fuses.

11.07 The 1094A protector, which may be used where station protectors are not required, used with 134A1A-type protectors or for ringing feeder circuits is shown in Fig. 82.

11.08 Two battery feeder pairs terminated at a 117-type protector equipped with 14A fuse holder and 60D fuses are illustrated in Fig. 84. The pairs are strapped on the PBX side of the fuses.

11.09 A fuseless protector equipped with 60A fuses for outdoor installations is shown in Fig. 89.

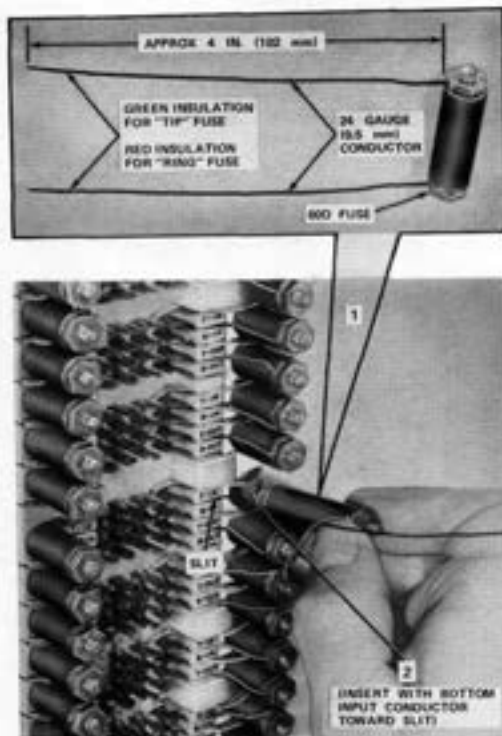


Fig. 87—Replacing Fuse

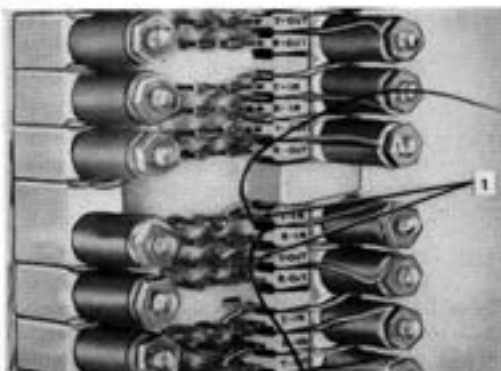


Fig. 88—Fuse Replaced

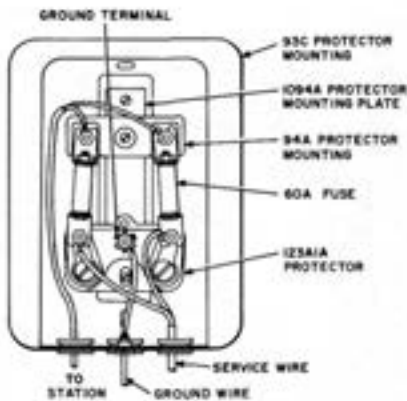


Fig. 89—Fuseless Protector Equipped With Sneak Current Fuses, Outdoor Installation

11.10 A fused protector equipped with 60A fuses is shown in Fig. 90. A converted protector equipped with 60A fuses is shown in Fig. 91.

11.11 Two battery feeder pairs terminated on fuseless station protectors equipped with 60A fuses and bridged to one station wire are shown in Fig. 92.

11.12 A maximum of three service wires furnishing battery for a system may be terminated on one fused protector and must be bridged on the line side of the protector (Fig. 93). In the event more than three service wires are required to extend a battery feed circuit, additional protectors must be installed (Fig. 94). Use two 11C fuses, one for the tip conductors and one for the ring conductors. If it is necessary to strap the conductors at the binding posts, remove the 2A1A protector units and substitute 2A1D (dummy) protector units where fuses have been removed as shown in Fig. 94. On disconnects, replace the 2A1D protector units with 2A1A protector units and replace fuses.

12. EXPOSED DROP WIRES CONNECTED TO UNEXPOSED CABLE

12.01 Drop wires, connected to an unexposed cable terminal and extending into an exposed area, expose both the subscriber station and the distribution cable. To avoid changing the status

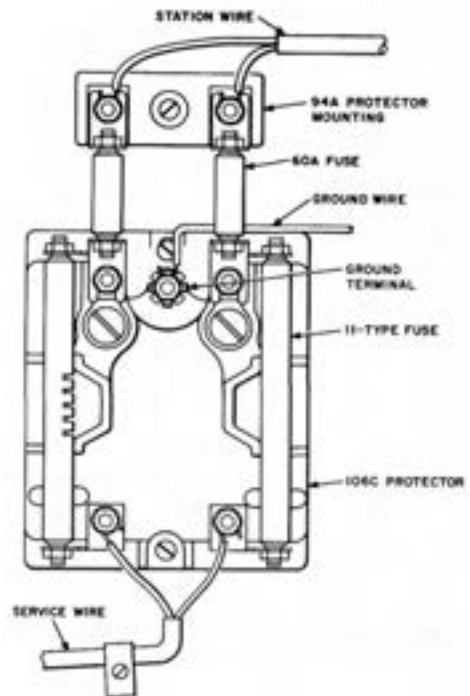


Fig. 90—60A Fuses Used With 94A Protector Mounting and 106C Protector

of the unexposed cable, protectors are required at the junction of the drop wire and the cable.



It is extremely important that telephone craft personnel be informed of locations as described in paragraph 12.01. If service orders do not specify protection required or the cable terminals are not specifically identified, local instructions must provide this information. Where there is any doubt on the part of the telephone craft force, maximum protection should be provided, treating telephone stations as exposed stations.

12.02 Where an exposed drop wire is to be connected to an unexposed pair of 19-gauge

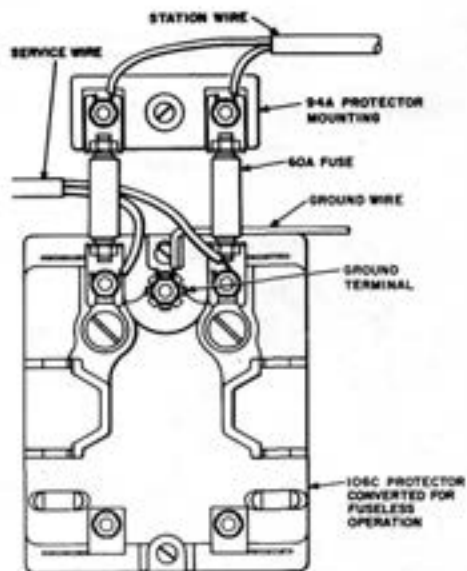


Fig. 91—60A Fuses Used With 94A Protector Mounting and Converted 106C Protector

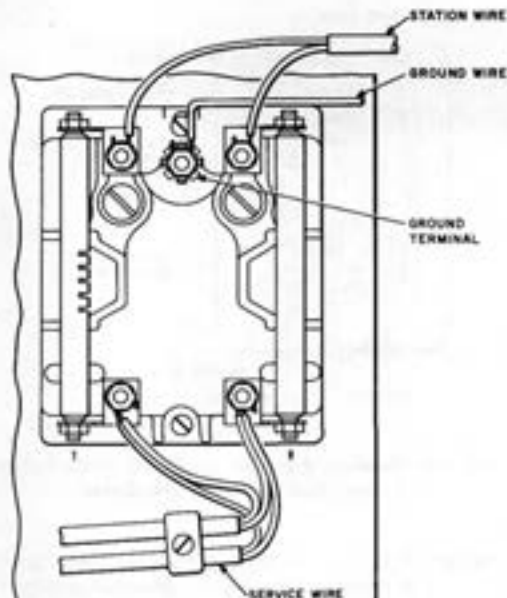


Fig. 93—Two Service Wires Bridged at Fused Protectors

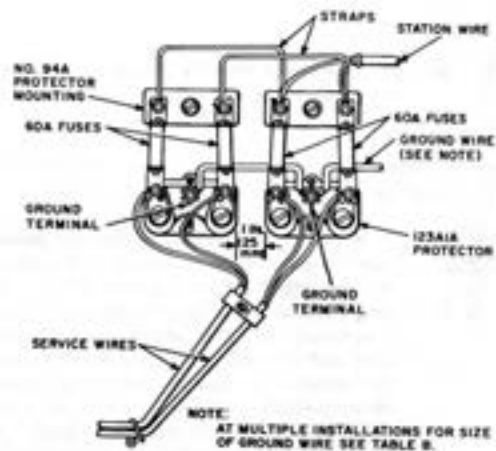
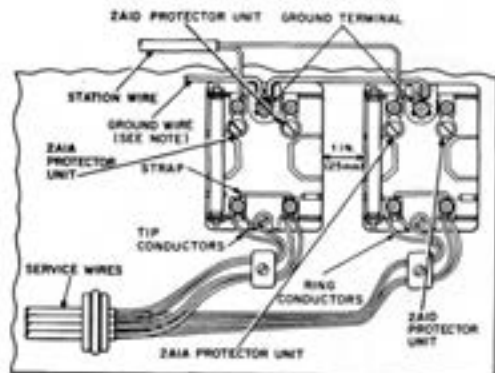


Fig. 92—Fuseless Protectors Used for Bridging Service Wires on Battery Feed Circuits

or 22-gauge cable, a fusible link of bridle wire is required between the cable pair and the drop wire, in addition to the protector. In addition, a fusible link is required between the exposed section and a fuseless station protector. Otherwise, a fused protector must be used.

12.03 Protectors must be installed at station locations as well as at terminal locations when exposed drop wires are connected to unexposed cables.

12.04 Where exposed drop or block wires are to be connected to unexposed cables terminated in 49-type terminals, install 3A3-3 protected terminal blocks in place of the unprotected blocks.



NOTE:
AT MULTIPLE INSTALLATIONS FOR SIZE OF GROUND WIRES SEE TABLE B

Fig. 94—Bridging Four Pairs at Fused Protectors

12.05 Typical wall and pole installations, using protectors for cable protection, are shown in Fig. 95 through 98.

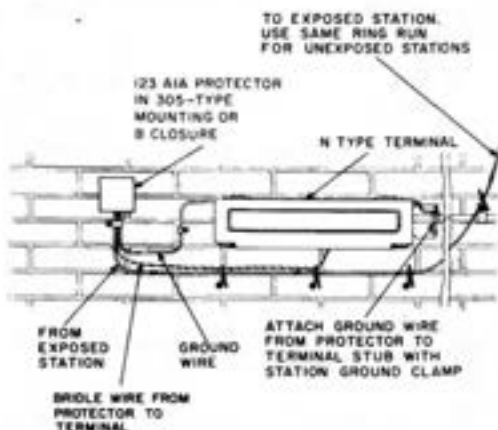


Fig. 95—N-Type Terminal, Wall Installation

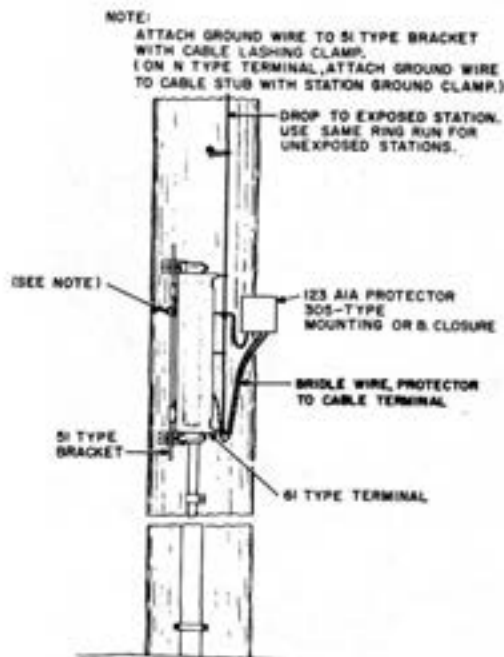


Fig. 96—N- or 61-Type Terminal, Pole Installation

13. 118B PROTECTOR

13.01 The 118B protector (Fig. 99), which supersedes the 99C protector, is designed to protect telephone circuits in the event of an accidental contact between power wires (of the MGN-type and carrying over 2000 volts) and telephone wires. The 118B protector consists of three carbon electrodes, having 0.020-inch gaps, mounted on a porcelain base and enclosed in a rubber case (Fig. 100). Three No. 14 gauge insulated wire leads extend from the bottom of the protector. One lead, 72-inches long, is connected to ground (of the MGN power) and two leads, 36-inches long, are connected to the telephone line wires.

13.02 The 118B protectors are connected to drop wires (Fig. 101) or rural wires (Fig. 102) as specified by detailed plans, telephone company engineering or supervisory instructions. The 118B

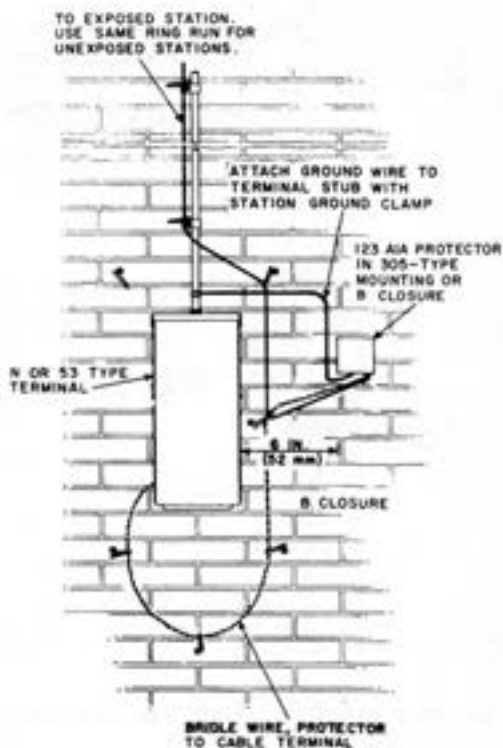


Fig. 97—N- or 53-Type Terminal, Wall Installation

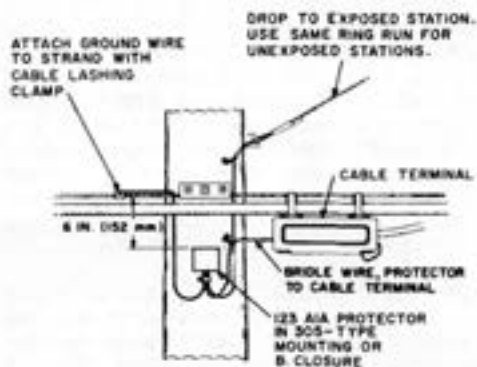


Fig. 98—N-Type Terminal, Strand Mounted

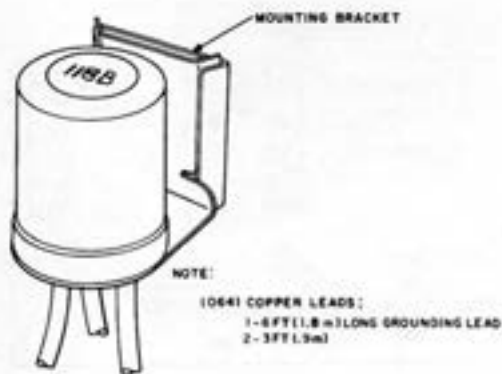


Fig. 99—118B Protector

protector provides protection for a single drop wire or rural wire; however, the length of a drop wire or rural wire run may dictate the installation of additional protectors on the same drop wire or rural wire.

13.03 Drop wires and rural wires, run on higher voltage joint use poles, do not require a 118B protector.

- Where wire runs (including branch runs) are 1000 feet or less in length
- Where wire runs are attached directly below aerial cables supported by effectively grounded strands.

13.04 Refer to Section 624-730-200 for additional information and illustrations for installing the 118B protector on rural wire.

13.05 Do not remove 118B protectors from dead circuits on joint use poles.

13.06 It is preferable to connect the ground wire of the 118B protector to a power vertical grounding conductor that is connected to both the power system multigrounded neutral wire and to a ground electrode. Grounding conductors on transformer poles which meet this requirement are satisfactory. **Grounding conductors from power lightning arresters shall not be used unless they are connected to the power neutral wire.** Where local instructions

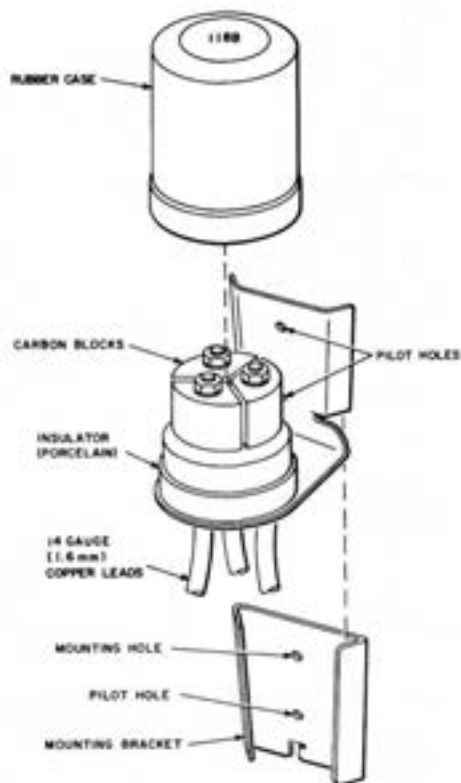


Fig. 100—118B Protector, Disassembled

and the power company permit, the connection between the ground lead of the 118B protector and the vertical grounding conductor may be made by telephone company personnel.

Danger: The power vertical grounding conductor shall be tested with a 188A test set (Stop Lite) or a B-voltage tester as described in Section 081-705-102 or 081-705-101, respectively, before making this connection.

13.07 Where the power company has installed an aluminum vertical grounding conductor, do not use an AT-7796X connector due to the likelihood

of corrosive chemical reaction between copper and aluminum. Make the grounding connection to an aluminum vertical grounding conductor with a Blackburn PAC3 or Fargo GA6100 connector.

13.08 When a 118B protector is to be installed at locations where there are no power system vertical grounding conductors, install a ground rod at the base of the pole and run No. 6 ground wire from the ground rod to the top of the telephone space and leave coiled at that point an additional length (usually about 6 feet) sufficient to reach the power neutral wire. **Power company personnel shall make the connection to the power neutral wire.** Report all such installations to the supervisor immediately so arrangements may be made to have the grounding conductor connected to the power neutral as soon as practical.

⚠Danger: Avoid personal injury by protecting eyes and hands when driving ground rods. Wear safety glasses and rubber gloves with leather protectors

Danger: Do not perform any work in the power company space on the pole.

13.09 To install a ground rod and vertical grounding conductor:

- Drive a ground rod about 2 feet from the base of the pole with the top of the rod at least 3 inches below ground level. The ground rod should be located so the grounding conductor may be run on the side of the pole reserved for power company attachments.
- Connect the vertical grounding conductor (No. 6 ground wire) directly to the ground rod with a B ground clamp.
- Fasten the grounding conductor to the pole at 18-inch intervals with 1-1/4 inch B staples.
- Where ground wire molding is used, fasten it to the pole with cable straps and strap nails at 4-foot intervals.

13.10 The 118B protector is self-cleaning and generally should require no maintenance. It is possible, however, that an operation will

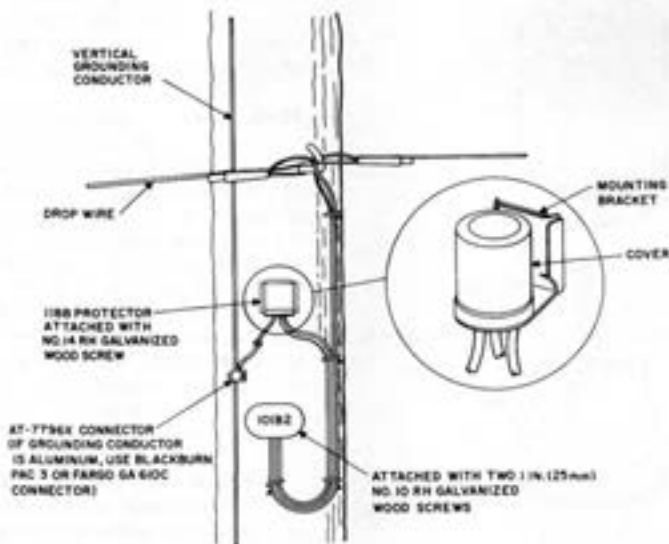


Fig. 101—118B Protector Connected to Drop Wire

cause the cover to be blown off or to rupture. When working on drop wires or rural wires connected to such a damaged protector, notify the supervisor or proceed according to local instructions.

14. CONVERTING PROTECTORS

Caution: When converting station protectors on SSM (Special Safeguarding Measures) and/or SSP (Special Service Protection) lines, arrangements must be made to have the special lines taken out of service before doing any work on the protector, since this work could readily cause service interruptions.

14.01 Fused protectors at stations not subject to conditions as outlined in paragraph 3.01, should be converted to fuseless operation or replaced by the 123- or 128-type protectors. Do not convert fused protectors to fuseless operation where the station is served by open, rural, or urban wire. If fuseless protection is required, a 123- or 128-type protector must be installed as a replacement.

14.02 The 98A (MD) protector (Fig. 44) can be converted to fuseless operation by adding two 121A adapters and two 213A connectors (Fig. 103) as follows:

- (1) Disconnect line wires.
- (2) Remove cap and protector blocks.
- (3) Insert the 121A adapters all the way into the protector well with the flat side against the ground electrode.
- (4) Check for ground at all protector terminals. With the protector blocks removed, the adapter should provide solid ground to the terminals.

Note: A check for ground may be made using the 1013A hand test set. With the TALK/MON switch of the test set in the TALK position, connect one cord clip to the ring side of the (working) line wire and, with the other cord clip, tap each line terminal of the protector. A pronounced click will be

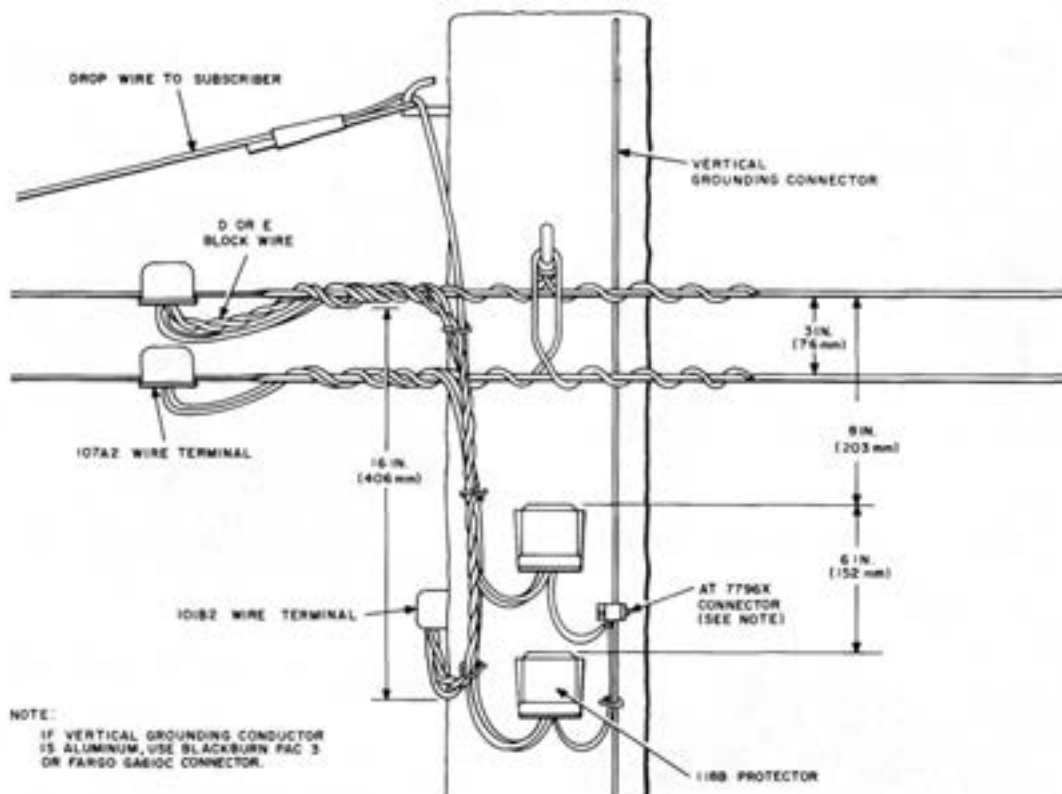


Fig. 102—118B Protectors Connected to Rural Wires

heard in the test set receiver when protector terminals are grounded.

- (5) Remove adapters from protector well and assemble each adapter with a No. 25 and a No. 27 protector block.
- (6) Install assemblies in protector well. Check for grounds; line terminals should not be grounded.
- (7) Where requirements of (4) and (6) are not met, discard adapters and replace with other adapters. If requirements cannot be met on the second attempt, do not try to convert the protector; install a 123- or 128-type protector

instead. Do not attempt to bend or adjust the adapter tabs or protector block springs.

- (8) Reinstall cap.
- (9) Connect line wires using care not to reverse tip and ring.

Note: The line wire may be moved to the station side of the protector if it is of sufficient length. If not, proceed to next step.

- (10) Loosen nuts on 11C fuses.
- (11) Insert 213A connectors over each fuse with end inside fuse clips. In cases where fuses

have shrunk slightly, one or both connector ends may be placed outside of fuse clips. Some bowing of the connectors is not considered objectionable.

(12) Tighten nuts on fuses (Fig. 104).

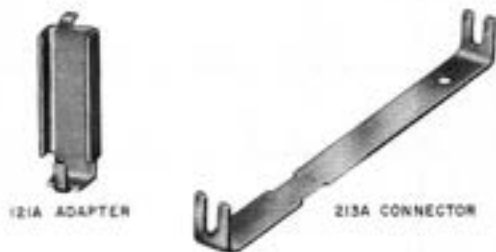


Fig. 103—121A Adapter and 213A Connector

connectors as described in paragraph 14.02(11). The 106C protector is equipped with 2A1A protector units; therefore, adapters are not required (Fig. 106).

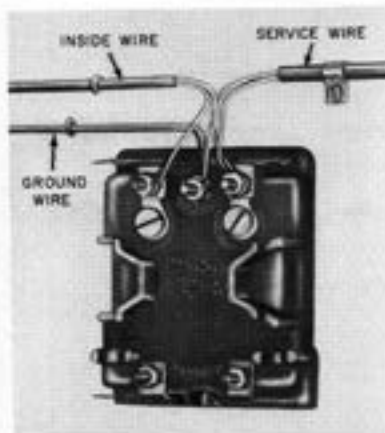


Fig. 105—Alternate Method of Converting 106C Protector

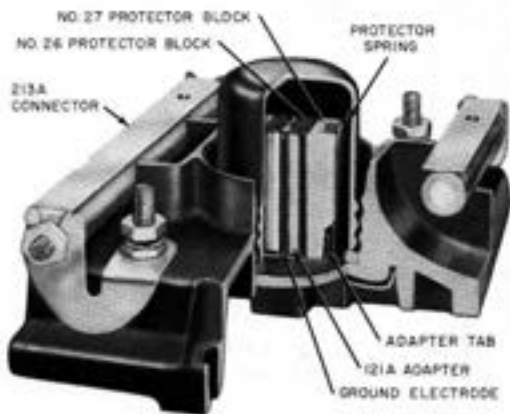


Fig. 104—Converted 98A (MD) Protector

14.03 The 106C and the 1293C (MD) protectors may be converted to fuseless operation by connecting the aerial or buried drop input line wires directly to the station side of the protector, provided the line wires are of sufficient length. The fuses may then be removed (Fig. 105). Where the input line wires are too short to reach the station side of the protector, install two 213A

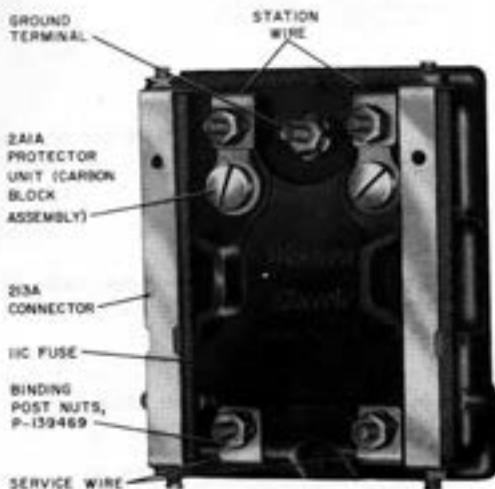


Fig. 106—Converted 106C Protector

14.04 The 106A (MD) protector cannot be converted to fuseless operation because of insufficient current-carrying capacity.

15. MAINTENANCE

15.01 When making station visits, inspect the telephone grounding system. If the protector ground is not connected to the best available ground electrode in accordance with Table D, change the ground conductor. **Make sure the protector ground, power service ground, and interior metallic water pipe are bonded together. If the protector and power are grounded to separate ground rods, make sure the ground rods are bonded together.**

15.02 Inspect the ground wire, ground clamps and connectors for broken or disconnected wires or loose connections. Replace hardware if defective, damaged, or badly corroded. Make sure the ground wire tag (Form E-3013B) is in place.

Note: ♦It is not necessary to replace No. 14 (MD) ground wire in existing installations unless it is defective or used to ground more than one circuit.♦

15.03 Replace grounded protector units, operated protector blocks, open fuses, and defective or badly corroded protectors. Replace protector units or protector blocks with proper types. **Do not use yellow or blue protector blocks.**

♦Danger: If for any reason, it is suspected that the protector is energized, DO NOT attempt to remove protector blocks. Verify presence or absence of voltage with a voltage tester. If energized, notify supervisor and proceed no further.♦

15.04 The 2B1A and 2B2A protector units are equivalent and either may be used in a 123A1A or 128A1A-2 protector. The 2B1A has a slotted screw-type cap while the 2B2A has a 3/8-inch hexagonal cap which requires the 216B tool for removal.

15.05 The 123B1A protector uses two 6B1A (gas tube) protector units in parallel with two 2B2A (carbon) protector units. When replacing protector units in the 123B1A protector, be sure to install the 2B2A protector units in the wells marked "CARBON ONLY" (Fig. 3).

15.06 The 111A (MD) protector uses 2A1A protector units instead of the 2B1A or 2B2A protector units.

15.07 When visiting PBX or KTS locations, make sure the proper size ground wire connects the protector ground terminal to the best available grounding electrode (Tables B and D). A cable shield or sheath is not an acceptable grounding electrode.

1. The first part of the document discusses the importance of maintaining accurate records of telephone calls. It emphasizes that these records are essential for legal proceedings, especially in cases involving harassment or fraud. The text notes that without proper documentation, it becomes difficult to prove the frequency and content of calls.

2. The second part of the document addresses the challenges of collecting evidence from telephone records. It highlights that many service providers do not retain call logs for long periods, and some may delete records upon request. The author suggests that individuals should act quickly to obtain their records before they are lost.

3. The third part of the document provides a step-by-step guide on how to request telephone records from a service provider. It includes a sample letter that can be used as a template. The letter should clearly state the purpose of the request and the specific information being sought.

4. The fourth part of the document discusses the legal implications of obtaining telephone records. It explains that while individuals have a right to their own records, there are restrictions on how this information can be used. The text advises that records should be used only for the purposes stated in the request and should be kept secure.

5. The fifth part of the document covers the costs associated with obtaining telephone records. It notes that many service providers charge a fee for this service, and the amount can vary significantly. The author suggests that individuals should compare prices from different providers to find the most cost-effective option.

6. The sixth part of the document discusses the importance of protecting personal information. It emphasizes that telephone records often contain sensitive data, such as names, addresses, and phone numbers. The text advises that individuals should take steps to ensure that this information is not shared with unauthorized parties.

7. The seventh part of the document provides a summary of the key points discussed in the document. It reiterates the importance of maintaining accurate records and the steps involved in obtaining them. The text concludes by encouraging individuals to take action if they believe their records are being misused.

8. The eighth part of the document includes a list of resources for further information. It provides links to websites that offer more detailed information on telephone records and legal rights. The text also includes contact information for legal aid organizations that can provide assistance to individuals who need help with their records.

SPECIAL SERVICE PROTECTIVE DEVICES

DESCRIPTION

1. GENERAL

1.01 This section provides information on protective devices used on special service circuits requiring special safeguard measures (SSM) or special service protection (SSP); these devices are used to guard against *accidental mechanical contact* and resulting disturbance of the circuits.

1.02 This section is reissued to:

- (a) Add information on No. 10 and 11 binding post insulators
- (b) Change title
- (c) Make minor corrections.

Revision arrows are used to emphasize the more significant changes. The Equipment Test List (ETL) is not affected.

1.03 Special service circuits, as discussed in this section, are cable and wire facilities furnished by the telephone company to connect with customer owned and maintained (COAM) and telephone company maintained (TCM) equipment, other than that used to provide exchange telephone service.

2. ORDERING GUIDE

2.01 Order special service protective devices as follows:

- Cap, Post, Binding, F, Fig. 4
- Cap, Post, Binding, G, Fig. 4
- Cap, Post, Binding, H, Fig. 4
- Guard, KS-14539, L5, Fig. 5
- Guard, KS-14539, L10 and L11, Fig. 6
- Insulator, Post, Binding, No. 1, Fig. 7
- Insulator, Post, Binding, No. 2, Fig. 7
- Insulator, Post, Binding, No. 3, Fig. 7
- Insulator, Post, Binding, No. 6, Fig. 7
- Insulator, Post, Binding, No. 10, Fig. 7
- Insulator, Post, Binding, No. 11, Fig. 7
- Insulator, Punching, Terminal, No. 4, Fig. 7
- Insulator, Punching, Terminal, No. 5, Fig. 7
- Insulator, Punching, Terminal, No. 7, Fig. 7
- Insulator, Punching, Terminal, No. 8, Fig. 7
- Insulator, Punching, Terminal, No. 9, Fig. 7
- Insulator, Terminal, Clip, B Fig. 9
- Insulator, Terminal, Clip, C Fig. 9
- Insulator, Terminal, Clip, D Fig. 9
- Insulator, Terminal, Clip, E Fig. 9
- Insulator, Terminal, Clip, F Fig. 9
- Insulator, Terminal, KS-21168, L1, Fig. 10
- Guard, KS-20353, L1, Fig. 12

NOTICE

Not for use or disclosure outside the
Bell System except under written agreement.

- Form E-5190, Warning Marker, Fig. 13
- Cap, 811655646 Heat Coil, Fig. 15
- Guard, KS-21369, L1, Fig. 16
- Tie, Cable, KS-20986, L4 or L3 (used with KS-21369, L1 guard when SSM is required), Fig. 16
- Guard, Circuit, 20A, Fig. 17

3. SPECIAL SERVICE PROTECTION

3.01 Special service circuits designated SSP require special protection to ensure that plant functions do not interfere with their operations. These circuits are of such a nature that momentary shorts, opens, or accidental contact may cause serious reaction in customer relations.

3.02 Binding post insulators and caps, pair indicators, and PBX frame guards are provided for field forces to place in terminals, PBX frames, and bridging locations where special service circuits appear. In addition to physical protection, these markings and protective devices are an indication that *approval from the Special Service Center is necessary before doing any work on these circuits.*

4. SPECIAL SAFEGUARDING MEASURES

4.01 The same protection used for SSP is required for SSM; in addition, locked terminals, unbridged pairs, wire in conduit, and cable in lieu of drop wire are required. Engineering authorization is required to establish SSM.

4.02 Services involving National Security primarily use SSM.

5. WORK ORDERS

5.01 The special service order is noted SSP alongside the circuit number when special service protection is required or SSP and SSM alongside the circuit number when special safeguarding measures are required. The toll circuit layout order is noted SSP or SSM, as appropriate, but need *not* be marked with both SSP and SSM as is required on the service order. In addition, Form E-4106 (Fig. 1) is used to notify the field forces where to place or remove protection when SSP or SSM is involved.

| SPECIAL SERVICE PROTECTION | | 1/2 | | |
|---|----------|-------------------------|-------------------|-------------------|
| BINDING POST INSULATORS | | PROTECTOR GUARD DEVICES | | |
| TERMINALS | | TERMINAL FRAMES | | |
| CENTRAL OFFICE | SHERWOOD | DATE | 8-15-60 | |
| OFFICE | | SERVICE ORDER NO. | 4073 | |
| DATE | 5/12 | BY | L.R. | |
| REASON | | TRAME | | |
| TYPE | FIELD | FOR INFORMATION CALL | 712-8183 | |
| PLACE AND REMOVE SPECIAL SERVICE PROTECTION AT LOCATIONS LISTED | | | | |
| LINE | PAIR | NO. | TERMINAL LOCATION | PROTECTIVE DEVICE |
| 21 | 22B | F | 310 STILES | X |
| | | F | 437 HARMON AV | X |
| | | 13 R | 92 CAROL RD. | X |
| | | 9 R | 98 " " | X |
| | | 5 R | 58 " " | X |
| | | 18 R | 76 " " | X |
| COMPLETED BY | | | | DATE |

Fig. 1—Facsimile of Form E-4106

5.02 Typical circuits requiring SSP and/or SSM are as follows:

- (a) Program transmission and television circuits
- (b) Telephotograph, telautograph, and facsimile transmission facilities
- (c) Other common carrier (OCC)
- (d) DATAPHONE* digital service (DDS) data communications service
- (e) Private line signal channel or radiotelephone circuits
- (f) Telegraph and teletypewriter leased line
- (g) TWX lines
- (h) Clock or ADT lines that operate on closed or series circuits
- (i) Remote control, signaling, metering, data circuits, and alarm circuits for fire, police, burglar, and watchman
- (j) Special facilities for defense or major disaster
- (k) Civil air defense warning network

- (l) Power company remote control circuits
- (m) Airway communication circuits
- (n) PBX battery and generator supply for hospitals, police and fire departments, or agencies who perform emergency service for the general public.

6. HOW TO AVOID DIFFICULTIES!

6.01 Difficulties can be avoided as follows:

- Obtaining authorization before working on a special circuit.
- Using SSP and/or SSM when required.
- Using 1013A or equivalent hand test set with capacitor in line (monitor position) when first going across a pair.
- Not shorting terminals when trying to locate a pair (Fig. 2).
- Exercising care to avoid accidental contact with other lines.
- Obtaining authorization before removing any SSP and/or SSM.

7. PROTECTIVE DEVICES

7.01 Common protective devices used on special service circuits are shown in Fig. 3 through 17.

INDICATORS (Fig. 3)

7.02 Indicator KS-6660 is a red plastic ring 1/2 inch in diameter. This indicator must be placed on wires before they are terminated. Indicator KS-16847 is a red cellulose-acetate spiral ring, 3/8 inch in diameter. The split-ring feature of this indicator permits placing or removing indicator on terminated wires.

BINDING POST CAPS (Fig. 4)

7.03 Binding post caps are neoprene caps for use on cable and wire terminals as protection against accidental contacts on special service lines and as a means of minimizing faceplate leakage in distribution cable terminals. They are available in red and

black colors. Red caps are intended for use on special service lines and the black caps are for general use.

7.04 Applications for these binding post caps are as follows:

- B binding post caps are for use on **nonworking** posts of N, T, and 61-type cable terminals.
- C binding post caps are for use on **working** posts of N, T, and 61-type cable terminals.
- D binding post caps are for use on 7A fuses installed in L-type fuse chambers.
- E binding post caps are for use on 49-, 104-, and 105-type cable terminals.
- F binding post caps are for use on terminals equipped with insulation crushing washers such as B buried cable terminals, 30-2, 57B, and 59A-type manufacture discontinued (MD) connecting blocks.
- G binding post caps are for use on 30-type connecting blocks.
- H binding post caps are for use on 31-type connecting blocks.

KS-14539, L5 GUARD (Fig. 5)

7.05 The KS-14539, L5 guard is a red plastic hood designed to cover the heat coils and springs on 1177-type protectors.

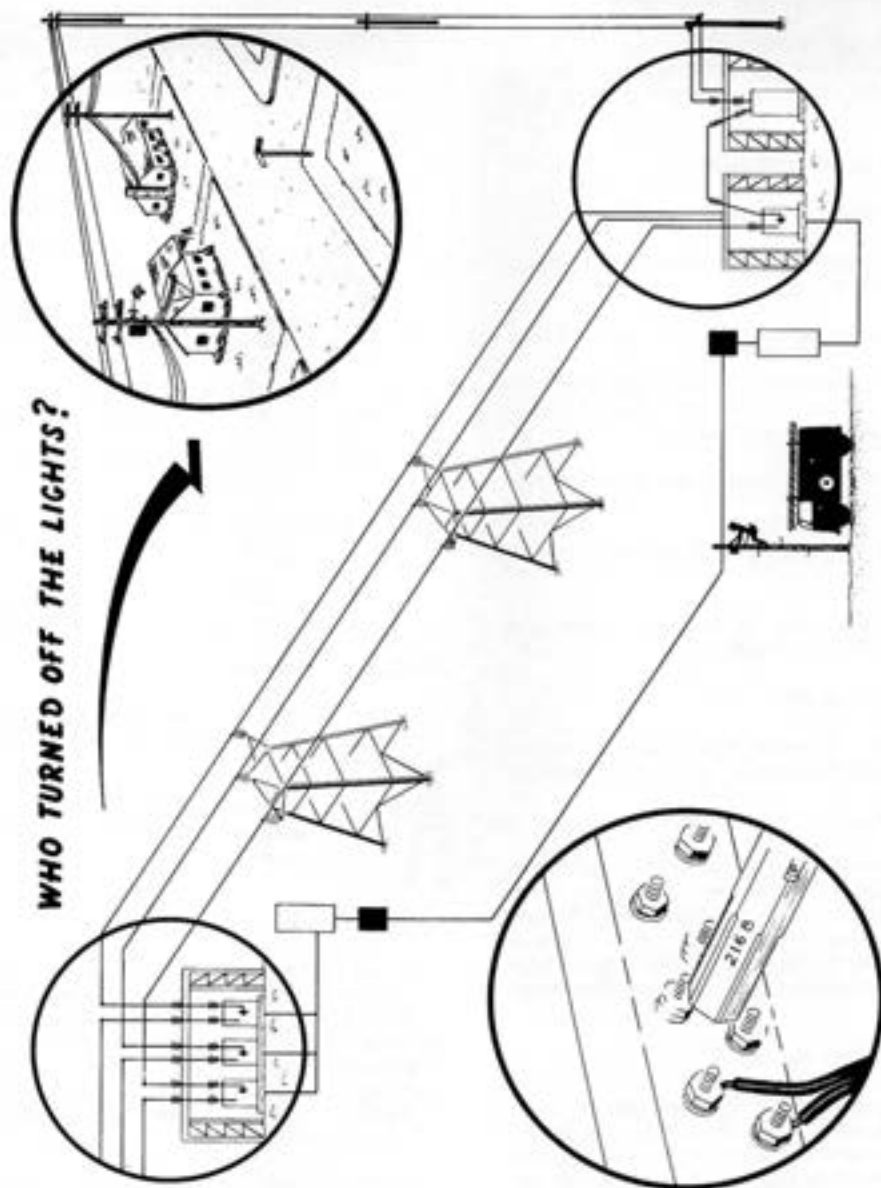


Protect each special circuit appearing on frame. Place SSP on each end of jumper wire.

KS-14539, L10 AND L11 GUARD (Fig. 6)

7.06 The KS-14539, L10 and L11 guard is a red, flame retardant plastic wrap around guard with a beaded cable tie, designed to insulate, protect, and designate SSP and SSM circuit pairs on C50 and C52 protectors. The KS-14539, L10 is the guard **only** which is used when **SSP** is required; the KS-14539, L11 is the guard **and** cable tie which is used when **SSM** is required.

7.07 The KS-14539, L10 guard is used in place of two KS-14539, L6 guards (MD) and four termi-



WHO TURNED OFF THE LIGHTS?

Fig. 2—Who Turned Off the Lights?

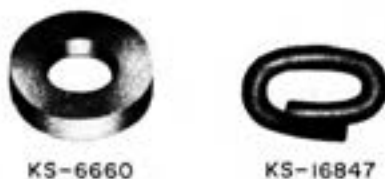


Fig. 3—KS-6660 and KS-16847 Indicators

nal punching insulators to designate and insulate a circuit pair on the C50-type protector. The physical design of the L10 allows a dislodged heat coil to fall to the floor level, preventing an accumulation of dislodged heat coils and possible short circuit.

7.08 The KS-14539, L10 and L11 guard is installed as shown in Fig. 31. When *SSM* is required, the L11 is installed by threading the beaded cable tie through the keyhole slot on one end of the guard, around the fanning strip, and through the keyhole slot on the opposite end. The tie is then drawn tight, locked in place, and cut, leaving the end of the cable tie approximately 1-inch long.

BINDING POST INSULATORS (Fig. 7)

7.09 Binding post insulators are open-ended, red, flame retardant plastic insulators for use on binding posts to prevent accidental contact. These insulators are designated No. 1, 2, 3, 6, 10, and 11.

7.10 Applications for these binding post insulators are as follows.

- No. 1 insulators are for use on binding posts having 3/8-inch hexagonal nuts and on 7T fuses.
- No. 2 insulators are for use on binding posts having 7/16-inch hexagonal nuts and on 7A fuses.
- No. 3 insulators fit the screw binding posts of BD, BE, BF, BG, BH, and BJ cable terminals.
- No. 6 insulators are for use on terminations of the alarm and contactor circuits in T pressure contactor terminals and 3-pair gas-tight terminals.
- No. 10 insulators are for use on BK/BL and 76-type binding post terminals.
- No. 11 insulators are for use on 95-type binding post terminals.♦

TERMINAL PUNCHING INSULATORS (Fig. 7)

7.11 Terminal punching insulators are open-ended, red, flame retardant plastic insulators for use on 300 connector terminals and terminal punchings to prevent accidental contacts. These insulators are designated No. 4, 5, 7, 8, and 9.

7.12 Applications for these terminal punching insulators are as follows:

- No. 4 and No. 5 insulators are 1/2 inch and 5/8 inch in length and are used on 300 connector terminals and terminal strips.
- No. 7 insulators are 3/4 inch in length and are used on cable conductor terminating lugs of the C- and E-type protector mountings.



Fig. 4—Binding Post Caps



Fig. 5—KS-14539, L5 Guard

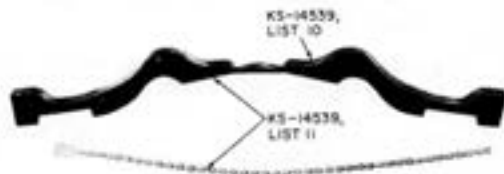


Fig. 6—KS-14539, L10 and L11 Guard

- No. 8 and No. 9 insulators are 1/2 inch and 5/8 inch in length and are used on terminal strips where terminal spacing and wire build-up create a space problem.

B COIL SPRING INSULATOR (MD) (Fig. 8)

7.13 The B coil spring insulator is a fiber insulator designed for use on 70-type (MD) connecting block. When installed, one B insulator will protect two coil springs, tip and ring, that are mounted on the face or station side of block. It has a red enamel finish.

CLIP TERMINAL INSULATORS (Fig. 9)

7.14 Clip terminal insulators are red plastic insulators designed to protect terminals on 66-, 78-, 5A1-, and 88-type connecting blocks.

7.15 Applications for the clip terminal insulators are as follows:

- B clip terminal insulator is approximately 2-inches long and is designed to protect one row of terminals on 66-type connecting blocks or may be cut to fit the desired number of terminals.
- C clip terminal insulator is approximately 1/2-inch long with closed ends and is de-

signed to protect two terminals on 66G- and 78A-type connecting blocks.

- D clip terminal insulator is approximately 7/8-inch long with closed ends and is designed to protect two terminals on 66H- and 78B-type connecting blocks.
- E clip terminal insulator is designed to protect a single terminal on 5A1- or 66-type connecting blocks.
- F clip terminal insulator is designed to protect two terminals on an 88-type connecting block.

KS-21168, L1 TERMINAL INSULATOR (Fig. 10)

7.16 The KS-21168, L1 terminal insulator is a dual, open-ended, red, flame retardant plastic insulator used to insulate, protect, and designate special service *pairs* on 303-type connector terminals. The insulator may be expanded or compressed to fit snugly over the wire-wrap terminal lugs; longitudinal slots provide clearance for bridged pairs. These insulators are recommended for use on 303-type connector terminals instead of No. 5 terminal punching insulators because of ease of handling, positive engagement, and one KS-21168, L1 insulator serves the function of two No. 5 insulators.

12-TYPE GUARD (MD) (Fig. 11)

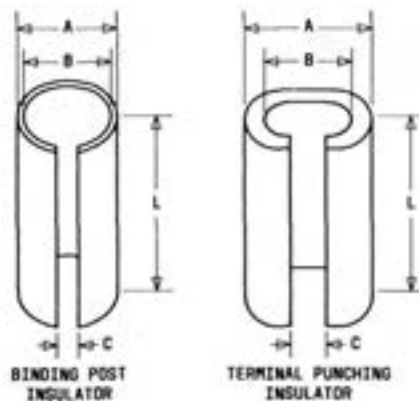
7.17 The 12-type guards are designed to protect special service lines appearing on frames that are equipped with 44A test jacks. The 12B guard (MD) (Fig. 11) is the same as the 12A guard (MD), except that it is equipped with a locking screw for maximum security. The 12-type guards have metal frames and brown phenolic fiber sides. They are replaced by the KS-20353, L1 guard.

KS-20353, L1 GUARD (Fig. 12)

7.18 The KS-20353, L1 guard is a red plastic guard for use in protecting pair positions of the 444 jack on distributing frames against accidental contact. It consists of a cavity on one side and a rectangular hole through the other.

WARNING MARKER FORM E-5190 (Fig. 13)

7.19 The warning marker Form E-5190 is a red, waterproof plastic cloth with a pressure sensi-



| SIZE NUMBER | | A (INCH) | B (INCH) | C (INCH) | L (INCH) |
|---------------------------|--------------------------------|-------------|-------------|-------------|-------------|
| BINDING POST INSULATOR | TERMINAL PUNCHING INSULATOR | | | | |
| 1 | | 35/64 | 27/64 | 3/32 | 5/8 |
| 2 | | 35/64 | 31/64 | 3/32 | 5/8 |
| 3 | | 13/32 | 11/32 | 1/8 | 7/8 |
| | 4 | 17/64 | 13/64 | 1/16 | 1/2 |
| | 5 | 17/64 | 13/64 | 1/16 | 5/8 |
| 6 | | 35/64 | 27/64 | 3/32 | 13/32 |
| | 7 | 17/64 | 13/64 | 1/16 | 3/4 |
| | 8 | 17/64 | 13/64 | 3/32 | 1/2 |
| | 9 | 17/64 | 13/64 | 3/32 | 5/8 |
| 10 | | 5/16 | 1/4 | 1/16 | 23/32 |
| 11 | | 3/8 | 5/16 | 1/16 | 9/16 |

Fig. 7—Binding Post and Terminal Punching Insulators

tive backing. The tapes are 1/4 inch wide by 1-1/2 inches long and are supplied on a dispenser card with 36 tapes to a card. It is designed for identification of special lines joined by B wire connectors (MD).

KS-16576 DESIGNATION PLATES (MD) (Fig. 14)

7.20 The KS-16576, L5 designation plate is a red plastic hood designed to cover the wire-wrap terminals of one pair on the jumper wire side of 300-type connectors.

7.21 The KS-16576, L6 designation plate is a red plastic hood designed to cover the test terminals of one pair on the cable side of 300-type connectors.

7.22 The KS-16576, L5 and L6 designation plates are replaced by the KS-21369, L1 guard.

811655646 HEAT COIL CAP (Fig. 15)

7.23 The 811655646 heat coil cap is a red plastic cap



Fig. 8—B Coil Spring Insulator (MD)

used in conjunction with the KS-21369, L1 guard to provide SSM and SSP on 300-type connectors. These caps are used with the protector units to indicate a special line and to prevent accidental opening of the line.

KS-21369, L1 GUARD AND KS-20986 CABLE TIE (Fig. 16)

7.24 The KS-21369, L1 guard is a red, flame retardant plastic wrap around guard designed to insulate, protect, and designate SSP and SSM circuit pairs on the 300-type connectors. The KS-21369, L1 guard is used when SSP is required; when SSM is required, a KS-20986 cable tie is used to secure the guard to the fanning strip on the 300-type connector. The KS-21369, L1 guard replaces the KS-16576, L5 and L6 designation plates which are rated MD.

7.25 The KS-21369, L1 guard is installed as shown in Fig. 35. The hook on the end of the left arm is attached to the rear of the left edge of the 300-type connector, covering the test points of the special circuit with the cap on the left arm. The guard is then wrapped around the front of the panel, over both protector units, and the right arm is snapped into place

on the ribs of the right edge of the connector, thereby enclosing the wire-wrap terminals.

7.26 When SSM is required, the KS-21369, L1 guard can be secured to the fanning strip of the 300-type connector by threading a KS-20986 self-locking, nonreleasing cable tie through the hole in the end of the right arm of the guard and through the fanning strip slot. The KS-20986, L4 can be used on the latest design of the 300-type connector, which is equipped with a fanning strip as an integral part of the connector. For the older version of the 300-type connector which requires a locally provided fanning strip added to the vertical, a longer cable tie, such as the KS-20986, L3, is required.

20A CIRCUIT GUARD (Fig. 17)

7.27 The 20A circuit guard is a cross-shaped metal strip which is used to prevent accidental removal of protector units from 302- and 303-type connectors associated with circuits requiring SSM. Installation of the guard with a 4A protector is shown in Fig. 37. The guard is designed with three holes, spaced for use with 3A, 4A, and 5A protectors. After determining the proper hole, the excess material, if any, is removed by snipping at the notched edges provided adjacent to the hole. The guard is then attached to the connector with the factory-provided self-tapping screw, which is inserted into the existing hole located between two contact holes on the connector panel. After the guard is attached to the connector, it is bent to a 90° angle, the protector is inserted, covering the screw head, and the three tabs on the locking end of the guard are bent around the edges of the T-shaped pull handle of the protector, locking it in the inserted position.

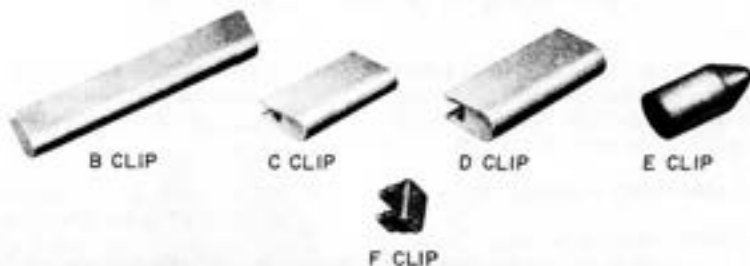


Fig. 9—Clip Terminal Insulator



Fig. 10—KS-21168, L1 Terminal Insulator



Fig. 11—12B Guard (MD)



Fig. 12—KS-20353, L1 Guard

8. INSTALLING AND REMOVING SSP (Fig. 18 through 38)

8.01 Upon receipt of Form E-4106 (Fig. 1), SSP may be installed or removed. It is essential that special service lines be protected at all times. Install SSP on binding post caps, terminals, etc. as follows:



At both ends of cross-connecting wires, SSP is required.



Fig. 13—Warning Marker Form E-5190



LIST 5



LIST 6

Fig. 14—KS-16576 Designation Plates (MD)



Fig. 15—811655646 Heat Coil Cap

- (1) Select wire pairs to be protected.
- (2) Make sure terminals and surface areas are clean and free from foreign materials before installing protective device.
- (3) Prior to terminating special service lines, slip the KS-6660 indicator over wire ends to be identified. The split-ring feature of the KS-16847 indicator permits placing or removing indicator on terminated wires.

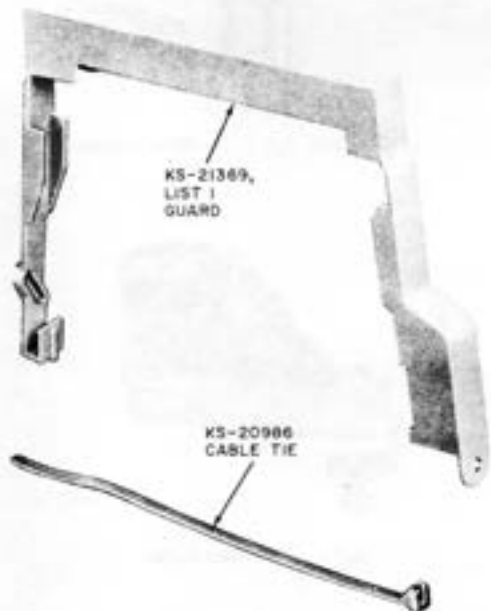


Fig. 16—KS-21369, L1 Guard and KS-20986 Cable Tie



Fig. 17—20A Circuit Guard

(4) Place caps, terminal insulators, guards, etc. over terminal(s) to be protected by dressing wires thru slot of protective devices (if provided). Push on device until properly seated against the faceplate of the protected area.



Fig. 18—Installing Binding Post Caps

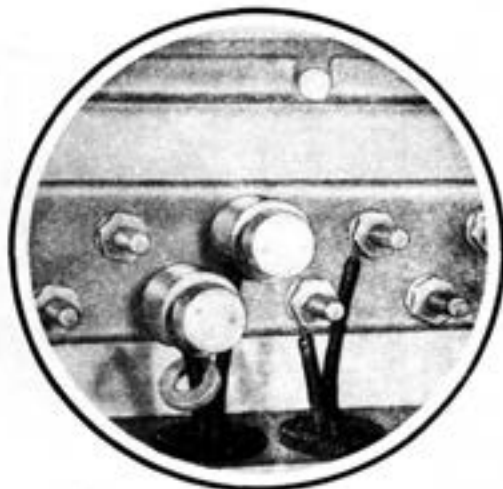
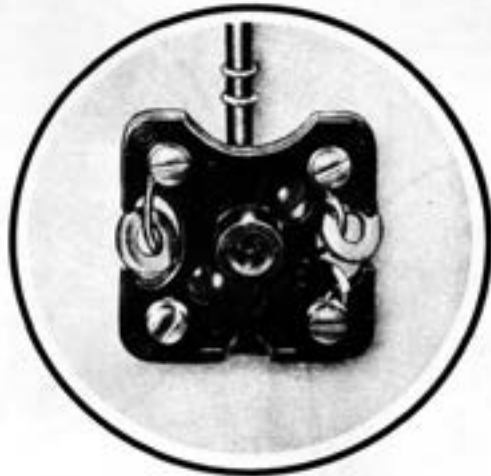


Fig. 20—Installed Binding Post Caps and Indicator at N-Type Cable Terminals



Fig. 19—Installed Binding Post Caps With KS-6660 Indicator

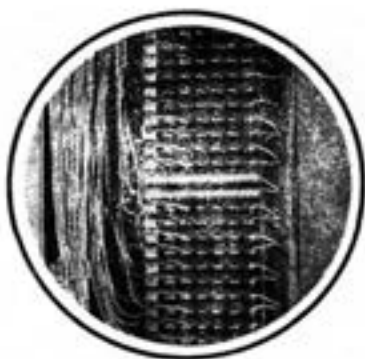


42A

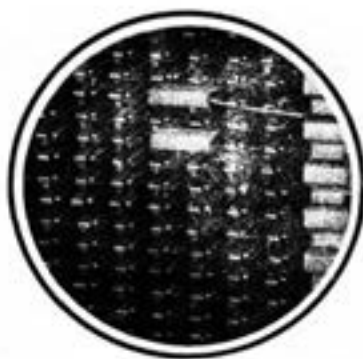


44A

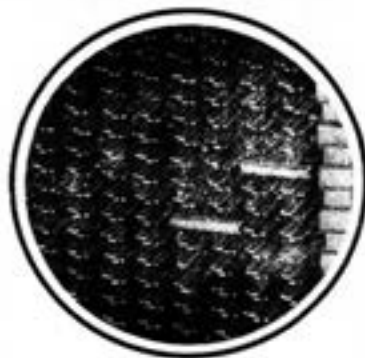
Fig. 21—Typical SSP Used With 42A or 44A Connecting Block



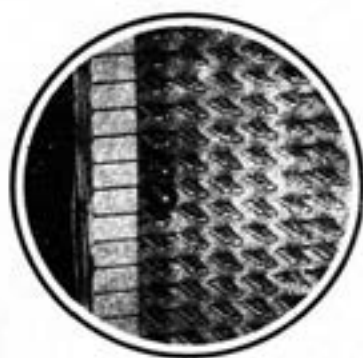
B CLIP



C CLIP



D CLIP



E CLIP



F CLIP

Fig. 22—Clip Terminal Insulators Installed on Connecting Blocks

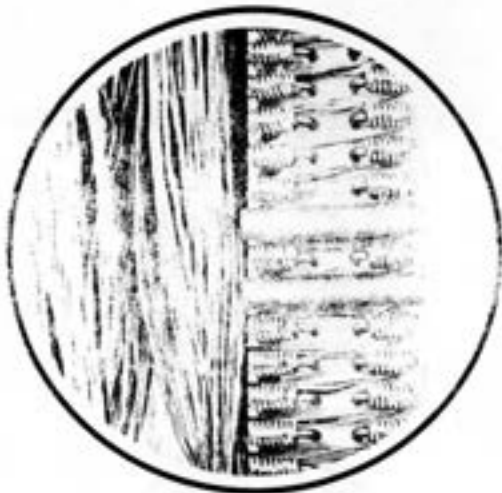


Fig. 23—B Coil Spring Insulators (MD) Installed on 70-Type Connecting Block (MD)



Fig. 25—E Binding Post Caps and Indicators Installed on 49A Cable Terminals

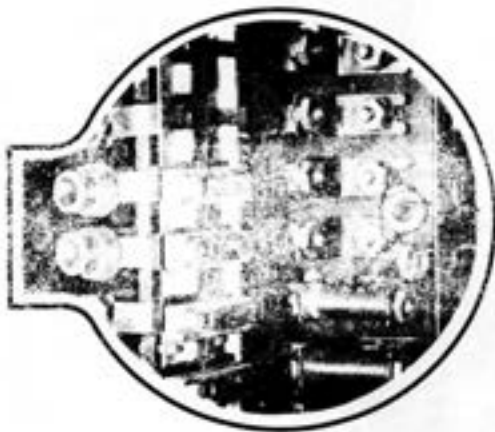


Fig. 24—D Binding Post Caps and Indicators Installed in L-Type Fuse Chamber



Fig. 26—KS-16847 Indicator Used With Station Protector



Fig. 27—Binding Post Insulators Installed at BD-Type Cable Terminals

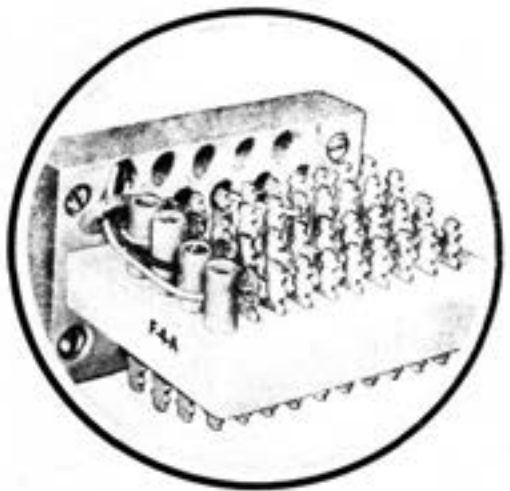


Fig. 29—Typical Installation Using Two Sizes of Punching Insulators on Same Connecting Block

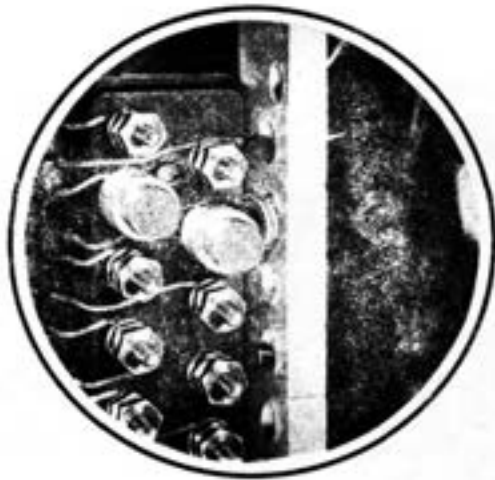


Fig. 28—Typical SSP at 30-Type Connecting Block

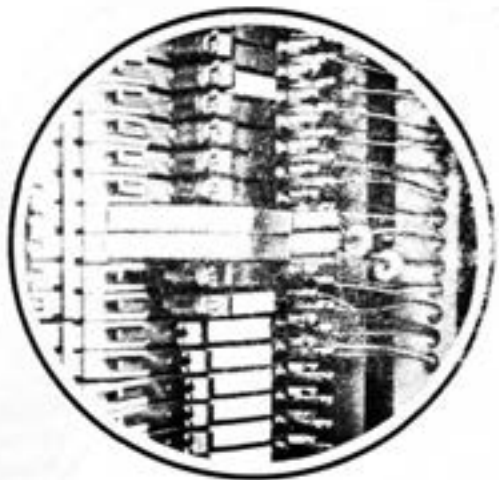


Fig. 30—KS-14539, L5 Guard Installed on 1177 Protector

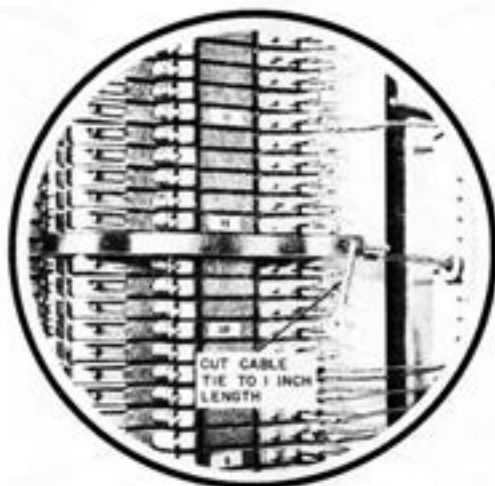


Fig. 31—KS-14539, L11 Guard Installed on C50-Type Protector

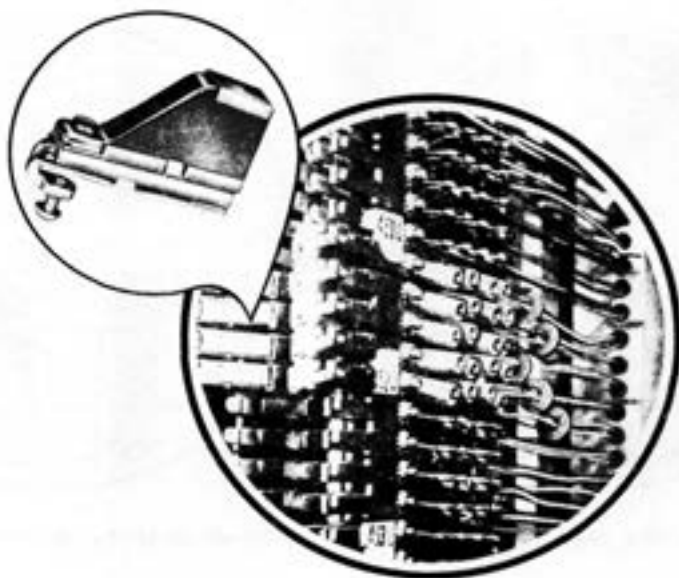


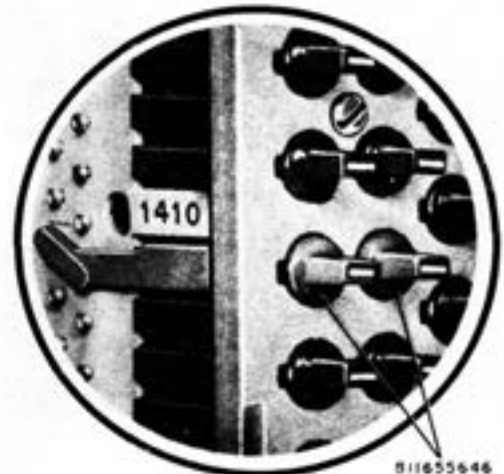
Fig. 32—SSP on Frame Equipped With 444A Test Jacks on 401 Connector



Fig. 33—Warning Marker Form E-5190 Installed on B Wire Marker



LIST 5



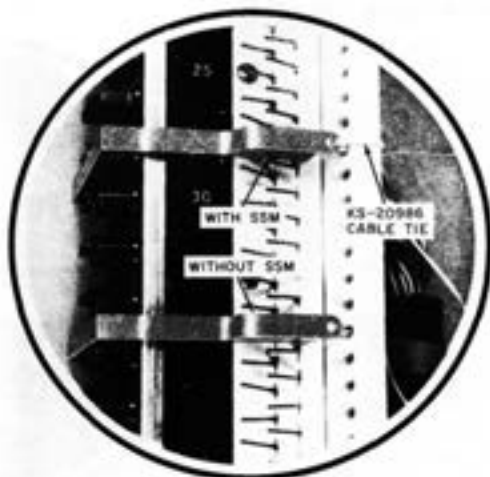
LIST 6

811655646
HEAT COIL
CAPS

Fig. 34—Installed KS-16576, LS and L6 Designation Plates (MD) and 811655646 Heat Coil Caps



LEFT SIDE



RIGHT SIDE

Fig. 35—KS-21369, L1 Guard Installed With and Without SSM

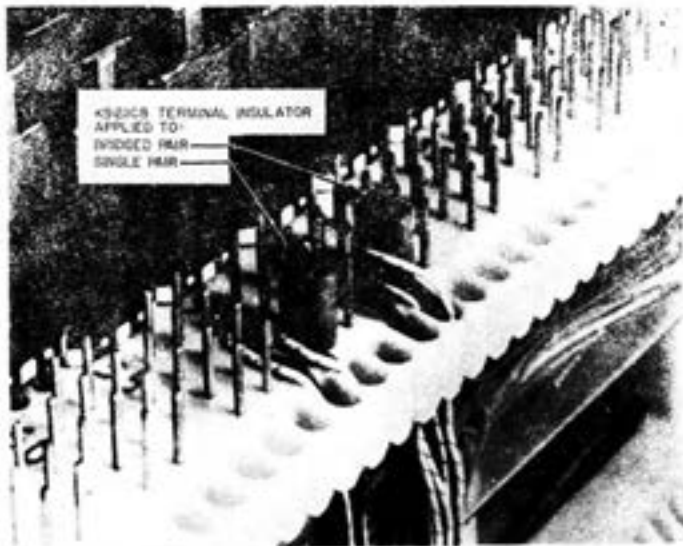


Fig. 36—SSP on 300-Type Connector Using KS-21168, L1 Terminal Punching Insulator

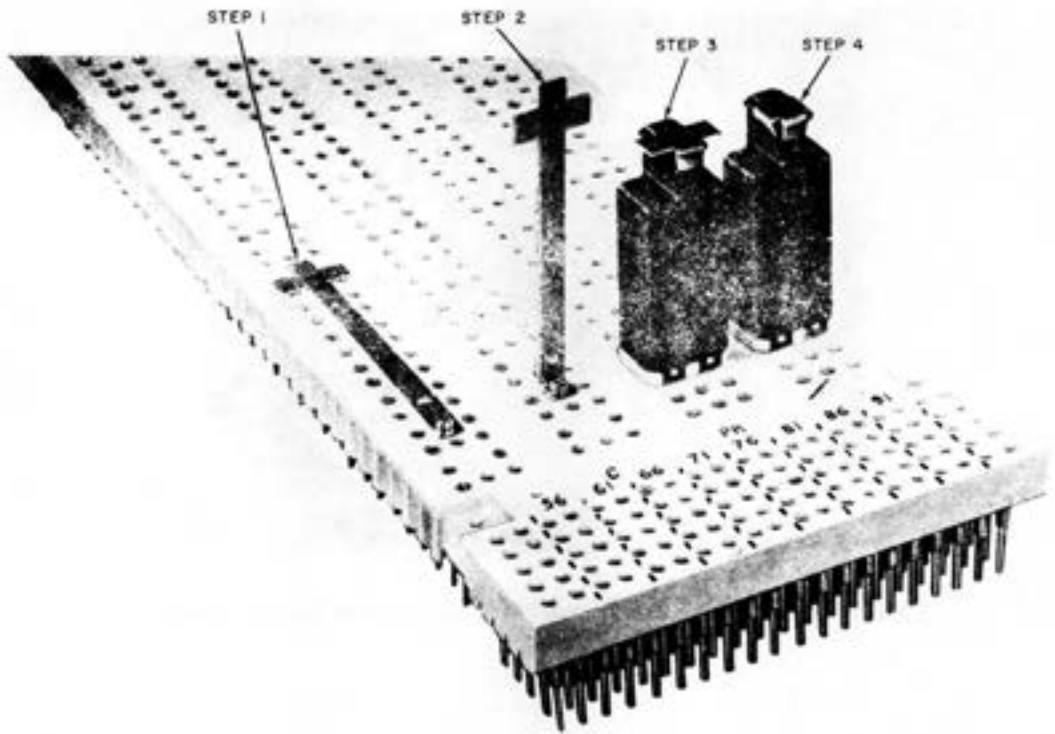


Fig. 37—Installing 20A Circuit Guard

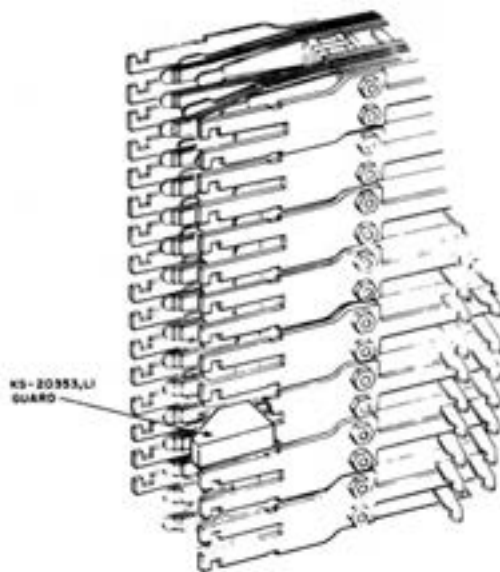


Fig. 38—KS-20353, L1 Guard on 444-Type Jack

INSULATING GLOVES

LEATHER PROTECTORS, FABRIC LINERS, AND GLOVE BAG

1. GENERAL

1.001 This addendum supplements Section 460-300-103, Issue 3. Place this pink sheet ahead of Page 1 of the section.

1.002 This addendum is issued to add:

- Information to paragraph 7.04 on inspection of rubber insulating gloves
- Information on inner ply color of insulating gloves.

2. CHANGES TO SECTION

2.001 On Page 2, revise paragraph 3.04 as follows:

3.04 The E insulating gloves are made of two plies of rubber: the outer ply black and the inner ply either red or yellow, to aid in determining the physical condition of the glove. Leather protector gloves must be worn over these gloves when in use. They are intended for use by outside plant forces.

2.002 On Page 2, revise paragraph 3.05 as follows:

3.05 The F insulating gloves are made of two plies of rubber, the inner ply either red or

yellow and the outer ply black, as an aid in visual inspection. They are of such thickness as not to require protector gloves when used in central offices. However, when used in the outside plant, the proper size D leather protector gloves must be used. The F insulating gloves are marked as shown in Table C.

2.003 On Page 6, revise paragraph 7.04 as follows but retain subparagraphs (1) through (3):

(4) Inspect the gloves over the entire surface (inside and out). Roll the rubber gently between the hands to expose defects, embedded foreign matter, and solvent or oil damage.

(5) The air test should be performed last (see paragraphs 8.01 and 8.02).

2.004 On Page 6, revise paragraph 7.05 as follows:

7.05 When performing the previous tests with the two-color D, E, and F insulating gloves, the appearance of red or yellow ply showing through the black means the glove is defective and not safe to use. It shall be disposed of in accordance with local instructions.

NOTICE

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Page 1
1 Page

INSULATING GLOVES

LEATHER PROTECTORS, FABRIC LINERS, AND GLOVE BAG

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• Rate the B and C leather protector gloves MD.

1.03 ¶The appropriate size D leather protector glove is to be worn over the F insulating glove at all times to avoid abrasion of the rubber except when used in central offices. Leather protectors are *not* required for central office use and are *always* required for outside plant use.¶ A reference between the insulating glove size and the compatible sizes of leather protectors and fabric liner gloves is shown in Table A.

2. PRECAUTIONS

2.01 Except in emergencies, such as to prevent serious injury or loss of life, employees shall not handle electric, power wires, or associated switches, and shall arrange to have the necessary work required on these circuits performed by the electric company. Similarly, employees shall not handle telephone wires that are known or suspected to be energized until the contact conditions have been cleared by the electric company. Employees wearing insulating gloves must avoid body contact with wires, poles, vehicles, and any other objects which might be energized.

2.02 Employees must be familiar with the precautions to be followed in rescuing an employee from a power contact (wearing insulating gloves) as described in Sections 010-100-012 and 010-100-013.

2.03 Insulating gloves are inspected and subjected to an electrical test to insure their insulating value when purchased from the manufacturer and periodically thereafter under the company's established routine. *Employees and storekeepers shall see that insulating gloves are returned for periodic electrical tests in accordance with local routine.*

1. GENERAL

1.01 This section covers the description, care, and maintenance of insulating gloves provided for the protection of employees against electric shock, and the precautions to be followed in their use. Information on leather protector gloves, fabric liner gloves, and B glove bag is also included.

1.02 This section is reissued to:

- Add information on the F insulating glove
- Add information on the D leather protector glove

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TABLE A

**COMPATIBLE SIZES FOR INSULATING
GLOVE-LEATHER PROTECTOR-FABRIC LINER**

| INSULATING GLOVE | | LEATHER PROTECTOR* | | | FABRIC LINER |
|------------------|-------|--------------------|-------------|--------|--------------|
| TYPE | SIZE | B-TYPE (MD) | C-TYPE (MD) | D-TYPE | |
| E or F | 8 | — | 8 | 8 | 6 |
| B, C, D, E, or F | 9-1/2 | 11 | 9-1/2 | 9-1/2 | 7 |
| B, C, D, E, or F | 10 | 11 | 10 | 10 | 7 |
| B, C, D, E, or F | 11 | 12 | 11 | 11 | 8 |
| B, C, D, E, or F | 12 | 12 | 12 | 12 | 8 |

* Does not apply to D insulating gloves.



‡The "F" insulating gloves provide outside plant forces protection from power contact from 8.7 kv phase to ground, 14.4 kv phase to phase up to 20.0 kv phase to ground and 34.5 kv phase to phase. Below 8.7 kv phase to ground "E" insulating gloves are adequate. The "D" insulating gloves are not to be used by outside plant forces.‡

2.04 Insulating gloves shall be inspected and tested in accordance with Parts 7 and 8 of this section.

2.05 Insulating gloves shall never be worn inside out as this stresses the curved portions of the gloves. Attack by ozone is more pronounced at points where rubber is stressed.

3. INSULATING GLOVES

3.01 All insulating gloves are ‡the straight cuff‡ type. Sizes 9-1/2, 10, 11, and 12 are ‡in use‡ in types B, C, D, E, and F. A smaller glove, size 8, is now available in types D, E, and F. The size is equal to the approximate number of inches around the glove measured as shown in Fig. 1. The length of each glove, measured from the tip of the second finger to the outer edge of the gauntlet, is approximately 14 inches (Fig. 1).

3.02 The B and C insulating gloves have been superseded by the E insulating gloves.

Protector gloves are required to be worn over these gloves for mechanical protection. The C insulating gloves, while not as thick as the B insulating gloves, still are consistent with the desired dielectric strength and permit maximum flexibility.

3.03 ‡The D insulating gloves have been superseded by the F insulating gloves.‡ The D insulating gloves are of sufficient thickness to eliminate the need for protector gloves ‡when used in central offices‡. They are intended for central office use ‡only and should not be used in the outside plant‡

3.04 The E insulating gloves are made of two plies of rubber, the outer ply black and the inner ply red, to aid in determining the physical condition of the glove. Leather protector gloves must always be worn over these gloves when in use. They are intended for use by outside plant forces. ‡The E insulating gloves are marked as shown in Table B.‡

3.05 ‡The F insulating gloves are made of two plies of rubber, the inner ply red and the outer ply black, as an aid in visual inspection. They are of such thickness as not to require protector gloves when used in central offices. However, when used in the outside plant, the proper size D leather protector gloves must be used. The F insulating gloves are marked as shown in Table C.‡



Fig. 1—E Insulating Glove

4. LEATHER PROTECTOR GLOVES

4.01 The B (MD) or C (MD) leather protector gloves (Fig. 2) shall always be worn over B, C, or E insulating gloves to prevent mechanical damage to the insulating gloves. The D leather protector gloves **must** be used with F insulating

gloves and may be used with the E. Leather protector gloves do not provide protection from electrical shock by themselves and shall never be worn except over insulating gloves. They shall neither be worn as a substitute for work gloves.

4.02 The B (MD) leather protector gloves are in use in two sizes for use with B, C, or E insulating gloves (see Table A).

4.03 The C (MD) leather protector gloves are flexible and less bulky than the B (MD) type and are in use in five sizes for use over B, C, or E insulating gloves (see Table A).

4.04 The D leather protector gloves, which replace the B and C protector gloves, feature an elastic shirring in place of the strap and buckle and shorter but wider fingers to facilitate fitting over the larger F insulating gloves. Five sizes are available for use over the E and F insulating gloves (see Table A).

4.05 Leather protector gloves shall be given reasonable care in their use. Oil, grease, paint, etc. on the palm and finger surfaces of the gloves will impair their usefulness for work operations. Such foreign matter should be immediately wiped off the gloves with a soft, dry cloth.

4.06 Inspect leather protector gloves before and after using them. Remove all foreign particles embedded in the surface, especially splinters of wood or metal, since they could damage the insulating gloves.

4.07 After visually inspecting the leather protector gloves, check the inner portion of the glove for sharp or foreign objects.

5. C FABRIC LINER GLOVES

5.01 The C fabric liner gloves (Fig. 3) are form-fitting gloves made of knit cotton cloth

◆ TABLE B ◆

E INSULATING GLOVES

| MARKING | TYPE OF MARKING | LOCATION |
|--|-----------------------------------|---|
| Manufacturer's name ANSI J6.6/ASTM D120 Type 1, Class I (Size) | White color label | Backhand side near rolled edge |
| Bell System "E" (Date of Manufacture) | Hot die stamp or indelible ink | |
| WECo Return for Test (Month-Year) | Indelible ink | Backhand side above white label on gaunt- let surface |
| "Use Protector" | Indelible ink | Palm side near rolled edge on gauntlet surface |

◆ TABLE C ◆

F INSULATING GLOVES

| MARKING | TYPE OF MARKING | LOCATION |
|---|-----------------------------------|--|
| Manufacturer's name ANSI J6.6/ASTM D120 Type 1, Class II (Size) | Yellow color label | Backhand side near rolled edge |
| Bell System "E" (Date of Manufacture) | Hot die stamp or indelible ink | |
| WECo Return for Test (Month-Year) | Indelible ink | Backhand side above yellow label on gauntlet surface |
| "Use Protector" | Indelible ink | Palm side near rolled edge on gauntlet surface |

and equipped with 3-inch wide rubberized fabric gauntlets.

5.02 The C fabric liner gloves are available in five sizes for use inside B, C, D, E, and F insulating gloves (see Table A).

5.03 The C fabric liner gloves may be worn inside all types of insulating gloves for warmth in cold weather and for absorbing perspiration in warm weather.

6. B GLOVE BAG

6.01 The B glove bag (Fig. 4) is provided for carrying and storing insulating gloves and associated leather protector and fabric liner gloves.

6.02 The bag is made of cotton duck with a liner of polyethylene. A web strap, terminated in a snap hook and a D ring is provided for suspending the bag from the body belt.

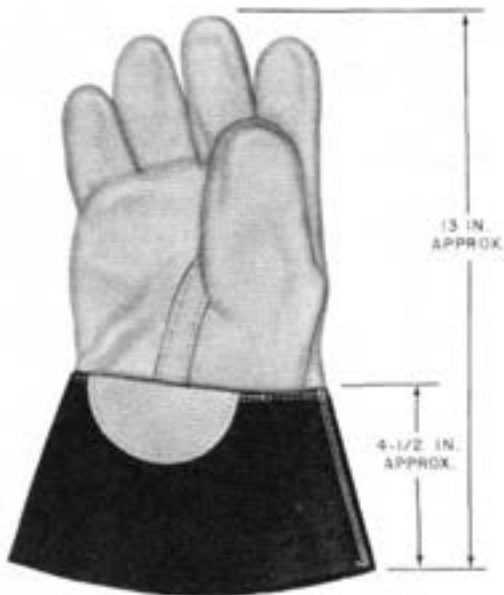


Fig. 2—Leather Protector Glove



Fig. 4—B Glove Bag

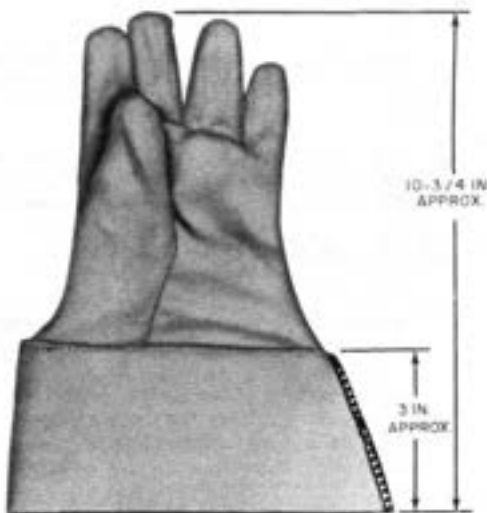


Fig. 3—Fabric Liner Glove

6.03 Dead air space is provided within the bag by the polyethylene liner and by the use of a zipper instead of a flap closure. The bag should be tightly zippered when gloves are stored in it to minimize ozone deterioration of the insulating glove.

7. INSPECTION OF INSULATING GLOVES

7.01 Employees shall at all times assume the responsibility for determining that their

insulating gloves are in good condition. The appearance of the gloves should indicate neither deterioration from an electrical or a mechanical standpoint. Employees shall verify that they are being used within the specified electrical test period as indicated by the "Return for Test" date stamped on the back side of the gauntlet.

7.02 Employees shall inspect the insulating gloves in accordance with Parts 7 and 8 as follows:

- (a) At the time the gloves are issued
- (b) Each time before using them
- (c) Each time after using them
- (d) A minimum of once each month.

7.03 The supervisor shall inspect the insulating gloves periodically and shall see that all instructions are followed. The frequency of this inspection shall be at intervals of not more than six months.

7.04 A visual inspection of insulating gloves shall be made to determine their condition. If any one of the following conditions is found to exist or if the condition of the gloves is such that there is any doubt as to their safety, they shall be exchanged at once for a pair in good condition in accordance with the locally established routine. Inspections should include the following in the sequence indicated:

- (1) Visually check return date for testing.
- (2) Pull the fingers to stretch the rubber in each finger crotch. Look for evidence of red color showing through the black on D, E, and F gloves and for evidence of cracks in the B and C gloves. Look for signs of abrasions or deterioration on the palm or back of the glove.
- (3) Squeeze the fingers of the glove together and let go, live rubber will return to normal position. If there is a sign of stickiness, check glove for deterioration and, if in doubt, exchange gloves.
- (4) The air test should be performed last. (See paragraphs 8.01 and 8.02.)

7.05 When performing the above tests with the two-color D, E, and F insulating gloves, the appearance of red showing through the black means that the glove is defective and not safe to use. It shall be discarded in accordance with local routine.

8. AIR TEST OF INSULATING GLOVES

8.01 The air test (Fig. 5) shall be made on insulating gloves only when the conditions listed under paragraph 7.04 are satisfactory. Make this test as follows:

- (1) Hold the glove at each side of the edge of the gauntlet. Slightly stretching the gauntlet will provide a slight air seal.
- (2) Revolve it about the edge of the gauntlet as an axis, thus rolling it toward the palm and confining the air in the palm and fingers.
- (3) Hold the rolled-up gauntlet in one hand.
- (4) At head level, squeeze the palm of the glove with the other hand to put the confined air under pressure.

8.02 An alternate method (Fig. 6) to air test the insulating gloves can be performed in the following manner:

- (1) Hold the glove at each end of the gauntlet, allowing the gauntlet end to attain maximum opening.
- (2) Bring the edges of the gauntlet together and, by using the fingers, roll up the gauntlet toward the palm of the glove 1-1/2 turns.
- (3) Fold the rolled gauntlet ends together and hold with one hand.
- (4) At head level, squeeze the confined air with the other hand. (See Step 4, Fig. 5.)

Note: Because of the rigidity in the D and F insulating gloves, the glove should be placed on a clean surface (desk or table) and rolled up to trap the air as described in paragraph 8.02(2) and (3).

8.03 Any puncture would be readily detected by feeling the escaping air against the face or



STEP 1



STEP 2



STEP 3



STEP 4

Fig. 5—Air Test Operations 1-2-3-4

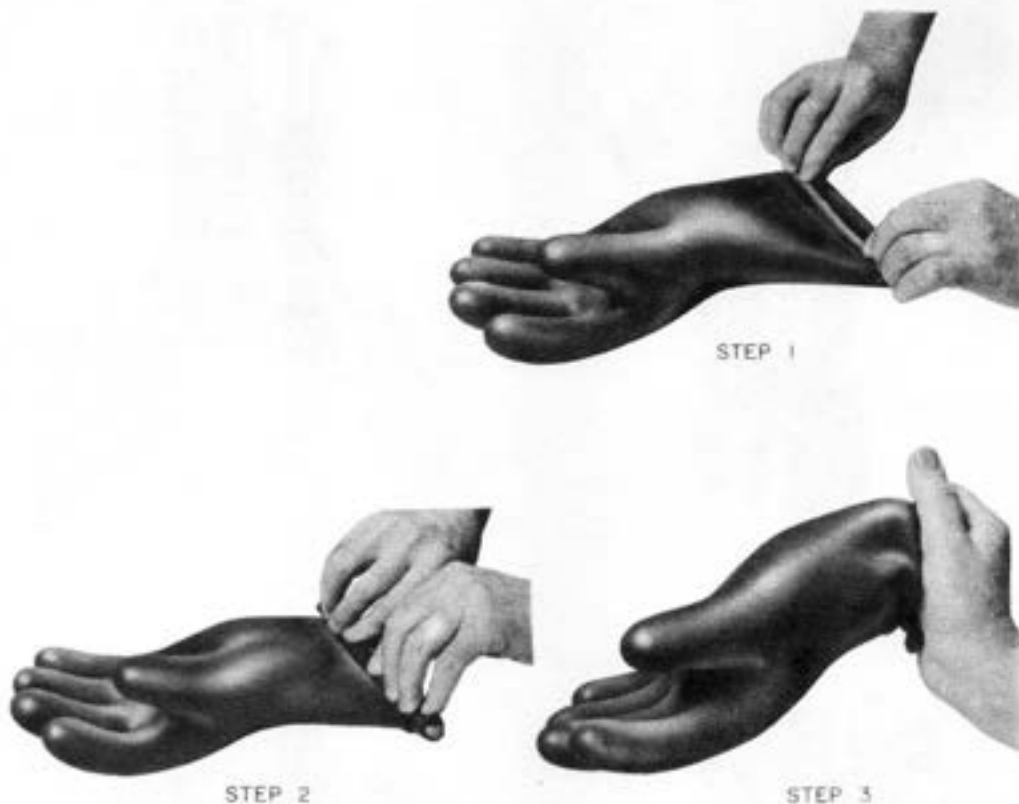


Fig. 6—Alternate Air Test

by sound when the glove is air tested at head level.

8.04 If a puncture is found or if the condition of the gloves is such that there is any doubt as to their safe use, they shall be exchanged at once for a pair in good condition in accordance with local routine.

9. CLEANING OF INSULATING GLOVES

9.01 Insulating gloves shall be cleaned when they become wet from perspiration or when the gloves are subjected to contact with dirt, mud, paint, creosote, or other foreign matter. Perspiration,

mud, dirt, and other foreign matter that does not adhere firmly to the glove shall be removed with clear water. Paint and creosote shall be removed as soon as practical, as some oils, if allowed to remain on the glove, will have an injurious effect on the glove.

9.02 The following method has been found satisfactory for removing paint or creosote from the glove:

- (1) Wipe off gloves with a dry cloth to remove as much wet paint or creosote as practical.

(2) Clean the entire glove thoroughly with a cloth moistened with KS-14356 cleaner (dry cleaning fluid), KS-7860 petroleum spirits, or KS-19578L1 cleaner (trichloroethane). Do not use an excessive amount of the cleaning fluid and do not wipe over "Return for Test" date.

Danger: This cleaning shall be done in a well-ventilated location, as these materials are either flammable or their vapors constitute a health hazard. As soon as each glove has been cleaned, it should be wiped thoroughly dry with a dry, clean cloth. Do not use gasoline.

Gasoline has a very low flash point and its use presents a much more serious fire hazard than does the use of the cleaning fluid or petroleum spirits which have a much higher flash point. KS-19578L1 cleaner is nonexplosive.

9.03 After insulating gloves are used, they should be thoroughly dried so the moisture from the hands will not become entrapped and cause the glove to deteriorate. Each time after use, gloves should be turned inside out and placed flat to dry. After the gloves have been dried, they shall be turned right side out and placed in the containers ready for use.

Caution: It is especially important to keep gloves out of direct sunlight and ultraviolet light sources and away from electrical discharges while turned inside out. Insulating gloves, turned inside out and exposed to such elements, are extremely susceptible to ozone and ultraviolet light degradations.

10. STORAGE

10.01 The quality and physical condition of insulating gloves will be maintained if they are properly stored. Folds, kinks, and creases can develop a weakness in the rubber and decrease the life expectancy of the insulating gloves.

10.02 Fabric liner gloves and leather protector gloves, where required, shall be stored with the insulating gloves so that they are available for use. Each of these gloves shall be dry before being stored.

10.03 Fabric liner gloves and leather protector gloves shall be separated from the insulating gloves before being stored.

10.04 Store the insulating gloves vertically in the B glove bag with the gauntlets down and between the fabric liner gloves and the leather protector gloves.

10.05 The storage method is as follows: stack a protective glove palm down, then an insulating glove palm up, the fabric liners and the other insulating glove palm down, and the last protective glove palm up.

Note: This method is used as an extra precaution to prevent damage to the insulating gloves from possible splinters or creosote that may be on the leather protector gloves. In addition, the sandwiching of the insulating gloves between the protector gloves will give added protection in the event a sharp object may press against the storage bag. Protector gloves do not apply to D and F insulating gloves when they are used in central offices.

10.06 Grasp all gloves together at the cuff in one hand and slide the hand holding the cuffs into the bag (Fig. 7). Insulating gloves must be stored with the fingers up to prevent them from collapsing or putting undue stress on the finger area (Fig. 8). When closing the zipper, keep one finger inside, guiding the zipper, to ensure that the insulating gloves are not pinched.

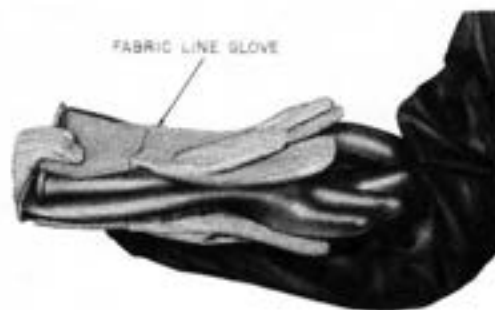


Fig. 7—Stacking Gloves



Fig. 8—Placing in Storage Bag

10.07 Insulating gloves deteriorate even when not in use. This deterioration is caused by ozone in the atmosphere reacting with the glove material to produce fine surface cracks. Ozone deterioration will be materially reduced if the gloves are stored as outlined in paragraphs 10.05 and 10.06 without bends or folds and protected from light, edged tools, and from pressure due to heavy objects. Do not store insulating gloves in unventilated rooms containing ozone producing apparatus or equipment such as commutator-type electric motors and generators. Never place insulating gloves near steam pipes, radiators, or in places where they will be subject to heat, as heat will impair the strength of the glove material. For maximum protection of the gloves, one of the following methods of storage shall be employed:

- (1) On motor vehicles, insulating gloves and associated leather protector and fabric liner gloves shall be kept in the glove bag, tightly zippered and stored in locations suitable for that purpose. They are not to be exposed to edged tools or pressure from weighted objects.
- (2) With tool bags, insulating gloves and associated leather protector and fabric liner gloves shall be kept tightly zippered in the glove bag, which should be attached to the tool bag.

Note: Care should be taken to attach the glove bag so it will be flat against that side of the tool bag which is away from the body when the tool bag is carried.

- (3) When kept in cable splicing trailers, insulating gloves and associated leather protector and

fabric liner gloves shall be kept in the glove bag, tightly zippered and stored to avoid contact with edged tools and pressure from heavy objects.

- (4) When the insulating gloves and associated leather protector and fabric liner gloves are being carried for use intermittently they shall be kept tightly zippered in the glove bag, attached to the body belt.
- (5) If they are stored in lockers, desks, or offices, insulating gloves shall be kept in the chipboard container in which they are supplied by the manufacturer, or in which they are returned from the routine electrical test. This container affords reasonable protection against ozone deterioration because of restricted air circulation and the fact that a reaction between ozone and cellulose decomposes the former into a less active oxygen.
- (6) When kept in central offices, the insulating gloves and fabric liners shall be kept in the glove bag tightly zipped and hung on a frame in a convenient, obvious, and easily accessible location. Keep away from sources of extreme heat, ozone generation, and physical abuse.

11. DISPOSITION OF INSULATING GLOVES REQUIRING ELECTRICAL TEST

11.01 Storekeepers are responsible for insulating gloves in the storerooms and employees are responsible for insulating gloves which they have in the field. The dates of "Return for Tests" are stamped upon the backs of the gloves and in the space on the boxes provided for that purpose.

11.02 Employees shall see that gloves in the field are returned to the storeroom or office prior to the "Return for Test" date. Replacement gloves shall be available before returning the gloves to be tested.

Note: The "do not" information, after the date that appears on the glove carton, is intended for Western Electric distribution only and does *not* apply to the Bell System Operating Companies.

11.03 Storekeepers shall see that all gloves in their possession are returned for inspection on the dates indicated to the Western Electric Branch House or other authorized inspection agency.

If, however, gloves are held beyond this date, they shall not be used or issued until retested.

11.04 All insulating gloves, before being returned to the Western Electric Company or other authorized agent, shall be given a careful inspection in accordance with Part 7 and a careful test in accordance with Part 8. Gloves with obvious defects shall be junked in accordance with Part 12.

12. DISPOSITION OF DEFECTIVE INSULATING GLOVES

12.01 Gloves with obvious defects should have the front cut open from the fingers to the top of the gauntlet and should be disposed of as junk in accordance with the locally established routine.

REFERENCE

LADDERS

SAFETY PRECAUTIONS, DESCRIPTION, TRANSPORTING, AND USE

| CONTENTS | PAGE | 1. GENERAL |
|--|------|--|
| 1. GENERAL | 1 | 1.01 This section describes the extension ladders and standard attachments used in the Bell System and specifies methods for using the ladders and attachments safely. |
| 2. SAFETY PRECAUTIONS | 2 | 1.02 This section is reissued to: |
| A. Locating | 2 | • Add information on the combination foot |
| B. Defective Ladders | 2 | • Add information on the double pulley option |
| C. Handling | 2 | • Add information on the B ladder pad |
| D. Securing Ladder | 2 | • Add information on the ladder wedge |
| E. Precautions While Using Ladders | 3 | • Add information on the E ladder support |
| 3. DESCRIPTION | 3 | • Revise information on vehicle mounting |
| 4. TRANSPORTING | 3 | • Revise information on carrying ladder |
| A. Transporting on Vehicles | 3 | • Revise text, illustrations, and format to agree with Section 081-740-105. |
| B. Transporting by Hand | 4 | Since this is a general revision, arrows ordinarily used to indicate changes have been omitted. |
| 5. USE | 4 | 1.03 For detailed descriptive and ordering information, refer to Section 081-740-105. |
| A. Selecting Footing | 4 | |
| B. Supporting Upper End | 4 | |
| C. Raising and Lowering (One-Person Method) | 6 | |
| D. Raising and Lowering (Ladders Over 28 Feet) | 6 | |
| 6. OPTIONS AND ACCESSORIES | 6 | |

NOTICE

Not for use or disclosure outside the Bell System except under written agreement

2. SAFETY PRECAUTIONS**A. Locating**

2.01 Where possible, locate ladders on strand from the field side of the cable to avoid vehicular traffic.

2.02 If the ladder must be placed on the strand from the street side of the cable, the company vehicle shall be parked in gear with the brakes set and wheels chocked to provide maximum protection for the ladder without obstructing traffic. In addition, warning signs, flags, traffic cones, or flashing signals shall be placed to divert traffic as discussed in Section 620-135-010.

2.03 Avoid placing a ladder in front of a doorway, especially where the door opens toward the ladder. If this is unavoidable, place barricades and block door open, or lock the door closed.

2.04 Avoid placing a ladder near passageways, moving machinery, or where pedestrians or any type of vehicles may strike or displace it. If this is unavoidable, place warning devices or barricades at these locations.

2.05 *Do not place a ladder inside or opposite an angle formed by wires or cables where loosening of the wire or cable attachments might cause the ladder to move or fall.*

2.06 Do not place a ladder against a suspension strand which is held under tension by a strand puller only.

2.07 Do not place a ladder against the support wire of multiple drop wire.

2.08 Do not place a ladder where it may come in contact with power lines.

B. Defective Ladders

2.09 Use only approved-type extension ladders.

2.10 Do not use ladders with defective or missing rungs, defective side rails, or defective hardware items.

2.11 Do not spill or splatter paraffin on a ladder. Wood or aluminum coated with paraffin is very slippery and can cause an accident.

C. Handling

2.12 Do not carry an extension ladder from one location to another while it is extended. Fully retract the fly (upper) section, secure the ladder rope, and then extend it again at the new location.

2.13 Point the spurs forward and downward when carrying a ladder on the shoulder.

2.14 Do not swing the ladder into the path of passing vehicles or pedestrians when carrying a ladder or removing it from a vehicle.

2.15 Extension ladders shall be erected with the fly section on top (toward the climber) of the base (lower) section in the overlap area.

2.16 Keep hands and feet off the rungs when raising or lowering the fly section. Stand clear when the fly section is being lowered so it will not strike the feet (see Part 5).

Note: Do not allow fly section to free-fall while lowering.

D. Securing Ladder

2.17 Ladders shall not be used to gain access to a roof unless the top of the ladder is extended at least 3 feet above the point of support, at eave, gutter, or roofline.

2.18 Make certain that ladder locks are engaged properly and the ladder rope is tied securely to one of the rungs of the bottom section before climbing an extension ladder.

2.19 If the ladder is equipped with ladder hooks and the ladder is to be used on aerial cable, turn the hooks to the working position before the ladder is raised. Ladder hooks shall be placed on the cable strand unless ladder is to be lashed as covered in Part 5. Do not turn the hooks in before descending the ladder.

2.20 Ladders not equipped with ladder hooks shall be positioned against the strand with a minimum of 3 feet of ladder length extending

above the strand when the craft person is in position on the ladder.

E. Precautions While Using Ladders

- 2.21 Always select a ladder of sufficient length for the work to be done. The length of the ladder shall be such that the work can be performed when standing no higher than on the fourth rung from the top, thus permitting the side rails to be grasped conveniently. Do not place ladder on boxes, barrels, or other objects to obtain additional height. If the ladder is too short for the work at hand, obtain a longer ladder. The maximum working length for the various sizes of ladders is listed in Table A.
- 2.22 Be especially careful when going up or down ladders during wet or icy weather.
- 2.23 **Do not climb a ladder while wearing climbers.**
- 2.24 Do not hurry when going up or down a ladder. Take one step at a time. Always face the ladder when going up or down and be sure to have both hands free.
- 2.25 Only one person at a time is permitted on a ladder.
- 2.26 When a ladder is lashed, or otherwise secured so it cannot slip, shift, or fall, the security of the craft person may be improved by placing one leg between the rungs.
- 2.27 When the top end of the ladder is secured to suspension strand or other support, the craft person shall secure himself by passing the safety strap around one or two rungs and around one side rail.
- 2.28 When the ladder is properly placed on the strand, (hooks over strand or 3 feet above strand) pass the safety strap around the strand and one side rail between two rungs.
- 2.29 **The craft person shall always remember to first make the ladder secure and then secure oneself on the ladder to avoid falling, in the event of slipping, loss of balance, or if something else goes wrong.** The manner in which the craft person is secured to the ladder will depend

on the security of the ladder, and the nature of the work to be done.

- 2.30 Do not throw tools or materials to a craft person working on a ladder; raise them by means of a handline. Be careful that tools or materials being used aloft cannot fall on persons passing below.
- 2.31 Do not attempt to lean to the side so far that the outside shoulder is more than 12 inches beyond the side rail when working on a ladder that is not lashed. Loss of footing in this position may cause loss of balance. The weight being shifted to one side of the ladder may cause it to slip at the top. Descend and move the ladder to the proper location.
- 2.32 When working from ladders, do not allow drop wires, lashing wires, handlines, or ladder ropes to dangle to the ground where they may be struck by passing vehicles. A wire or rope caught on a passing vehicle may pull the ladder causing it to fall or it may pull the craft person off the ladder. The handline, when not in use, shall be tied to the lower portion of the ladder or pulled aloft.
- 2.33 Do not slide down an extension ladder.
- 2.34 Do not tie drop wires or pulling lines to ladders.
- 2.35 Do not use a ladder in a horizontal position as a platform, runway, scaffold, or bridge.

3. DESCRIPTION

- 3.01 Extension ladders and their features are listed in Table B and are shown in Fig. 1, 2, and 3.

4. TRANSPORTING

A. Transporting on Vehicles

- 4.01 When transporting ladders on trucks or other motor vehicles, always fasten them securely in their proper position in the brackets provided for that purpose. Never use wire for securing a ladder to the brackets of a truck. A ladder hanging loosely on the brackets of a truck will be marred, cracked, and weakened by road shocks.

Warning: The E fiberglass extension ladder shall be transported only on vehicles equipped with brackets designed for the fiberglass ladder or on vehicles whose brackets have been modified to accept the fiberglass ladder. Failure to use proper brackets may damage the ladder.

Note: Ladder brackets designed to be used with both wood and fiberglass ladders shall be adjusted to fit the type of ladder being transported.

4.02 Mount ladders on vehicles equipped with roof-type ladder brackets as illustrated in Fig. 4.

4.03 Mount ladders on vehicles equipped with ladder aid and roof-type ladder brackets as illustrated in Fig. 5.

4.04 Drivers of motor vehicles transporting ladders shall exercise caution to avoid letting the ladder strike trees, posts, walls, or other objects, especially when backing or turning corners. Any ladder subjected to such a shock shall be carefully inspected prior to use in accordance with Section 081-740-105.

4.05 If an extension ladder extends an excessive distance (3 feet in most cases) beyond the rear of a motor vehicle, attach a warning flag or light to the projecting end of the ladder.

B. Transporting by Hand

4.06 Carry extension ladders as shown in Fig. 6 or 7.

4.07 An alternate one-person method of carrying an extension ladder is shown in Fig. 8.

5. USE

A. Selecting Footing

5.01 Before attempting to position a ladder, select the appropriate position (spur or pad) of the combination feet to provide maximum security of the base (Fig. 31).

5.02 Exercise care when positioning ladders before climbing. The correct angle is obtained

when facing the ladder with your toes placed against the siderails; you should be able to grasp the siderails with your hands by reaching straight out (Fig. 9 and 10). When this is accomplished, the ratio of B/A should be approximately 1/4.

5.03 Set the ladder only on secure footing. Set both feet of the ladder at the same level and on a line parallel to the surface on which the top of the ladder rests. If necessary, a B ladder leveling wedge on a B ladder foot for wooden ladders may be used to level the base of the ladder (Fig. 11, 34, and 41) or earth may be removed from beneath the high side to bring it to the level of the lower side. **Do not increase the length of a side rail by nailing, clamping, or tying a board to it.** If a ladder leans to the right or left, it is not properly placed. A ladder properly placed is shown in Fig. 12.

5.04 When it is impossible to avoid placing the base of the ladder on a surface where it might slip, such as on wet or oily pavement, a smooth floor, or icy or metal surfaces, tie the base of the ladder securely in place. If this is impractical, the ladder must be held by another craft person. The person holding the ladder shall be on the alert at all times to protect the person on the ladder and anyone passing below. Never leave a raised ladder unattended under these conditions. The ladder might slip and cause injury, damage, or both.

B. Supporting Upper End

5.05 Objects against which the top of the ladder will be placed shall be sufficiently rigid and have ample strength to support the ladder and the craft person performing necessary work operations.

5.06 Before placing a ladder against suspension strand, test the strength of the strand and its supports as outlined in Section 627-295-500.

5.07 When using a ladder on a strand having a fairly steep slope, secure the ladder with rope to prevent the top of the ladder from sliding along the strand. Before raising the ladder, throw or place a handline over the strand and secure one end of the handline to the second rung from the top of the fly section. After placing the ladder on the strand, pull the other end of the handline taut and secure it to an adequate support on the

uphill side of the ladder, such as a pole, tree, or digging bar firmly anchored in the ground. If no such anchorage is obtainable, secure the ladder to the cable and strand by throwing the handline over the strand again, so the rope passes twice around the cable and strand. Tie the rope securely to a rung on the base section of the ladder.

5.08 When a ladder is placed against the strand and heavy work such as pulling or lifting is to be done, lash the ladder to the strand with a short length of rope, as shown in Fig. 13. Where the cable is supported in rings, pass the lashing rope around the strand only; where the cable is lashed, pass the lashing rope around the strand and cable. ***Do not move the base of the ladder after the upper end has been secured to the strand.***

5.09 When pushing or pulling heavy loads from a working position on a ladder, exercise care not to place undue stress on the ladder which would tend to dislodge it.

5.10 When using a ladder on a suspension strand that is attached to a building wall, wherever possible, place the ladder so it will tend to push the wall attachment against rather than away from the building wall.

5.11 When placing a ladder against a tree, select the tree trunk or its larger limbs for support. When it is necessary to place a ladder so the top rung rests against a tree trunk or similar object, a handline may be thrown or placed with a wire-raising tool or tree pruner handle over a tree limb, tied to the top rung of the ladder, and used to assist in raising the ladder. After the ladder has been placed, tie the free end of the handline to one of the lower rungs, thus holding the ladder until a more secure lashing is made. The ladder shall be lashed securely at one or two points to prevent the ladder from twisting or sliding when the craft person's weight is put on one side. The lashing can be made in the following manner with a second rope (Fig. 14):

- (a) Make a slip noose about 15 feet from the free end of the rope so the noose will tighten when the free end of the rope is pulled.
- (b) Place the slip noose over the top end of one side rail.

- (c) Pass the free end of the rope down behind and under the top rung, then toward the front of the ladder, around the rail, and then back of the tree or pole.

- (d) Make two complete wraps around the tree or pole, then pass the rope twice around the opposite rail below the first rung and then up behind the rung.

- (e) Reverse the direction of wrapping and make two half-hitches on the rail so the ladder is lashed tightly to the tree or pole.

5.12 An alternate method for lashing a ladder to a pole is shown in Fig. 15. This method makes it possible to lash the ladder prior to climbing.

5.13 Do not place an extension ladder against a window sash. If it is impractical to avoid a window, lash a board to the ladder as shown in Fig. 16 to provide support on each side of the window frame.

5.14 Ladder strand hooks (Fig. 29) shall be used on lashed, ring-supported, and self-supporting cable when the ladder is not lashed to the strand.

Caution: When using ladder hooks on aerial cable, make certain the ladder is placed on firm and level footing to prevent the ladder from twisting or sliding along the strand.

A greater margin of safety is provided with the hooks in the working position even if the ladder is lashed to the strand and especially when placing and removing the ladder.

Note: Turn ladder hooks in between rails when the ladder is to be placed against building walls or other flat surfaces, mounted on trucks, or stored.

5.15 To prevent possible damage to a building having fragile siding, such as enameled aluminum, asbestos, etc, attach a ***B ladder pad*** (Fig. 37) to the top section of the ladder before it is placed against the structure.

5.16 The ***D and E ladder supports*** are used to support the upper end of the ladder permitting the craft person to sit or stand between

the ladder and the cable using the C or D ladder platform (see Fig. 40 through 46).

C. Raising and Lowering (One-Person Method)

5.17 The one-person method of raising an extension ladder, 28 feet or less, to a suspension strand is illustrated in Fig. 16 through 21.

5.18 The one-person method of raising an extension ladder, 28 feet or less, to a wall or building is illustrated in Fig. 22, 23, and 24.

5.19 The one-person method of lowering an extension ladder is illustrated in Fig. 25 and 26.

D. Raising and Lowering (Ladders Over 28 Feet)

5.20 Under certain ideal conditions, it may be possible for one craft person to safely raise and lower ladders longer than 28 feet (see paragraphs 5.17, 5.18, and 5.19).

5.21 The two-person method of raising an extension ladder is illustrated in Fig. 27 and 28.

6. OPTIONS AND ACCESSORIES

6.01 The options and accessories available for use with extension ladders are listed in Table C and are shown in Fig. 29 through 47.

6.02 The installation and the use of extension ladder accessories, where applicable, are contained in Part 5 of this section.

TABLE A

| WORKING LENGTHS OF EXTENSION LADDERS | | |
|--------------------------------------|-------------------------------|---------------------------------|
| SIZE OF LADDER (FEET) | MAXIMUM WORKING LENGTH (FEET) | MINIMUM NUMBER OF RUNGS OVERLAP |
| 16 | 12 | 4 |
| 20 | 16 | 4 |
| 24 | 20 | 4 |
| 28 | 24 | 4 |
| 32 | 28 | 4 |
| 36 | 31 | 5 |
| 40 | 35 | 5 |

TABLE B

EXTENSION LADDERS

| EXTENSION LADDER | RATING | MATERIAL | | AVAILABLE SIZES (FT) (NOTE 1) | | | | | | | FIG. NO. | |
|------------------|--------|----------------------|----------------------|-------------------------------|----|----|----|----|----|----|----------|---|
| | | RAILS | RUNGS | 16 | 20 | 24 | 28 | 32 | 36 | 40 | | |
| C | STD | Solid wood (Treated) | Solid wood (Treated) | X (Note 2) | X | X | X | X | X | X | X | 1 |
| E | STD | Fiberglass | Aluminum | | | X | X | | | | | 2 |
| D | MD | Laminated wood | Aluminum | | | X | X | | | | | 3 |

Note 1: The size shown is the sum of the length of the two sections, not the length the ladder is designed to reach.

Note 2: Rope for raising top section is not provided with 16-foot ladder.

TABLE C
EXTENSION LADDER ACCESSORIES

| ACCESSORY | RATING | FIG. NO. | FOR USE WITH EXTENSION LADDER | COMMENTS |
|----------------------------------|--------|----------|--|---|
| Rail coating (protective finish) | STD | — | E | Factory option — to protect against prolonged adverse environmental effects |
| Ladder hooks | STD | 29 | C and E | Factory option — enables ladder to be used for work on aerial cables |
| Double pulley arrangement | STD | 30 | C and E | Factory option — provides an increased mechanical advantage in raising or lowering fly section of ladder |
| Combination foot | STD | 31 | C and E | Factory installed — provides secure footing on various surfaces |
| B ladder pulley kit | STD | 32 | All 20-, 24-, 28-, 32-, 36-, and 40-foot | Same as double pulley arrangement installed locally (see Fig. 33) |
| B ladder foot | STD | 34 | C and D | Temporarily installed to provide level footing on uneven surfaces |
| B ladder tread | STD | 35 | All | Provides more comfortable footing and reduces fatigue when working at constant height for extended period of time |
| B ladder leveling wedge | STD | 36 | All | Provides level footing on uneven surfaces |
| B ladder pad | STD | 37 | All | Improves stability and protects siding such as aluminum, asbestos, and vinyl against scratches and dents |
| C ladder platform | STD | 38 | All | Provides a seat for the crafts-person while aloft (used with D or E ladder support) (Note 1) |
| D ladder platform | STD | 39 | All | Reduces fatigue when working at constant height for extended period of time (Note 1) |

Note 1: If the platform support hooks or lower supports and their associated latches do not slip readily over the rungs of the fiberglass ladder, they may be adjusted by spreading with a standard 1-inch iron pipe (1-5/16 inch od). The platform shall fit freely at all bearing points and the latches should readily engage.

TABLE C (Contd)
EXTENSION LADDER ACCESSORIES

| ACCESSORY | RATING | FIG. NO. | FOR USE WITH EXTENSION LADDER | COMMENTS |
|------------------|--------|-----------|-------------------------------|---|
| D ladder support | STD | 40 | C and D | Clamps to strand to support upper end of ladder providing area for sitting or standing between ladder and cable (See Fig. 40 thru 43) — cannot be used with E fiberglass extension ladder |
| E ladder support | STD | 44 | All | Clamps to strand to support upper end of ladder providing area for sitting or standing between ladder and cable (see Fig. 45 and 46) |
| Ladder pad | MD | 47 | C and D | Superseded by B ladder pad |
| B ladder support | MD | Not shown | C and D | Superseded by D ladder support—cannot be used on 6.6M strand |
| C ladder support | MD | Not shown | C and D | Superseded by E ladder support—cannot be used on 6.6M strand |

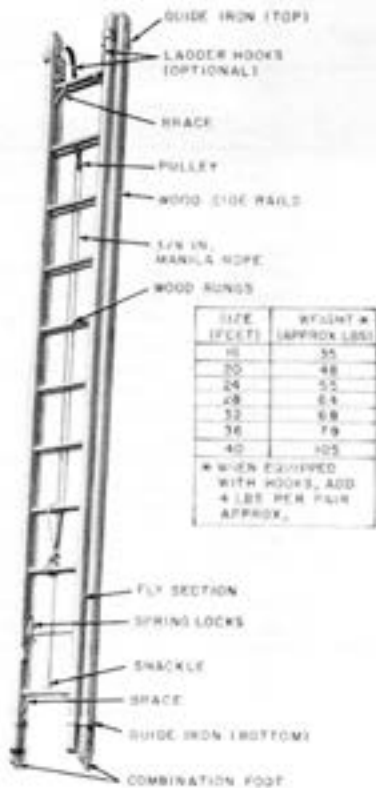


Fig. 1—C Extension Ladder

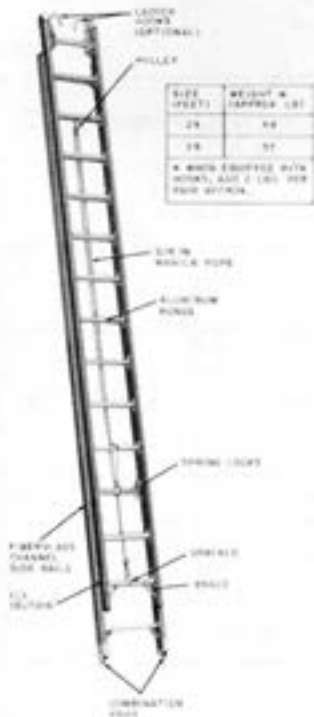


Fig. 2—E Extension Ladder

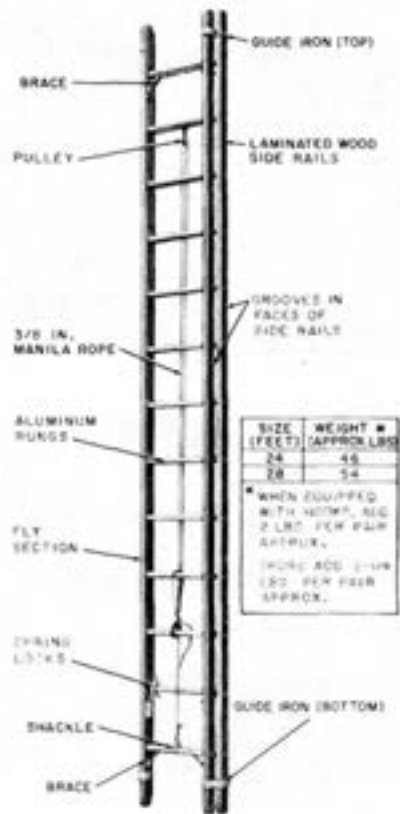


Fig. 3—D Extension Ladder (MD)



Fig. 4—Mounting Ladder on Roof-Type Ladder Bracket



Fig. 5—Mounting Ladder on Roof-Type Ladder Bracket—Vehicle Equipped With Ladder Aid



Fig. 6—One-Person Method of Carrying an Extension Ladder

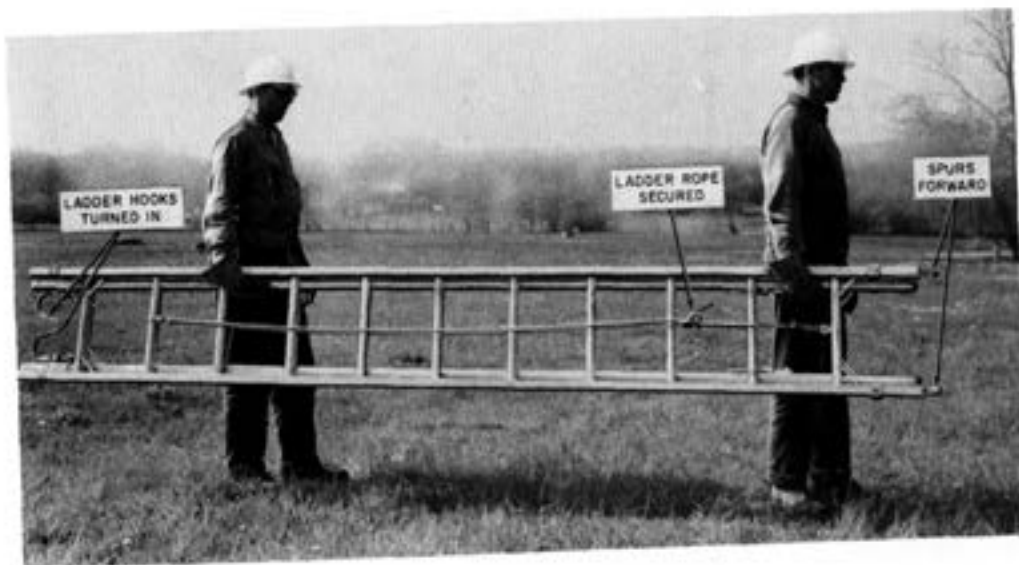


Fig. 7—Two-Person Method of Carrying an Extension Ladder



Fig. 8—Alternate One-Person Method of Carrying an Extension Ladder

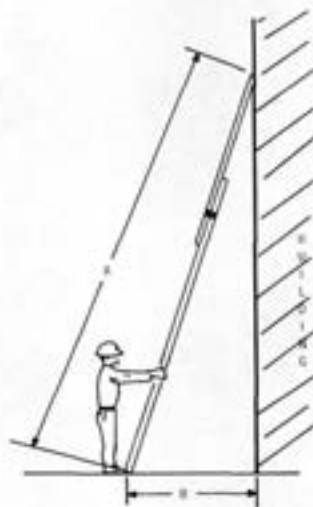


Fig. 9—Ladder Placed Against Wall

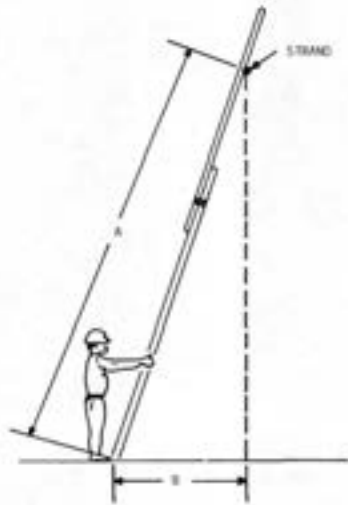


Fig. 10—Ladder Placed Against Strand

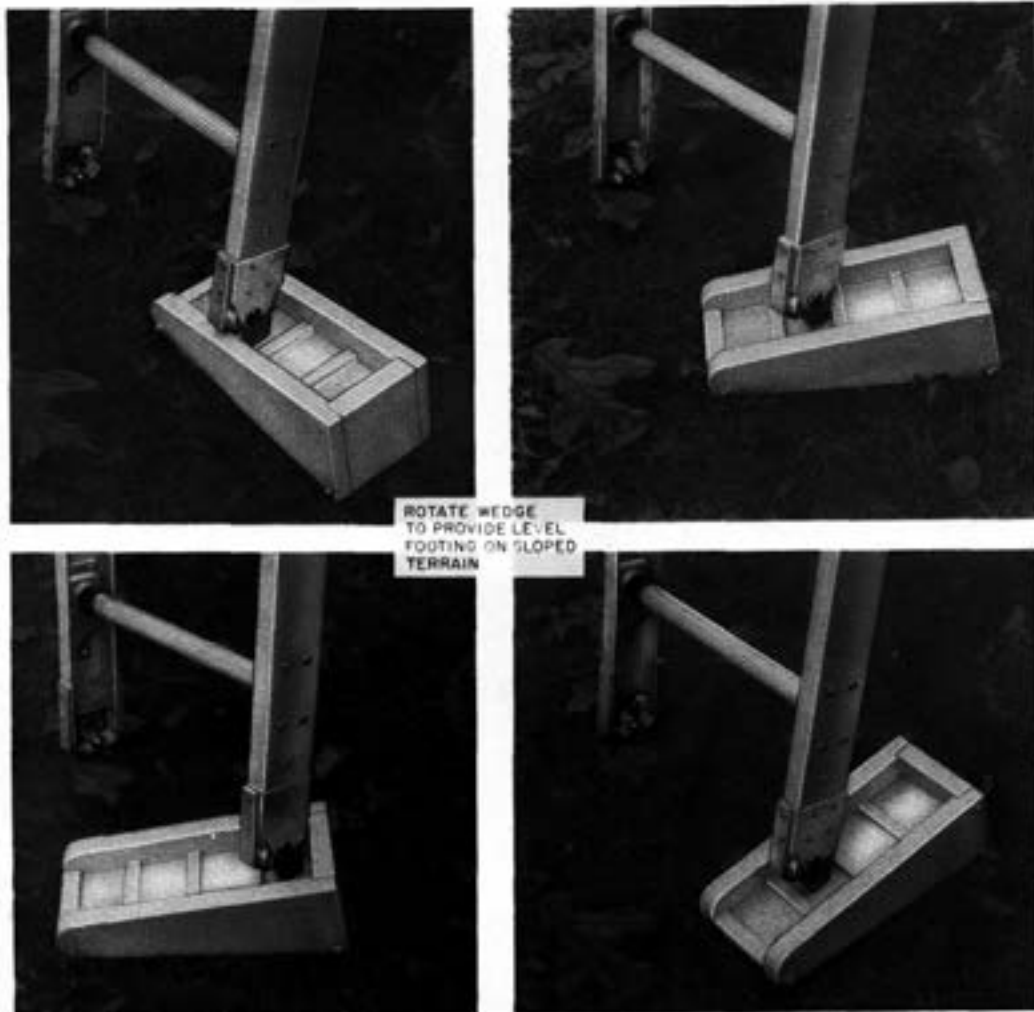


Fig. 11—B Ladder Leveling Wedge in Use



Fig. 12—Base of Ladder Properly Positioned

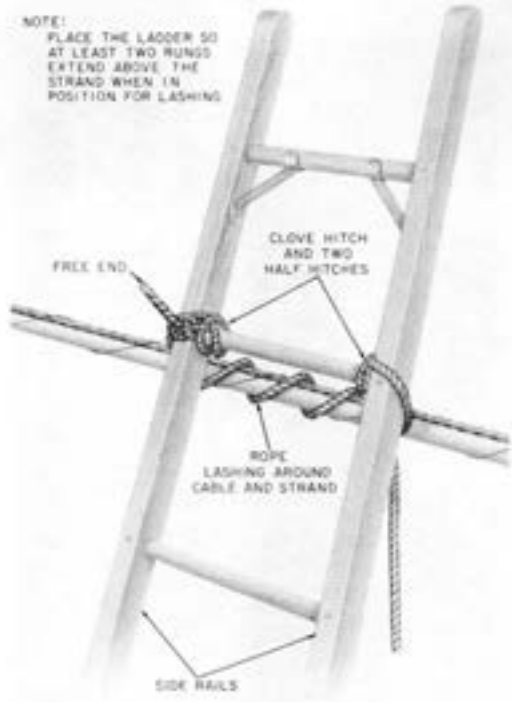


Fig. 13—Lashing Ladder to Strand

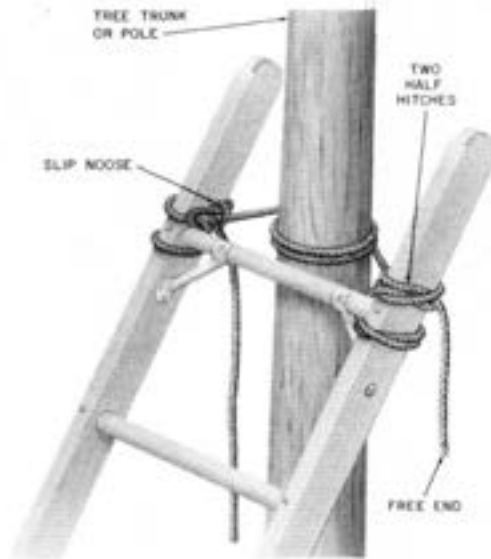
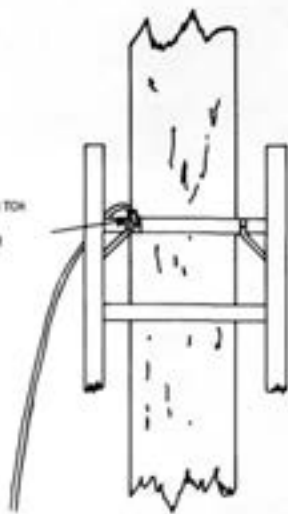


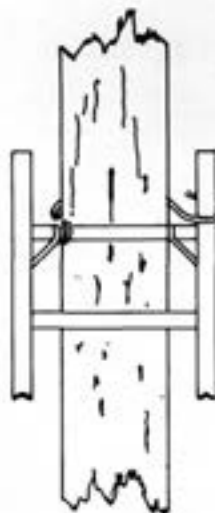
Fig. 14—Ladder Lashed to Tree or Pole

SECURE END OF HANDLINE WITH CLOVE HITCH AND TWO HALF HITCHES PRIOR TO RAISING LADDER.



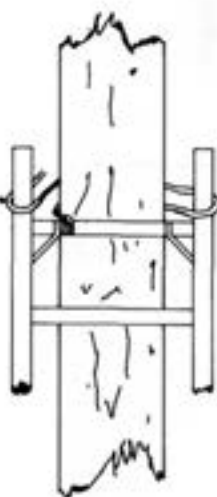
(A)

BRING HANDLINE BEHIND POLE AND LOOP AROUND RAIL.



(B)

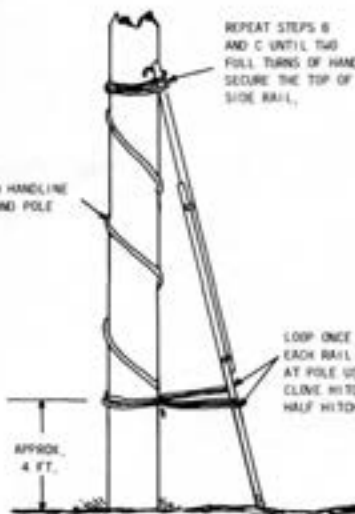
BRING HANDLINE BACK BEHIND POLE AND LOOP AROUND RAIL.



(C)

REPEAT STEPS B AND C UNTIL TWO FULL TURNS OF HANDLINE SECURE THE TOP OF EACH SIDE RAIL.

WIND HANDLINE AROUND POLE



(D)

LOOP ONCE AROUND EACH RAIL AND TIE AT POLE USING A CLOVE HITCH AND TWO HALF HITCHES.

APPROX. 4 FT.

Fig. 15—Alternate Method of Lashing Ladder to Pole



Fig. 16—Ladder Placed in Front of Window

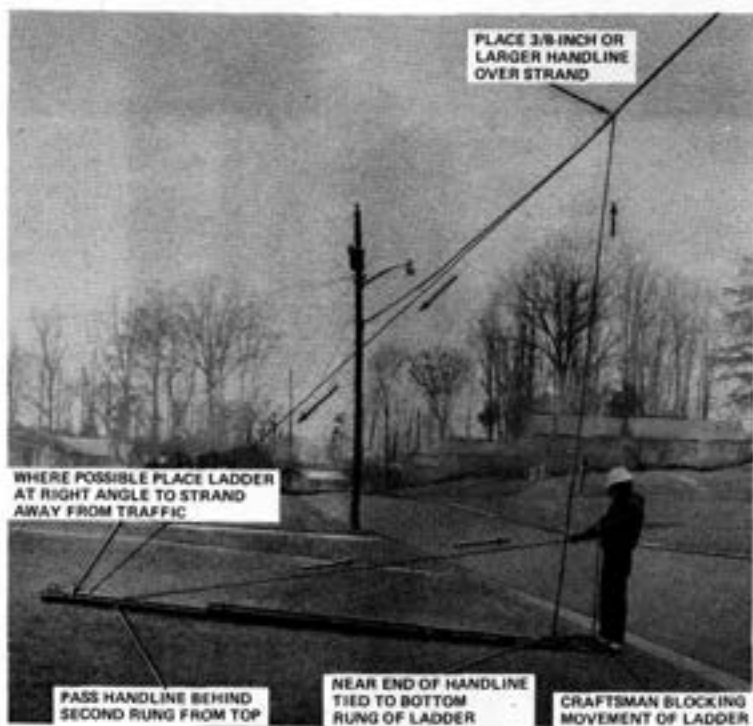


Fig. 17—Preparing to Raise Extension Ladder



Fig. 18—Ladder Partially Raised



Fig. 19—Ladder in Vertical Position



Fig. 20—Method of Securing Handline



Fig. 21—Ladder in Working Position



Fig. 22—One Person Raising Ladder



Fig. 23—Preparing to Extend Fly Section



Fig. 24—Fly Section Extended



Fig. 25—Preparing to Lower Fly Section



Fig. 26—Fly Section Lowered



Fig. 27—Two Persons Raising Ladder

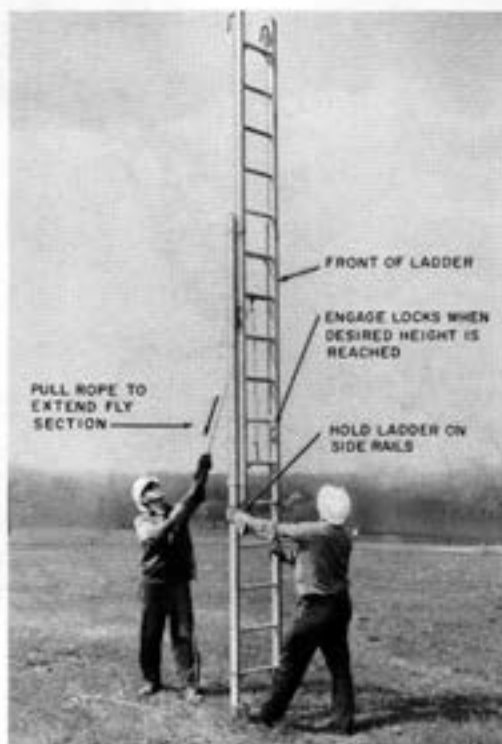


Fig. 28—Two-Person Method of Extending Fly Section

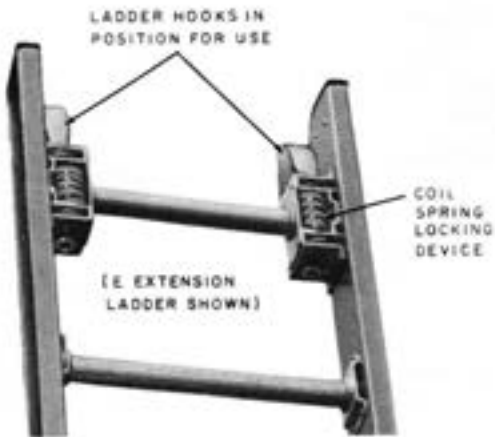
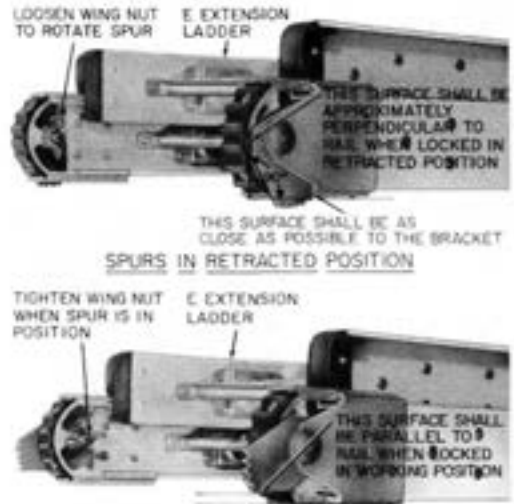


Fig. 29—Ladder Hooks



SPURS IN WORKING POSITION

Fig. 31—Combination Foot

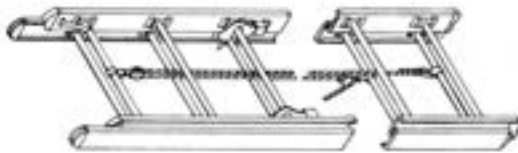
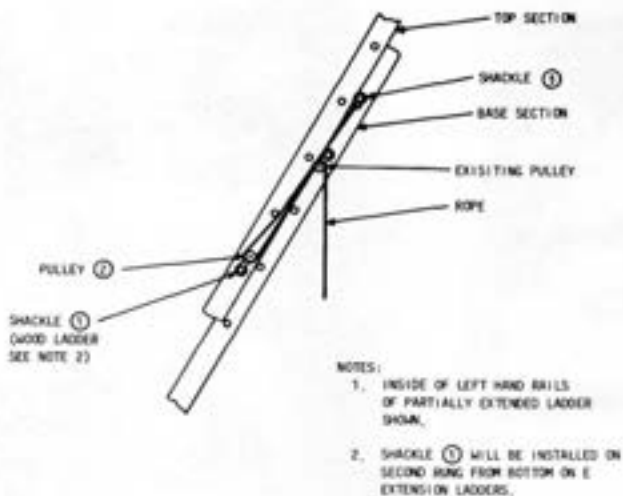


Fig. 30—Double Pulley Arrangement



Fig. 32—B Ladder Pulley Kit



ASSEMBLY PROCEDURE:

1. REMOVE EXISTING LADDER ROPE BY REMOVING NUT AND BOLT FROM SHACKLE 1
2. INSTALL PULLEY SUPPLIED IN KIT 2 IN SHACKLE 1
3. INSTALL SHACKLE SUPPLIED IN KIT 1 ON TOP RING OF BASE SECTION AND ATTACH THE ROPE TO THIS SHACKLE WITH 1/4-20 NUT AND BOLT PROVIDED.
4. THREAD ROPE THROUGH PULLEYS AS SHOWN ABOVE.

Fig. 33—Installing B Ladder Pulley Kit

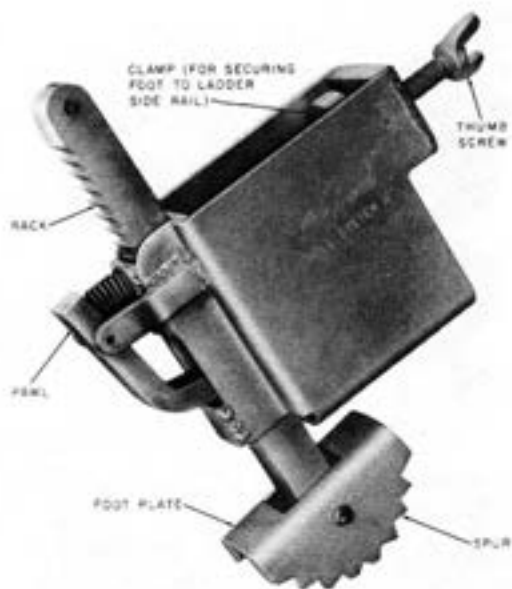


Fig. 34—B Ladder Foot

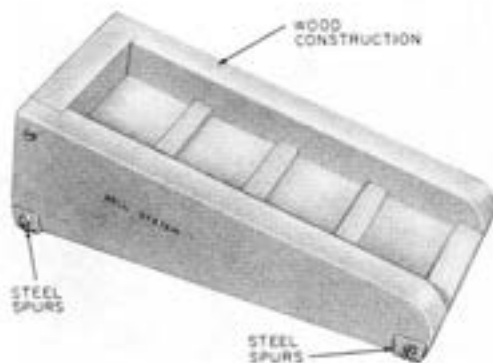


Fig. 36—B Ladder Leveling Wedge

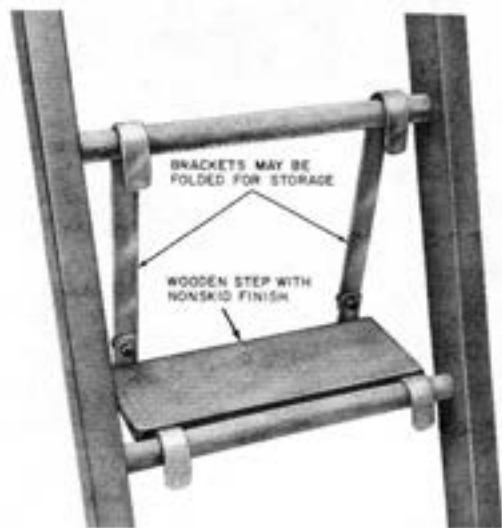


Fig. 35—B Ladder Tread in Working Position

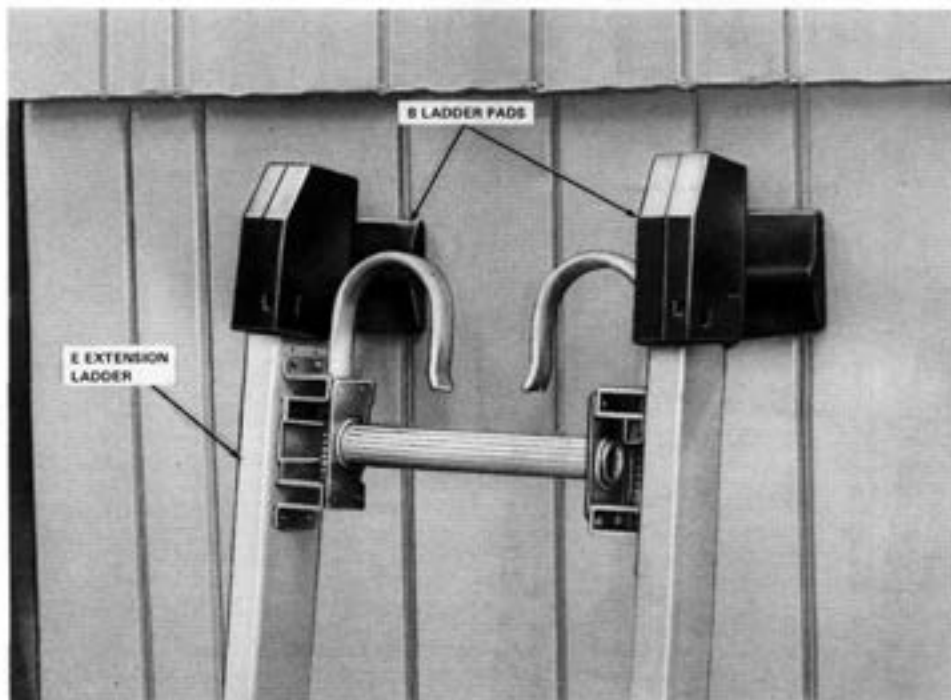
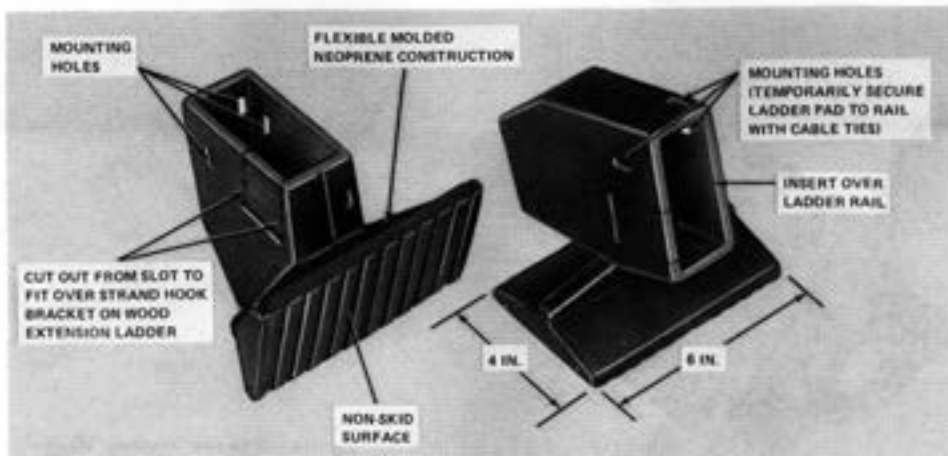


Fig. 37—B Ladder Pad

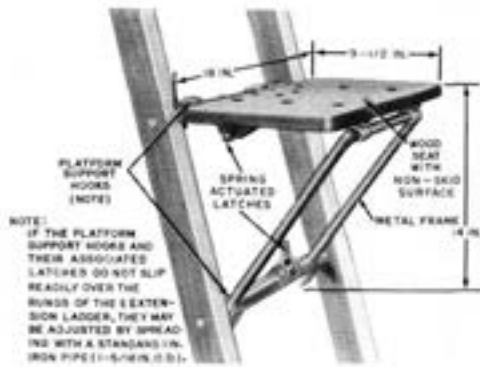


Fig. 38—C Ladder Platform

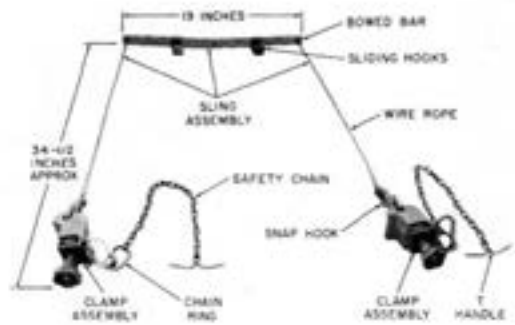


Fig. 40—D Ladder Support

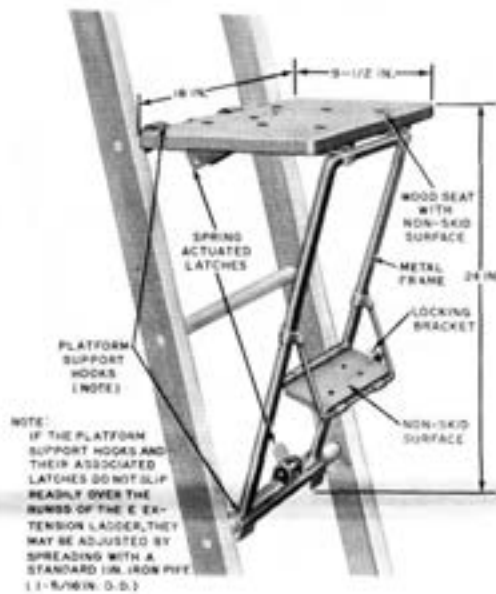


Fig. 39—D Ladder Platform

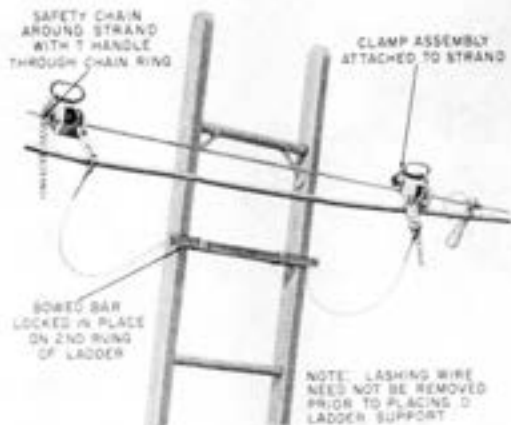


Fig. 41—D Ladder Support Attached to Strand



Fig. 42—D Ladder Support in Use

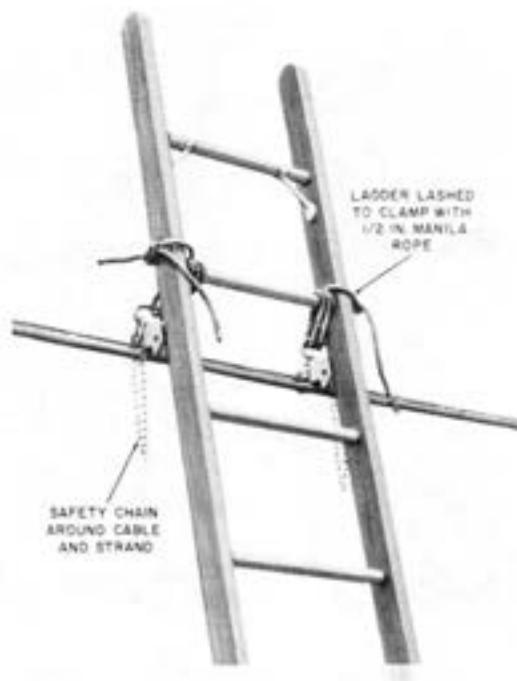


Fig. 43—Ladder Attached to Strand With D Ladder Support Clamps

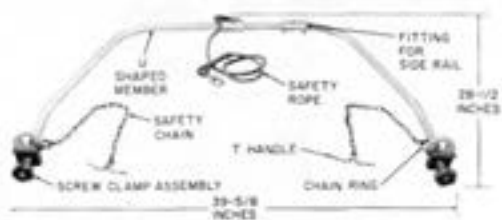


Fig. 44—E Ladder Support

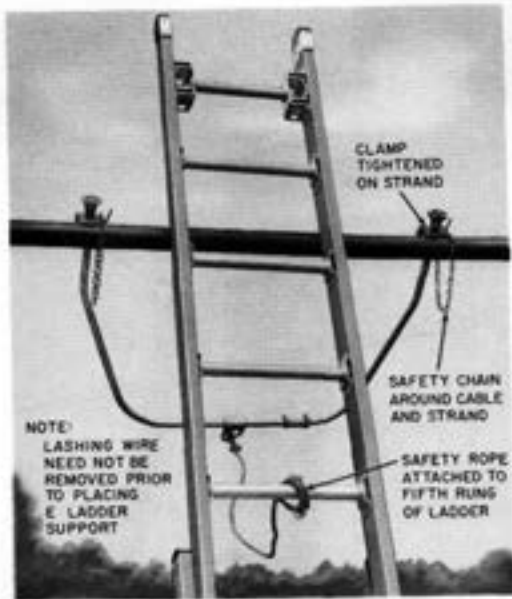


Fig. 45—E Ladder Support in Position on Strand



Fig. 46—E Ladder Support in Use

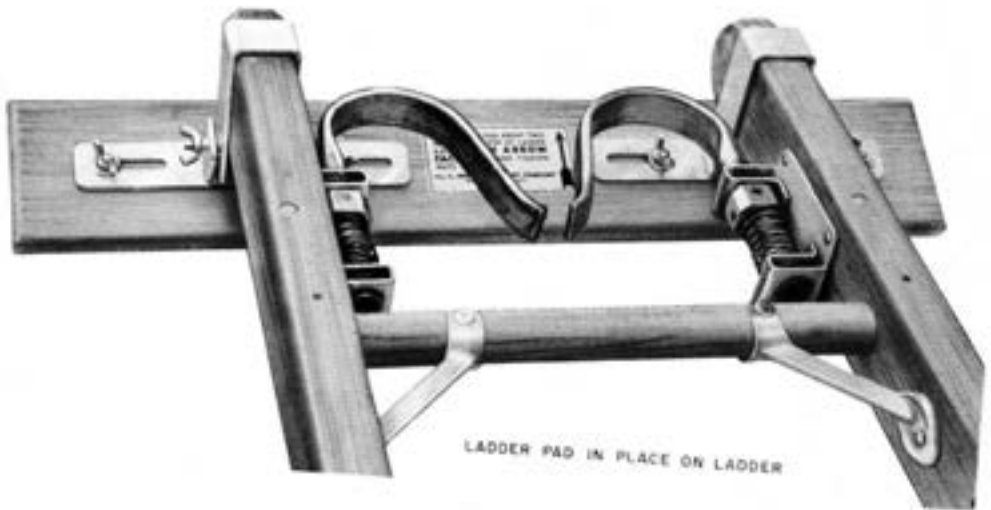
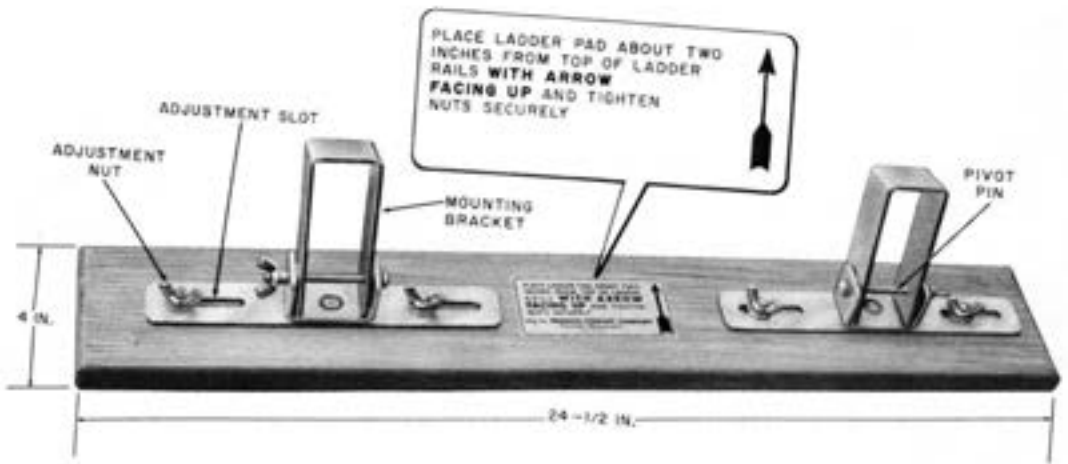


Fig. 47—Ladder Pad (MD)

CLIMBING PRECAUTIONS

1. GENERAL

1.001 This addendum supplements Section 460-300-110, Issue 1. Place this pink sheet ahead of Page 1 of the section.

1.002 This addendum is reissued to change the section numbers in Division 620 referred to in the section and in Issue 1 of this addendum.

1.003 Issue 1 of this addendum was issued to clarify whether or when a pole can be climbed if a B or C pole tag has been affixed to a pole.

2. CHANGES TO SECTION

ISSUE 1 CHANGES

2.001 On Page 1, revise paragraph 1.02 as follows:

1.02 Further tests required when hanging an aerial platform or riding strand in a cable

car are outlined in Sections 620-131-010 and 627-295-500. If the results of tests indicate poles must be temporarily supported, refer to Section 620-131-010.

ISSUE 2 CHANGES

2.002 On Page 5 add the following to paragraph 2.28:
It serves as a warning to craftspeople that the pole is defective and should **not** be climbed or worked on without following the recommendations of Section 620-131-010.

2.003 On Page 5 add the following to paragraph 2.29:
It serves as a warning to craftspeople that the pole is in a dangerous condition and should not be climbed or worked on before being temporarily supported as described in Section 620-131-010.

NOTICE

Not for use or disclosure outside the
Bell System except under written agreement.

Printed in U.S.A.

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SEE ADDENDUM

CLIMBING PRECAUTIONS

1. GENERAL

1.01 The tests and inspections described in this section should be performed, except as stipulated before climbing a pole or placing a ladder against a pole, against the strand in a pole-to-pole span or a pole-to-building span.

1.02 Further tests required when hanging an aerial platform or riding strand in a cable car are outlined in Sections 620-131-010, 630-132-010, and 627-295-500. If the results of tests indicate poles must be temporarily supported, refer to Section 620-133-010.

1.03 It is unnecessary to make tests or to apply a temporary support before climbing a pole, if **any** of the following conditions will exist throughout the work operations:

- (a) The pole is storm guyed on four sides.
- (b) The pole carries two or more storm side guys and a load as described in 1.04 (b).
- (c) The pole is part of an H fixture which is provided with head and back guys.
- (d) The pole is not in a straight section of a line, but is an adequately guyed corner pole and carries a load as described in 1.04 (b).

1.04 It is also unnecessary to make tests or to apply a temporary support before climbing a pole if **all** of the following conditions exist throughout the work operations and the proposed work operations do not involve placing a heavy unbalanced load (excess of 150 pounds) on the pole:

- (a) The pole is in a straight section of line, but is not a dead-end pole.
- (b) The pole is carrying a 6M or larger suspension strand which is securely clamped to it and

to each adjacent pole and will remain so attached throughout the work operations.

- (c) There is no downward change in grade at the pole.
- (d) Neither adjacent span length is in excess of 165 feet.

1.05 It is also unnecessary to make tests or to provide supplementary supports before climbing a pole if the following conditions exist:

- (a) Instead of carrying a suspension strand, the pole carries ten or more copper, copper-steel, or steel line wires which will remain securely tied at the pole and at each adjacent pole throughout the work operation.
- (b) All the other conditions described in 1.04 (a) (c), and (d) exist

1.06 It is unnecessary to make tests before placing any strand-supported equipment if the following conditions exist:

- (a) The poles supporting the span and the poles at the far end of the adjoining spans form a straight section.
- (b) The suspension strand in the span is 6M or larger and is securely clamped to the two adjacent poles on each side of the span, and will remain attached to these four poles throughout the work operation.
- (c) There is no downward change in grade at the poles at each end of the span.
- (d) The span length and the adjacent span lengths are not in excess of 165 feet each.

2. POLES—PRECAUTIONS AND TESTING

Precautions

2.01 An end pole in a line, even though head guyed, should always be examined and tested before climbing since the guy and the end spans do not contribute any stability to the pole in a direction across the line.

2.02 *No work aloft should be started unless the workman is satisfied that the pole line structure has adequate strength to support the load resulting from working aloft and the load which will result from the proposed work operations. If the strength of the pole line structure is in doubt, temporary or permanent supports must be applied before starting work.*

2.03 The failure of a pole is usually due to one or more of the following causes:

- (a) Decay of the pole at or below groundline.
- (b) Storm damage.
- (c) Mechanical damage, such as might result from a vehicle collision.
- (d) Termite, carpenter ant, or other insect attack.
- (e) Lightning damage or fire damage.
- (f) Woodpecker attack.
- (g) Application of excessive loads or creating unbalanced loads which are excessive under the existing conditions. These excessive loads may result from the use of improper or inadequate construction or maintenance methods.

2.04 Before climbing a pole or testing it for safe climbing conditions, make a visual check for the following conditions:

- (a) Excessive rake or unexplained leaning of a pole. This may be due to failure of the pole at or below groundline.
- (b) Insufficient depth of setting. This may be due to erosion of the earth around the pole as a result of heavy rainfall, flood water, road widening, etc. and would affect the stability of

the pole. The depth of setting can frequently be checked by reference to the brand which is present on most poles at a distance of ten feet (measured to the bottom of the brand) from the butt of the pole. Do not rely upon the brand mark to determine the depth of setting of non-Bell System poles.

- (c) Evidence of collision damage if the pole is at an exposed location along a highway.
- (d) Presence of fungus growth in checks or protruding from the pole surface or on areas near groundline where the wood appears water-soaked in contrast to surrounding wood. These symptoms usually indicate a condition of advanced decay in the interior of the pole.
- (e) Presence of termite or carpenter ant infestation, evidenced by mud channels or debris in the checks, wood dust at the base of the pole, or movement of ants when the pole is stuck with a hammer or other tool.
- (f) Bent, loose, or missing pole steps.
- (g) Wide seasoning checks which could result in loosening of pole steps or a climbing hazard.
- (h) Evidence of compression wood indicated by short horizontal cracks along one side of the surface of the pole, or by curling of short sections out away from the pole surface.
- (i) Presence and distribution of large knots, excessive knot clusters, climber gaff splinters, unauthorized signs, aerials, clotheslines, and nearby interfering tree growth.
- (j) Presence of large stones, ground irregularities, and debris at base of pole.
- (k) Presence of conduits or vertical runs on pole which might interfere with use of pole steps or climbing.
- (l) Broken wires in adjacent span.
- (m) Excessively tight or excessively slack drop or line wires on one side of pole.
- (n) Contact or insufficient separation between telephone and power wires or other plant

on the pole, or in the span or spans adjacent to the pole.

- (o) Woodpecker holes.
- (p) Evidence of lightning or fire damage.
- (q) Presence of markings or pole tags placed by pole inspector to indicate an unsafe pole or pole to be replaced.
- (r) Presence of ice on the pole surface or pole steps which might result in hazardous climbing.
- (s) Shell rot decay on cedar poles.

2.05 Swinging rapidly around a pole imposes an additional load on any pole and should be avoided.

2.06 Where a work operation is planned which is likely to result in a shock load on a pole or on an adjacent pole, a workman should remain off the pole to avoid being shaken off by the shock load. If the shock load would be likely to break the pole, temporary guys should first be placed to take up the shock.

2.07 *Heavy unbalanced loads, such as those caused by placing or removing conductors or strands under tension at ungued poles or inadequately guyed corners or deadends, may cause even a pole in good condition to fail.* Therefore it is important to plan the work operations so the poles will not be subjected to too heavy an unbalanced load. The use of guys or braces provides a means of preventing excessive unbalanced loads. Typical operations for which temporary or permanent supporting of poles may be required are as follows:

- (a) Removal of guys.
- (b) Untying wires.
- (c) Releasing wires or strand under tension. *Do not cut while under tension.*
- (d) Placing additional wires or strand.
- (e) Tensioning wires or strand.
- (f) Changing locations of wire or strand attachments.

(g) Loosening suspension clamps or guy clamps.

(h) Moving line because of road widening.

Testing

2.08 *In any case where suitable means for determining the condition of a pole and bracing it when necessary are not available and there is any question about the pole being sufficiently strong to permit safe climbing and safe working, do not climb the pole.* Inform your supervisor about the condition and request the necessary assistance to enable the work to be done safely.

2.09 Each of the methods of testing listed below has certain limitations and may not be applicable under the conditions existing at certain locations. It is important, therefore, to make a selection of the tests that are applicable and most suitable under the existing conditions. The tests are as follows:

- (a) Pike Pole Test
- (b) Prod and Sounding Test
- (c) Boring Test
- (d) Hand Line Test

2.10 The pike pole test is applied by making a vigorous effort to rock the pole back and forth in a direction at right angles to that of the line by pushing the pole with a 12-foot or longer pike pole. If practicable, the pike pole should be held at an angle of about 45° with the pole. If the pole cracks or breaks, the test should be discontinued immediately and the pole should be regarded as unsafe for climbing. The pole should not be rocked so hard as to cause the wires to swing together and thus introduce trouble in the circuits.

2.11 If in certain cases (particularly in connection with the longer spans of telephone open wire and power wires) it is found impracticable to rock the pole without causing the wires to swing together, the pole should be given a steady push with the pike pole, applying as heavy a push as possible. If the pole withstands such a push, it should also be subjected to the prod and sounding test before being climbed.

- 2.12** If a 16-foot pike pole is available, its use is preferred to that of a shorter size, inasmuch as it enables the push to be applied at a higher point on the pole and is therefore more effective. In those cases, however, where a 16-foot pike pole is not available, use may be made of a standard 14-foot or 12-foot pike pole or a standard 1-3/4 inch test-pike, fitted with two extension sections of the large tree pruner handle. As an alternative to the 1-3/4 inch test-pike, a standard 1-1/4 inch test-pike may be used, and it should be fitted with a tapered section and one extension section of a large tree pruner handle.
- 2.13** The pike pole test cannot effectively be applied to poles that have attachments such as wires, guys, push braces, etc., arranged in such a manner as to take the thrust of the pike, rather than permitting the thrust to be transferred directly to the pole. Some locations at which such conditions are encountered are guyed corner poles, junction poles, side storm guyed poles, etc.
- 2.14** Many of the small poles in suburban or rural leads, carrying eight wires or less have sufficient strength from a service standpoint, but can be broken by applying the pike pole test too vigorously. In applying the test to such poles, exercise reasonable care to prevent breaking those which are in serviceable condition and can be climbed safely.
- 2.15** Pavement or frozen ground surrounding poles sometimes tends to hold poles firmly, even though they may be badly deteriorated. Where such conditions exist, it is usually desirable to apply temporary supports to the pole, if there is any question as to the soundness of the pole.
- 2.16** *The pike pole test should not be applied to poles which, if they were to break off, might cause damage to nearby property or result in contact between telephone plant and electric light or power wires, or introduce some other hazardous situation.*
- 2.17** The tool used for the prod test is a pole inspector's prod or screwdriver having a 5-inch or longer blade. It is undesirable to use a heavy, pointed tool, such as a digging bar, because of the damage which such a tool can cause to the treated sapwood of a sound pole, thus reducing the effectiveness of the preservative treatment and exposing the interior of the pole to decay attack.
- 2.18** Inasmuch as the section of maximum decay is normally encountered between the groundline and a point about 12 inches below the groundline, it is desirable, if conditions permit, to excavate sufficient earth from around the pole to permit a more satisfactory examination of the pole. If, however, the pole is set in pavement, or for other reasons, it is impracticable to remove any earth, the prod should be applied as close to the groundline as practicable at any angle of approximately 45 degrees with the pole and completely around the pole. The presence of general sapwood decay or decay pockets will usually be evident from this test.
- 2.19** If the prod test indicates the presence of extensive decay, it is desirable to apply temporary supports, regardless of the original circumference of the pole, unless supports are not required (Part 1).
- 2.20** If there is no indication of decay or other reduction of strength in the prod and sounding tests and the pole has been subjected to a moderate pike pole test where conditions permit its use, **25-foot or shorter poles** in straight sections of rural lines carrying eight or less 104 copper or stronger wires with no downward change in grade, and measuring 13 inches or more in circumference at the groundline, may be climbed without placing temporary supports.
- 2.21** The prod test is not considered as satisfactory as the pike pole test and it should not be completely depended upon to furnish information as to the soundness of the pole.
- 2.22** The sounding test consists of applying blows with a hammer, such as a drilling hammer, or the back of a hand axe, to the pole surface completely around the pole from points close to the groundline to as high as can conveniently be reached. The presence of a hollow heart condition or advanced internal decay can usually be recognized by the characteristic hollow or dull sound resulting from the blows on the wood. A pole free from decay usually sounds clear and the hammer usually rebounds noticeably when the pole is struck sharply and squarely. Wet surfaces due to recent rains, wet interior near the groundline due to high soil moisture, wide checks, or shakes in the pole near

the surface may change the sound of a solid pole. Care must be taken not to mistake the altered sound due to these causes for the sound associated with internal decay.

2.23 The boring test consists of boring a hole in the pole at a point where internal decay is suspected by means of a 3/8 inch wood boring bit or by means of an increment borer. The condition of the wood can be determined by an examination of the chips or core brought out by the bit. The presence of a hollow heart condition is, of course, revealed by the bit breaking through the wood.

2.24 If a hole is bored in a pole and it is concluded that the pole is in sound condition and the pole is to be left in plant, the hole should be filled by means of a wooden plug. [Ordering information is as follows: Plug, Wooden (length) inches. Plugs come in 2-, 3-, 4-, or 6-inch lengths. Order the length desired.]

2.25 The hand line method consists of applying a series of pulls to a pole with the object of rocking the pole back and forth. In applying this test, use should be made of a 3/8 inch or larger rope, attached to the pole at such a height that the pull can be applied at right angles to the direction of the line and at an angle of about 45 degrees with the pole. The same use limitations and precautions applying to the pike pole test, apply also to this method of testing. In attaching the rope to the pole, the pole should not be climbed, but the rope should be thrown over a fixed attachment, such as a pole step or a crossarm, or a loop should be made at the base of the pole and moved into position by means of a convenient tool, such as a wire raising tool.

2.26 Poles found by the previously described tests to be unsafe for climbing should be marked immediately with a B or C Pole Tag. (Fig. 1). The unsafe condition should be reported promptly to your supervisor.

2.27 If the pole has been broken, resulting in an unsafe condition and requiring immediate support, temporary supports should, if practicable, be applied immediately to prevent the pole from falling. If suitable bracing means are not available, steps should be taken to warn passers-by or traffic away from the location until a safe condition can be restored and a report of the condition should be made promptly to your supervisor.

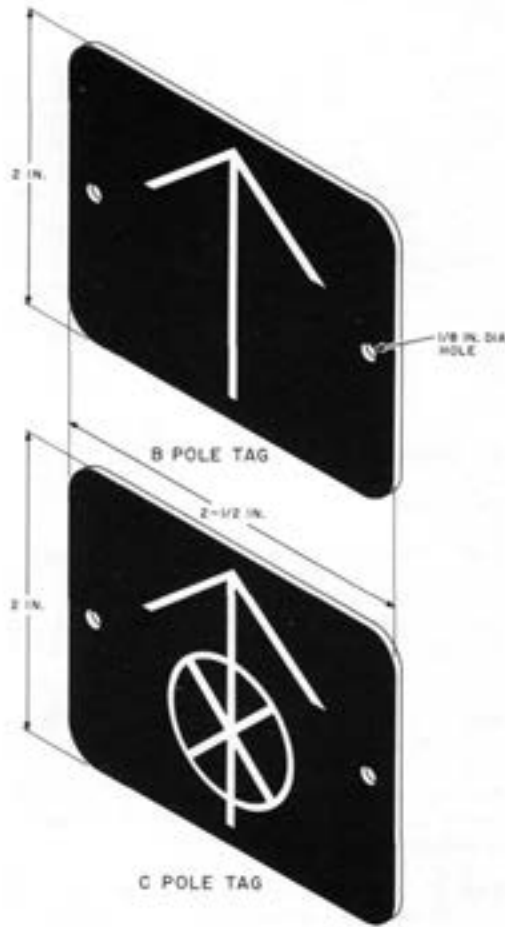


Fig. 1—B and C Pole Tags

2.28 The B Pole Tag has a white arrow on a red background. It is intended for marking defective poles which do not require immediate replacement, that is, defective poles which are not yet considered dangerous.

2.29 The C Pole Tag is similar to the B Pole Tag except that an "X" inscribed in a circle is imposed on the shaft of the arrow. This tag is intended for marking poles which are in a dangerous condition and require immediate replacement.

2.30 Place one tag on the road side of the pole just below the pole number, if the pole is numbered, or at approximately 6 feet above groundline if the pole is not numbered. Place another tag at approximately the same height on the field side of the pole. If the pole is defective in the groundline section, place the tags so that the arrow points downward. If the pole is defective in the upper portion, place the tags so that the arrow points upward. If, however, the pole is defective in both the groundline section and in the upper portion place a double set of tags, one set with the arrow pointing downward and the other set with the arrow pointing upward. Attach the tags with Pole Tag Nails.

3. STRAND-PRECAUTIONS AND TESTING

Precautions

3.01 Vehicles, tools, and equipment that might be damaged as a result of strand breakage should not be located under the strand when it is being tested. Only the individuals involved in making the test should be permitted in the work area.

3.02 On joint use lines or at power crossings, the rope used for testing shall not be thrown over the strand. Pass the rope over the strand with a tree pruner handle or place it over the strand at the pole and move the rope along the strand to the desired location.

3.03 Do not make a mechanical test in spans that cross over electric light, power, fire alarm, or trolley wires. Make a careful visual inspection of the span from the ground. Then, from a working position on the poles, examine the strand adjacent to each of the supporting poles. If any of the following defects are found, the strand must be repaired before performing any work operation that will place an additional load on the strand.

- (a) *Corrosion of the strand* to the extent that no galvanizing remains.
- (b) *Strand wire breaks* in one or more of the strand wires.
- (c) *Excessive strand wear* caused by rings, tree interference, cable guards, etc.

(d) *Any loose attachments* affecting the structure within reach of the workman.

3.04 If any defects are found and work operations must be performed on the cable prior to making repairs on the strand, use a ladder platform or aerial lift truck or place an auxiliary strand to work from.

3.05 Do not make a mechanical test of a span that crosses over a main line railroad track. If the strand has been in place less than one year or if it is known that no coal-burning locomotives have been in use under the strand since it was placed, examine the strand as prescribed in 3.03. *If the strand has been exposed to coal-burning locomotive smoke and is more than one year old, it shall not be ridden.* All work operations shall be performed from a ladder platform or aerial lift truck or from an auxiliary strand. A truck shall not be used within 10 feet of the railroad track.

3.06 Do not make a mechanical test of a span that crosses an electrified railroad. All work operations shall be performed from a ladder platform or aerial lift truck or from an auxiliary strand. A truck shall not be used within 10 feet of the railroad track.

3.07 Do not make a mechanical test of any strand that has been in contact with a power wire. Immediate replacement or repair of the strand is necessary.

3.08 Spans over non-electrified spur railroad tracks may be given a mechanical test provided signalmen are posted along the tracks in both directions and at sufficient distance from the work location to give ample warning of approaching trains.

3.09 Strand crossing streets and highways where no power crossings are involved may be given a mechanical test provided proper warning signs are posted and all traffic is stopped during the test. For those locations where the traffic cannot be stopped, do not make a mechanical test, but follow the procedures in 3.03.

3.10 Before testing suspension strand or the strand of self-supporting cable, examine the span from the ground for:

- (a) The presence of power crossings, power clearances, etc., that may prevent testing the strand.
- (b) Strand abrasion or corrosion, particularly at points of tree interference, strand splices and dead ends, strand attachments, etc., and for any other irregularities of the strand, cable, lashing wire, or rings which may require attention. Observe self-supporting cable spans closely as the covering on this strand may hide possible defects.

3.11 Before placing a ladder against suspension strand or the strand of self-supporting cable, the strength of the strand and its supports should be tested in the following manner:

- (1) Inspect and test the poles at each end of the span (Part 1 and 2).
- (2) Throw or place the handline (3.02) over the strand at the point where the ladder is to be placed.
- (3) The workman who will work from the ladder should grasp the two ends of the handline and gradually apply his full weight to the strand by lifting himself slowly off the ground (Fig. 2).

3.12 Be alert for visual or audible signs of weakness. A strand and its supports which will support the workman without showing any signs of failure or slippage have ample strength to support the ladder and the workman.



Fig. 2—Testing Strand Prior to Placing Ladder

JOINT USE POLES CLEARANCE AND SEPARATIONS

1. GENERAL

1.02 For safety reasons, the methods and tools to be employed in determining or measuring separations should not expose the workman to foreign potentials.

1.02 If 0-750 volt supply circuits are in place, wear rubber gloves and use a standard measuring rule or approved equivalent free from metallic strips or edging. Measure from non-metallic parts of the supply structure such as a wood crossarm, or measure along the surface of the wood pole, and make adjustments for the difference in elevation or position of the foreign wires, metallic parts of the structure, etc.

1.03 If supply circuits of more than 750 volts are in place, separations from such circuits should be estimated or the proper location of telephone attachments relative to such circuits should be obtained from your Supervisor. Gains or bolt holes below existing supply attachments may be used as reference points in which case the measuring rule can be used.

1.04 Refer to Table A for the tools that may be used to measure separations and clearances in the span.

1.05 The clearances and separations specified are those which should exist at 60°F. with no wind. The clearances and separations for wires and cables placed at temperatures other than 60°F. should be adjusted for temperature differences. For information regarding effects of temperature changes on sags refer to the sections of the Practices covering sags of wire, cable, etc., and make proper allowance for changes in sags and clearances due to temperature changes.

1.06 If conditions are found which appear to require the rearrangement of plant for clearance or separation reasons notify your Supervisor so that the case can be handled in accordance with established local procedures.

1.07 These sections shall be supplemented by locally prepared instructions covering any changes required to meet—

- (a) The lawful requirements of state, municipal, or other authorities, and
- (b) specific local conditions not covered herein.

1.08 Attachments to joint use poles shall be located at the proper level so that telephone wires, cables, etc., will have (a) the clearances required above ground, streets, tracks, etc., and (b) the separations from supply wires, cables, etc., required in the span and at the pole, as shown in the tables and illustrations.

1.09 The separations required in the span at the pole are based on the assumption that telephone attachments are placed below supply attachments, except that street light span wires, vertical runs, and lamp brackets may be located above or below telephone attachments. Where trolley construction is involved, it is usually located below the telephone attachments.

2. VERTICAL RUNS

2.01 *Vertical Runs Installed on the Pole Surface:* The clearance and separation requirements applying to telephone and supply vertical runs installed on the pole surface are as follows:

- (a) Where both power and telephone vertical runs are located on the same pole, they shall be at least 2 inches apart and preferably on opposite sides of the pole.
- (b) Vertical runs shall be at least 3 inches from pole steps, and shall be so arranged as not to interfere with the safe use of pole steps.
- (c) Vertical runs shall be separated from span or guy wires, cable suspension strands, vertical runs, or other metal parts of the

TABLE A
RECOMMENDED MEASURING TOOLS

| TOOLS (BY GROUPS) | TELEPHONE LINE WIRES, CABLES, GUYS, AND DROP WIRES | SUPPLY CABLES, MULTI-GROUNDED NEUTRAL WIRES, GUYS, AND 0-750 VOLT SUPPLY WIRES | ALL OTHER SUPPLY WIRES | REMARKS |
|--|---|---|------------------------------|---|
| GROUP 1 Clearance measuring lines, non-metallic linen tapes, ropes, etc. | Yes | Must not be used | Must not be used | Tools must be dry and free of metallic strands or threads |
| GROUP 2 Tree pruner handles, pike poles, rods of wood, bamboo, etc. | Yes | No | Must not be used | — |
| GROUP 3 B Clearance Rod | Yes | Yes | Yes | — |
| GROUP 4 Transits, sextants, range finders, hand levels, tele- heights, hitemeters, etc. | Yes | Yes | Yes | — |

equipment of another company (including through bolts and washers), by 1/8 of the circumference of the pole where practicable, but in all cases by at least 2 inches measured in any direction from the nearest part of the vertical run (including staples or other devices by which the run or its covering is attached to the pole).

Note: For drive hooks, drive screws, pole steps, etc., this minimum separation can be met in most cases by locating such metal parts at least 2 inches above or below the attachment level of the staples or other devices by which the vertical run or its covering is attached to the pole.

(d) With the following exceptions, all vertical runs of cables, conductors, and grounding wires shall be protected up to a point 8 feet above ground by a covering which gives suitable mechanical protection. For grounding conductors from supply lightning arrestors, this covering shall consist of wood molding or other insulating material giving equivalent protection.

Exceptions—This covering may be omitted from:

- Armored cables or cables installed in grounded metal conduit.

- Grounding conductors in rural areas where such conductors have a weather-resistant covering.
- Grounding conductors metallically connected to a conductor which forms part of an effective grounding system.
- Wires which are used solely to protect poles from lightning.

(e) Vertical runs of telephone drop wires, ground wires, and cables that pass trolley feeders shall be provided with an insulating covering such as wood molding or fiber conduit from a point 40 inches above the highest trolley feeders to a point 6 feet below the lowest trolley feeders, but need not extend below the top of any mechanical protection which may be provided within 8 feet of the ground.

(f) Vertical runs of supply cables or conductors, ground wires, and trolley feeders that pass telephone space and are installed on the surface of the pole (and any metal pipe or conduit in which such cables or conductors are enclosed) shall be provided with an insulating covering such as wood molding or fiber conduit, from a point 40 inches above the highest telephone

attachment to the lowest point of the vertical run, with the following exceptions:

- The insulating covering need not extend below a point 8 feet above ground.
- If the pole has no trolley attachments, the insulating covering may be omitted if the supply cables or conductors have an effectively grounded metallic sheath or are enclosed in effectively grounded continuous metal pipe.
- Wood molding or fiber conduit may be omitted in the case of secondary supply conductors of not more than 300 volts to ground run in multiple conductor cable and attached to the pole surface. In the case of aerial supply services, the point where such supply cables leave the pole shall be at least 40 inches above the highest or 40 inches below the lowest, telephone attachment.
- An insulating covering is not required on vertical runs of ground wires that bond telephone plant (cables, guys, protective devices, etc.) to supply multi-grounded neutral systems.

2.02 Vertical Runs Not Installed on the Pole

Surface: Vertical supply cables or conductors not installed on the pole surface require clearances, as follows:

- (a) Supply service leads of not over 750 volts and lamp leads of street lighting circuits run in paired wire or multiple conductor cable on the street side of the pole on suitable insulators supported on pins or brackets shall be held taut at a distance of approximately 5 inches from the surface of the pole or from any pole steps.
- (b) When supply circuits are run as described (a) they shall clear telephone conductors or cables as follows:
 - (1) Lamp leads of street light circuits or other supply conductors of 750 volts or less; by 6 inches if practicable, but not less than 3 inches.
 - (2) Lamp leads of street light circuits exceeding 750 volts; by at least 6 inches.

If supply conductors of over 750 volts other than street light leads are run as in (a) report the matter to your Supervisor. Supply conductors of over 750 volts which are not street lighting leads should be run on the surface of the pole in conduit or metal sheath cable protected by molding or other covering.

(c) Lamp leads that pass into or through the telephone space and are run from a supply crossarm directly to a street lamp or lamp bracket shall consist of paired wire or multiple conductor cable securely attached at both ends to suitable brackets and insulators. The leads shall be held taut at least 40 inches from the surface of the pole, at least 12 inches beyond the end of a telephone crossarm, and at least 6 inches from telephone drop wires.

3. CLIMBING SPACE

3.01 The required climbing space shall be provided and maintained on every jointly used pole so that workmen can go up or down the pole, and can perform work operations aloft with reasonable safety and convenience.

3.02 Climbing space is defined as the vertical space reserved along the side of a pole to permit access to equipment and conductors located on the pole structure. It consists of a horizontal area 30 inches square, extending vertically not less than 40 inches above and below the cables, conductors, crossarms, or other attachments (Fig. 2).

3.03 Climbing space is required only on one side or corner of the pole. Portions of the pole when included in one side or corner of the climbing space, and vertical runs incased in conduit (or other protective covering) and securely attached to the surface of the pole are not considered to obstruct the climbing space.

3.04 If the only supply conductors at a level above telephone cables, conductors, etc., are secondaries (0-750 volts between conductors) supplying airport or airway marker lights, or crossing over the telephone line and attached to the pole top or to a pole top extension fixture, the width of the climbing space measured across the line may be reduced to 16 inches (Fig. 3).

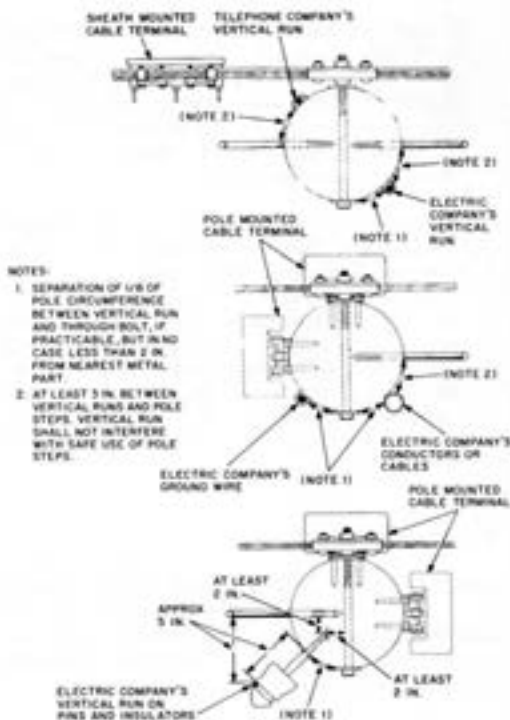


Fig. 1—Typical Vertical Run Clearances

- 3.05** When drop wire attachments are made directly to a joint use pole, distribute from the face or back of the pole (Fig. 4).
- 3.06** Where climbing space cannot otherwise be obtained on either the field or street side

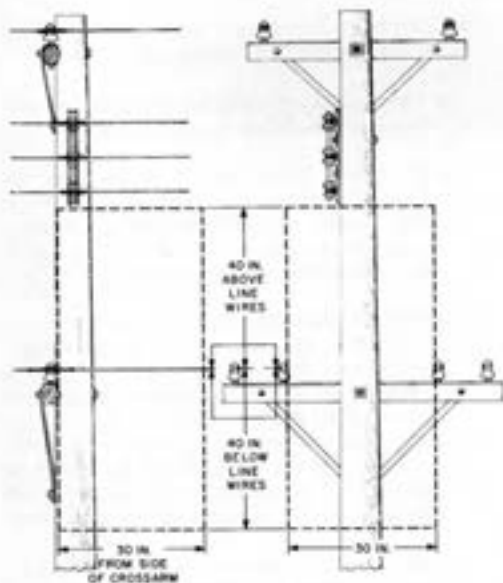


Fig. 2—Climbing Space Requirements

of the pole, place a guard arm and distribute from it, or place span clamps on the suspension strand (Fig. 5).

- 3.07** The full width of climbing space shall be provided past longitudinal runs of cables, drop wires, etc., and shall be measured from the longitudinal run concerned. Where telephone cable is less than 40 inches from telephone wires on jointly used poles, respace pins to provide the 30-inch climbing space (Fig. 6).

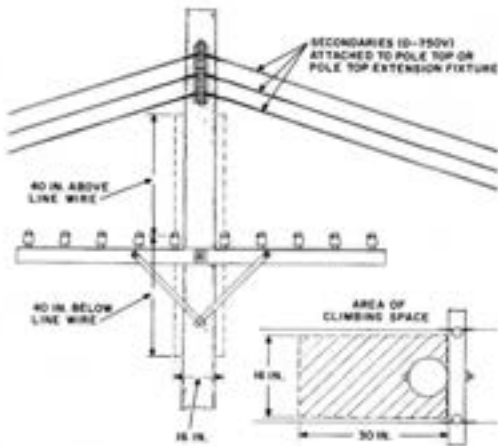


Fig. 3—Secondary Feeder Crossing Over Telephone Lines

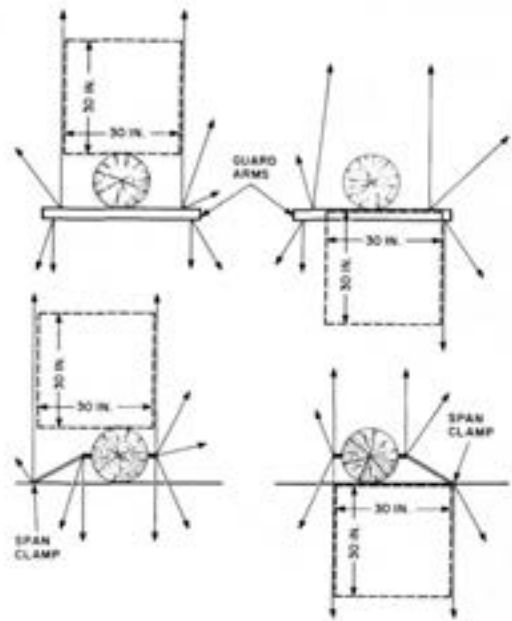


Fig. 5—Use of Guard Arm or Span Clamp to Maintain Climbing Space

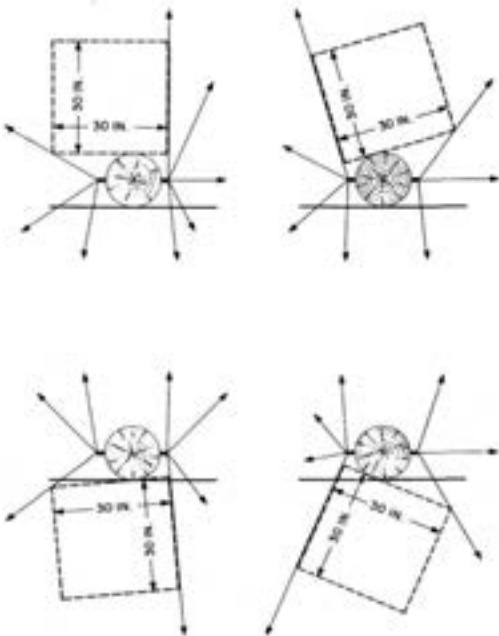


Fig. 4—Climbing Space When Drops are Attached Directly to Pole

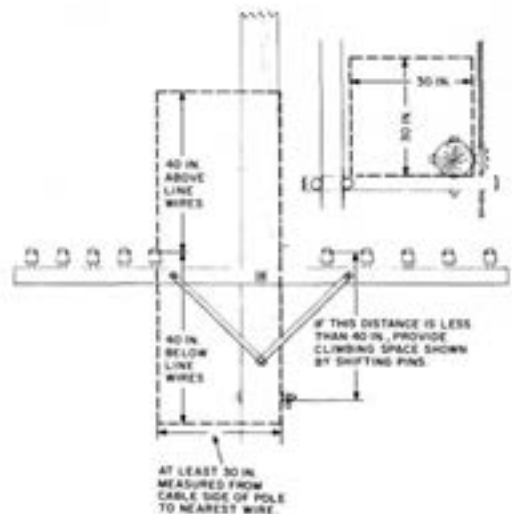


Fig. 6—Respacings Pins for Climbing Space

1. REMOVE FROM THE SECTION THE PAGES NUMBERED THE SAME AS THOSE ATTACHED TO THIS PINK SHEET.
2. INSERT THE ATTACHED PAGES INTO THE SECTION IN THEIR PLACE.
3. PLACE THIS PINK SHEET AHEAD OF PAGE 1 OF THE SECTION.

DROPS FROM OPEN AND RURAL LINES

1. GENERAL

1.001 This addendum supplements Section 460-300-121, Issue 1. The attached pages must be inserted in the section in accordance with the filing instructions above.

1.002 This addendum is issued to change the word pin to pair in 8.02 and 8.03.

8. INSTALLATION OF 105A WIRE TERMINAL ON INTERMEDIATE POLES

The following changes apply to Part 8 of the section:

- (a) 8.02—revised
- (b) 8.03—revised

Attached:

Page 5 dated January 1974, revised

Page 6 dated January 1974, reissued

THE TELEPHONE COLLECTORS' ASSOCIATION
INCORPORATED IN GREAT BRITAIN
1911-12

REPORT OF THE ASSOCIATION FOR THE YEAR 1911-12

The Association was formed on the 15th of January 1911, and since that date has been engaged in a most successful and profitable business. It has been the object of the Association to collect and preserve the various types of telephones which have been used in Great Britain, and to make them available to the public. The Association has been successful in this object, and has now a large and valuable collection of telephones, which are being sold to the public at a price which is very reasonable.

The Association has also been successful in its efforts to secure the preservation of the various types of telephones which have been used in Great Britain. It has been the object of the Association to collect and preserve the various types of telephones which have been used in Great Britain, and to make them available to the public. The Association has been successful in this object, and has now a large and valuable collection of telephones, which are being sold to the public at a price which is very reasonable.

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DROPS FROM OPEN AND RURAL LINES

1. GENERAL

1.01 This section covers methods of bridling to open wire and installing 105A wire terminal at intermediate and dead-end poles.

2. DISTRIBUTING DROPS FROM OPEN WIRE LINES

2.01 Distribute drops from a drive hook in the pole if climbing space, joint use, and ground clearances permit, and there is adequate clearance between the drops and existing or future open wires. Otherwise distribute drops from crossarms as outlined in 2.02.

2.02 Distribute drops from crossarms as follows:

(a) *Crossarms Other Than DE Type:* Distribute from a drop wire hook where not more than two drops will be run from the same point on the crossarm. Distribute from a guard arm hook where more than two drops will be run. Not more than five drops shall be attached to one guard arm hook.

(b) *DE Crossarm:* Distribute drops from drop wire hooks attached to the sides of the crossarm.

3. INSTALLING DROP WIRE AND GUARD ARM HOOKS ON CROSSARMS

3.01 Attach drop wire hook to crossarm with a 1-1/2 inch No. 18 RH galvanized wood screw. On a crossarm equipped with insulator pins, center the hook on side of crossarm and between pins as covered in 4.10 or closer to the pole if adequate clearances can be obtained and climbing space is not obstructed. On a crossarm on which the open wires are terminated on deadend brackets, locate the hook midway between the two outer bracket positions and 1-1/8 inches above bottom of crossarm. Shift location of hook as necessary to avoid checks or cracks in crossarm. Drill lead hole for the No. 18 wood screw with an 11/64-inch drill point.

3.02 Place guard arm hook in a 9/16- or 5/8-inch clearance hole drilled in the side of the crossarm (3-1/4 inches thick). Center the hole between top and bottom of the arm and between pins or closer to the pole if adequate clearances can be obtained and climbing space is not obstructed.

4. WIRING AT CROSSARMS AND POLES

4.01 Terminate parallel drop wire at a 101B wire terminal and run twisted pair wire between the terminal and the open wire.

4.02 If the drop is run with HD wire, the 101B wire terminal is not required, as this wire may be connected directly to the open wire.

4.03 Locate the 101B terminal on pole side of crossarm with lower edge 3/4 inch above bottom of crossarm. Locate the first terminal to be placed between the first and second wires from the pole so that it will be readily accessible. Space additional terminals 2-1/2 inches apart on DE crossarms and 3-1/2 inches apart on other crossarms.

Note: To avoid splicing out parallel drop wires installed prior to placing the 101B terminal or to comply with distances specified in Part 7, the terminal may be located between any pin position.

4.04 The binding posts of the 101B terminal will accommodate three parallel drop wires and the bridle wire to the open wire.

4.05 Terminate twisted pair wire under the bottom washers on the binding posts, and the first parallel drop wire between the second and third washers and so on.

4.06 If four drops wires are to be bridged to the same open wire, install two 101B terminals and bridle from each terminal to separate bridging sleeves or bridging connectors spaced approximately 2 inches apart on the open wire.

4.07 Install 5/8-inch drive rings on underside of crossarm near the point where the drop is attached and at points where wires extend to the open wire at the 101B terminals. Install additional rings as required to limit ring spacings to approximately 20 inches.

4.08 Use B bridle wire for bridling between 101B terminals and open wire except where the use of D or E block wire is specified as in Part 7 or by local instructions. Use bridging sleeves or bridging connectors for connection to open wire.

4.09 At double crossarms equipped with insulator pins follow the general wiring method specified for single crossarms, locating the 101B terminal preferably on the side of the crossarm toward the bridging sleeves or bridging connectors. Locate the wire run on the underside of the same crossarm.

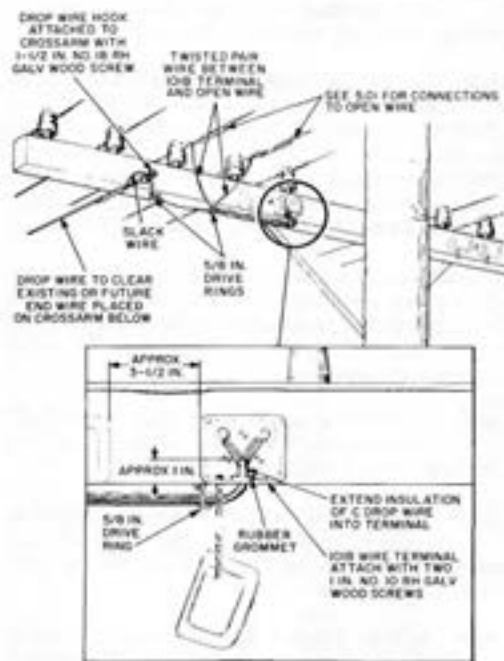


Fig. 1—Where Drop Wire is Distributed From Crossarms Other Than DE-Type

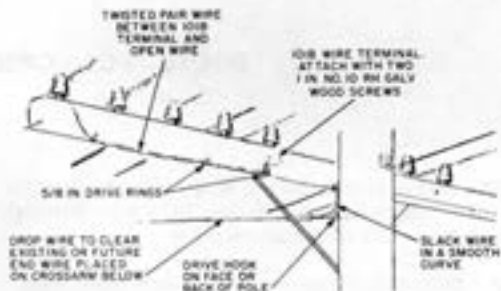


Fig. 2—Where Drop Wire is Distributed From a Pole

Crossarms Equipped with Insulator Pins

4.10 The wiring arrangement on crossarms equipped with insulator pins is shown in Fig. 1 and 2.

4.11 Crossarms equipped with deadend brackets (Fig. 3).

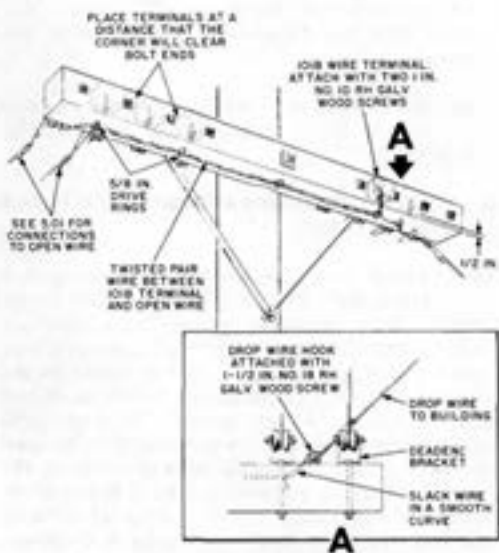


Fig. 3—Wiring Arrangement on DE Crossarms not Having Back Braces

- 4.12 The wiring arrangement on DE crossarms equipped with back braces is shown in Fig. 4.

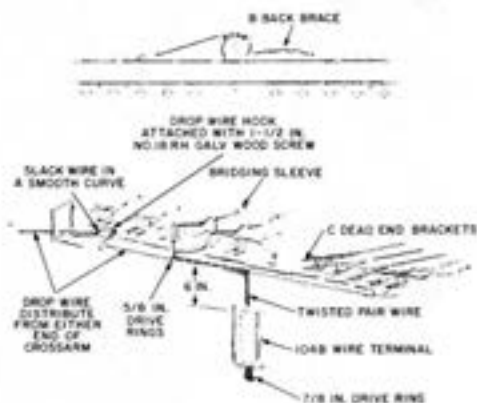


Fig. 4—For More Than Two Drops Use a 104B Wire Terminal Mounted on Pole

- 4.13 At double crossarms equipped with deadend brackets, follow the general wiring method as shown in Fig. 3, locating the 101B terminal on the outer side of the crossarm not equipped with deadend brackets. Locate the wire run on the underside of the same crossarm.

Poles Equipped with Wooden Pole Brackets

- 4.14 The wiring arrangements on line poles equipped with wooden pole brackets are shown in Fig. 5.
- 4.15 Poles equipped with deadend brackets (Fig. 6).

5. CONNECTING TWISTED PAIR WIRE TO OPEN WIRE

5.01 In general, connect twisted pair wire to open wire attached to glass insulators or deadend brackets. As an alternate, bridging connectors may be used in lieu of bridging sleeves. However, in localities where corrosion of the bridge wire occurs adjacent to the bridging connector, connect to open wire as covered in 5.02 or 5.03 depending on the severity of corrosion.

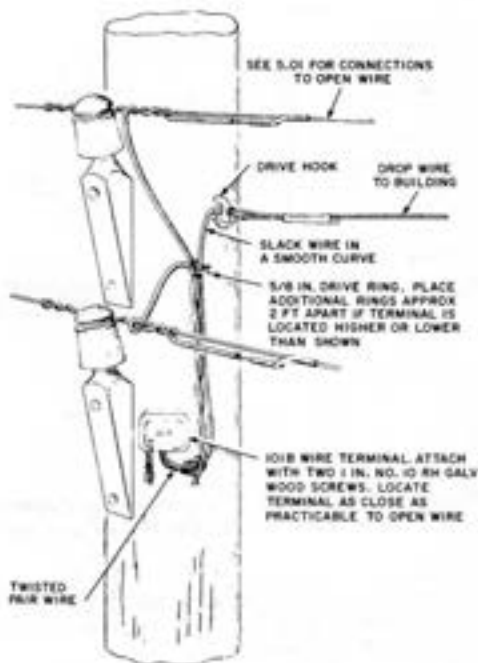


Fig. 5—Where Pole Brackets are Located on Same Side of Pole

5.02 Where corrosion of the bridge wire occurs between the end of the conductor insulation and the bridging connector, provide a bypass in making the connection to the open wire as covered below. For the more severe corrosive conditions, follow the method outlined in 5.03.

- (1) Provide a sufficient length of twisted pair wire to extend from the 101B terminal to approximately 8 inches beyond the bridging connectors.
- (2) Remove the insulation for approximately 8 inches from each bridge conductor at the open wire end.
- (3) Thoroughly clean the conductors for approximately 2 inches beyond the end of the insulation.

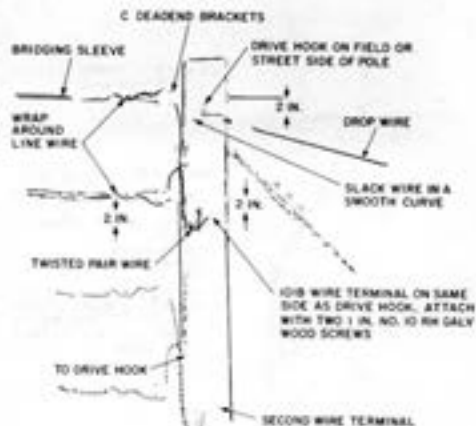


Fig. 6—Where Lines are Terminated on Deadend Brackets Attached to Face or Back of a Pole

- (4) Extend bridle wire directly from last drive ring to bridging connectors without making any wraps around the line wire.
- (5) Connect each conductor at the open wire by means of a bridging connector installed with the bolt in a horizontal position and extend the excess length of bare conductor back on the insulated portion in spiral wraps as shown in Fig. 7 and 8.

5.03 Where exposure conditions are so severe that the bypass method covered in 5.02 does not provide sufficient permanence because of rapid corrosion of the spiral wrap, a more durable bypass may be provided as follows:

- (1) Provide a sufficient length of twisted pair wire to extend from the 101B terminal to the bridging connectors.
- (2) Extend bridle wire directly from last drive ring to bridging connectors without making any wraps around the line wire, and connect each conductor to bridging connector installed with the bolt in a horizontal position.
- (3) Starting approximately 4 inches from bridging connector, make at least four spiral wraps of a half-length of 19-inch 080

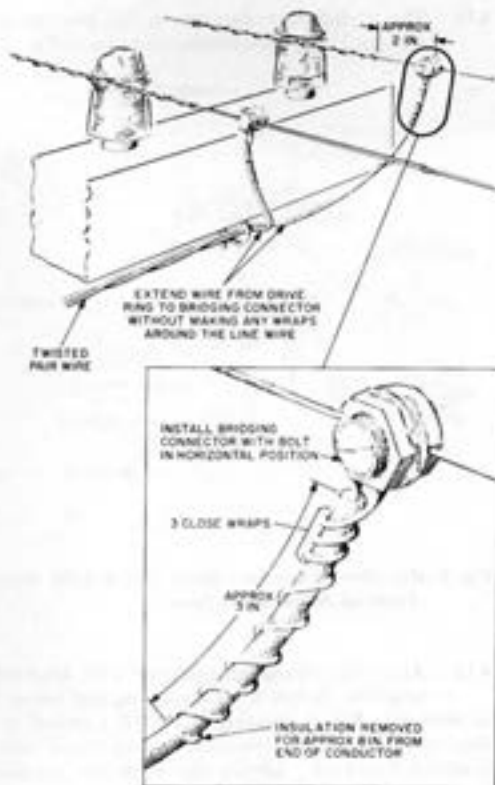


Fig. 7—Where Line Wires are Tied to Pin-Type Insulators

or 104 copper tie wire around each bridle conductor in the direction toward the bridging connector. The last wrap shall be close to the end of the rubber insulation but shall not make contact with the bare conductor.

- (4) Extend tie wire to an additional bridging connector.

5.04 Where corrosion of bridle wire occurs between end of conductor insulation and a bridging sleeve, provide a bypass in the manner described in 5.03 using a bridging connector for attaching the tie wire to the line wire.

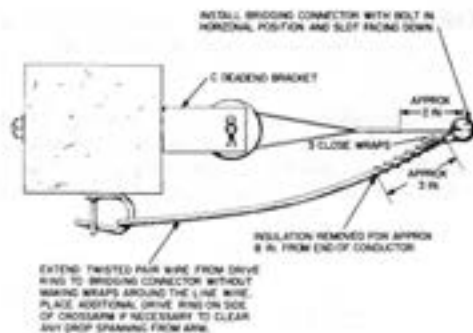


Fig. 8—Where Line Wire are Terminated on Deadend Brackets

5.05 Connect bridle wire to tree wire, using one of the methods covered for bare line wire, depending on the exposure conditions involved. Remove sufficient insulation from the tree wire to permit making the connection as specified for bare line wire.

6. INSTALLATION OF WIRE VIBRATION DAMPER

6.01 Install vibration dampers as covered in Section 623-030-103 where upon wires vibrate to such an extent as to cause breakage of twisted pair wires at bridging points or to produce a vibration noise at a building to which a drop wire is attached.

7. BRIDLING WHEN FUSELESS PROTECTORS ARE USED AT STATION

7.01 Where stations served from open wire or rural wire will use the fuseless protector, 123A1A or 128A1A-2, a length of D or E block wire not less than 2 feet shall be used between the drop wire and open or rural wire. Bridging to 109 size steel wire or 104 size copper steel wire may be made with bridging connectors or a combination of a 109 by 109B aluminum bridging sleeve and an 034 H splice sleeve.

8. INSTALLATION OF 105A WIRE TERMINAL ON INTERMEDIATE POLES

8.01 Locate wire terminal approximately 12-inches from pole. Remove binder from multiple line wire run and place 5 wraps of D vinyl tape.

Grip conductors with both hands, and twist against the lay of wire until conductors are loose and parallel to the support wire.

8.02 Insert wire wedges so that support wire is separated from the conductors and locate pair to be terminated.

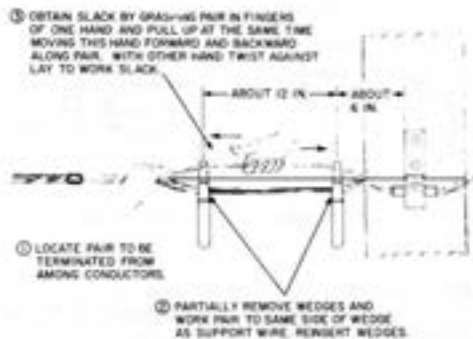


Fig. 9—Locating Wire Pair

8.03 Attach 105A wire terminal (Fig. 10) to wire pair and secure to support wire as shown in Fig. 11.

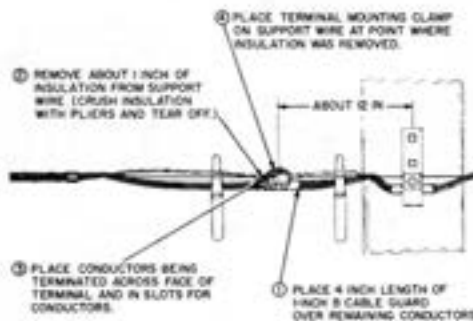


Fig. 10—Attaching 105A Wire Terminal

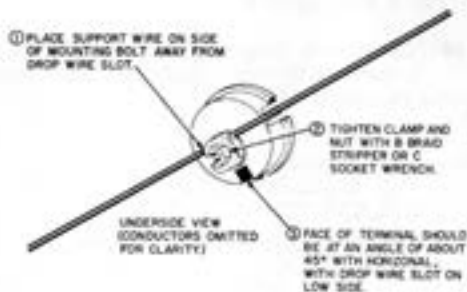


Fig. 11—Attaching Support Wire

8.04 Dress wire conductors and drop wire into slots provided in wire terminal. Secure leads to binding posts as shown in Fig. 12.

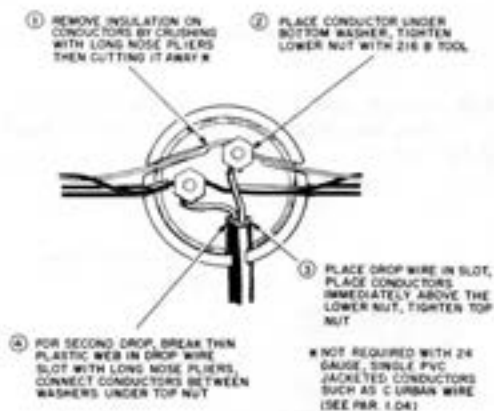


Fig. 12—Terminating Wire Leads

8.05 Replace cover on wire terminal and dress pole attachments as shown in Fig. 13.

8.06 A maximum of three wire terminals can be mounted on each side of the wire bracket. A complete installation is shown in Fig. 14, although individual terminals are added only as needed.

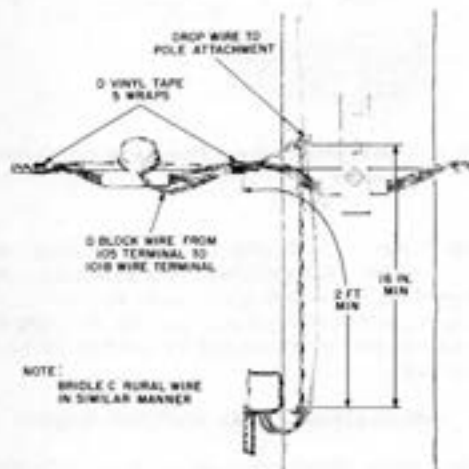


Fig. 13—Pole Attachment of Block and Rural Wire

The order of installation would depend on the direction of feed for the drop wires.

9. INSTALLATION OF 105A WIRE TERMINAL AT DEAD-END POLES

9.01 Fig. 15 shows multiple line wires terminated at dead-end pole.

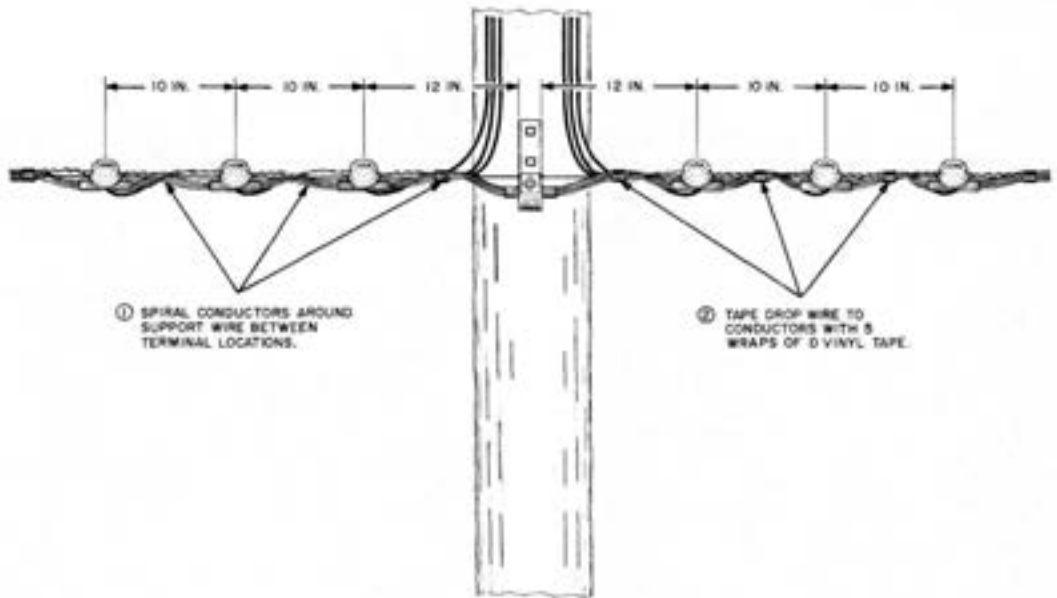


Fig. 14—Arrangement of Wire Terminals

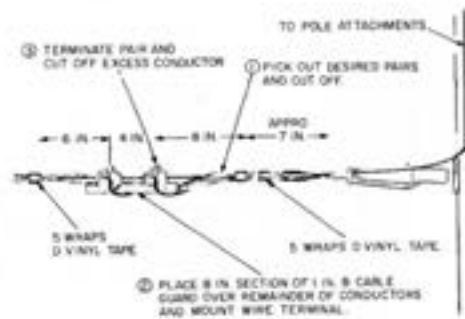


Fig. 15—Location of Wire Terminals at Dead-End Pole

DROP AND BLOCK WIRE ATTACHING AND FASTENING

1. GENERAL

1.01 In order to obtain secure attachments and avoid damage to building surfaces, it is essential that the proper clearance and lead holes be used for fasteners as shown in Division 080.

1.02 This section is reissued to:

- Add new C wire loop that replaces the B wire loop which has been rated MD.
- Add new B masonry fastener that replaces the D masonry fastener which has been rated MD.
- Add KS-19094 anti-seize compound for use with dissimilar metals.
- Add new F drop wire (AT-8668) which will replace the C drop wire.

1.03 Apply KS-19094, List 1 anti-seize compound when installing galvanized attachments on aluminum siding to prevent galvanic action. Squeeze paste from tube onto finger and apply even coat to inside surfaces of attachment and mounting screws.

1.04 Apply KS-14681, List 1 anti-rust compound to mounting screwthreads when installing galvanized attachments on steel pipe or galvanized siding. Refer to Section 080-720-110 for application.

1.05 The B masonry fastener is a nail-type fastener used with the C wire loop at permanent installations. The D (MD) masonry fastener is a nail-type fastener used to support the B (MD) wire loop.

1.06 The C wire loop replaces the B (MD) wire loop and will accommodate the same number of wires or cables as did the comparable B (MD) wire loop.

1.07 F drop wire consists of two parallel No. 18-1/2 AWG copper-covered steel conductors

insulated with a single layer of black vinyl plastic compound. A single ridge tracer on the insulation surface provides conductor identification. As F drop wire becomes available, the C drop wire will be rated MD. Refer to Section 462-200-200 for information on F drop wire.

1.08 It is possible for foreign voltage to be present on buildings covered with metal siding.

Caution: Before making body contact with any portion of the metal siding, test siding with B voltage tester. Refer to Section 460-300-109 for use of B voltage tester.

2. TYPICAL FIRST ATTACHMENTS TO BUILDINGS AND STEEL STRUCTURES (Fig. 1 through 9)

2.01 Tables A, B, and C list anchoring devices of first attachments used on various surfaces.

2.02 Table D lists equipping information for first attachments.

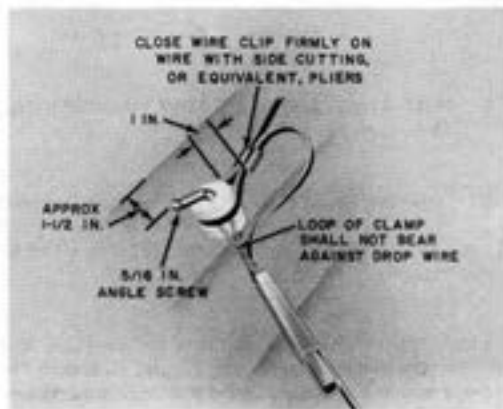


Fig. 1—First Attachment, Horizontal Run



Fig. 2—First Attachment, Vertical Run



Fig. 3—First Attachment, Drop Wire Hook

3. FIRST ATTACHMENTS ON LOW BUILDINGS (Fig. 10 through 13)

3.01 Where house clearance fixtures are required but have not been provided or where joint use of a fixture is impractical, refer matter to supervision.

3.02 Where clearance fixtures are provided but the required minimum ground clearance for drops cannot be obtained, refer matter to supervision.

4. PRECAUTIONS

4.01 Observe the following precaution when planning attachments to a subscriber-owned clearance fixture.

- Avoid climbing on roofs of subscriber premises.
- Wear safety glasses when drilling or hammering.
- Before making attachment, inspect fixtures, but do not make an attachment if there is any doubt as to the strength or firmness of the fixture.

(d) On joint-use fixtures observe location of the power service drops in order to avoid body contact. Wear rubber gloves and avoid body contact when making attachment to the fixture. Obtain a separation of at least 1 foot between telephone and power wires (Fig. 12 or 13).

5. INTERMEDIATE AND LAST ATTACHMENTS

5.01 Plan the wire run so that the locations of the point of entrance and the location of the station protectors, where the latter are required, will conform to the rules covered in Section 460-100-200 covering installation of station protector.

5.02 Do not use block wire as any part of the connection between exposed plant and the protectors, except when used as the bridle fuse wire on stations served from open wire, C rural, or 19-gauge multiple line wire with a 123A1A, 123B1A, or 128A1A-2 protector. Block wire may be used on the station side of protector.

6. SPACING OF ATTACHMENTS

6.01 Space drop wire attachments 9 feet apart or less on horizontal runs and 12 feet apart or less on vertical runs.

6.02 Space block wire attachments 4 feet apart or less on horizontal runs and 8 feet apart or less on vertical runs.

TABLE A
FASTENERS FOR DROP WIRE HOOK

| WALL TYPE | FASTENERS | | REMARKS |
|---|-----------|---|--|
| | QUANTITY | TYPE | |
| Wood Siding | 1 | 2-in. No. 18 RH galvanized wood screw | Place screw in studding. |
| Stucco on Wood | 1 | 2-in. No. 18 RH galvanized wood screw | Place screw in studding. |
| Rigid Composition Shingles | 1 | 2-in. No. 18 RH galvanized wood screw | Drill clearance hole to avoid splitting shingle. |
| Masonry or Substantial Brick Veneer* | 1 | 5/16-in. by 1-3/4-in. B drive anchor | Locate anchor in center of brick. Second drop wire hook should be located in separate brick. |
| Thin Wall Brick Veneer (Less Than 3-3/4 Inch Thickness) | 1 | 4-in. No. 18 RH galvanized wood screw | Pass screw through the seam between bricks. Penetrate wood backing approximately 1 inch. |
| Hollow Tile | 1 | 5/16-in. by 5-in. RH galvanized toggle bolt | Place 7/16 in. by 2-in. galvanized square washer between wall and drop wire hook. |

* Do not use corner or top row of bricks.

TABLE B
FASTENERS FOR S AND T KNOBS

| WALL TYPE | ATTACHMENT KNOB | FASTENERS | | REMARKS | |
|---|-----------------|-----------|---|--|-------------------------------------|
| | | QUANTITY | TYPE | | |
| Wood Siding | S | 1 | 2-1/2 in. No. 18 FH galvanized wood screw | Place screw in studding. | |
| | T | 1 | 3-1/2 in. No. 18 FH galvanized wood screw | | |
| Stucco on Wood | S | 1 | 3-in. No. 18 FH galvanized wood screw | Use 3-1/2 in. | If necessary to penetrate studding. |
| | T | 1 | 3-1/2 in. No. 18 FH galvanized wood screw | Use 4-1/2 in. | |
| Rigid Composition Shingles | S | 1 | 3-1/2 in. No. 18 FH galvanized wood screw | Drill clearance hole to avoid splitting shingle. | |
| | T | 1 | 4-1/2 in. No. 18 FH galvanized wood screw | | |
| Thin Wall Brick Veneer (Less Than 3-3/4 Inch Thickness) | S | 1 | 7-in. No. 18 FH galvanized wood screw | Pass screw through the seam between bricks. Penetrate wood backing approximately 1 inch. | |
| | T | 1 | 7-in. No. 18 FH galvanized wood screw | | |
| Hollow Wall | S | 1 | 5/16 in. by 5 in. RH galvanized toggle bolt | Place flat side of S knob against bolt head. | |
| | T | 1 | 5/16 in. by 6 in. FH galvanized toggle bolt | | |

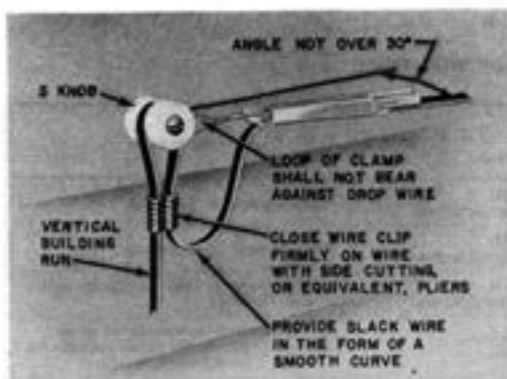


Fig. 4—First Attachment, S Knob

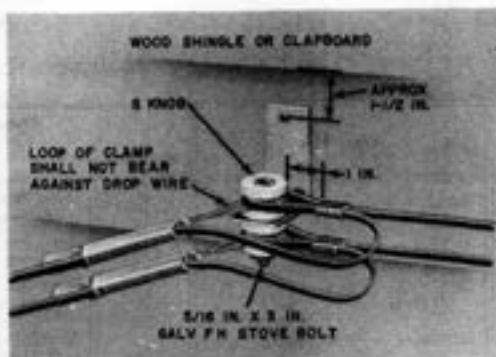


Fig. 6—First Attachment, House Bracket Horizontal Run

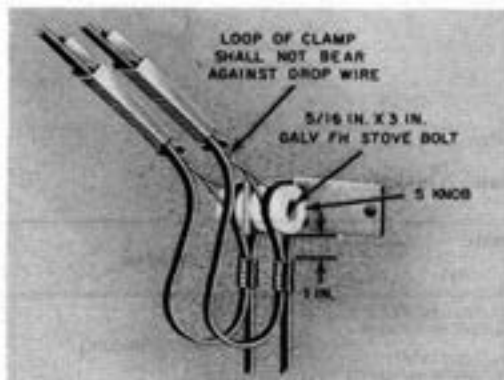


Fig. 5—First Attachment, House Bracket

6.03 Locate attachments so that fasteners will not be placed closer than 10 inches to the corner or the top of a wall, except in turning corners.

6.04 Place additional attachments as required to keep exposed wires terminated at fused-type protectors from touching flammable surfaces.

6.05 Where windows are available for making attachments on vertical runs, place an attachment at each floor.



Fig. 7—First Attachment, Corner Bracket

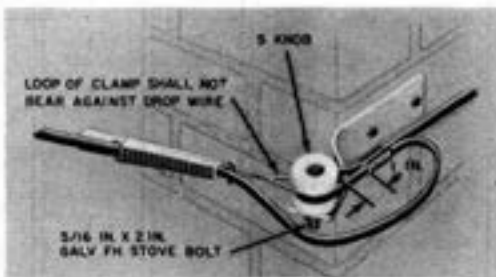


Fig. 8—First Attachment, Corner Bracket Using S Knob

TABLE C
FASTENERS FOR HOUSE AND CORNER BRACKETS

| WALL TYPE | QUANTITY | | FASTENERS TYPE | REMARKS |
|---|----------|--------|---|--|
| | HOUSE | CORNER | | |
| Wood Siding | 3 | 2 | 2-in. No. 14 RH galvanized wood screws | Place screw in studding. |
| Stucco on Wood | 3 | 2 | 2-1/2 in. No. 14 RH galvanized wood screws | Place screw in studding. |
| Rigid Composition Shingles | 3 | 2 | 3-in. No. 14 RH galvanized wood screws | Drill clearance hole to avoid splitting shingle. |
| Masonry or Substantial Brick Veneer | 2 | 2 | 5/16 in. by 1-1/4 in. B drive anchor | |
| Thin Wall Brick Veneer (Less Than 2-3/4 Inch Thickness) | 2 | 2 | 6-in. No. 14 RH galvanized wood screws | Pass screw through the seam between bricks. Penetrate wood backing approximately 1 inch. |
| Hollow Wall | 2 | 2 | 1/4 in. by 3 in. or 4 in. RH galvanized toggle bolt | |



| WHICH OF THESE ITEMS ARE FURNISHED WITH THE SIGN BRACKET | TYPE | SIZE | DIAMETER OF SUPPORT INCHES |
|--|------|------|----------------------------|
| | 170 | 2 | 1-7/8 TO 3 |
| | 170 | 3 | 3 TO 4 |
| | 170 | 4 | 4 TO 5 |

Fig. 9—First Attachment, Sign Bracket 170 Type

6.06 When establishing a wire run on a building wall where cable has been placed, the wire run should, in general, parallel the cable run.

(a) When paralleling cable is attached to building wall by cable clamps, place rings in every third cable clamp where clamps are 17 inches apart and in every other cable clamp where clamps are 26 inches apart.

(b) When paralleling cable is placed on strand, place separate cable rings for block wires and space them at double the spacing of the cable rings.

7. INTERMEDIATE ATTACHMENTS ON BUILDINGS (Tables E, F, G and Fig. 14 through 20)

7.01 Make all vertical or horizontal attachments on a straight line.

7.02 Wire loops, drive rings, or insulated screw eyes may be used for drop wire attachments at inside corners or for a change of direction. Drop wire hooks may also be used for this purpose.

7.03 Drop or block wires extending from unexposed plant should be supported with the following attachments:

- (a) Drive rings on wood frame building.
- (b) ϕ C wire loops and a suitable B masonry fastener on masonry surfaces. ϕ
- (c) Toggle bridle rings on hollow surfaces
- (d) Bridle rings as a substitute for drive rings when:
 - (1) Drive rings are likely to split woodwork.

TABLE D

EQUIPPING DROP WIRE ATTACHMENTS WITH S KNOB, T KNOB, OR DROP WIRE HOOK

| ATTACHMENTS | | EQUIPPED WITH | | | HARDWARE | REMARKS |
|------------------------|----------|---------------|--------|----------------|---|---|
| | | S KNOB | T KNOB | DROP WIRE HOOK | | |
| Angle Screw | 5/16 in. | 1 | | | Nut furnished | Place flat side of knob against beveled side of nut. |
| | 3/8 in. | | 1 | | | |
| House Bracket | | 1 | | | 5/16 in. by 2 in. FH galvanized stove bolt | Place flat side of first knob against house bracket. |
| | | 2* | | | 5/16 in. by 3 in. FH galvanized stove bolt | Place flat side of second knob against beveled side of nut. |
| | | | 1 | | 3/8 in. by 3 in. galvanized machine bolt | Place flat side of first knob against bolt head. |
| | | | 2* | | 3/8 in. by 5 in. galvanized machine bolt | Place flat side of second knob against nut. |
| | | | | 1 | 5/16 in. by 1 in. FH galvanized machine screw | Obtained locally. |
| Corner Bracket | | 1 | | | 5/16 in. by 2 in. FH galvanized stove bolt | Place flat side of knob against corner bracket. |
| | | 2* | | | 5/16 in. by 3 in. FH galvanized stove bolt | Place flat side of top knob against bolt head and place nut against flat side of lower knob. |
| | | | 1 | | 3/8 in. by 3 in. galvanized machine bolt | Place flat side of knob against bolt head. |
| | | | | 1 | 5/16 in. by 1 in. FH galvanized machine screw | Obtained locally. |
| Insulator Supports | D | 1 | | | 5/16 in. by 2 in. FH galvanized stove bolt | Place flat side of knob against beveled side of nut. |
| | C | | 1 | | 3/8 in. by 3 in. galvanized machine bolt | |
| | D | | | 1 | 5/16 in. by 1 in. FH galvanized machine screw | Obtained locally. |
| | C | | | | | |
| Sign Bracket, 170 Type | | | | 1 | 5/16 in. by 3/4 in. RH galvanized machine screw | Machine screw and lock washers furnished. Obtain 7/16 in. by 1 in. galvanized round washer locally. |

* Locate one knob above and one knob below bracket.

(2) An intermediate support is needed for greater wire carrying capacity.

7.04 Drive rings equipped with a D drive anchor or C bridle rings equipped with a D plastic anchor may be used on masonry surfaces if they can be used in situations to better advantage than C wire loops.

7.05 Exposed drop wire runs that require fused protection and that are to be attached to a flammable surface should be supported with:

- (a) Insulated screw eyes.
- (b) C knob may be used if not more than two wires are to be placed.

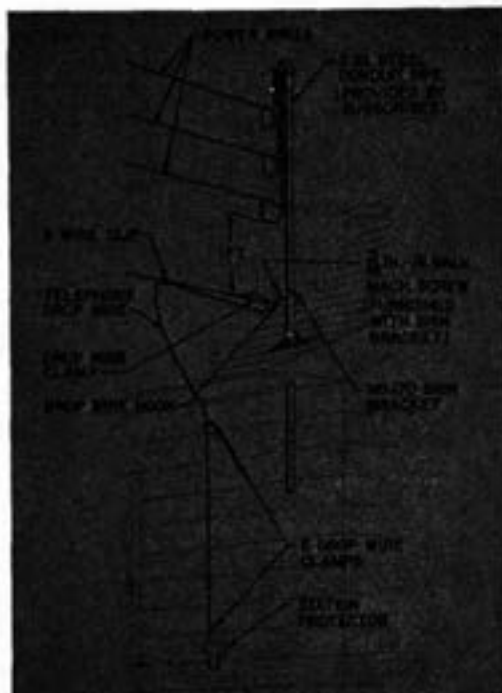


Fig. 10—Drop Wire Attached to Power Fixture

8. INTERMEDIATE ATTACHMENT INSIDE BUILDINGS

8.01 Drop wire runs between the point of entrance and the station protector should be kept as short as practicable.

8.02 Exposed runs that require fused protection and attach to flammable surfaces should be supported with insulated attachments.

8.03 Space attachments 16 inches apart on runs between the point of entrance and the protector or connecting block. Spacing will vary at corners with type of attachment used.

8.04 Where drop or block wires are extended from unexposed plant, or where block wire is extended from the station side of a fuseless protector, the method of fastening between the point of entrance and the connecting block or



Fig. 11—Drop Wire Attached to 2-inch Angle Iron

subscriber set is the same as for fastening station wire.

9. ATTACHING TO STEEL STRUCTURES

9.01 Manufacturing buildings, warehouses, piers, etc, require special means of attaching.

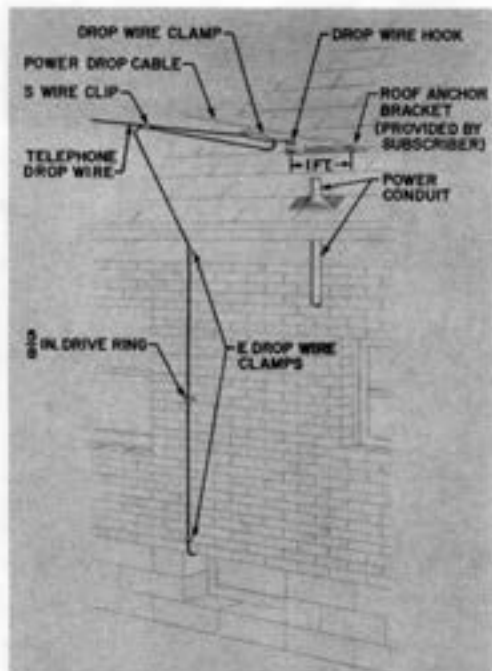


Fig. 12—Drop Wire Attached to Roof Anchor Brackets

- (a) The B beam clip equipped with either a drive ring or the B, K, or M bridle ring is used to support wire runs on I beams, angle irons, etc. on beam thickness of 1/8 inch to 1/2 inch.
- (b) B, C, or D insulator supports equipped with C or T knobs, bridle rings, or a one-bolt clamp can be used in various applications to attach to I beams, angle irons, etc.
- (1) B insulator support will accommodate B or M bridle rings only. It can be attached to steel structures up to 3/4 inch in thickness.
- (2) D insulator support will accommodate S knobs or B, K, or M bridle rings. It can be attached to steel structures up to 3/4 inch in thickness.

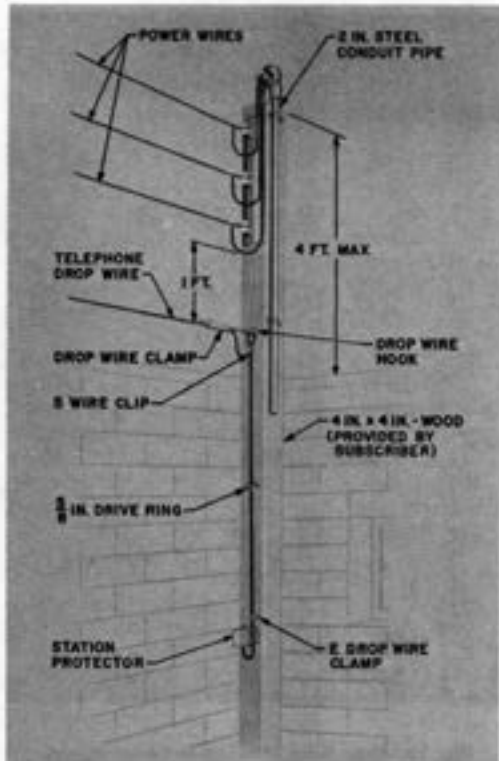


Fig. 13—Drop Wire Attached to Subscriber Pole

10. AERIAL BLOCK WIRE SPANS

- 10.01 Block wire must not be used in aerial spans that will introduce an exposure.
- 10.02 Where aerial span crosses driveway or private property, provide proper clearances.
- 10.03 Where span is 5 feet or less, bridle wire may be run without special supports. Where appearance is not essential and run is out of persons reach, this distance may be increased to 12 feet.
- 10.04 Where only a few bridle wires will be run and the span is 35 feet or less in length, provide drop wire hooks and clamps to support run.

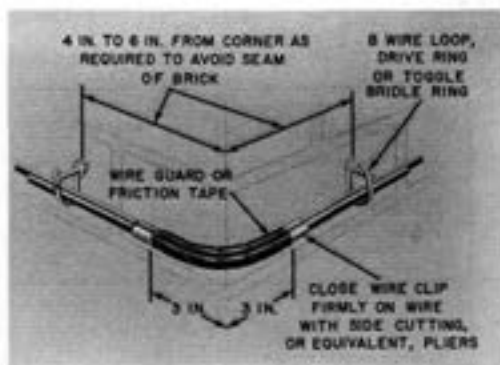


Fig. 14—Spacing Attachments at Outside Corner of Building

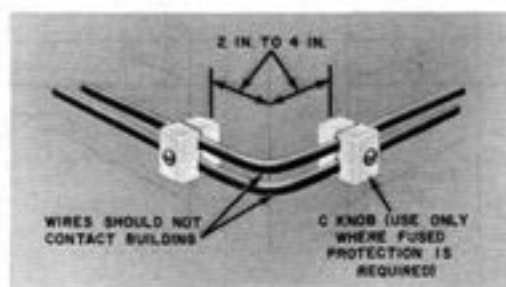


Fig. 15—Spacing C Knobs on Outside Corner of Building

10.05 Where span is more than 35 feet in length, use either drop wire attached at each end on drop wire hooks or bridle wire supported on 2200-pound strand.

10.06 Where span exceeds lengths specified in 10.03 or 10.04, bridle wire may be run in 1-1/2 inch No. 22 cable rings attached to 2200-pound strand. Space cable rings 3 feet apart. Place a drag line in the rings of the crossing span at the time they are attached. The drag line should always be replaced after it has been used for pulling wires across the aerial block wire span.

10.07 Fasten 1/2-inch wall strap to wooden building with two 3/8- by 4-inch coach screws installed

in studding. Bore 1/4-inch lead holes for drive screws.

11. EQUIPPING AND INSTALLING W LEADER BRACKET

11.01 The W leader bracket is a metal strap designed to be installed over small obstructions such as pipes, rain spouts, etc., on walls. The bracket will clear obstructions extending 5 inches from wall surfaces. The W leader bracket has a single-tapped hole in the center for equipping it with a B, K, or M bridle ring.

12. LAST ATTACHMENTS

12.01 The last attachment should be located within 18 inches of the building entrance hole.

12.02 Use the C knob on exposed wires that pass through a flammable surface. The E drop wire clamp is used on unexposed wires.

13. BUILDING ENTRANCE HOLES FOR DROP AND BLOCK WIRES

13.01 Use plastic tubes at building entrance holes for drop wire where fused protection is required and the wire passes through a flammable surface. Cut plastic tubes with a hack saw or diagonal pliers. Do not use split tubes at entrance holes.

13.02 The B entrance plug is intended primarily for use with NP, C, E, or F drop wires and is furnished in 1/2- and 3/4-inch diameter sizes. This plug may be used:

- To seal unused entrance holes in buildings to prevent entrance of rain, wind, insects, etc.
- To mechanically protect wire against abrasion.
- In place of plastic tube at building entrance hole on stations not requiring fused protection.

13.03 B entrance plug may be added to existing drop wire by separating partial split provided on inside surface of plug.

13.04 When drilling building entrance holes, consider the following:

- Drill holes away from side where appearance is most important.

TABLE E

FASTENERS FOR INTERMEDIATE ATTACHMENTS ON DROP AND BLOCK WIRE

| ATTACHMENT | | FASTENER | | TYPE OF CONSTRUCTION | | REMARKS | |
|---|---|---|--|--|--|---|-------|
| | | QUAN | TYPE | | | | |
| C Wire Loops | No. 1/2 No. 5/8 No. 7/8 No. 1-1/4 | 1 | B Masonry Fastener | No. 3 | Concrete | Fasteners for hand- type drive tools | |
| | | | | No. 4 | Mortar | | |
| | | | | No. 5 | Cinder | | Block |
| | | | | | Cement | | |
| Drive Rings | 1/2 in. | 1 | 3/16 in. x 5/8 in. D Drive Anchor | Masonry or substantial brick veneer | | | |
| | 5/8 in. and 7/8 in. | 1 | 1/4 in. x 1 in. D Drive Anchor | | | | |
| | 5/8 in. L* 7/8 in. L* 1-1/4 in. 1-1/4 in. L* | 1 | 1/4 in. x 1 in. D Drive Anchor | | | | |
| C Bridle Rings | 7/8 in. | 1 | No. 12 D Plastic Anchor | Masonry or substantial brick veneer | | | |
| | 1-1/4 in. 1-5/8 in. | 1 | No. 16 D Plastic Anchor | | | | |
| | 3 in. | | | | | | |
| B, K, or M Bridle Rings | | 1 | B beam clip insulator support | Angle irons, I beams, etc | | | |
| C Knob (used only where fused protectors are required) | | 1 | 2-1/2 in. No. 10 RH galvanized wood screw | Exposed woodwork (outdoors) | Locate screw approxi- mately 1 in. above bottom shingle or clapboard. | | |
| | | 1 | 2 in. No. 8 RH blued wood screw | Exposed woodwork (indoors) | | | |
| | | 1 | 3 in. No. 10 RH galvanized wood screw | Stucco on wood | | | |
| E Drop Wire Clamp | | 1 | D Masonry Fastener | No. 3 | Concrete | Fasteners for hand- type drive tools | |
| | | | | No. 4 | Mortar | | |
| | | | | No. 5 | Cinder | | Block |
| | | | | | Cement | | |
| | | | | 1 | 3/16 in. x 1 in. B Plastic Anchor | | Brick |
| 1 | 1 in. No. 8 RH galvanized wood screw | Wood siding or shingle and Metallic siding on wood | Locate screw approxi- mately 1 in. above bottom shingle or clapboard. | | | | |
| 1 | 3/16 in. x 3 in. toggle bolt | Hollow wall | | | | | |

* The L type is equipped with longer shank.

(b) Slope holes upward from outside.

(c) Use seams when drilling through masonry.

(d) Exercise care to avoid splintering wood or cracking masonry or brick.

(e) Drill clearance hole on all types of shingle siding.

13.05 Sizes of building entrance holes for wires and plastic tubes are shown in Table G.

TABLE F 4

CAPACITY OF WIRE LOOPS, DRIVE RINGS, BRIDLE RINGS FOR DROP AND BLOCK WIRE

| TYPE OF RING OR INSULATED SCREW EYE | SIZE | MAXIMUM NUMBER OF WIRES | | |
|-------------------------------------|--------------------------------|--------------------------|------------|--------------------|
| | | NP, C, E, or F DROP WIRE | BLOCK WIRE | MULTIPLE DROP WIRE |
| Drive Rings | 1/2 | 2 | 3 | 0 |
| | 5/8 and 5/8 L ^a | 6 | 9 | 1 |
| | 7/8 and 7/8 L ^a | 16 | 22 | 2 |
| | 1-1/4 and 1-1/4 L ^a | 30 | 40 | 5 |
| C Wire Loop† | No. 1/2 | 2 | 3 | 0 |
| | No. 5/8 | 6 | 9 | 1 |
| | No. 7/8 | 16 | 22 | 2 |
| | No. 1-1/4 | 30 | 40 | 5 |
| C Bridle Rings | 7/8 | 6 | 9 | 1 |
| | 1-1/4 | 16 | 22 | 2 |
| | 1-5/8 | 30 | 40 | 5 |
| | 3 | 100 | 140 | 16 |
| B, K, or M Bridle Rings | 1-1/4 | 16 | 22 | 2 |
| Insulated Screw Eyes | 5/8 S and L ^a | 4 | | 0 |
| | 1 S and L ^a | 10 | | 1 |

^a L represents longer shank.

† Install with suitable B masonry fasteners.

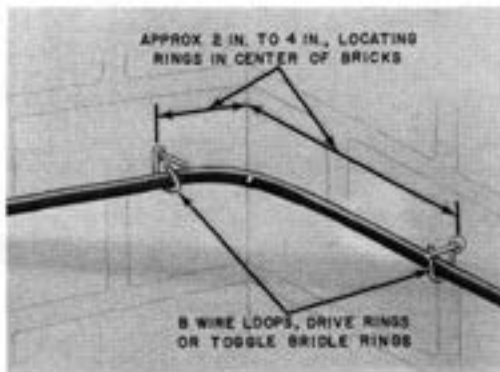


Fig. 16—Spacing Attachments at Inside Corner of Building

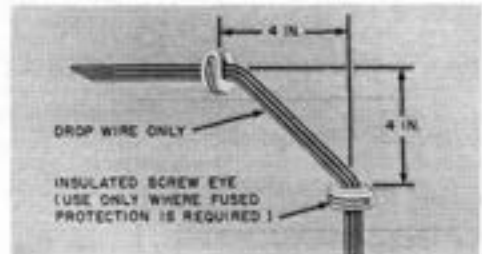


Fig. 17—Spacing Insulated Screw Eye When Changing Direction of Wire Run

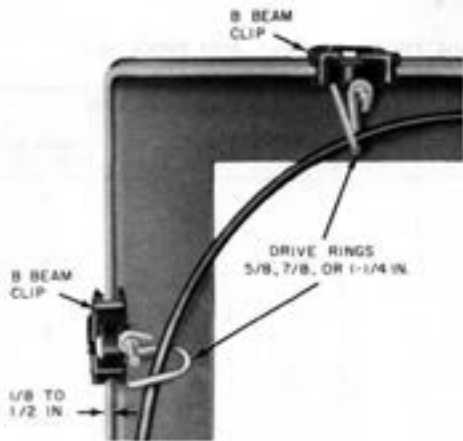


Fig. 18—B Beam Clips

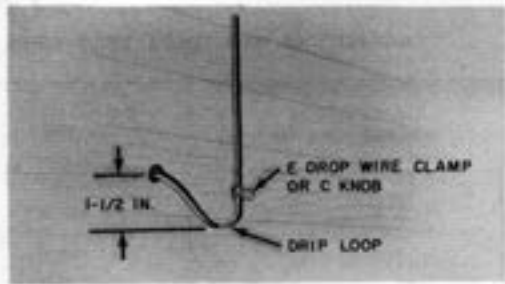


Fig. 20—Last Attachment, Building Entrance Hole Does Not Slope Upward From Outside

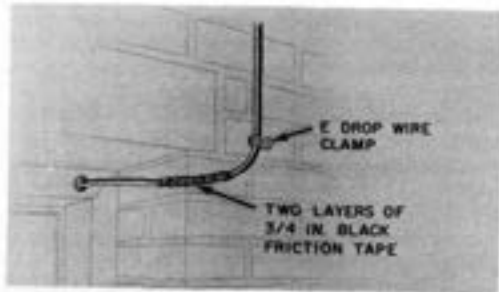


Fig. 19—Last Attachment, Building Entrance Slopes Upward From Outside

♦ TABLE G ♦

**SIZES OF BUILDING ENTRANCE HOLES
FOR DROP AND BLOCK WIRES AND PLASTIC TUBES**

| TYPE | WIRE, QUANTITY | | | | | | |
|--------------------------|--------------------------|-----|-----|-------------------|-----|-----|-----|
| | D block (bridle) | | | | 2 | 3 | 4 |
| NP, C, E, or F drop | 1 | 2 | 3 | 1 | 2 | 3 | 4 |
| | PLASTIC TUBE REQUIRED | | | TUBE NOT REQUIRED | | | |
| TUBE SIZE, INCH | 3/8 | 1/2 | 5/8 | | | | |
| ENTRANCE HOLE SIZE, INCH | 1/2 | 5/8 | 3/4 | 3/8 | 1/2 | 5/8 | 3/4 |

Note: When porcelain tubes are used, the size of the hole must be increased.

POLE-TO-POLE AND POLE-TO-BUILDING RUNS

1. GENERAL

1.01 Drop wire should be strung to normal stringing sags unless ground clearances make it necessary to use the minimum stringing sags as outlined in the section stringing sags of Drop Wires.

2. DISTRIBUTING DROPS FROM TERMINAL POLES

2.01 At Terminal Poles Not Requiring Guard Arms: Distribute drop wires from drive hooks placed on the face or back of poles. On pole-to-building spans, use drive hooks located above the suspension strand. On spans from pole-to-pole and from pole-to-span clamp, use the drive hook located below the cable. Existing drive hooks below the strand may also be used for drop runs to buildings if proper clearances can be obtained. Pass the drop wire through the drive hook only when no sharp bends will be placed in the wire.

3. DROP WIRE RUNS ALONG THE LEAD SECTION

General

3.01 For transmission and maintenance reasons, observe local instructions as to the maximum number of drops permissible and limit the length of a drop wire run to 500 feet.

3.02 Attach drop wire runs to poles along the lead by means of drive hooks. However, existing pole brackets may be used if they are located as specified for drive hooks.

Lead Carrying Aerial Cable

3.03 On straight line poles or inside corner poles where the pull of the wire is away from the pole, use a single drive hook to support the drop wire.

3.04 On jointly used poles or poles which are likely to become jointly used, drop wires, may be distributed from guard arm hooks where

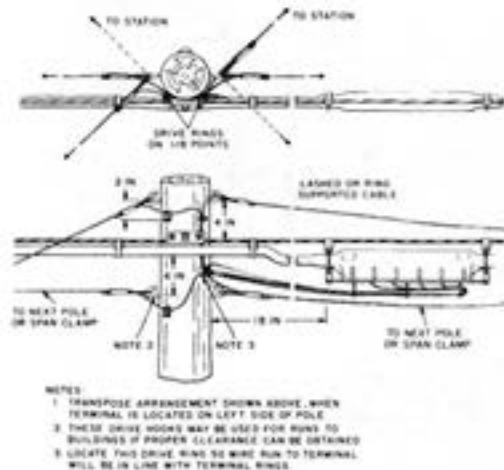


Fig. 1—Strand Mounted Terminal

a guard arm is required to provide proper climbing space.

4. PARTY-LINE TAPS ON DROP WIRE RUNS ALONG THE LEAD

Tap at Intermediate Points

4.01 To make an intermediate party tap along the lead, proceed as follows:

- (1) Install a 101B wire terminal on the pole directly below the drive hook.
- (2) Place a second drive hook on the face or back of the pole at the same level as the existing hook supporting the through drop wire.

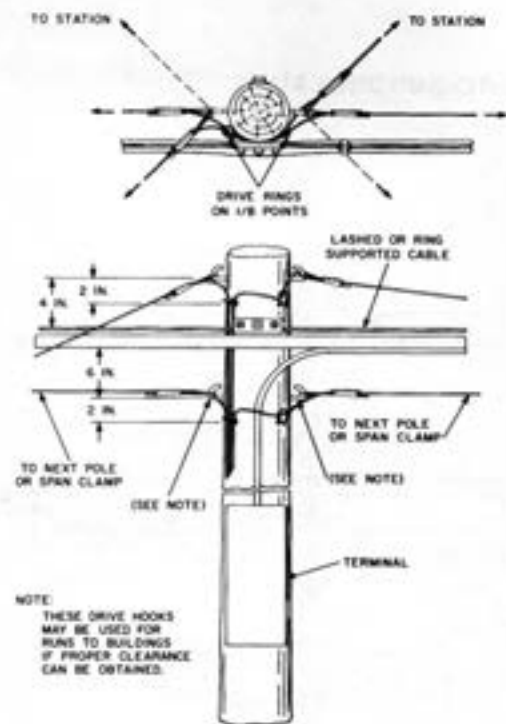


Fig. 2—Terminal Mounted on Cable Side of Pole

(3) After testing to make sure the line is not in use, cut the through drop wire about 2 feet from the first drive hook. The drop wire puller can be used to hold the wire before the cut is made.

(4) Splice a piece of drop wire to the short end of the through drop wire supported by the drop wire puller. Install a drop wire clamp on the spliced wire and place it on the new drive hook on the face or back of the pole.

(5) Place drive rings on pole and run the wire through them and terminate the two ends of the through drop wire on the binding posts of the wire terminal. Terminate the bridging drop wire in the wire terminal on top of the through wire connections. The complete party line tap is illustrated in Fig. 9.

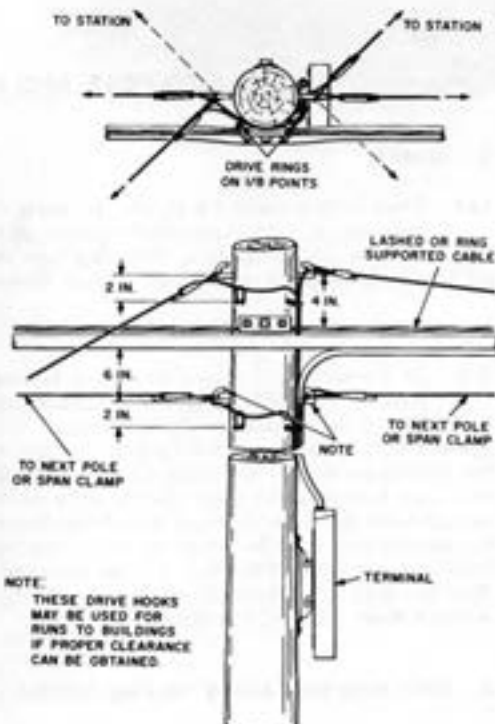


Fig. 3—Terminal Mounted on Face or Back of Pole

Top of End of Run

4.02 If the drop wire run along the lead is to be extended to an additional station, proceed as follows:

- (1) Place a 101B wire terminal on the pole and cut the existing subscriber circuit into it.
- (2) Terminate the drop wire extension in the 101B wire terminal to make the bridging connection.
- (3) Splice out the existing drop loop and terminate it in the wire terminal. The complete arrangements are similar to those shown in Fig. 9.

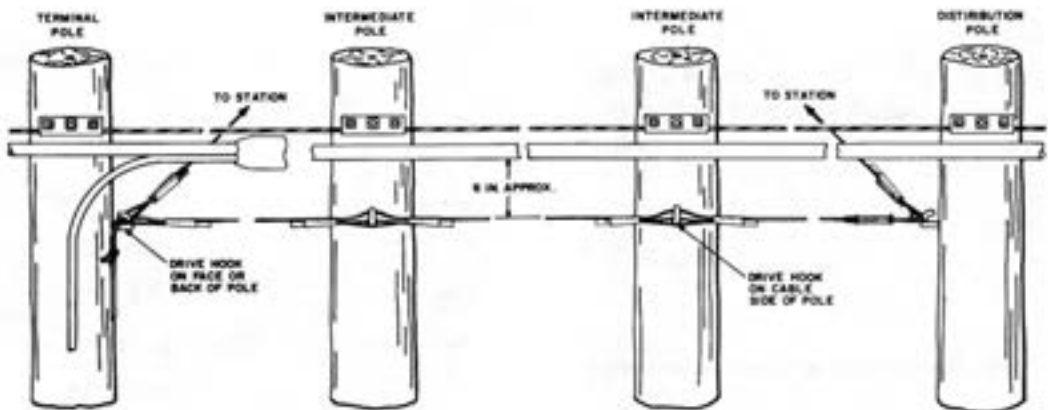


Fig. 4—Drop Wire Run Along Lead Carrying Cable

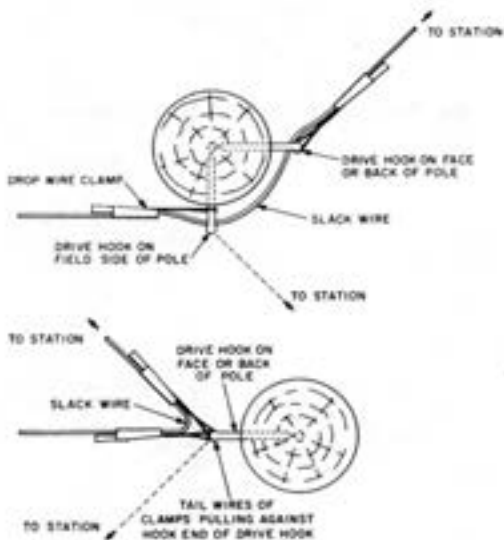


Fig. 5—Distributing Wires From Pole Other Than Terminal

4.03 In disconnecting a party line tap, lift its termination in the 101B wire terminal. Tag and cap the free end of the wire and bend it back

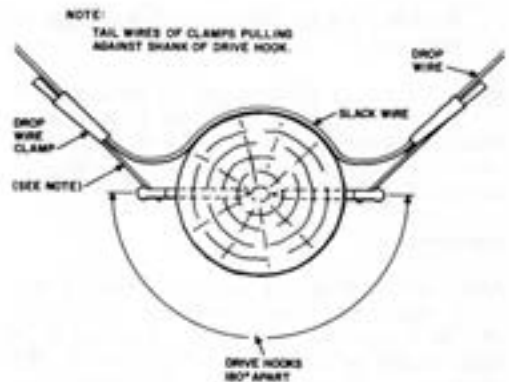


Fig. 6—Turning Outside Corner

upon itself about the lower ring and tape securely to the supporting wire.

5. RUNNING DROP WIRE PAST CABLE TERMINALS

5.01 Avoid drop wire runs past a cable terminal by endeavoring to obtain a reassignment to a nearer terminal.

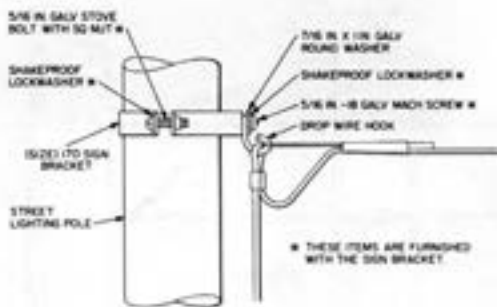


Fig. 7—Attachment to Type 170 Sign Bracket

5.02 Where a disconnected drop wire passing a terminal is to be reused, obtain an assignment to the nearer terminal if practicable.

6. ATTACHING DROP WIRE TO METAL TROLLEY OR STREET LIGHTING POLES

6.01 Drop wire attachments to metal trolley, traffic signaling, or street lighting poles should be avoided. However, if it is unavoidable, refer the case to your supervisor for specific approval before attachments are made.

Installation

6.02 Attach drop wire to metal street lighting, traffic signaling, or trolley pole by means of a drop wire hook fastened to a type 170 or 188 sign bracket as illustrated in Fig. 7 and 8. The diameter of the pole determines the type of sign bracket to be used, as follows:

| Type of Sign Bracket | Diameter of Pole |
|----------------------|-------------------|
| 2-170 | 1-7/8 to 3 inches |
| 3-170 | 3 to 4 inches |
| 4-170 | 4 to 5 inches |
| 6-188 | 5 to 8 inches |
| 10-188 | 8 to 12 inches |

6.03 Only one drop wire shall be attached to a sign bracket.

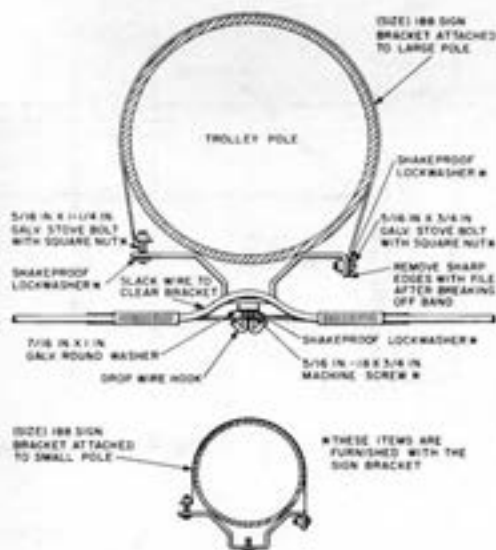


Fig. 8—Attachment to Type 188 Sign Bracket

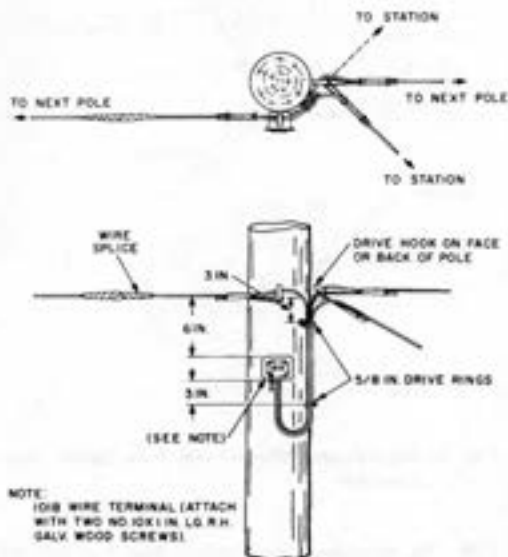


Fig. 9—Completed Party Line Top

DROP AND BLOCK WIRE—DISCONTINUANCE OF SERVICE

1. GENERAL

1.01 This section outlines methods for disposing of drop wire at customer building and pole on discontinuance of service.

2. STATION PROTECTOR OR CONNECTING BLOCK LEFT IN PLACE

2.01 Where station protector or connecting block is not to be removed, do not disconnect the outside drop at the customer building.

3. STATION PROTECTOR OR CONNECTING BLOCK REMOVED AND DROP WIRE LEFT IN PLACE

3.01 Where drop loop terminates on station protector or connecting block inside the subscriber building, disconnect the drop at station protector or connecting block and pull it out of the building entrance hole. Secure wire as shown in Fig. 1.

3.02 Where drop wire is terminated in a station protector located on outside of building proceed as follows:

- (1) Disconnect drop, ground, and station wires at the protector.
- (2) Tape and secure wire as shown in (Fig. 2).

3.03 Where station protector or connecting block is used as a bridging point for two or more party-line stations and one station is to be disconnected, disconnect only the associated station wiring at the bridging point. Secure the free end of wire in one of the following ways:

- (a) Lay free end of wire back on itself about the nearest ring and secure to supporting wire with friction tape.
- (b) Tape the free end of wire with friction tape and secure with inside wiring nails or staples. If all the party-line stations are to be disconnected



Fig. 1—Terminating Drop Wire When Protector is Removed

at the same time, dispose of the drop loop in the manner outlined in 3.01 and 3.02 for single station installations.

4. STATION EQUIPMENT TO BE REMOVED BUT NO ACCESS TO STATION PROTECTOR OR CONNECTING BLOCK

4.01 Cut drop wire at entrance hole. Serve and tape the free end as shown in Fig. 1.

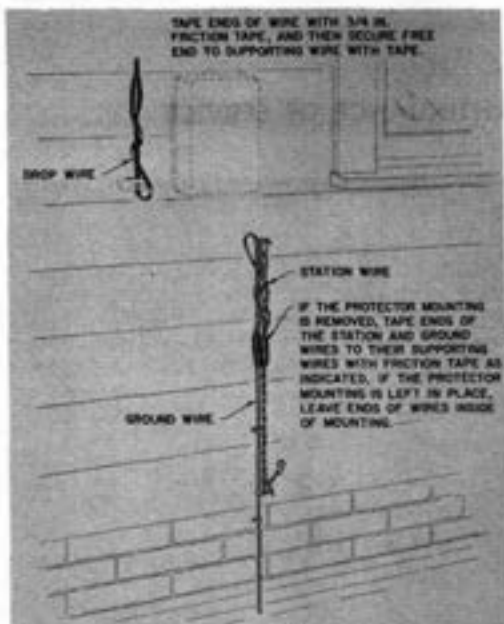


Fig. 2—Terminating Drop and Station Wiring When Protector is Removed

5. DROP AND BLOCK WIRE DISCONNECTS AT POLE

5.01 Suitable tags, locally provided, are wrapped around the ends of disconnected drops as a means of identifying each drop in connection with plant orders to restore service. The tag should indicate the address of the customer served and other pertinent information as determined by local service practices.

5.02 The top nuts of the binding posts which are vacated by disconnected drops, should be turned down fingertight.

5.03 Where a cable pair becomes spare on disconnecting a drop and it appears in a cross connecting terminal in the cable run, the associated cross connection should be removed in accordance with local instructions.

6. PLACING B DROP WIRE CAP ON END OF DISCONNECTED DROP WIRE

6.01 Fig. 3 shows the procedure for placing the B Drop Wire Cap.

7. DISCONNECTING DROP WIRE AT DISTRIBUTION CABLE TERMINALS

7.01 *Pole Mounted Terminals:* Dispose of connected drop as follows:

- (1) Pull the free end of wire out of the terminal.
- (2) Lay wire back on itself at the first ring below the terminal, tag and cap the free end and then secure the free end to the supporting part of the wire (Fig. 4).

7.02 *Strand and Sheath Mounted Terminals:* Dispose of disconnected wire at 49-, N-, and T-type terminals as follows:

- (1) Pull free end of wire out of the terminal.
- (2) Lay wire back on itself at the wiring ring, which will allow the free end to fall outside the terminal wiring rings.
- (3) Tag and cap the wire end and secure it to the supporting part of the wire as shown in Fig. 5.

7.03 *Wall Mounted Terminals:*

- (a) *Vertically Mounted Terminals:* Dispose of disconnected drop in the manner described in 7.01 for pole-mounted terminals.
- (b) *Horizontally Mounted Terminals:* Dispose of disconnected drops in the manner described in 7.02 for strand mounted terminals. The completed operation is shown in Fig. 6.

8. DISCONNECTING DROP WIRE AT WIRE TERMINALS

8.01 *Party Line Taps in Drop Wire Runs Along a Lead:* Pull the free end of wire out of the wire terminal, tag and cap it and secure to the supporting part of the drop as shown in Fig. 7. If the party line extending beyond the wire terminal pole is disconnected, treat its free end at

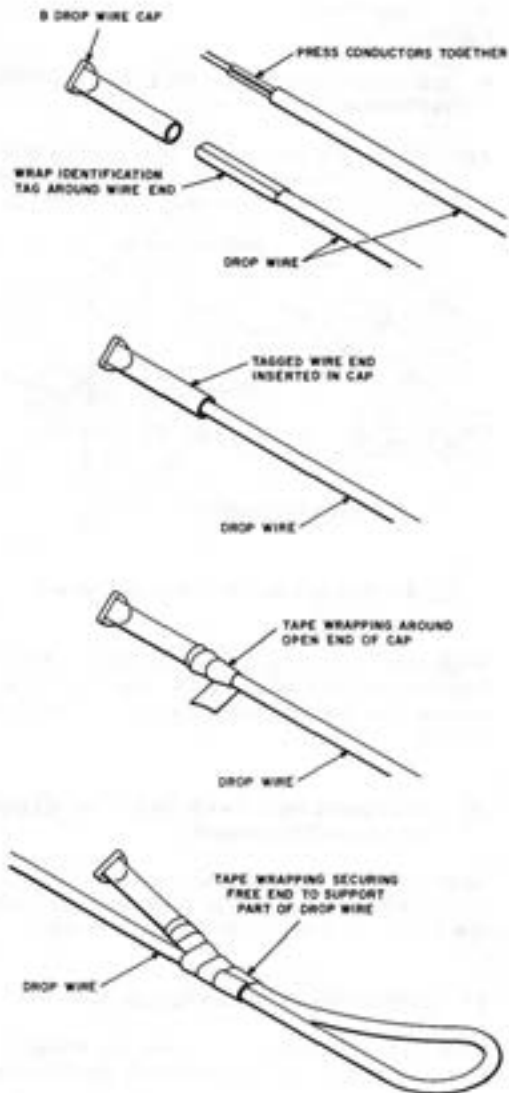


Fig. 3—Disposition of Disconnected Drop Wire

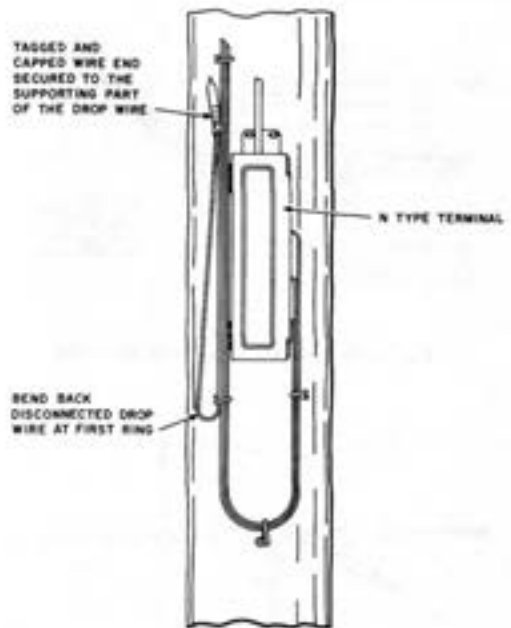


Fig. 4—N-Type Terminal, Pole Mounted

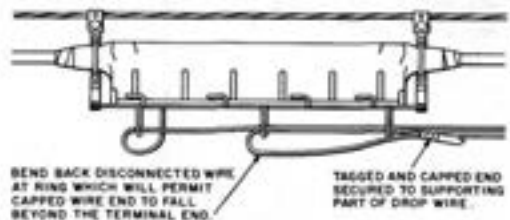


Fig. 5—49-Type Terminal, Strand Mounted

this point the same as for the intermediate party line.

8.02 Drops from Open Wire Lines: Pull disconnected drop from the wire terminal mounted on the crossarm or pole. Lay wire back on itself at drive ring located below the wire terminal, tag and cap the free end and secure it

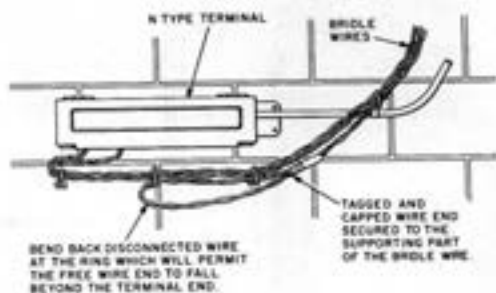


Fig. 6—N-Type Terminal Wall Mounted

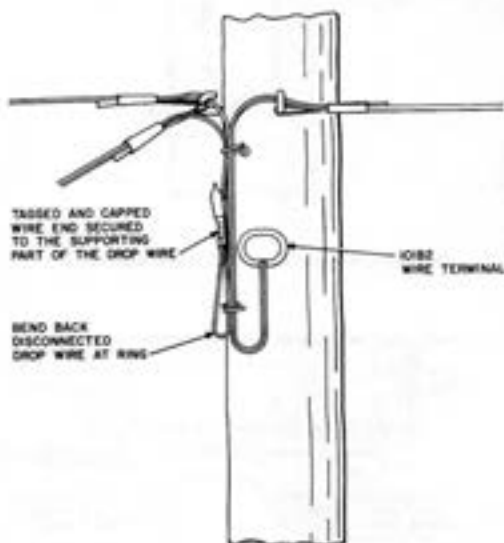


Fig. 7—101-Type Wire Terminal, Pole Mounted

to the supporting part of the drop as shown in Fig. 8.

9. DISCONNECTING DROP WIRE AT 116-TYPE PROTECTOR

9.01 Where, for purposes of protection, a drop wire is connected *through* a 116-type protector to a cable distribution terminal, disconnect the

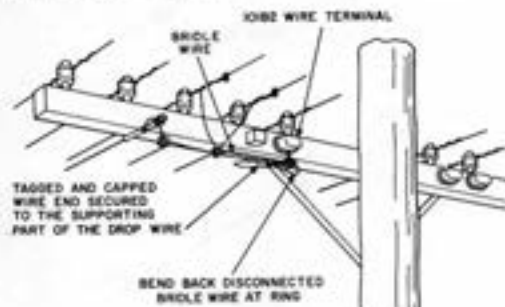


Fig. 8—Wire Terminal Mounted on Crossarm

bridle cross connection wire at the cable terminal. Pull the free end of the bridle wire out of the terminal and tag, cap, and support it as described in Part 7.

10. DISCONNECTING DROP WIRE AT CROSS CONNECTING TERMINALS

10.01 Disconnect the drop wire and tag and cap the end. Bend the wire back on itself and secure the free end *inside* the terminal.

11. TAPING END OF DISCONNECTED DROP WIRE

11.01 Where B drop wire caps are not available, wire ends may be taped with friction tape.

MULTIPLE DROP WIRE PLACEMENT

1. GENERAL

1.01 This section covers methods for placing multiple drop wire in spans and on building walls.

2. MULTIPLE DROP WIRE RUNS ON BUILDINGS (Fig. 1)

2.01 *First Building Attachment:* Use a drop wire hook as the first building attachment for multiple drop wire in pole-to-house spans. Attach hook to masonry walls with 5/16 by 1-3/4 inch hammer drive anchor; and to wood, stucco on wood, and metal on wood walls with No. 18 RH galvanized wood screw 2-1/2 inches or longer. The screw should penetrate the house studding at least 1-1/4 inch. Only one multiple drop wire should be supported on a drop wire hook.

2.02 *Second Building Attachment:* Clamp the cable to the wall close to the drop wire hook attachment with a No. 9 cable clamp. Attach clamp to walls as follows:

Wood walls—1-1/2 inch No. 14 galvanized RH wood screws

Masonry walls—1/4- by 1-inch hammer drive anchor

Stucco on wood }
Metal on wood } 2-inch No. 14 galvanized
Rigid composition } RH wood screw

2.03 *Intermediate Building Attachments:* Use 5/8-inch drive rings about 3 feet apart as intermediate attachments. It will be necessary to spread the opening in the rings slightly in order to insert the multiple drop wire.

2.04 *Last Building Attachment:* Place a No. 9 cable clamp on the multiple drop wire 6 inches from point of entrance to protector, wire terminal, or building after pulling the wire taut in the ring run. Attach clamp to wall as indicated in 2.02.

2.05 The multiple drop wire may be terminated in 6-pair wire terminal or 6-pair protector on the outside wall or inside the building.

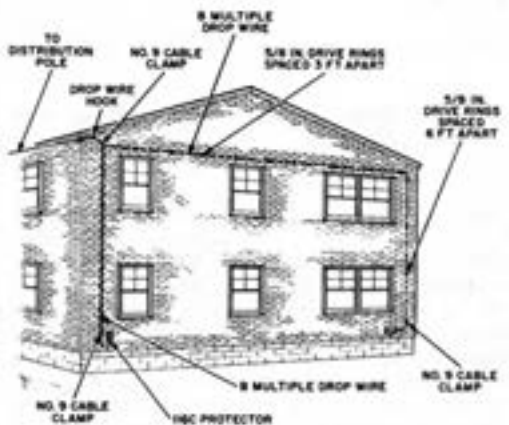


Fig. 1—Complete Wire Run on Building

3. PLACING D DROP WIRE CLAMPS ON MULTIPLE DROP WIRE

3.01 The D clamp is designed primarily for use on multiple drop wire. It consists of two identical semicircular shells and two flat wedges held together by a tail wire.

3.02 Install the clamp on the wire in the following manner:

- (1) Interlock the two shells on the wire with the large ends toward the span.
- (2) Press the shells together and slide the wedges into the tab rails on the sides of the shells. Tap the wedges with pliers to seat them firmly.
- (3) Place the tail wire over the drive hook or drop wire hook (Fig. 2).

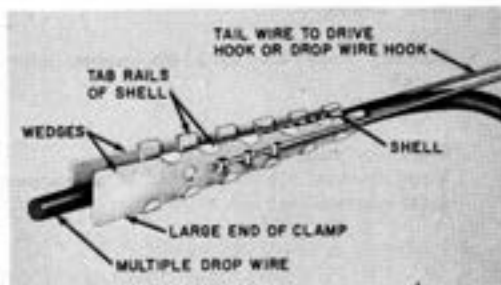


Fig. 2—D Drop Wire Clamp Assembled on Wire

4. TERMINATING MULTIPLE DROP WIRE IN CABLE TERMINALS

4.01 Remove the outer jacket and glass yarn tape back to the first of the three drive or bridle rings associated with a pole- or wall-mounted terminal. For sheath-mounted terminals, strip jacket at terminal wiring ring nearest the pole. Fan out the pairs, run them through the rings, and terminate them in the terminal in the manner followed for block wire.

5. TERMINATING MULTIPLE DROP WIRE IN 116-TYPE PROTECTORS

5.01 The 116C protector can be used with multiple or individual drop wires. It contains twelve

2A1A or 2B2-type protector units, six pairs of line terminals, and two terminals for signal ground connections.

5.02 The 116A (MD) protector is equipped with a housing which is similar to that of the 10-pair N-type distribution terminals.

5.03 Insert the multiple wire or separate drop wire into either end of the protector as desired. It will greatly facilitate conductor terminations if the end of the wire is stripped of its outer jacket before inserting the wire into the protector housing.

5.04 All drop wire conductors should be terminated during the initial installation. Place the individual wires under the bottom nut of each binding post. Station wires entering the protector through the wire holes are terminated between the washers below the top nut. The signaling ground terminals are bonded internally to the protector ground terminal.

6. INSTALLING 60-TYPE FUSES ON 116-TYPE PROTECTORS

6.01 Sneak current fuses, when specified, may be added to the 116-type protector. A 14A fuse holder is used to mount the 60-type fuse on the protector.

7. TERMINATING MULTIPLE DROP WIRE IN 104B WIRE TERMINALS

7.01 A 6-pair wire terminal similar in design to the 116C protector is used where station protectors are not required. The terminal block is similar to the block in the 116C protector except for the omission of the protector units and ground clamp. The wiring of the wire terminal will be the same as for the 116C protector, except, that the ground wire connection when required for station ringers is made on one of the ground posts. Use a No. 14 ground wire for this purpose.

DEDICATED PLANT— WIRING ACCESS POINTS

1. GENERAL

1.01 Under the dedicated plant plan, a pair is permanently assigned to a specific residence or non-key business address from a central office. Once dedicated, the pair will remain permanently assigned to a customer's location, whether working or idle.

1.02 This section is reissued to add information on the:

- UP-1248 cable closure
- B and C bond clamps and WE-1 cable tie
- Restoring previously used *IN* cable pair.

1.03 Subscriber drop, block, or buried service wires should not be terminated in an access point; they should be terminated in distribution terminals.

1.04 Access points can be distinguished from control points by:

- (a) A green B cable tie placed around the *EXPRESS* cable of a strand-mounted access point (Fig. 2). A red B cable tie identifies a control point (Fig. 4).
- (b) A marker with a letter *A* on a green background installed on pole- and wall-mounted closures, building cabinets, and buried closures identify access points. Control points are identified by a letter *C* on a red background.

1.05 Control points are under administrative control of the engineer of outside plant, and all pair connections in control points are made under engineering work orders.

1.06 Access points have been designed so that Telephone Company personnel entering an access point will find the *OUT* cable pairs placed through the rear holes of the wiring brackets, and the method of connecting the *IN* and *OUT* pairs

the same regardless of the type of closure. This has been done to facilitate good housekeeping. The closure should always look neat after the workman leaves the job.

1.07 When piecing-out cable pairs, do not change colors. Always use wire of the same color and gauge as the cable pair being pieced-out.

1.08 A talk pair is provided for calling testboard and other locations which will reduce test pick damage to the conductors.

2. DEFINITIONS

2.01 *Access Points* provide a means of connecting pairs in distribution cables to spare pairs in main or branch feeder cables. Cables entering access points from the central office or a preceding control point are termed *IN* or *EXPRESS* cables (Fig. 1). Cables leaving access points toward subscribers are termed *OUT* cables. Cables which originate in the access point assume the address of the access point, and the cable pair numbers assigned to the pairs in these cables begin at one (1) and continue up to the total number of pairs originating at this location. *EXPRESS* feeder cables leaving access points do not change designations.

2.02 *Continuous PIC Sheath Count* provides binder group identification by the use of colored wire ties installed at the time of construction of the access point. Table A lists an example of continuous PIC sheath count in an access point with one or more *IN* and *OUT* cables.

2.03 A workman visiting the following types of access points will find that the *OUT* cable units have been positioned in the wiring brackets and identified by a continuous PIC sheath count. The access point may have a number of pairs connected or no pairs connected.

- (a) *Strand-Mounted Access Point*—The 1B1 closure (Fig. 2) is used as a strand-mounted access point.

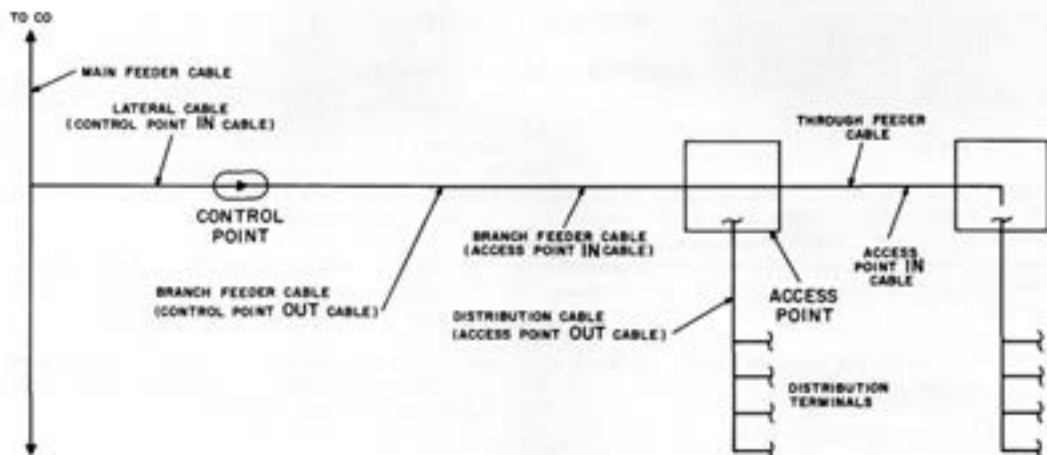


Fig. 1—Simplified Dedicated Plant Distribution System

(b) **Pole- and Wall-Mounted Access Points**—The 5-type closures (Fig. 3) and the 29-type cabinets (Fig. 4) are used to enclose pole- and wall-mounted access points.

(c) **Access Points in Buried Plant**—The L backboard (Fig. 5), the M backboard (Fig. 6), and the N backboard (Fig. 7), used in conjunction with the G, H, UP-1200, and UP-1248 cable closures, respectively, are used for access points in buried plant. The UP-1248 cable closure (Fig. 8) supersedes the UP-1200 cable closure and is used to enclose large PIC cable splices, to house access and control points, and to house CCTV (close circuit television) equipment.

(d) **B or C Bond Clamp (Fig. 9 and 10)**: Used to bond the metallic shield of PIC cables to the ground bracket of the closure (Fig. 11).

(e) **WE-1 Cable Tie (Fig. 11)**: Used to secure the cables to the ground bracket assembly. ¶

3. IDENTIFYING SPECIAL CIRCUITS

3.01 When cable pairs are used for special services, it will be necessary to identify the circuits at the time the pairs are connected by wrapping a red warning marker tape around each B wire connector as shown in Fig. 3.

3.02 When disconnecting the special service pairs, remove the red warning marker tape from the B wire connectors.

4. CONNECTING

4.01 The procedures for connecting the *IN* and *OUT* cable pairs in an access point are the same in each type of closure and are designed to eliminate unnecessary handling of pairs once they are connected, promote good housekeeping, and provide easy identification; therefore, it is important that the procedures outlined in this section be followed.

Cable End Location or Locations Fed by Stub Cable

4.02 Loosen the B cable tie and select the assigned *IN* pair.

4.03 Cut the assigned *IN* pair as close to the acetate container as possible.

Note: If the wrong pair is cut, splice with same color wire and insert each conductor in a B wire connector and press. Replace the pair within its binder group.

4.04 Pull the assigned *IN* pair from the binder group and place in the *front* wiring bracket

TABLE A
EXAMPLE OF A CONTINUOUS PIC SHEATH COUNT IN AN ACCESS POINT

| OUT CABLES ¹ | | | | | IN CABLES ² | | | | |
|-------------------------|------------------------|--------------|------------------------|-------------------------------------|------------------------|------------------------|--------------|------------------------|-------------------------------------|
| CABLE NO. | CABLE PIC SHEATH COUNT | BINDER GROUP | CONTS PIC SHEATH COUNT | COLOR OF WIRE ON CONTS GREEN BINDER | CABLE NO. | CABLE PIC SHEATH COUNT | BINDER GROUP | CONTS PIC SHEATH COUNT | COLOR OF WIRE ON CONTS GREEN BINDER |
| 1 | 1-25 | BL-W | 1-25 | BL-W | 1 | 1-25 | BL-W | 1-25 | BL-W |
| 1 | 26-50 | O-W | 26-50 | O-W | 1 | 26-50 | O-W | 26-50 | O-W |
| 1 | 51-75 | G-W | 51-75 | G-W | 1 | 51-75 | G-W | 51-75 | G-W |
| 1 | 76-100 | BR-W | 76-100 | BR-W | 1 | 76-100 | BR-W | 76-100 | BR-W |
| 2 | 1-25 | BL-W | 101-125 | S-W | 1 | 101-125 | S-W | 101-125 | S-W |
| 2 | 26-50 | O-W | 126-150 | BL-R | 1 | 126-150 | BL-R | 126-150 | BL-R |
| 2 | 51-75 | G-W | 151-175 | O-R | 1 | 151-175 | O-R | 151-175 | O-R |
| 2 | 76-100 | BR-W | 176-200 | G-R | 1 | 176-200 | G-R | 176-200 | G-R |
| 3 | 1-25 | BL-W | 201-225 | BR-R | 2 | 1-25 | BL-W | 201-225 | BR-R |
| 3 | 26-50 | O-W | 226-250 | S-R | 2 | 26-50 | O-W | 226-250 | S-R |
| 4 | 1-25 | BL-W | 251-275 | BL-BK | 2 | 51-75 | G-W | 251-275 | BL-BK |
| 4 | 26-50 | O-W | 276-300 | O-BK | 2 | 76-100 | BR-W | 276-300 | O-BK |
| | | | | | 2 | 101-125 | S-W | 301-325 | G-BK |
| | | | | | 2 | 126-150 | BL-R | 326-350 | BR-BK |
| | | | | | 2 | 151-175 | O-R | 351-375 | S-BK |
| | | | | | 2 | 176-200 | G-R | 376-400 | BL-Y |

Notes 1: *OUT* cable number and pairs are: (1)100-pair, (2)100-pair, (3)50-pair, (4)50-pair.

2: *IN* cable number and pairs are: (1)200-pair and (2)200-pair.

hole (Fig. 12) corresponding to the assigned *OUT* cable pair to which it is to be connected. **Do not remove the *OUT* cable pair from the rear hole of the wiring bracket.**

4.05 Remove the *OUT* cable pair from the single wire tie.

4.06 Cut the assigned *IN* pair to the same length as the assigned *OUT* pair and connect with a B wire connector. If for any reason the *IN* pair is shorter than the *OUT* pair, piece out the *IN* pair (Part 5). Do not cut the *OUT* pair. Use only a B connector presser or pneumatic presser for crimping the B wire connectors.

4.07 Tighten the single wire tie on the remaining unconnected pairs of the *OUT* binder groups.

4.08 Secure the capped spare binder groups to the bottom of the closure by tightening the B cable tie.

Loop-Through Locations and Strand-Mounted Closures

4.09 Select the *IN* cable pair from the preferred count and cut the pair at the butt of the cable **away** from the central office side of the closure.

4.10 Repeat 4.04 and 4.06 for placing and connecting the assigned *IN* cable pair.

5. PIECING-OUT

***OUT* Cable Pair**

5.01 If for any reason the *OUT* cable pair is too short to reach an assigned wiring bracket hole, piece out the conductor as follows. Use wire

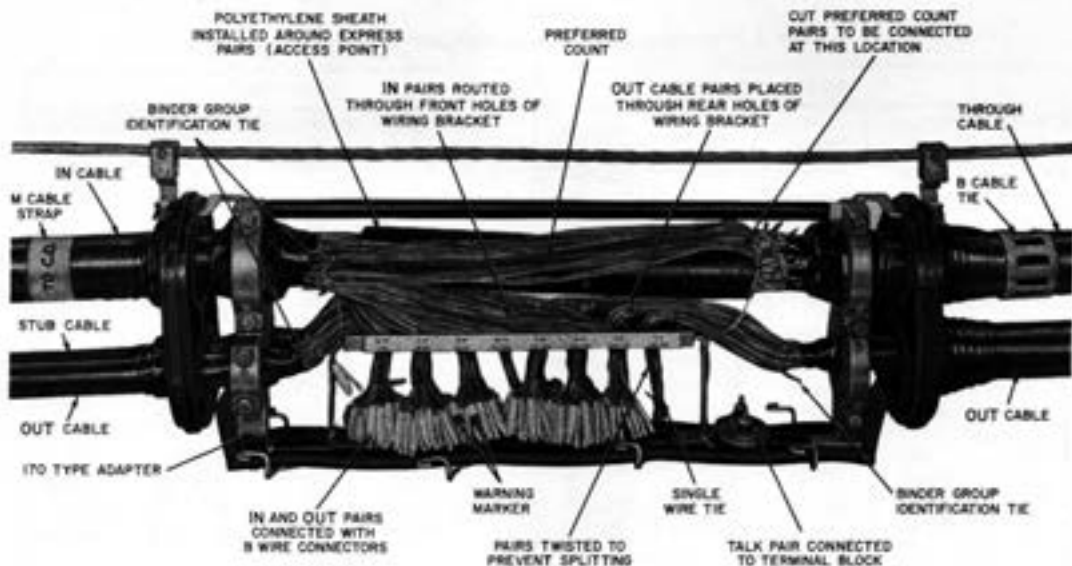


Fig. 2—1B1 Closure

having the same colored insulation and gauge as the cable pair.

- (a) Cut the *OUT* cable pairs even.
- (b) Insert the tip conductor and the like-colored piecing-out wire in a B wire connector and press.
- (c) Insert the ring conductor and the like-colored piecing-out wire in a B wire connector and press.
- (d) Route the *OUT* cable pair through the assigned rear hole of the wiring bracket and apply from four to six tight twists as close to the bottom of the wiring bracket as possible. This prevents pair splitting.
- (e) Cut the piecing-out wire to the same length as the other unconnected pairs of the binder group.

IN Cable Pair

5.02 The procedures for piecing-out the *IN* cable pair are identical to the procedures outlined in 5.01, except cross-connecting wire may be used as the piecing-out wire if no wire having the same colored insulation or gauge as the *IN* cable pair is available. **Never use an odd-colored wire.**

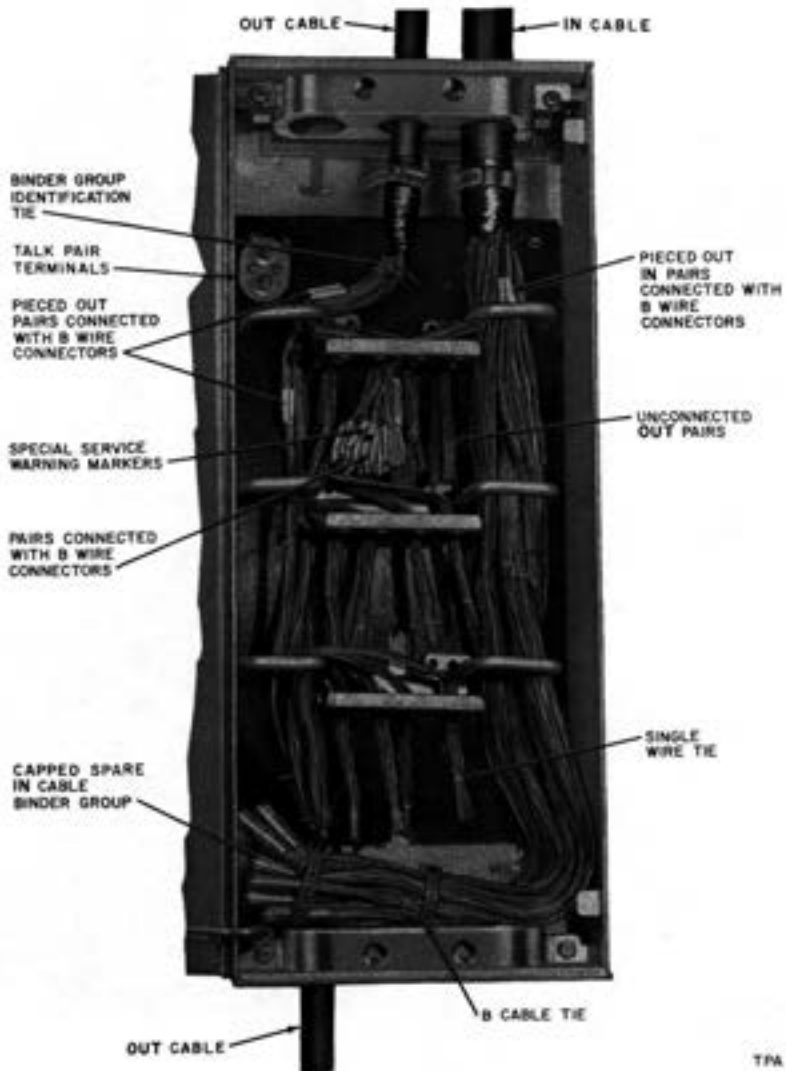
5.03 Route the pieced-out wire through the distributing rings, binder group identification tie, and the front hole of the wiring bracket corresponding to the assigned *OUT* cable pair.

5.04 Connect the assigned *IN* cable pair and the *OUT* cable pair using B wire connectors.

PIECING-OUT AND RESTORING PREVIOUSLY USED *IN* CABLE PAIR WITHIN BINDER GROUP FOR FUTURE USE

5.05 Remove the disconnected *IN* cable pair from the *front* hole of the wiring bracket.

5.06 Obtain a length of piecing-out wire having the same colored insulation and gauge as the disconnected *IN* cable pair. **If no wire with the same colored insulation or gauge as the *IN***



TPA 506028

Fig. 3—5-Type Closure (Pole Mounted)

TPA 470373

OUT CABLE

IN CABLE

TALK PAIR
TERMINALS

OUT CABLE PAIRS ROUTED
THROUGH REAR HOLES OF
WIRING BRACKET

IN CABLE PAIRS ROUTED
THROUGH FRONT HOLES
OF WIRING BRACKET

IN AND OUT CABLE PAIRS
CONNECTED WITH
B WIRE CONNECTORS

CAPPED UNASSIGNED
IN CABLE BINDER GROUPS

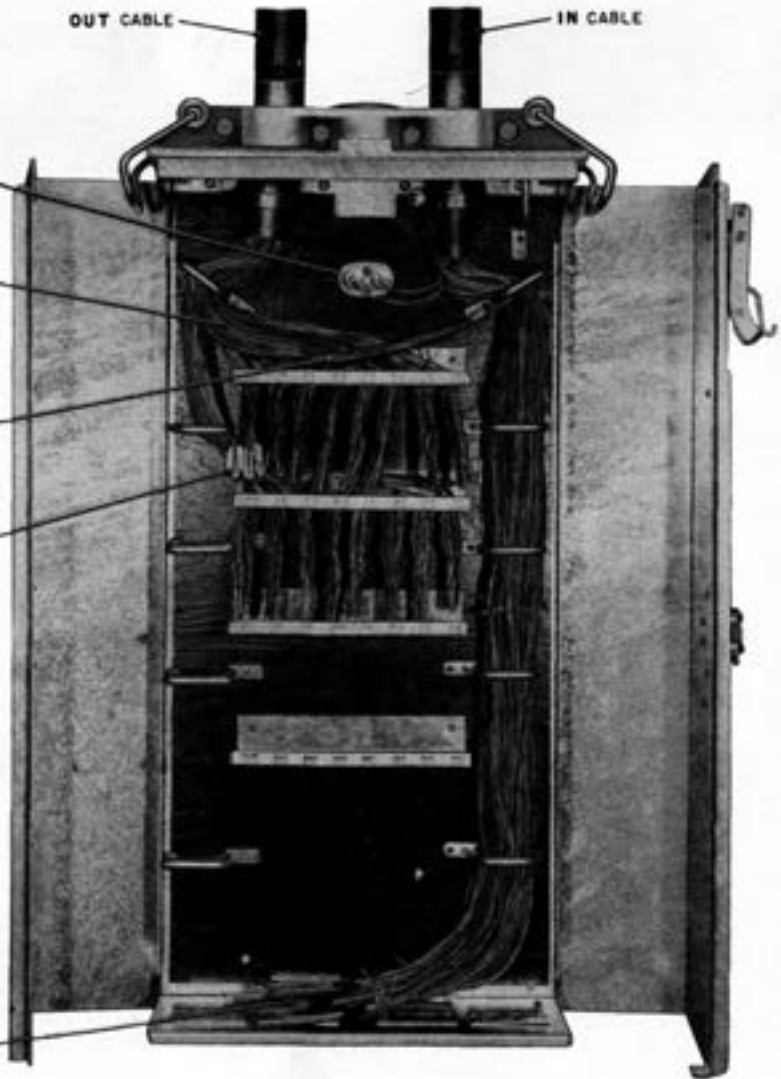


Fig. 4—29-Type Cabinet (Wall Mounted)

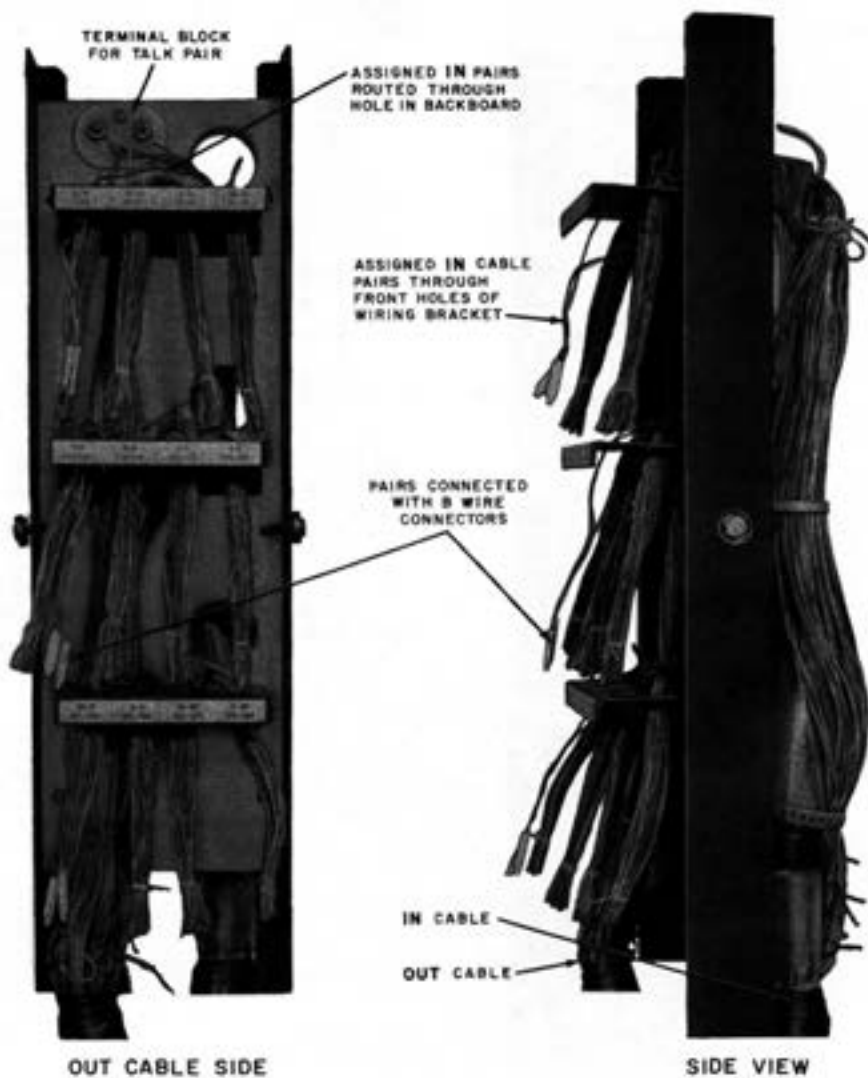


Fig. 5—L-Backboard



Fig. 6—M-Backboard

cable pair is available, use cross-connecting wire for piecing out. Do not substitute an odd-colored wire.

5.07 Splice the piecing-out wires to the disconnected *IN* cable pair using B wire connectors.

5.08 Clear ends of pieced-out pair using B wire connectors, then restore the pieced-out pair within its original binder group and secure within the unassigned *IN* cable pairs with a B cable tie.⚡

6. TALKING CIRCUIT

6.01 The terminal block, installed at the time of construction, provides the workman with a talking circuit for calling the test desk, etc.

6.02 Detailed instructions covering the use of specific types of handsets are covered in other sections.

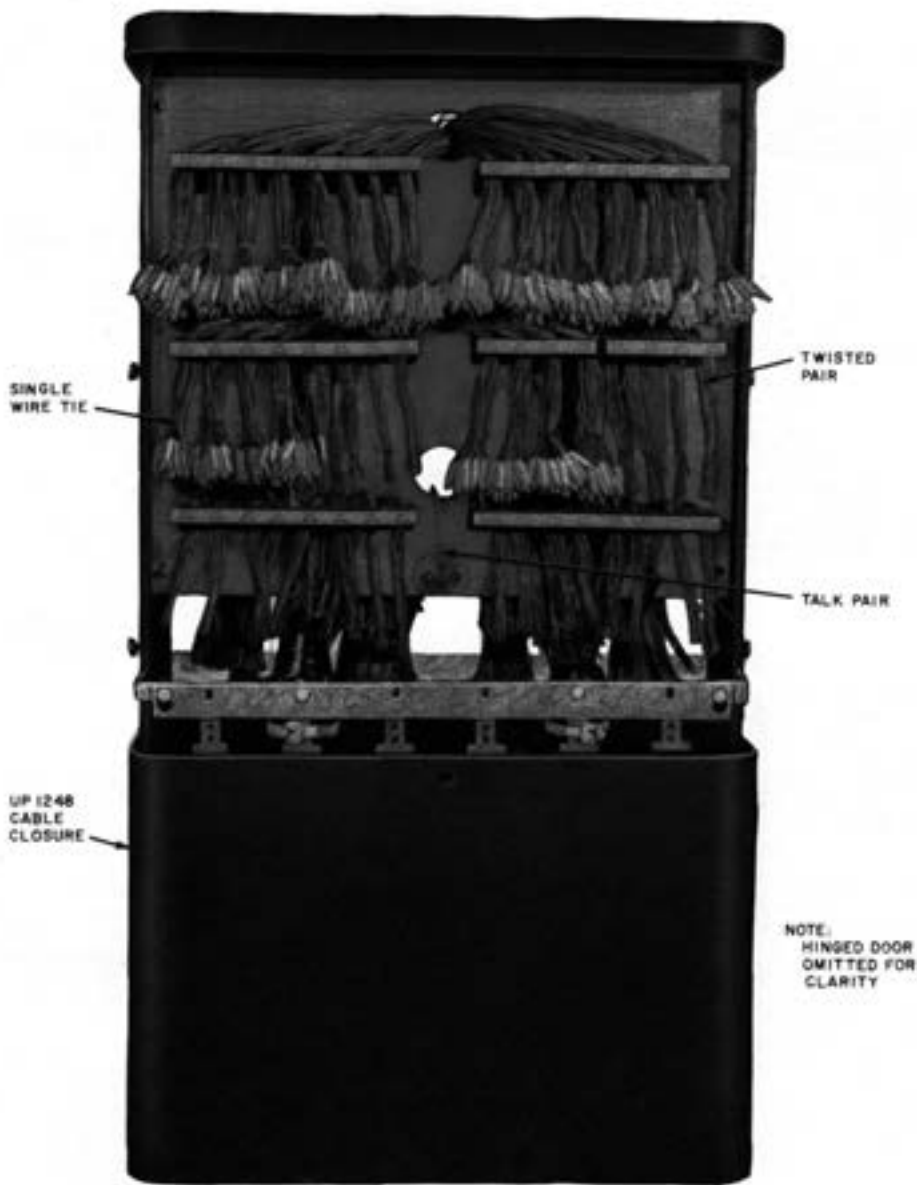


Fig. 7—N-Backboard

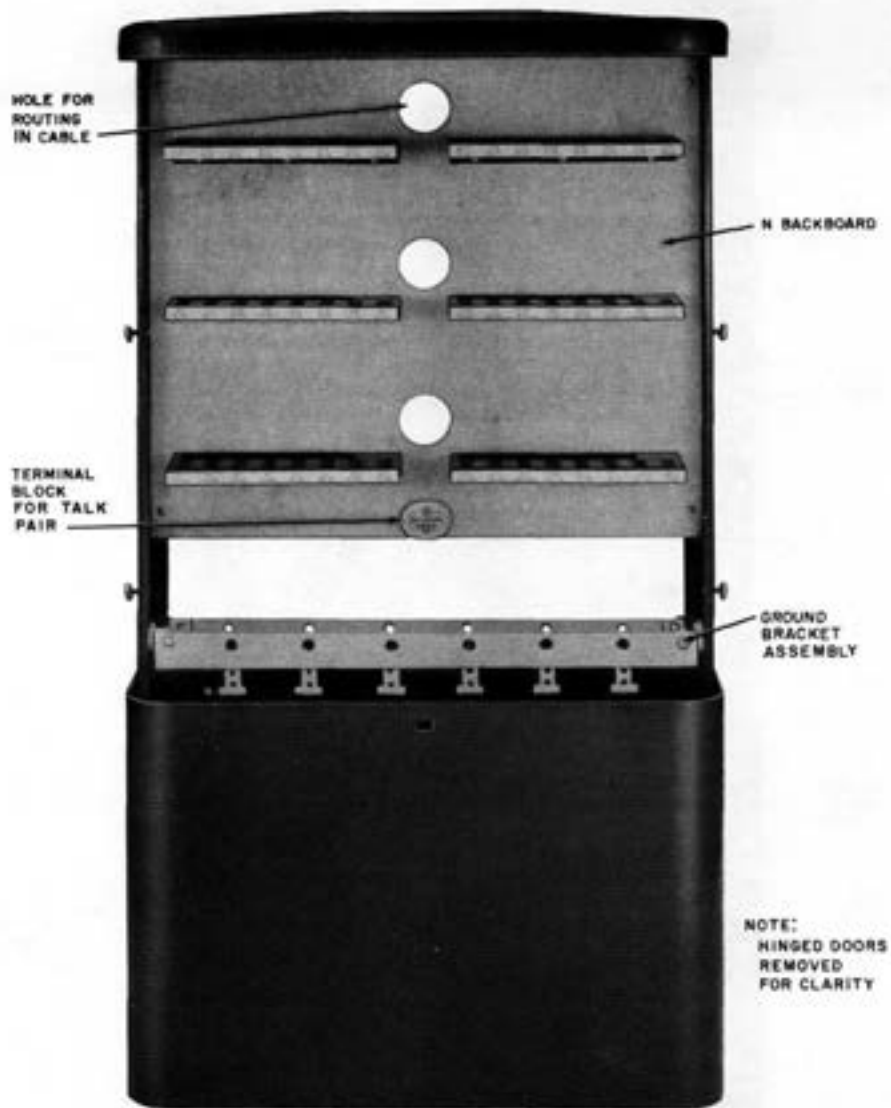
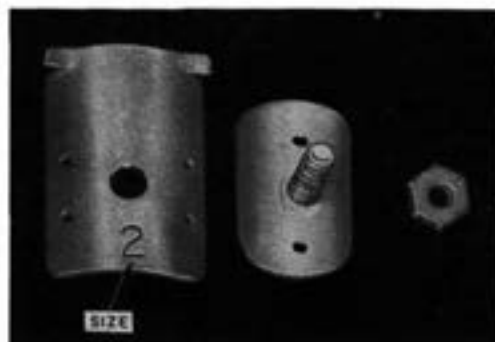


Fig. 8—4UP-1248 Cable Closure Equipped With N Backboard



B BOND CLAMP



C BOND CLAMP

Fig. 9—B and C Bond Clamp

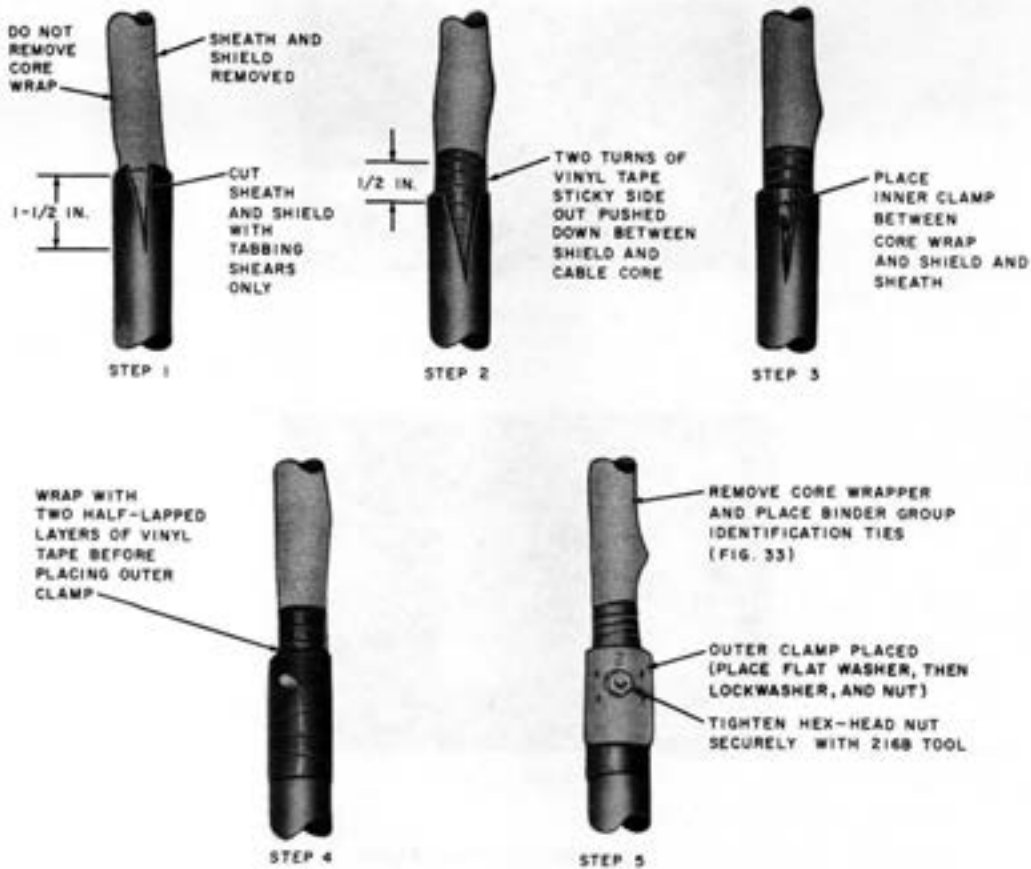


Fig. 10—Placing Bond Clamp

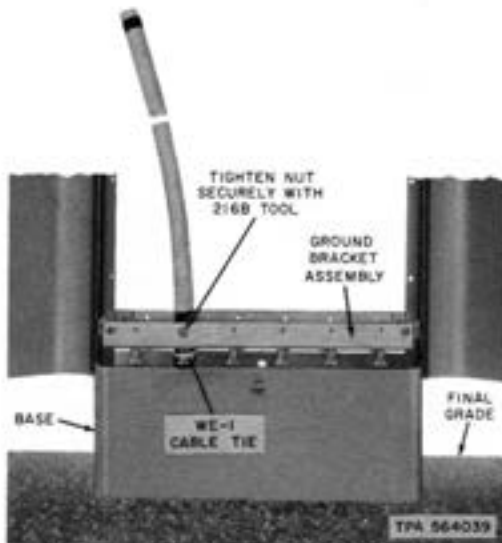


Fig. 11—Cable Installed in Closure

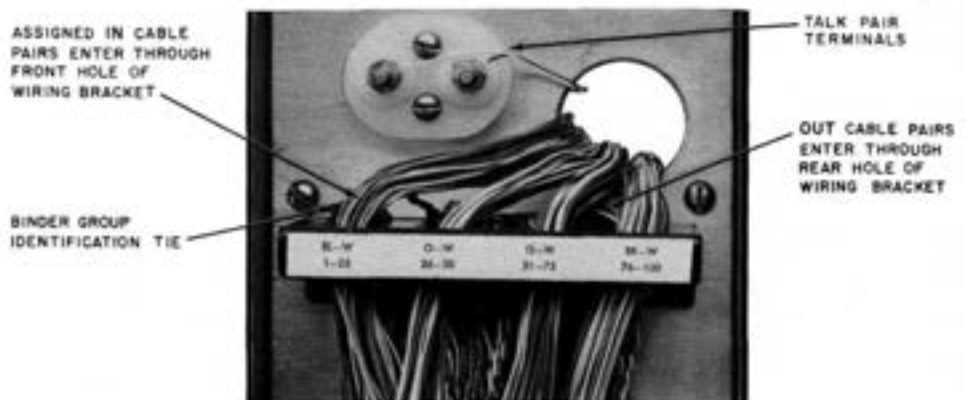


Fig. 12—Assigned IN Cable Pair Routed Through Front Holes of Wiring Bracket

WIRE TERMINALS MULTIPLE LINE WIRES

1. GENERAL

1.01 Where a wire terminal or protector is to be installed on new wire, leave sufficient slack in the conductors at the time the new wire is being placed for proper installation of the terminal. Slack is provided by cutting out a section of the support wire and splicing the remaining ends of the support wire together. A wire terminal is installed on *existing* multiple line wire by splicing slack into the conductors. Be sure to maintain the color of conductors when providing slack. Cut only the conductors being terminated; the others can be placed in a B Cable Guard through the B Wire Bracket or behind the terminal.

1.02 A 116-type protector should be grounded as follows:

- (a) To a cable strand or power multigrounded neutral wire with B Ground Wire.
- (b) To the support wire of multiple line wire with a 109 Construction Wire or 109 Steel Line Wire.

2. LOCATING ON SUPPORT WIRE OF MULTIPLE LINE WIRE

2.01 Installation of 104B2-6 Wire Terminal or 116D2B-6 Protector

- (a) Place a B Wire Adapter about 5 inches from the end of the wirewise or sleeve deadending the support wire. *Do not remove the insulation from the support wire* before placing the wire adapter. The wire adapter is installed as follows:
 - (1) Place the 3-wire set first, starting at the center which is marked by paint, as shown in Fig. 3. Place the 3-wire set (gauge by eye) on the support wire so that it is centered at the terminal clamp nearest the pole (Fig. 1). Wrap the set so it is spiraled around the

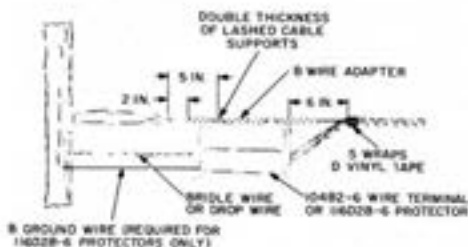


Fig. 1—Multiple Line Wire Deadend

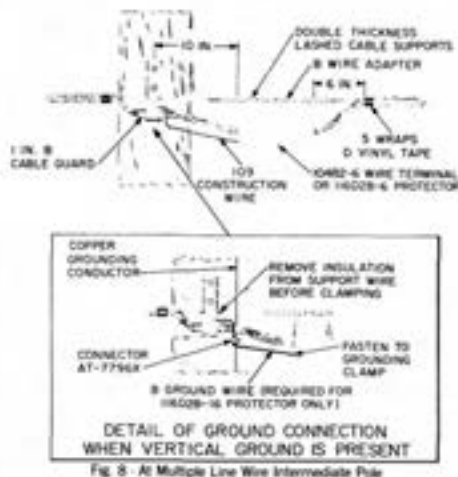


Fig. 2—At Multiple Line Wire Intermediate Pole

support wire from the center out to the ends in each direction at once using the thumb and forefinger of each hand. Be sure that the ends are snapped into place over the support wire.

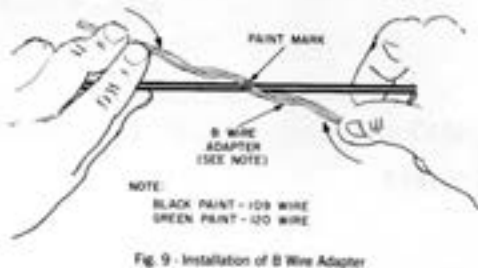


Fig. 3—Installation of B Wire Adapter

Fig. 3—Installation of B Wire Adapter

(2) Place the second 3-wire set for 120 size or first 2-wire set for 109 size next to the first 3-wire set, being sure to match the paint marks at the center so the ends will be approximately even. It is installed in a similar manner to the 3-wire set.

(3) Place the last 2-wire set in the gap left between the other sets and match the paint marks so the ends will be about even. Install as described in (1).

(b) Start the second B Wire Adapter on the support wire with the paint mark about 3 inches from the end of the first B Wire Adapter so that it is centered at the far terminal clamp. (Fig. 1).

(c) Cut off the buckles from a pair of lashed cable supports and fold in half to obtain double thickness. Bend straps over the wire adapter on support wire with ends pointing down (Fig. 4).

(d) Hold the terminal in proper alignment with support wire, and tighten the bolts of the terminal clamps with the C Socket Wrench or N Cable Terminal Wrench. Take up alternately on the two bolts of each clamp.

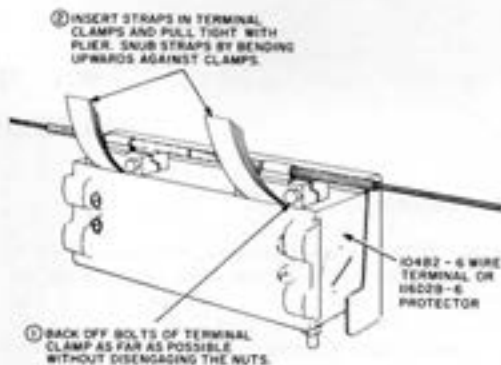


Fig. 4—Inserting Cable Supports in Terminal Clamps

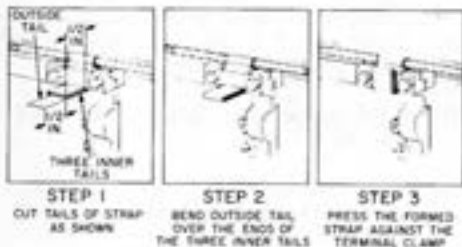


Fig. 5—Terminating Cable Supports

(e) Terminate straps as shown in Fig. 5.

3. LOCATING ON MULTIPLE LINE WIRE POLES

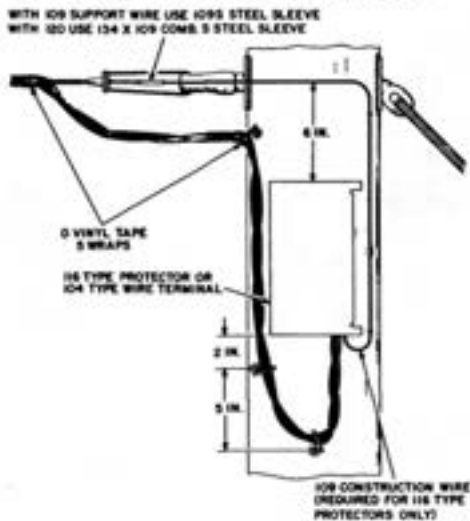


Fig. 6—At Wire Deadend Pole

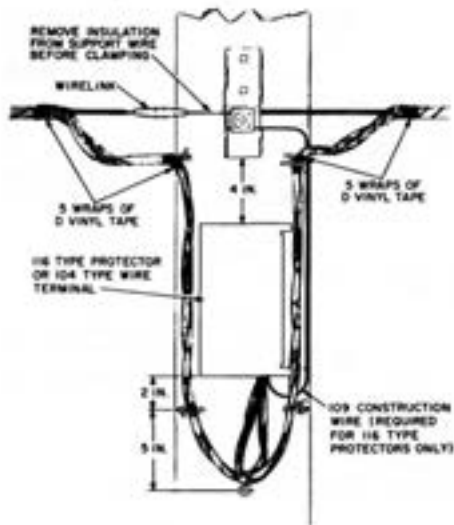


Fig. 7—Intermediate Pole

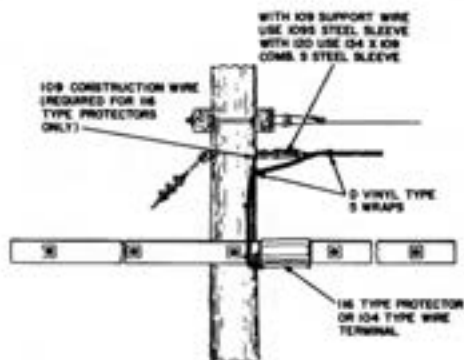


Fig. 8—Crossarm or Wire Deadend Pole

4. LOCATING ON CABLE POLES

4.01 Wire terminals and protectors should be placed on the cable suspension strand in such a location that they do not interfere with climbing space, existing aerial splices, or terminals.

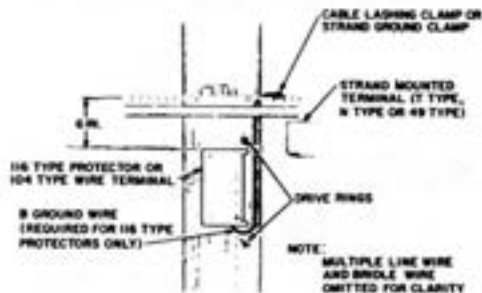


Fig. 9—Pole With Strand-Mounted Cable Terminal (multiple line wire and bridle wire omitted for clarity)

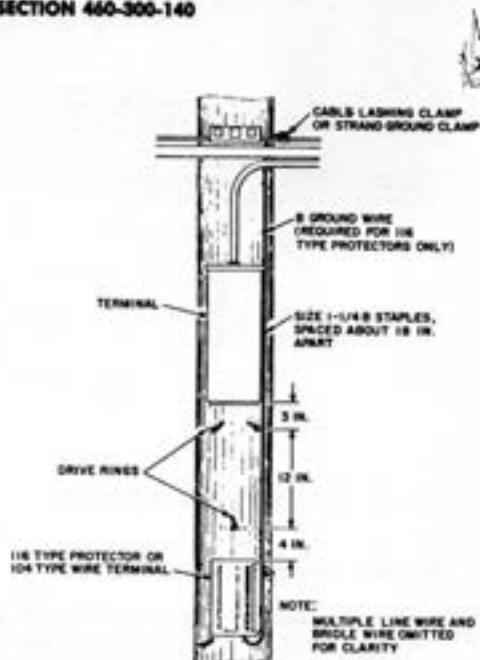


Fig. 10—Pole With Pole-Mounted Cable Terminal (multiple line wire and bridle wire omitted for clarity)

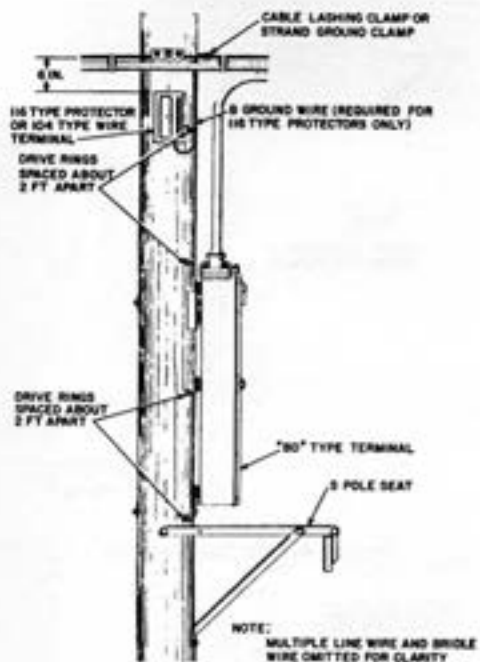


Fig. 11—Pole With Pole-Mounted Cross-Connecting Terminal (multiple line wire and bridle wire omitted for clarity)

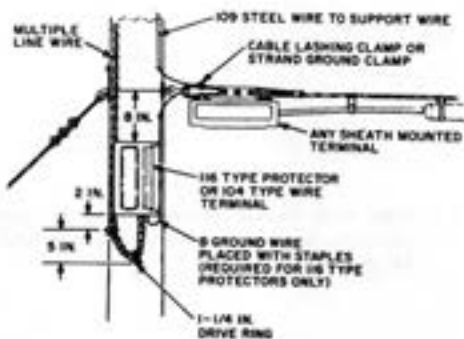


Fig. 12—Deadend Pole With Strand-Mounted Cable Terminal

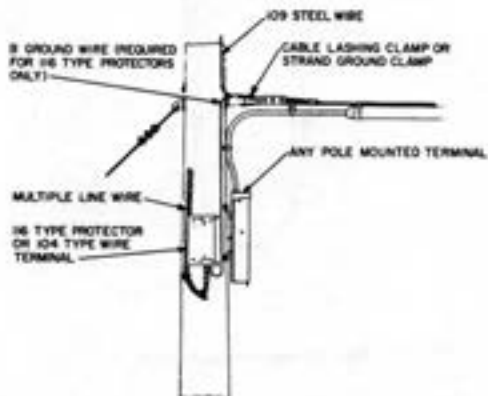


Fig. 13—Deadend Pole With Pole-Mounted Cable Terminal

BURIED PLANT—BURIED WIRE TERMINATIONS

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- Information on E armored service wire
- Information on C service wire (2- and 5-pair)
- Information on E buried wire
- Information on the following cable closures:
 - 13-Type (Fig. 5)
 - 14-Type (Fig. 6)
 - RC4/72 (Fig. 8)
 - PC6/48 (Fig. 10)
 - PC12/55 (Fig. 12)
 - J (Fig. 16)
 - K (Fig. 18)
 - LD (Fig. 20)
 - UP200 (Fig. 22)

Information formerly contained in Part 4 through Part 8 is now found in Part 6 through Part 10. Revision arrows used throughout this reissue will emphasize the most significant changes.

1. GENERAL

- 1.01 This section describes methods used for terminating service wires at junctions with other types of buried plant and at customer locations.
- 1.02 This section is reissued to add the following:
- Table of Contents
 - New method of identification for buried wire

1.03 The metal tape or armor of service wires must *always* be grounded to the customer's protector when the protector is fed from aerial or buried plant. The grounding is needed at customer locations to protect against lightning damage and to minimize shock or fire hazards caused by sustained power contact. The metal tape or the armor of service wires should always be bonded to the terminal housing at the junction with buried cable.

1.04 At the older buried wire installations where a shield wire was used, the shield wire can be terminated in the same manner as recommended for metal tape or armor.

1.05 Those stations which use fuseless protectors and which are served from buried distribution cable of 19- or 22-gauge that is exposed to possible contact with power of over 300 volts, such as in random separation construction or aerial plant,

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require a fusible link in the circuit between the exposed cable and the station. This fusible link can be provided at junctions of buried cable and buried service wire by terminating the buried service wire on the following terminal blocks:

- 3A3-6 (MD) terminal block installed in a buried cable pedestal
- 6A2-3 (A&M) terminal block installed in K-, E-, J-, and PC-type closures.
- 9A1-5, 9A1A-5, 9A1B-5 terminal blocks installed in a PC-type closure.♦

The 24-gauge wire leads which are connected to the cable pair provide the fusible link. The 3A3-6 (MD) terminal blocks can be used only in B and E cable closures. The 6A2-3 terminal blocks can be used only in K-, E-, J-, and PC-type cable closures. The 3A3-3 terminal block is used with the 49-type aerial terminal. ♦The 9A1-5, 9A1A-5, and 9A1B-5 terminal blocks are intended for use in the PC-type closures.♦

1.06 ♦After the service wires have been placed, the type of identification required is dependent only on the length of time required to retain the wire identity. Steps (a) and (b) outline procedures for identifying service wires when identity must be retained for less than three months. Step (c) outlines procedures for identifying service wires when identity must be retained for more than three months.

- (a) Using a pen or felt marker, write the identity of the service wire on a self-laminating label (obtain from T&B Company, W. H. Brady Company, or other companies with equivalent labels).
- (b) Remove the label from pad and place on service wire by wrapping it on itself so that the transparent adhesive covers the written identity (Fig. 1).♦
- (c) ♦Install TY-RAP ties and markers (obtain from T&B Company or other companies with equivalent ties and markers) on service wire as follows:

- (1) Twist off and retain locking head from nylon tie.



Fig. 1—♦Placing Self-Laminating Label♦

- (2) Wrap the tie around the service wire and slip the tail through the eye of the grommet end and pull taut.
- (3) Slide the desired preprinted tubular markers on the tail of the tie, then slide the locking head on the tie and push snug against the markers (Fig. 2).♦



Fig. 2—♦Placing Tie and Marker♦

1.07 The B and D cable closures are rated MD.

Sections 631-604-203, 631-600-205, and 631-601-201 cover the description and installation of the K and J cable closures used for buried wire terminations. The 9-type closures described in Section 631-600-215 can also be used, in addition to the 13- and 14-type closures described in Section 631-600-217.†

2. DISPOSITION OF UNTERMINATED PAIRS

2.01 †Buried wire not in use may include new installations when some time may elapse before the buried wire is placed in service or where existing service is being disconnected. To avoid differences in potential between conductors and the metallic shield or armor, buried wire which is not in use should be protected as follows:

(a) *New installations* where the wire is not being terminated on a station protector at time of placing —

- (1) At station end, twist the bare conductors and metallic shield together and wrap with vinyl tape.
- (2) At end toward central office, bridge metallic shield or armor and conductors to a common ground post or, if not available, follow instructions in (1) above.

(b) *Service disconnections* where the wire has been terminated and existing service is being disconnected —

- (1) At station end, leave all terminations as they are, but where the station protector is being removed, twist the metallic shield or armor and bare conductors together and wrap with vinyl tape.
- (2) At end toward central office, when the wire terminates on a protector, leave the terminations as they are. Under "Dedicated Plant" conditions, leave the terminations as they are. Under all other conditions, follow the instructions in (a)(2).†

3. †TERMINATING SERVICE WIRE—PREFILLED CLOSURES FOR FILLED SERVICE WIRE

3.01 Prepare service wire as shown in Fig. 3.

Note: Preparation of 2-pair and 5-pair C service wire is identical.

3.02 Install the metallic shield of the filled service wire in the AT-7796X (Fig. 4) and tighten the screw.

3.03 Splice the service wire to the cable pairs using 700-type connectors *only*, as shown in Fig. 5 or 6.†

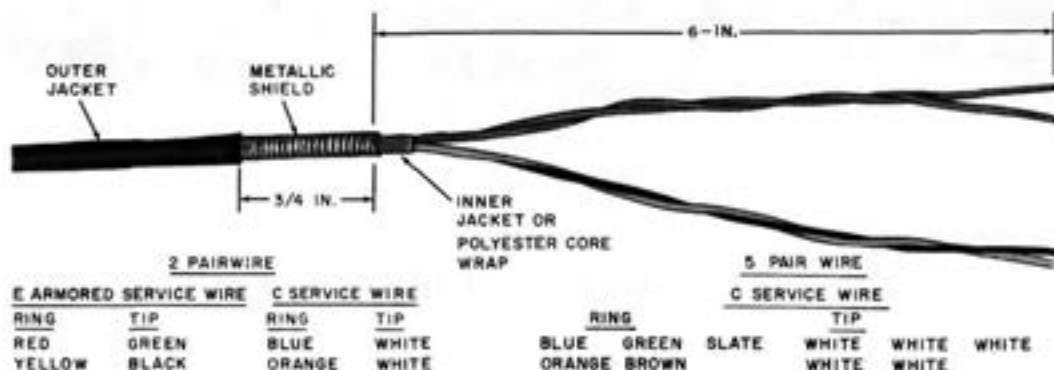


Fig. 3—†Prepared Service Wire—13- or 14-Type Closure†

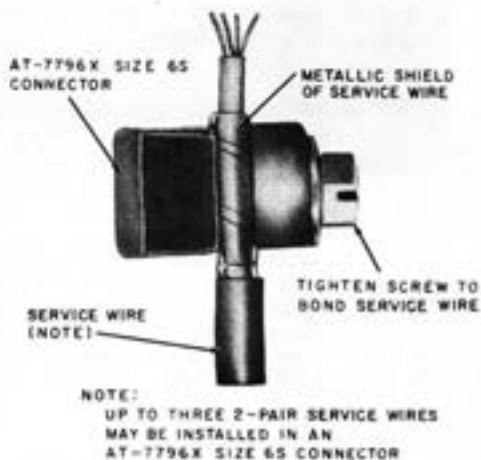


Fig. 4—Service Wire Installed in AT-7796X Connector

4. TERMINATING SERVICE WIRE AT CABLE CLOSURES

IRC4/72 Cable Closures

4.01 Prepare service wire as shown in Fig. 7 and install the metallic shield in the AT-7796X connector as shown in Fig. 4.

4.02 Where *fixed count* or *preferred count* termination is desired, run the service wire to the assigned binding post of the terminal block as shown in Fig. 8.

IPC6/48 and PC12/55 Cable Closures

4.03 Prepare the service wire as shown in Fig. 9 and install the metallic shield in the AT-7796X connector as shown in Fig. 4.

4.04 Run the conductor of the service wire up through the wire rings, back down through the center ring, then up or down to the assigned

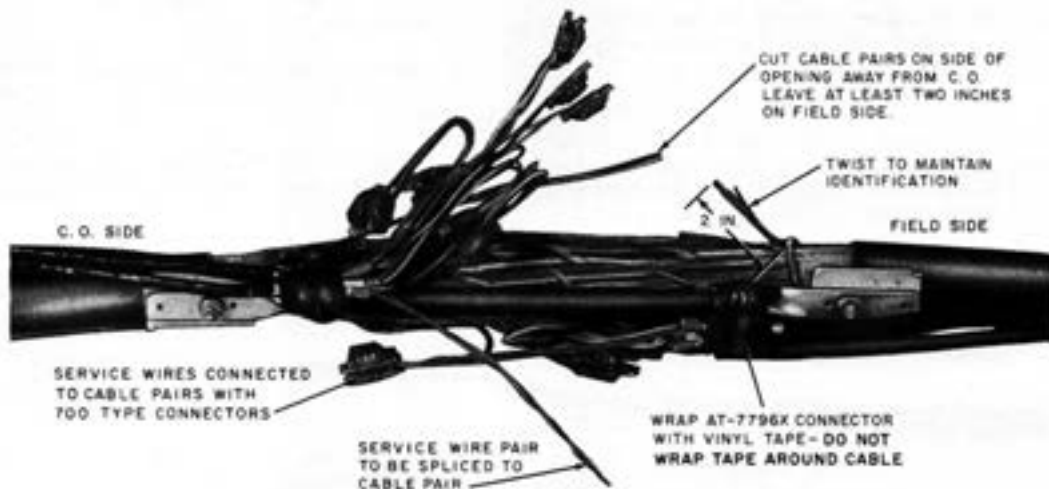


Fig. 5—Splicing Cable Pairs—13-Type Closure

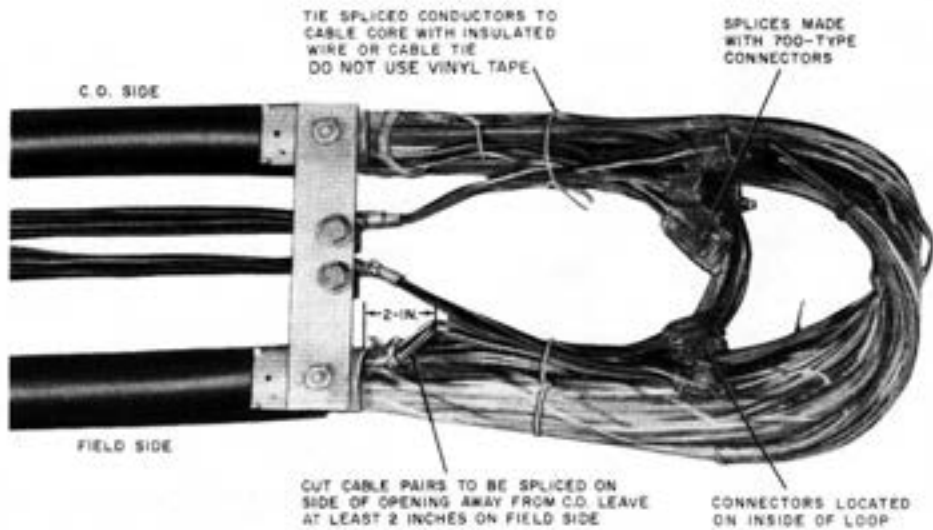


Fig. 6—**Wire Work Completed—14-Type Closure**

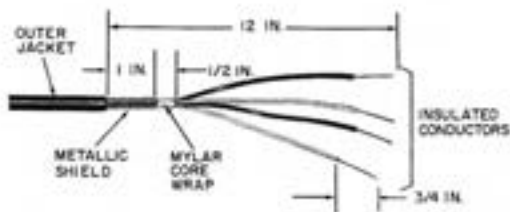


Fig. 7—**Prepared Service Wire—RC4/72 Cable Closure**

binding post on the terminal block as shown in Fig. 10, 11, and 12.

5. TERMINATING SERVICE WIRE AT SUPERSEDED-TYPE CABLE CLOSURES

5.01 The B, C, D, E, G, H, J, K, LD, and UP200 cable closures have been rated MD.

B Cable Closure (MD)

5.02 Prepare the service wire as illustrated in Fig. 13.

D Cable Closure (MD)

5.03 Route service wire in D cable closure and secure in place with ground connector.

5.04 Prepare service wire as illustrated in Fig. 14.

E Cable Closure (MD)

5.05 Route service wire in E cable closure and secure in place with AT-7796X connector as shown in Fig. 4.

5.06 Prepare service wire as illustrated in Fig. 15.

G and H Cable Closures (MD)

5.07 The G and H cable closures have been replaced by the LD6/42 and LD10/42, respectively. The termination of service wire in the G and H cable closures is the same as the LD-type cable closures (refer to 5.12 and 5.13).

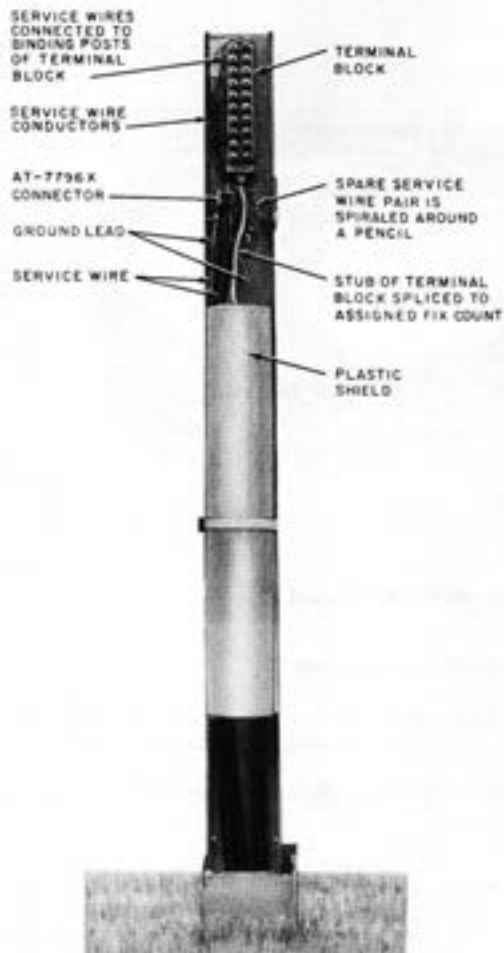


Fig. 8—Service Wires Terminated in RC4/72 Cable Closure

J Cable Closure (MD)

5.08 Prepare service wire for J cable closure the same as for E cable closure. Refer to Fig. 15.

5.09 Insert metal shield of service wire into AT-7796X connector and tighten securely. Refer to Fig. 16.

K Cable Closure (MD)

5.10 Prepare service wire for termination in K cable closure as shown in Fig. 17.

5.11 Terminate service wire in K cable closure as shown in Fig. 18.

LD-Type Cable Closures (MD)

5.12 Termination of service wire is identical in both the LD6/42 and LD10/42 cable closures.

5.13 Prepare the service wire as shown in Fig. 19 and terminate as shown in Fig. 20.

UP200 Cable Closure (MD)

Note: There are no facilities for installing terminal blocks in the UP200 cable closure.

5.14 Prepare service wire as shown in Fig. 21.

5.15 Terminate service wire as shown in Fig. 22.

6. TERMINATING SERVICE WIRE—D AND E BURIED WIRE TERMINALS

6.01 At junctions of buried wire, place a D or E buried wire terminal as described in Section 629-720-215. Bridge the branch buried wires in the terminal as required. Each wire can be identified with a suitable designation by placing a self-laminating label as covered in 1.06. The metal tape or armor wire of buried service wire must be connected to the ground post of each terminal.

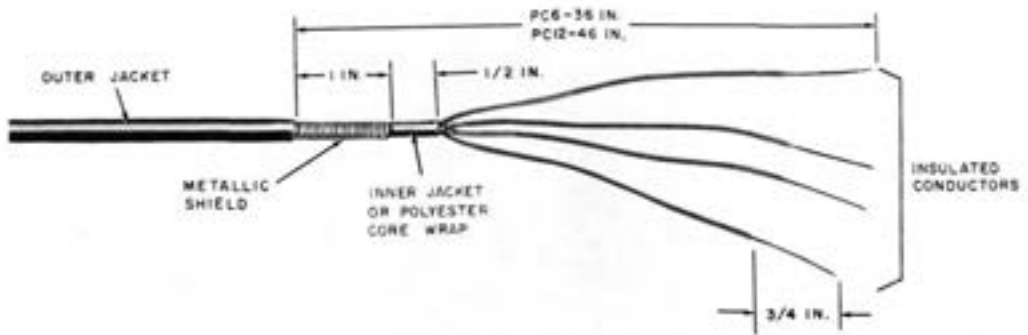


Fig. 9—Prepared Service Wire—PC6/48 or PC12/55 Cable Closure

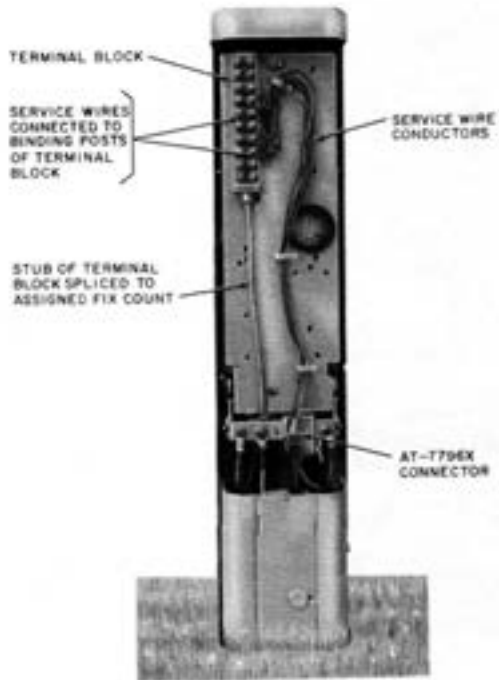


Fig. 10—Service Wires Terminated in PC6/48 Cable Closure—Fixed Count Mode

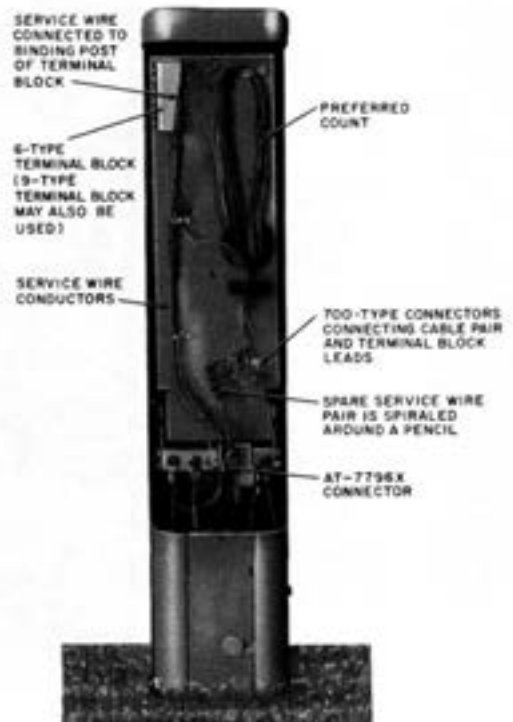


Fig. 11—Service Wires Terminated in PC6/48 Cable Closure—Preferred Count Mode

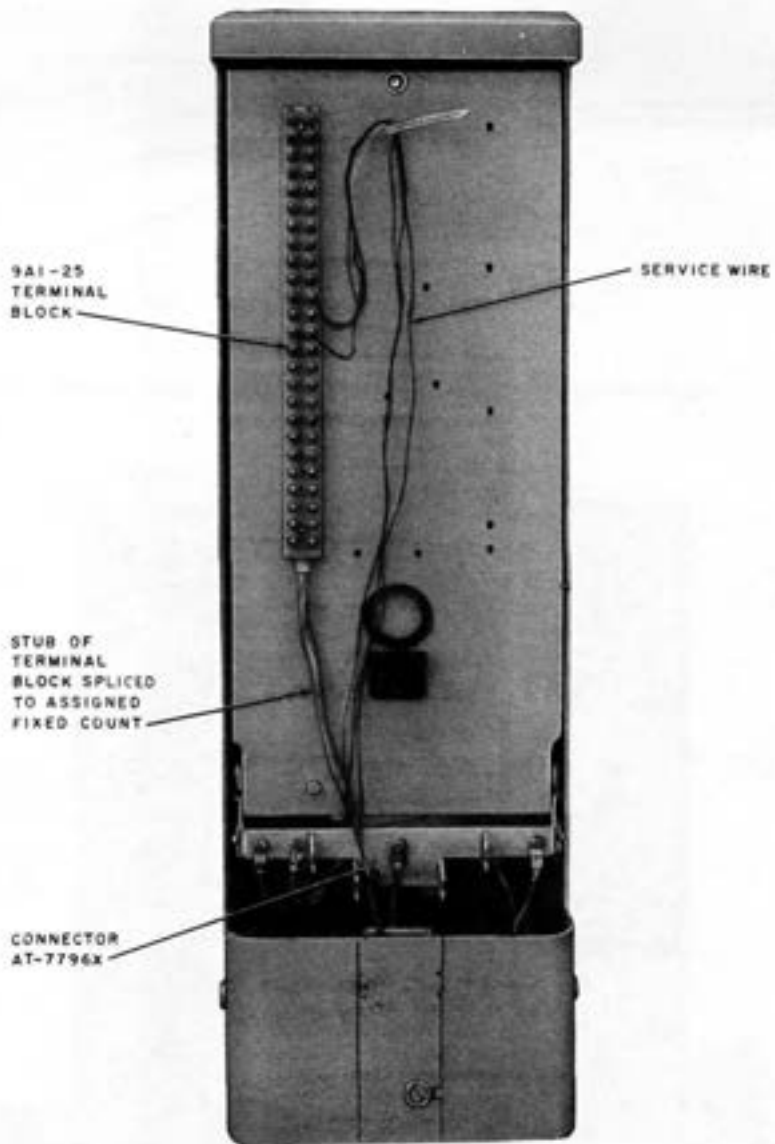


Fig. 12—Service Wire Terminated in PC12/55 Cable Closure—Fixed Count Model

6.02 ¶The termination of service wire in either the D or E buried wire terminal is identical. Prepare the service wire as shown in Fig. 23 and terminate as shown in Fig. 24.¶

7. ¶TERMINATING SERVICE WIRE—JUNCTION WITH AERIAL CABLE¶

7.01 At the cable terminal or closure where buried service wire feeds from aerial cable and where the length of the buried service wire is:

- (a) ¶700¶ feet or less, do not bond the metallic shield of service wire to the strand or terminal housing. This will *protect the subscriber location from possible fire* caused by excessive power fault, should the circuit come in contact with power line of any voltage.



Fig. 13—¶Prepared Service Wire—B Cable Closure¶

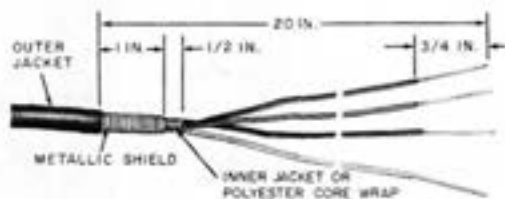


Fig. 14—¶Prepared Service Wire—D Cable Closure¶

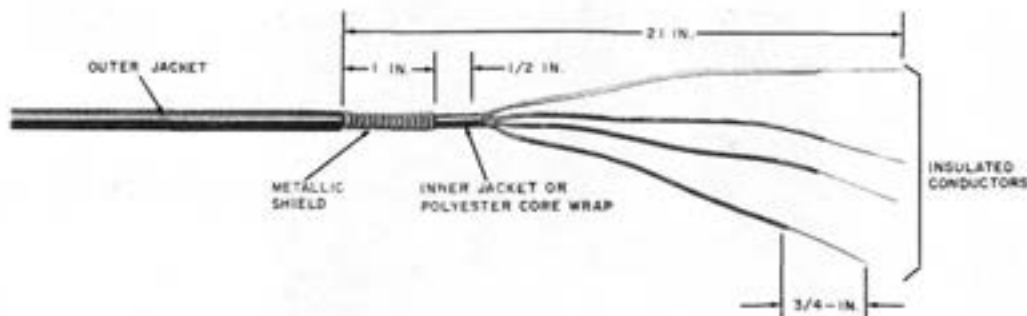


Fig. 15—¶Prepared Service Wire—E Cable Closure¶

- (b) ¶More than 700¶ feet, use E buried wire and bond the metallic shield to the strand or terminal housing. When the length of buried wire is greater than 700 feet, the resistance of E buried wire, because of its length, will limit the fault current to safe values. *C service wire and E armored service wire are not to be used for distances of more than 700 feet.*¶

7.02 No carbon block protection is required between the cable conductors and the buried

service wire conductors unless severe lightning exposure exists (see 7.07).

7.03 Buried service wire can be brought up a pole and terminated directly in a pole- or strand-mounted cable terminal or cable closure if the cable conductor is 24- or 26-gauge. Where fuseless protectors are used at the station and the cable conductor is 22- or 19-gauge and exposed to power contact, a fusible link is required between the cable pair and the service wire. As stated in 1.05, the 24-gauge conductors in a cable stub or

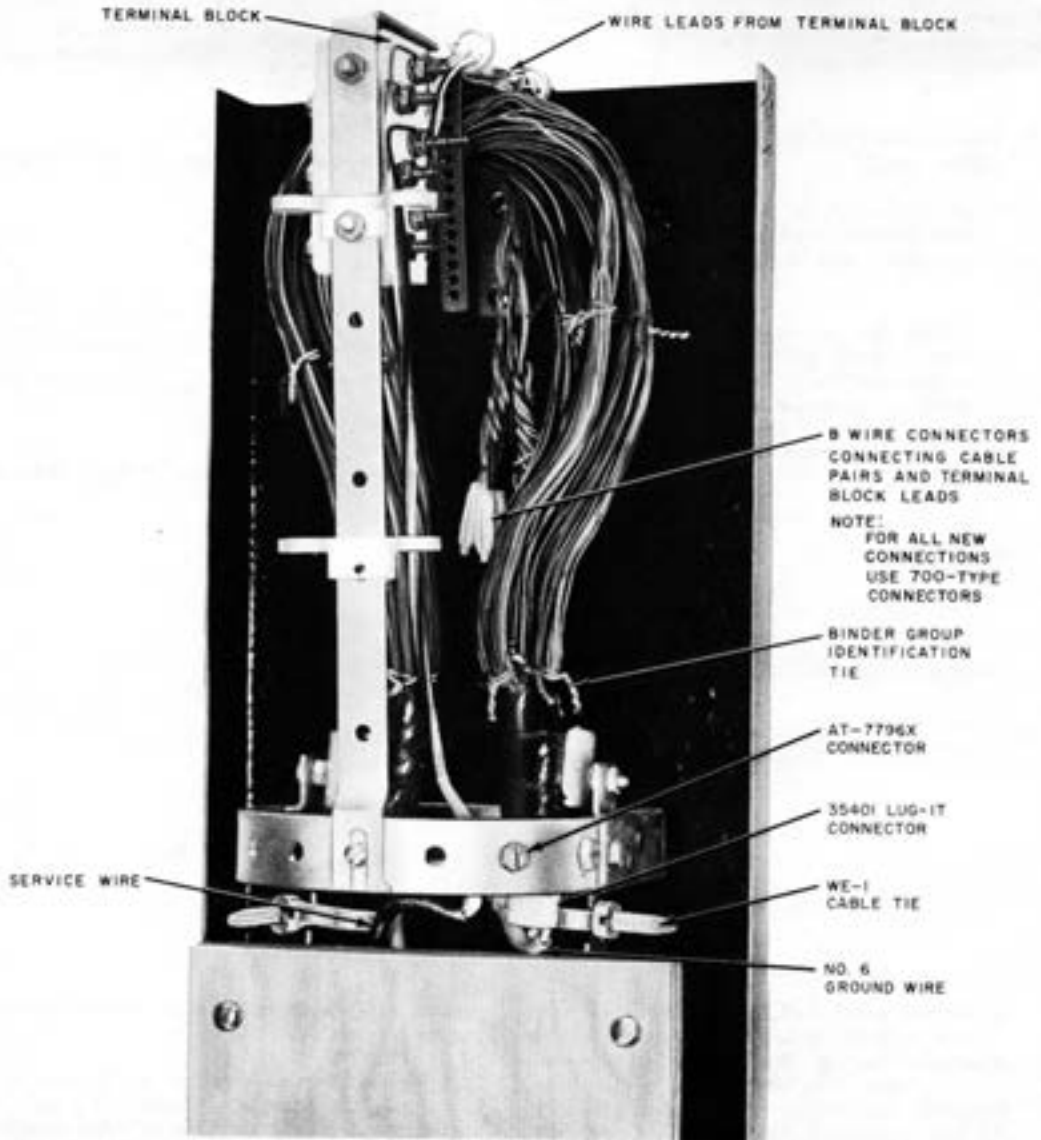


Fig. 16—Service Wire Installed—J Cable Closure (Protected)

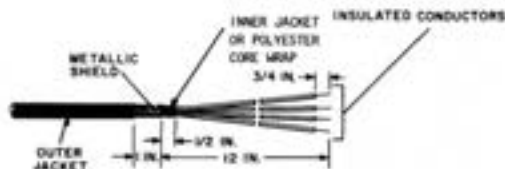


Fig. 17—Prepared Service Wire—K Type Cable Closure

the connecting block of a 49-type cable terminal are satisfactory fusible links. At the groundline, the wire should be protected with an 8-foot length of No. 0 U cable guard. A typical installation terminating in a 49-type cable terminal is shown in Fig. 25.

Inside a Cable Terminal

7.04 Where the buried wire is 700 feet or less in length, grounding of the metallic shield at the cable terminal is omitted, unless special lightning protection is required (see 7.07). Cut off the metallic shield at the terminal location and wrap with two turns of vinyl tape to protect against sharp edges (Fig. 26).

7.05 Where the buried wire is over 700 feet in length, the metallic shield of the E buried wire must be bonded to the cable terminal. A B bond clip and B appliance wire may be installed on the metallic shield in a solderless connector as shown in Fig. 27.

7.06 Inside a cable terminal, the conductors of service wire should be terminated on the binding post in the usual manner. The stub cable conductors of the terminal provide the fusible link.

Special Lightning Protection

7.07 In lightning areas where the subscriber's station is exposed to lightning, it may be desirable to furnish additional lightning protection to buried service wires which are 700 feet or less in length. Under these conditions, detailed plans or other special instructions will authorize bonding the metallic shield at the aerial cable terminal. Such installations require the use of a 123- or 128-type protector (equipped with 2B2E protector units) and bonding the metallic shield to

the ground post of the protector. A bond is also required between the protector ground post and the cable strand. For the latter purpose, block wire is required as a fusible link to prevent the metallic shield from overheating. A typical installation is shown in Fig. 28.

8. TERMINATING SERVICE WIRE—JUNCTION WITH MULTIPLE WIRE

8.01 Where multiple wire is exposed to power contact and a fuseless protector is used at the station, C service wire or E armored service wire must not be used with or fed from multiple wire of current manufacture, because of the relatively small size and low fusing level of the conductors of the service wires. A satisfactory fusible link is not available for use between the multiple wire conductors and the service wire conductors.

Note: Earlier manufactured multiple wire with 24-gauge conductors may be satisfactorily used with C service wire or E armored service wire.

8.02 E buried wire can be used with or fed from multiple wire where the multiple wire is exposed to power contact and fuseless station protection is used. E buried wire should be brought up a pole and terminated in a 101B2 wire terminal. The metallic shield should be cut back and taped as shown in Fig. 26. Connect the conductors of E buried wire to the conductors of the multiple wire with block wire. At the groundline the wire should be covered with an 8-foot length of No. 0 U cable guard. Fig. 29 shows a typical example of E buried wire being connected to a 105-type wire terminal.

8.03 The block wire serving as a fusible link between the E buried wire conductors and the multiple wire conductors can be terminated in a 105A wire terminal, a 104-type wire terminal, a 116-type protector, a 108-type wire terminal, or in similar wire terminals used with multiple wire.

9. TERMINATING SERVICE WIRE—JUNCTION WITH C RURAL WIRE

9.01 Do not connect C service wire or E armored service wire to C rural wire because of the small size of the conductors of the service wire and because no satisfactory fuse link is available.

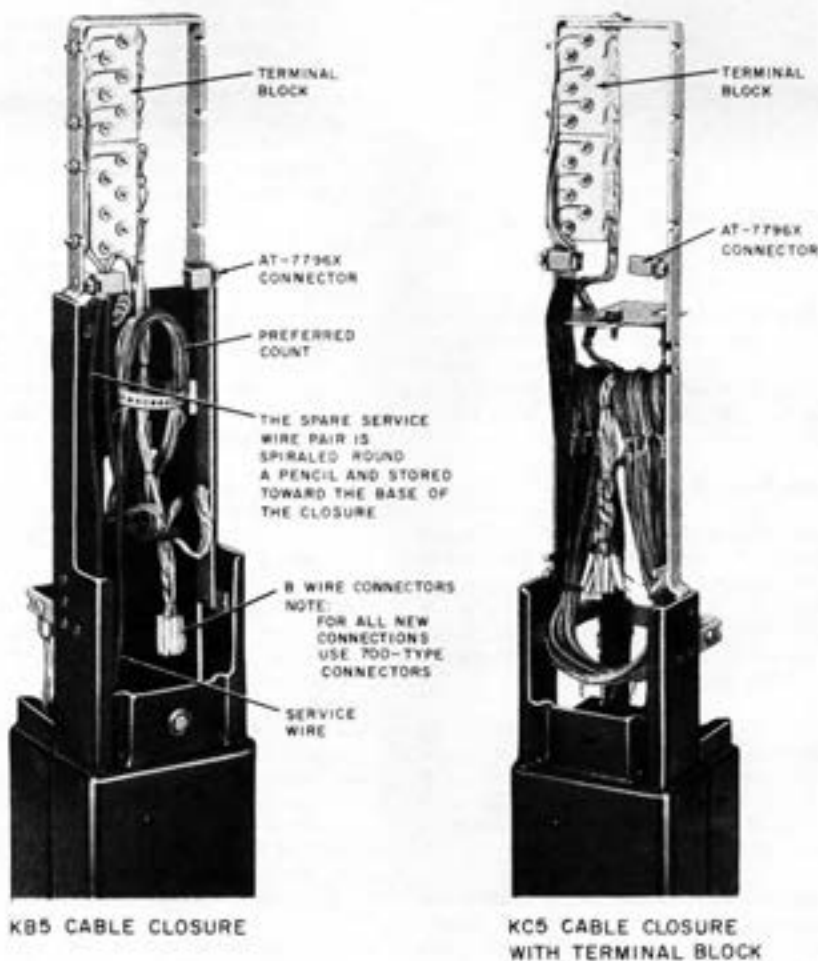


Fig. 18—Service Wire Installed—K Type Cable Closure (Protected)

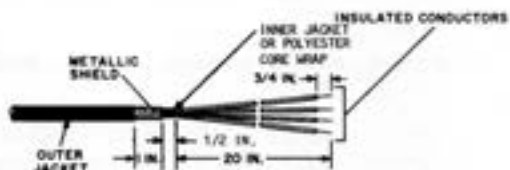


Fig. 19—Prepared Service Wire—LD Type Cable Closure

9.02 At the junction with C rural wire, E buried wire can be brought up a pole and terminated in a 101B2 wire terminal. The metallic shield should be cut off and taped as shown in Fig. 26. Block wire should be used to bridge between the 101B2 wire terminal and the 107-type wire terminal on the C rural wire. At the groundline, the E buried wire should be covered with an 8-foot length of No. 0 U cable guard. A typical installation is shown in Fig. 30.

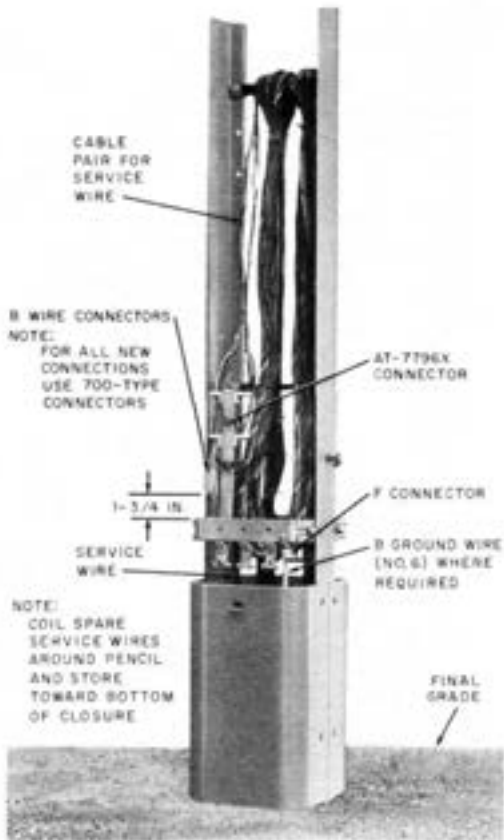


Fig. 20—Service Wire Installed—LD Type Cable Closure

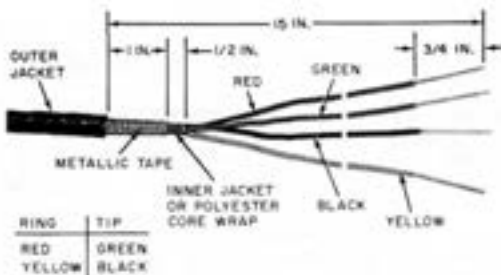


Fig. 21—Prepared Service Wire—UP200 Cable Closure

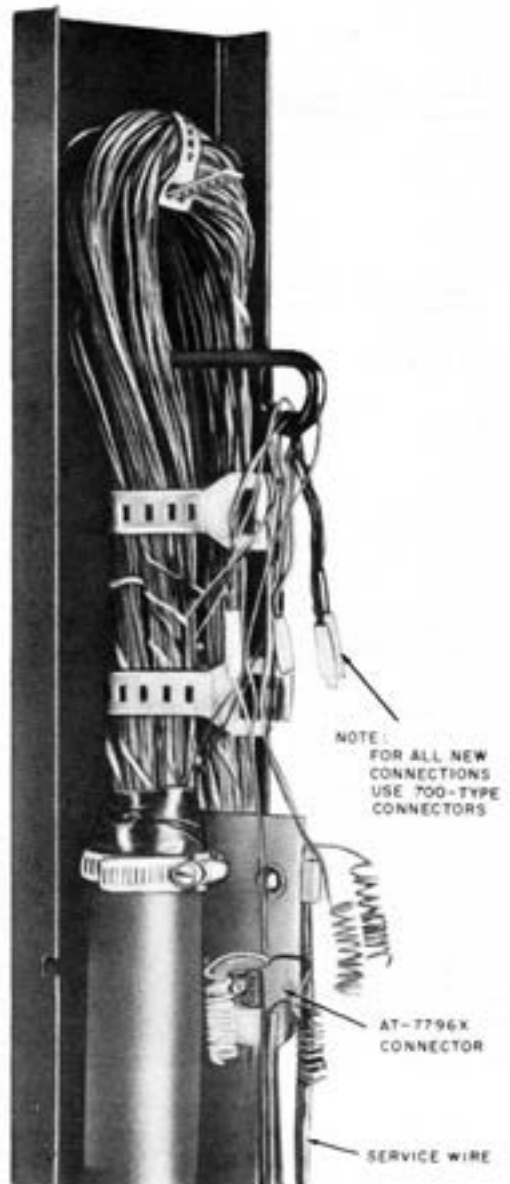


Fig. 22—Service Wire Installed—UP200 Cable Closure

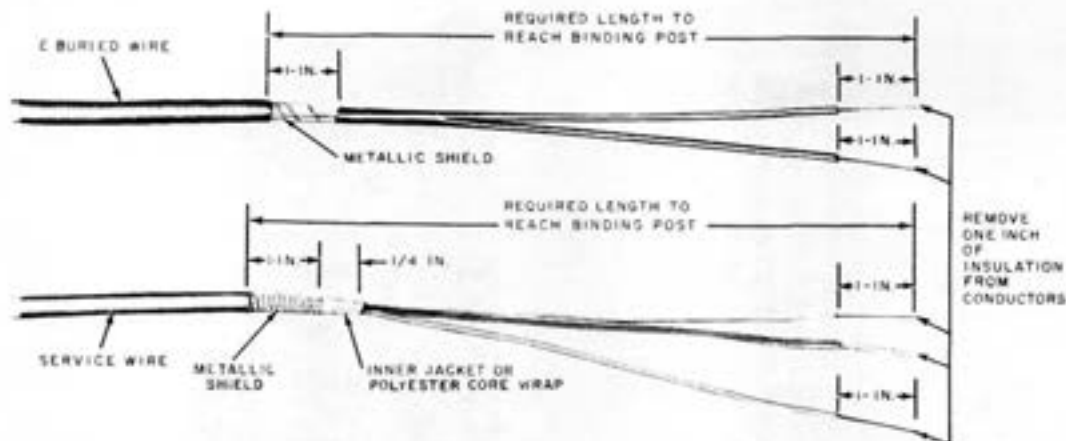


Fig. 23—Prepared Service Wire—D or E Buried Wire Terminal

SPARE PAIR OF SERVICE WIRE TERMINATED ON SPARE BINDING POST OF CONNECTING BLOCK

BURIED WIRE AND SERVICE WIRES TERMINATED ON TIP AND RING BINDING POST

EXPOSED METALLIC SHIELD OF SERVICE WIRE PLACED IN CONNECTOR AT-7796X

EXPOSED METALLIC SHIELDS OF BURIED WIRES PLACED IN SPLIT-BOLT

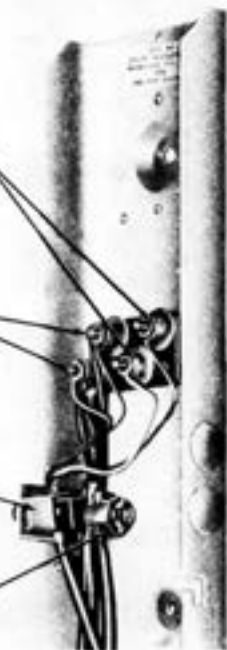


Fig. 24—Service Wire Terminated—D or E Buried Wire Terminal

10. TERMINATING SERVICE WIRE—JUNCTION WITH OPEN WIRE

10.01 C service wire and E armored wire should not be used with or fed from open wire due to the relatively small size and low fusing level of the conductors of the C service wire and no satisfactory fuse link being available.

10.02 At the junction with open wire, E buried wire can be brought up a pole and terminated in a 101B2 wire terminal. The metallic shield should be cut off and taped as shown in Fig. 26. Block wire must be used between the protector and the open wire. At the groundline, the wire should be covered with an 8-foot length of No. 0 U cable guard. A typical installation is shown in Fig. 31.

11. TERMINATIONS AT CUSTOMER LOCATIONS

11.01 An F connector is used to bond the metal tape of service wire or E buried wire to a 1231A, 123B1A, or 128A1A protector. (Do not attempt to bond the metal tape otherwise.) The F connector has a hook tip which can be placed under the pronged washer on the protector ground terminal post without removing the nut. A spade tip solderless connector is used with D underground wire (see 11.06).

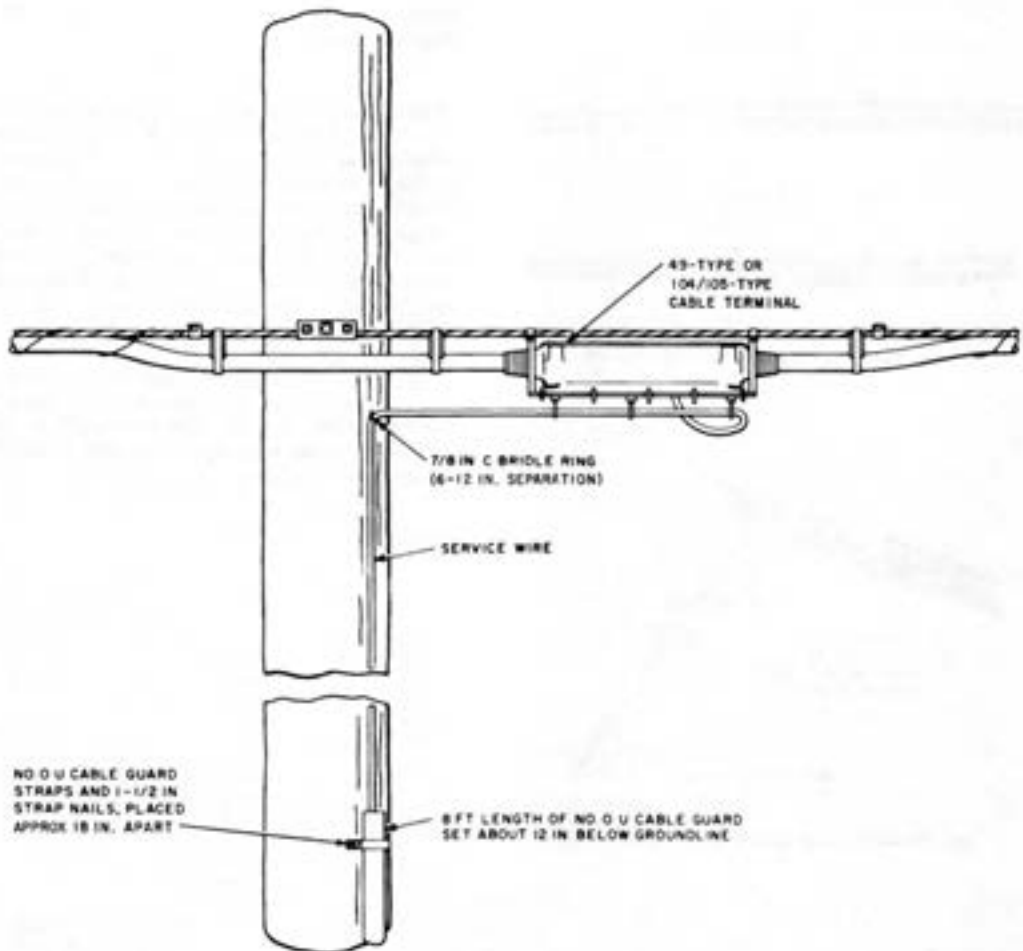
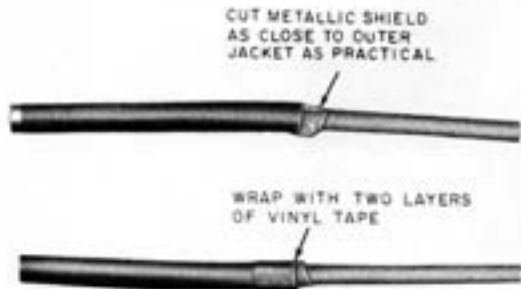


Fig. 25—Buried Plant Rvn Up a Pole

- 11.02 Mount the 123- or 128-type protector on the wall and mark the location of the F connector on the service or buried wire. Cut off the wire about 5 inches beyond this point. Remove the outer jacket.
- 11.03 Remove the metal tape as shown in Fig. 32.
- 11.04 Remove the inner jacket of the service wire or E buried wire up to the metal tape.

Position the F connector on the service wire or buried wire as shown in Fig. 33 and tighten firmly with a C, D, or 4-inch E screwdriver. Do not crush the insulation by too great a pressure.

11.05 Terminate the service or buried wire on a protector as illustrated in Fig. 34. Place the hook tip of the F connector under the pronged washer on the ground terminal post. Place the ground wire between the pronged washer and brass

Fig. 26—**Removal of Metallic Shield**Fig. 27—**Bonded Shield of E Buried Wire**

washer. Tighten the nut securely and replace protector cover.

11.06 The armor wires of D underground wire are terminated in a No. 31589 solderless connector as illustrated in Fig. 35. The spade tip of the solderless connector is placed under the pronged washer on the ground terminal post. Place the ground wire between the pronged washer and brass washer. Tighten the nut securely. Terminate the conductors on a protector as illustrated in Fig. 34 and replace protector cover.

11.07 Where a protector is not required, a service wire can be terminated on a 42A connecting block mounted on a 168-type backboard as shown in Fig. 36. This termination method is used only at unexposed stations.

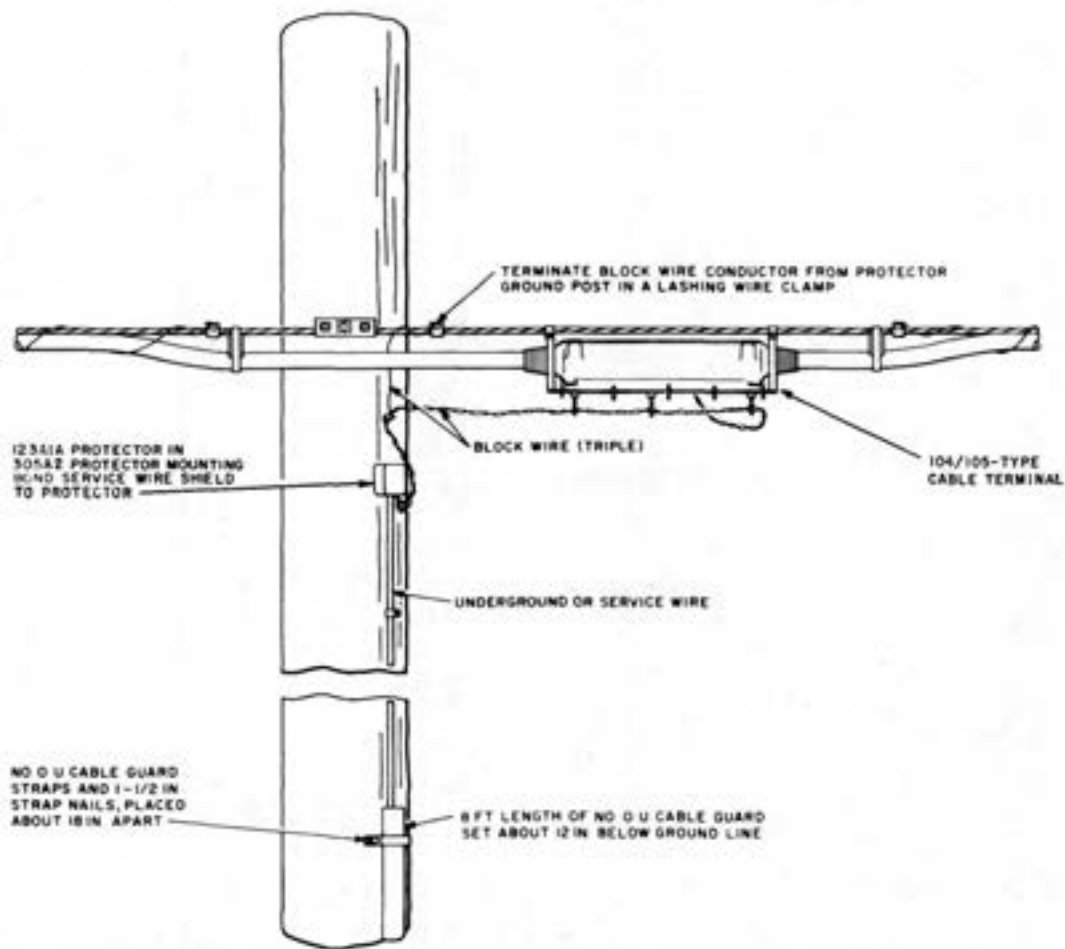


Fig. 28—Termination for Special Lightning Protection

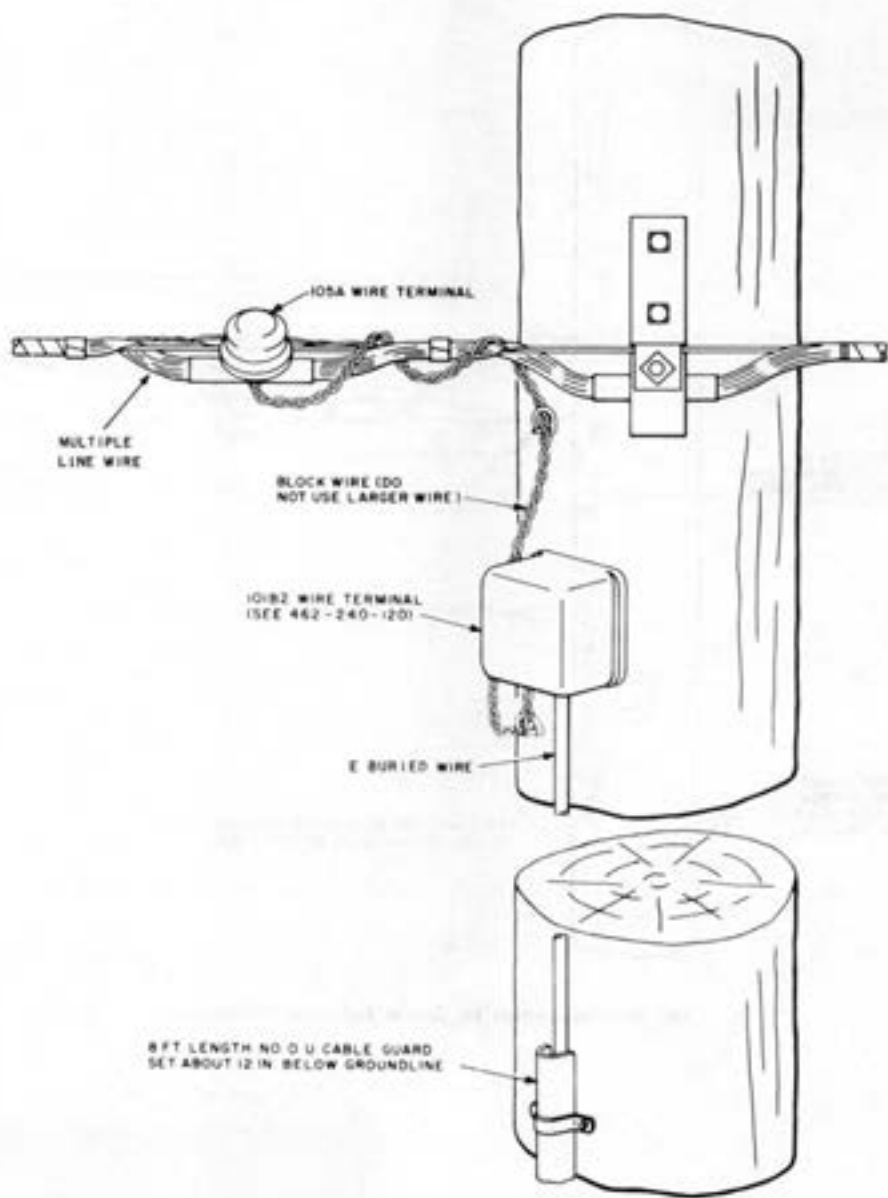


Fig. 29—E Buried Wire Terminated to Multiple Line Wire

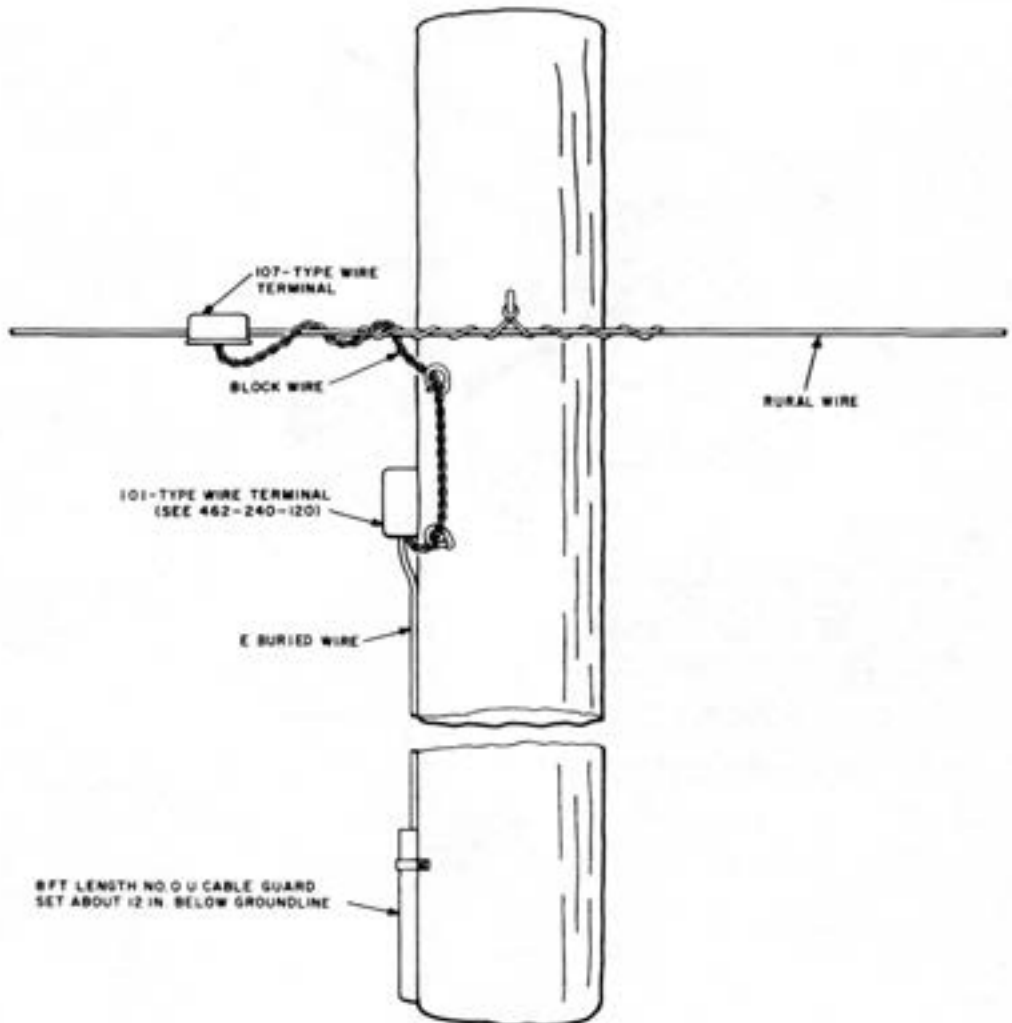


Fig. 30—Termination of E Buried Wire and Rural Wire

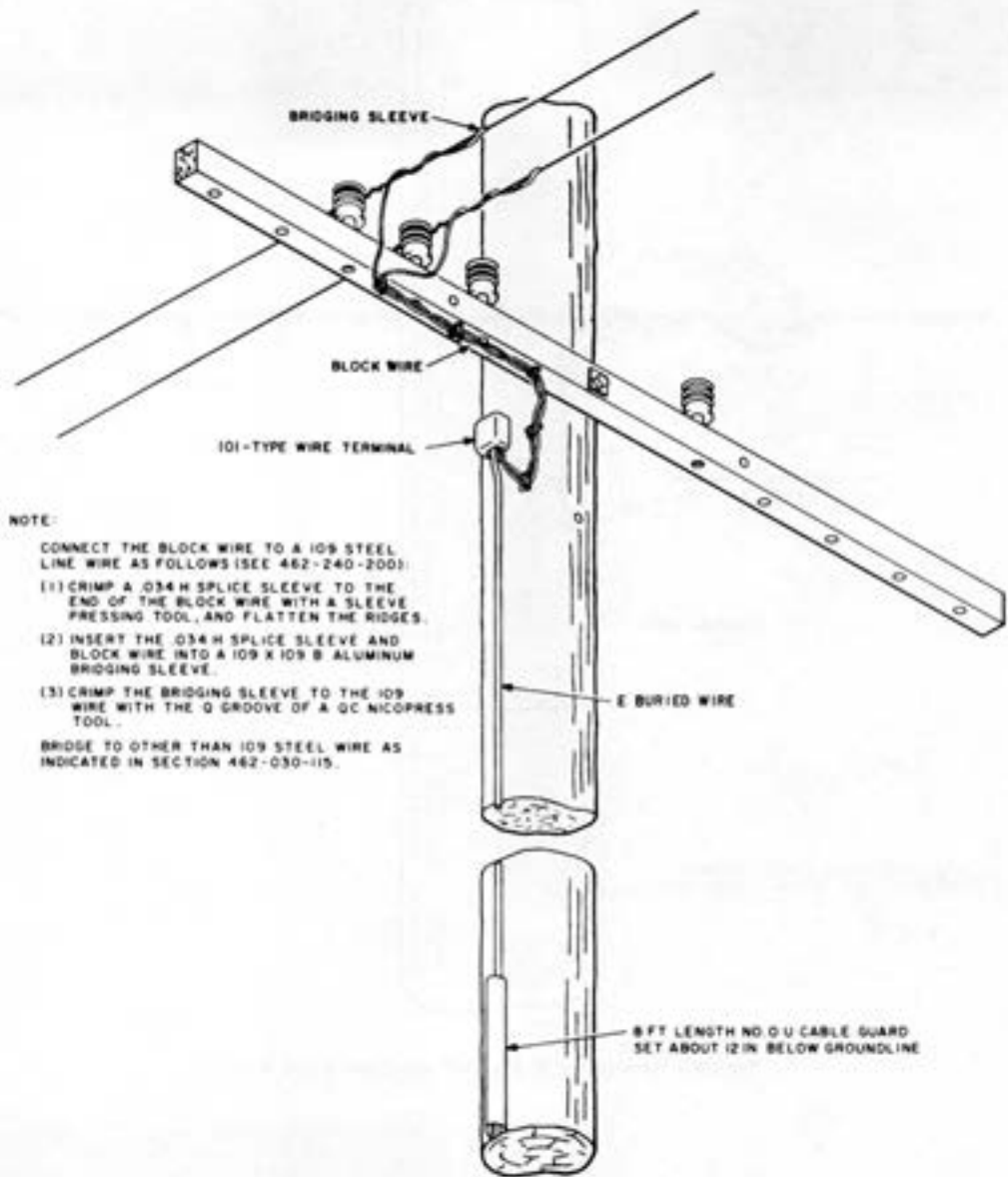


Fig. 31—Termination of E Buried Wire and Open Wire

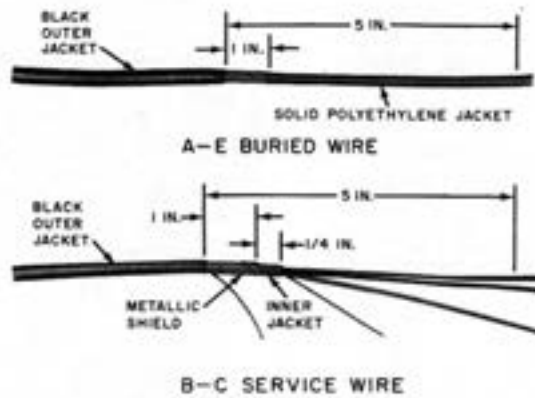


Fig. 32—Sheath Preparation for Placing F Connector

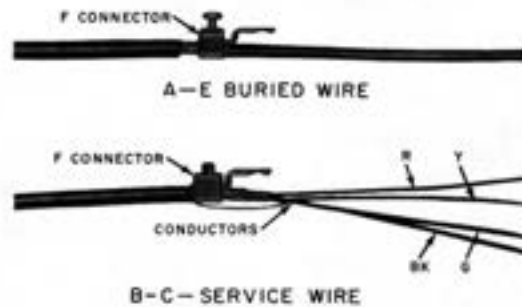


Fig. 33—F Connector on Service Wire

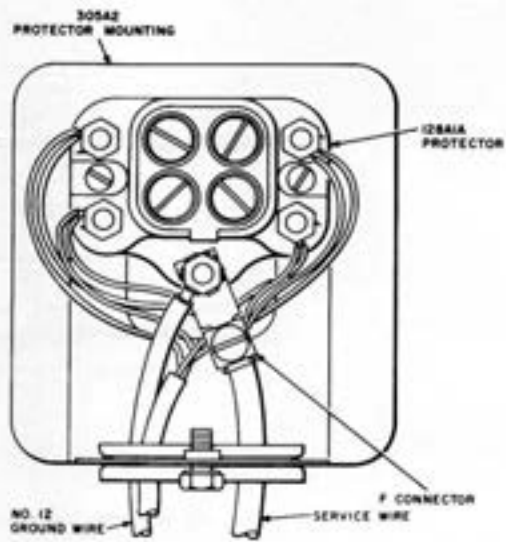
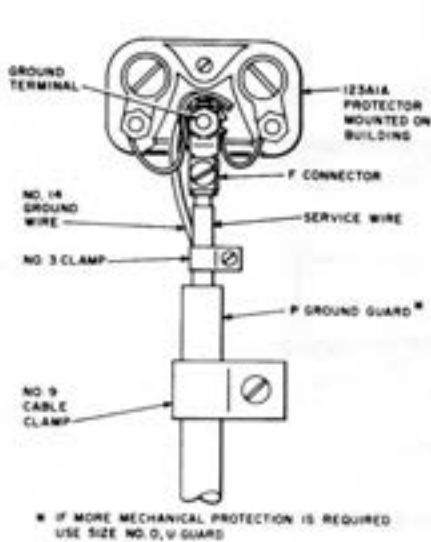


Fig. 34—Service Wire on Protector

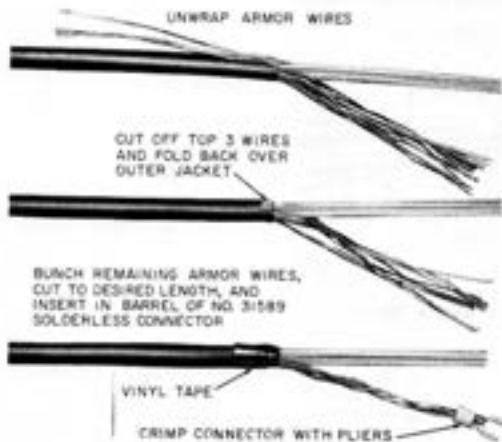


Fig. 35—Preparation of D Underground Wire (MD) for Protection or Cable Terminal Where Grounding is Required

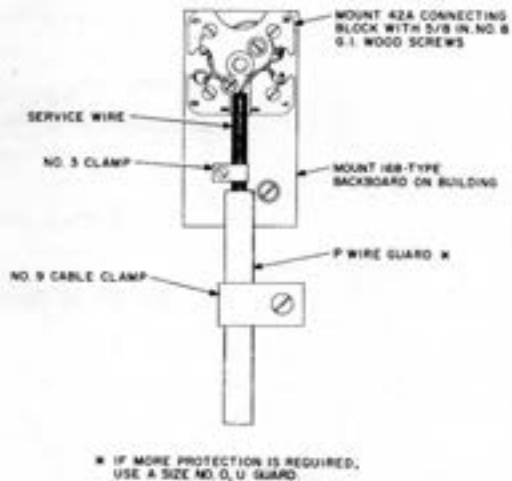


Fig. 36—Service Wire on 42A Connecting Block (Prepared for Unexposed Stations)

DROP AND BLOCK STRAND, SHEATH, POLE, AND WALL WIRE TERMINALS

1. GENERAL

1.01 This section describes routing and terminating of drop and block wiring at aerial cable terminals.

1.02 This section is reissued to:

- Add information on the 3A4-3 terminal block which replaces the 3A3-3 and 3A3-2 terminal blocks.
- Add information on the routing of drop and block wiring.
- Revise format and illustrations.

1.03 ¶All employees engaged in aerial work should be familiar with the safety precautions to be observed in working on poles and aerial terminals.¶

1.04 ¶At each visit to the terminal location, perform the following procedures:

- Finger-tighten the nuts on all unused binding posts to keep all contact areas as clean as possible.
- Brush the faceplate with a water tool brush to remove any dirt that may have accumulated and check for excessive corrosion on the faceplate.
- Trim frayed ends of wires which might cause leakage to adjacent wires or binding posts.

Caution: *When cutting wire ends of wire terminated on binding posts, wear eye protection and place the free hand over the binding post before cutting the wire.¶*

1.05 ¶Where additional information is required, refer to Section 462-260-201 (Drop and block wiring at aerial cable terminals).¶

2. ¶ROUTING OF WIRE RUNS¶

Strand-Mounted Terminals

2.01 Drop wires should preferably be run to the terminal from the adjacent pole (Fig. 1) except where they distribute from a cable extension arm or from a span clamp. A drop wire distributing from a span clamp should be run directly from the span clamp to the terminal when the span clamp is adjacent to the terminal.

2.02 Route the drop or block wires through the three hangers below the terminal, around the hanger at the far end, and below the terminal to the proper wire entrance holes of the assigned binding posts.

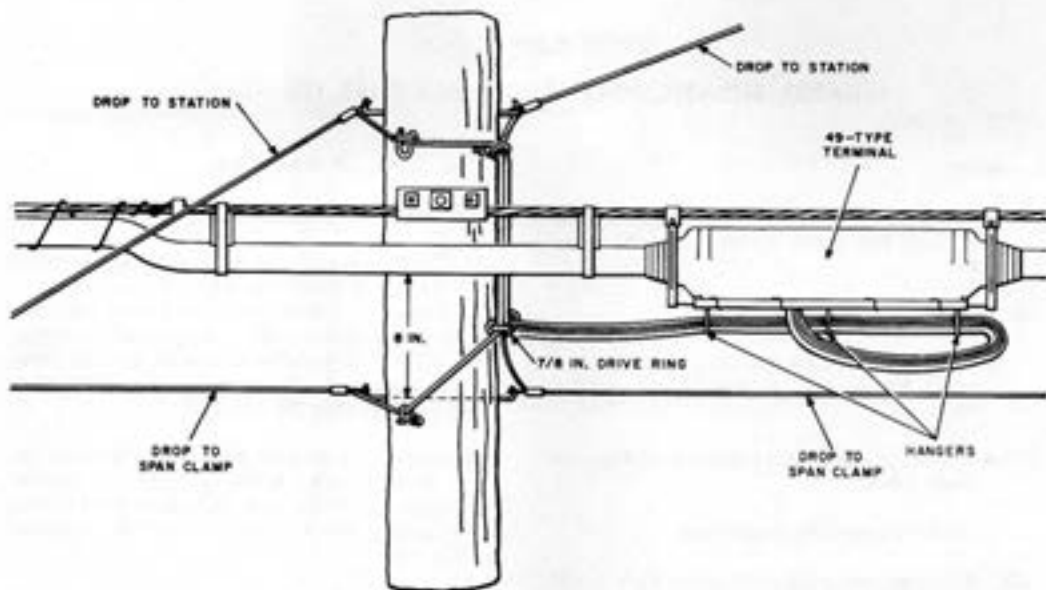
2.03 Refer to Fig. 1, 2, 3, 4, and 5 for typical arrangements of drop wires fed from strand-mounted terminals on aerial cable. Note that the arrangement of wires is similar at all strand-mounted cable terminals.

2.04 When placing new connections, the wire should be run through all the rings below the terminal in order to provide enough slack to enable any wire to reach any pair of binding posts in the event of changes in cable pair assignments. Wire should be loosely placed to avoid sharp bends around rings which may cause damage to the wire insulation.

Pole-Mounted Terminals

2.05 All vertical drop and block wire runs on poles should be in drive rings which are in a straight line on the pole and spaced evenly about two feet apart. This line of drive rings should be about 45 degrees around the pole from the face or side of the pole upon which the terminal is mounted.

2.06 Wires should be routed through the ring run to the terminal entrance hole.



† Fig. 1—Running Drop Wire to 49-Type Terminal at Pole †

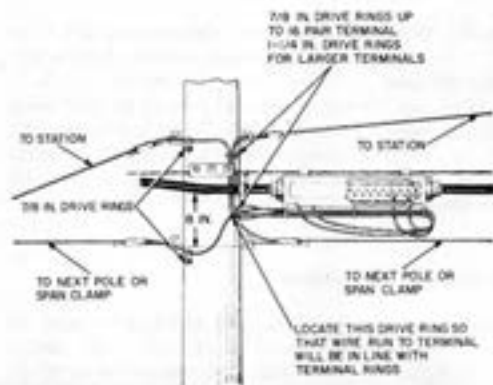


Fig. 2—Running Drop Wires to 61-Type Terminal

2.07 Refer to Fig. 6 and 7 for typical arrangements of drop wires at N-type terminals which are mounted on poles.

2.08 With pole-mounted cross-connecting terminals, install drop wire in accordance with the following procedure:

- (a) Place drive rings on the pole as shown in Fig. 8.
- (b) Where a drop wire is to be terminated on the left side of the terminal chamber, run the wire down the right side of the pole behind the terminal, through the two rings below the terminal, and into the wire entrance holes on the bottom left of the terminal box. Where the drop wire is to be terminated on the right side of the terminal chamber, run the wire down the left side of the pole behind the terminal, through the two rings below the terminal, and into the wire entrance holes on the bottom right of the terminal box.
- (c) Insert the drop wire into one of the entrance holes located in the bottom of the terminal housing.

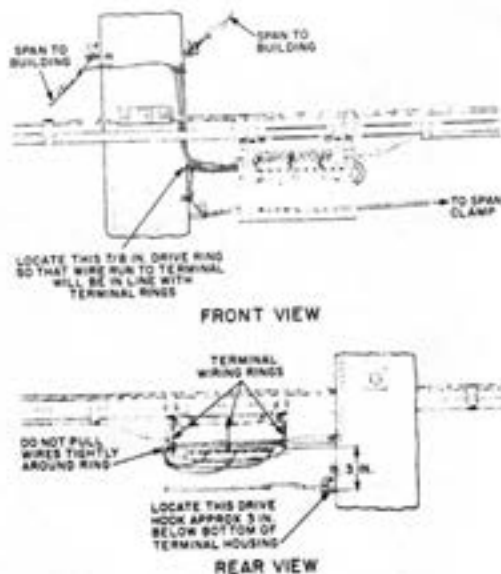


Fig. 3—Running Drop Wire to N-Type Terminal From Pole

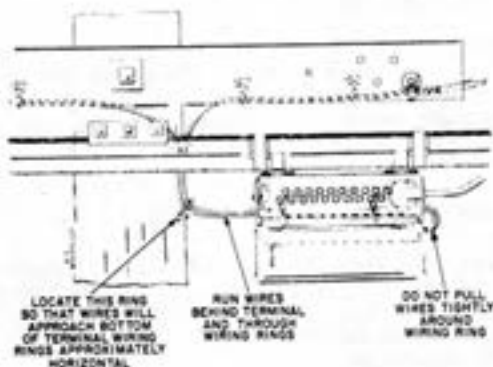


Fig. 4—Running Drop Wire to N-Type Terminal From Guard Arm

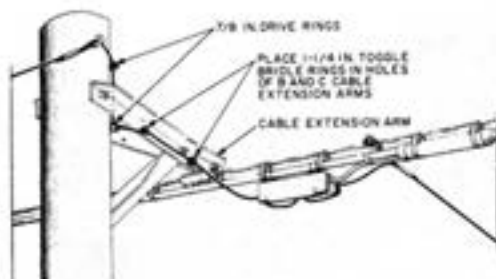


Fig. 5—Running Drop Wire to N-Type Terminal From Cable Extension Arm

Wall-Mounted Terminals

2.09 The wiring arrangements at wall-mounted terminals are very much like the arrangements at strand- and pole-mounted terminals, and should always be done in a neat and orderly fashion.

2.10 Refer to Fig. 9, 10, and 11 for arranging drop and block wires at wall-mounted terminals.

101-Type Wire Terminals

2.11 See Section 462-240-120 for a description of the 101-type wire terminals. The 101B2 wire terminal supersedes both the 101A and 101B (Fig. 12) wire terminal. It is used for making party line taps in drop and block wire runs, in distributing drops from cable and open wire lines, and in placing fusible links.

2.12 The 101-type wire terminal should be mounted on poles and walls as shown on Fig. 13, 14, 15, 16, and 17.

3. TERMINATING WIRING AT CABLE TERMINALS

Miscellaneous Type Terminals

3.01 Cut wire to the proper length for terminating, and remove the required amount of insulation from the wire to terminate on the binding post. See Fig. 18.

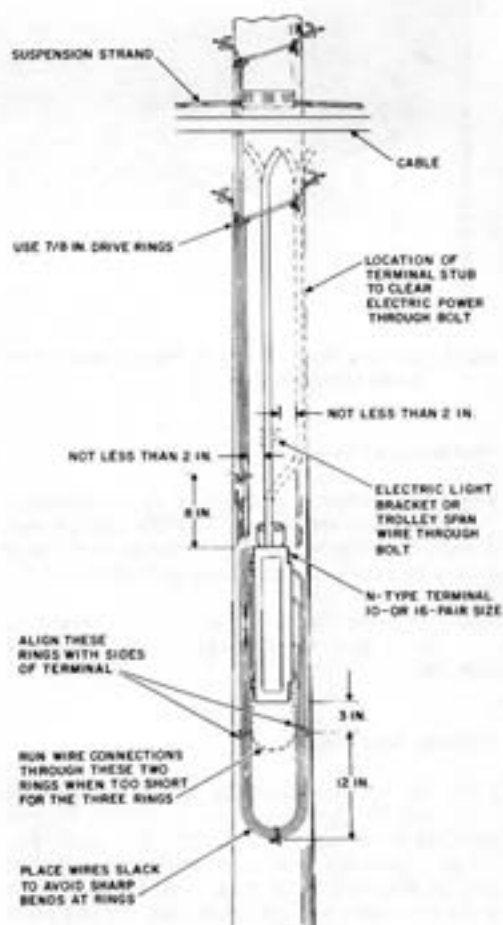


Fig. 6—Running Drop Wire to 10- or 16-Pair N-Type Terminal Mounted on Pole

3.02 Using long-nose pliers or other suitable tool, break through the wire entrance hole immediately below the proper pair of binding posts.

3.03 Insert the wire through the wire entrance hole and terminate it on the binding post so that the end of the insulation is about 1/8 inch from the washers. The outer covering of the drop wires should extend at least 1/4 inch inside the terminal housing. See Fig. 19.

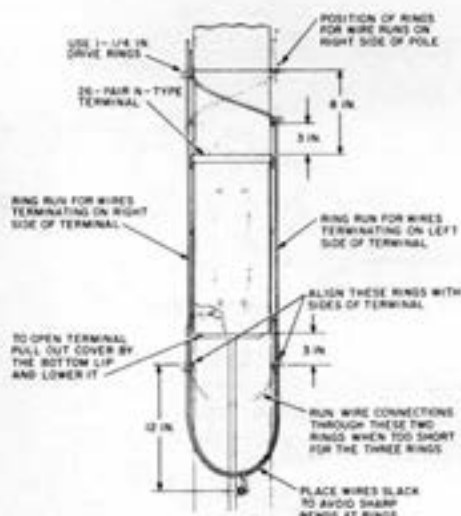


Fig. 7—Running Drop Wire to 26-Pair N-Type Terminal Mounted on Pole

3.04 Bridge no more than two conductors on each binding post. Where additional bridging is necessary, utilize wire terminals.

3.05 Terminate drop wire on cross-connecting type terminals by installing drop wire as shown in Fig. 20. Use G cross-connecting wire between the feeder pair binding posts and vacant drop wire binding posts if required.

49-Type Terminal

3.06 The 3A4-3 terminal block (Fig. 21) replaces the 3A3-2 and 3A3-3 (Fig. 22) terminal blocks for use in the 49-type cable terminal. The 3A3-2 and 3A3-3 terminal blocks will be rated manufacture discontinued (MD).

3.07 The 49-type terminal was formerly supplied with one P-18A782 terminal block in position 1 and additional blocks in positions 2 and 3, if required.

3.08 Current terminals are furnished with two terminal blocks (Fig. 25) in positions 2 and

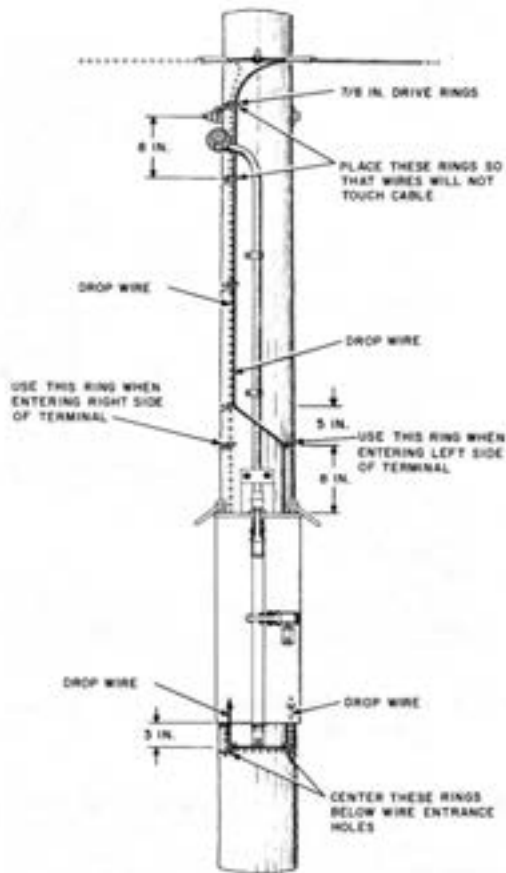


Fig. 8—Running Drop Wire at Cross-Connecting Terminal

3. If an additional block is required, install in position 4.

3.09 Refer to Table A for lead colors using P-18A782 and 3A3-3 or 3A4-3 terminal blocks.

Note: No more than three terminal blocks should be mounted in a 49-type terminal and no more than eight pairs of binding posts should be used.

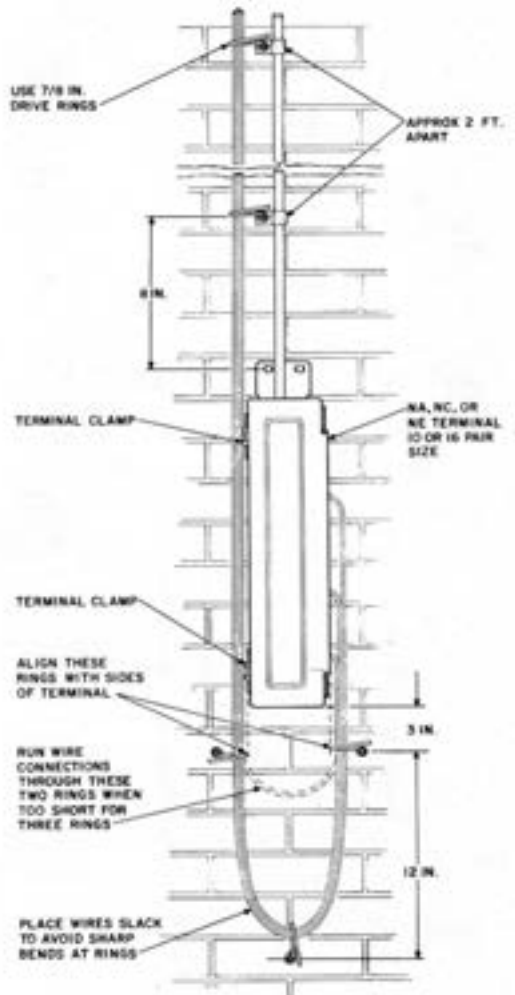


Fig. 9—Wall Mounted 10- or 16-Pair Terminal With Stub at Top

3.10 At seacoast or other locations where corrosion due to salt atmosphere can be expected, remove existing 3A3-3 and replace with a 3A2-3 or 3A4-3 terminal block. These blocks are similar to the 3A3-3 except that the mounting studs are made of zinc-plated steel, and the 3A4-3 has a single mounting stud.

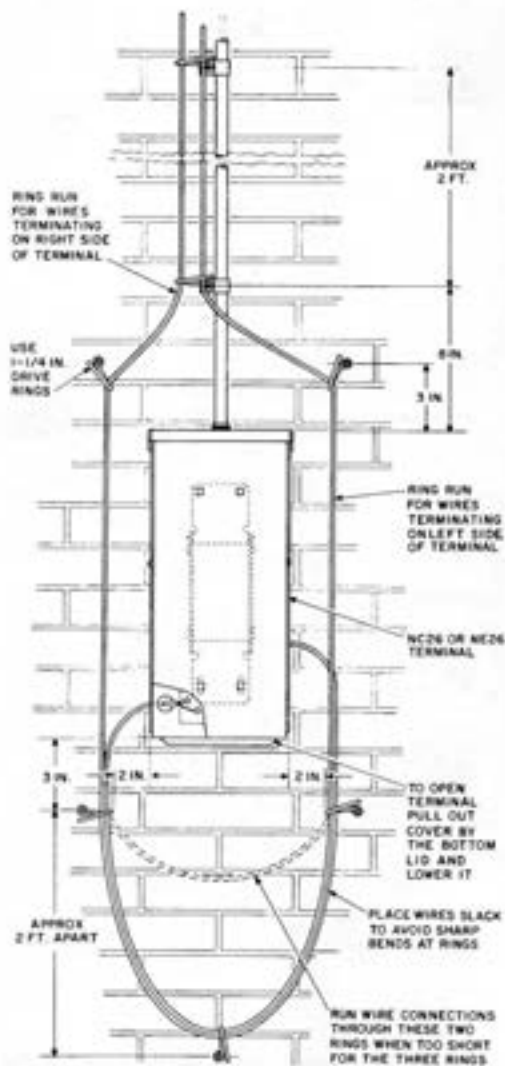


Fig. 10—Wall Mounted 26-Pair Terminal With Stub at Top

3.11 If cable protection is required, remove the existing block and substitute a 3A2B-3 terminal block. This block is equipped with protector units and two internally connected leads per binding post (Fig. 23).

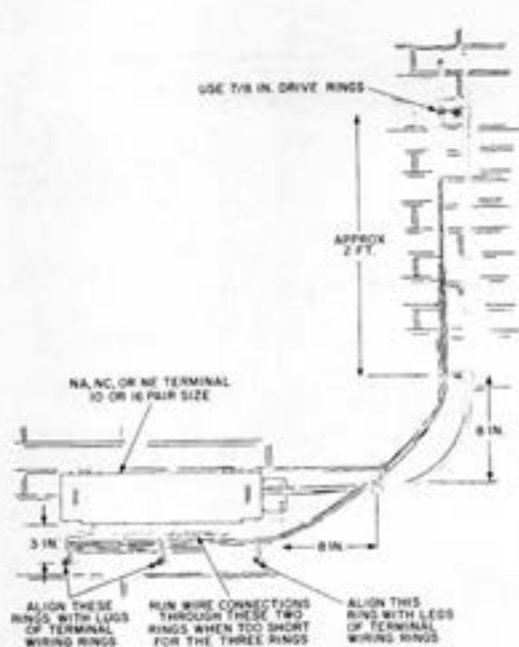


Fig. 11—Horizontal Wall Mounted Terminal With Stub Turned Up

3.12 When SCOTCHLOK® UG Bridging Connectors are used to connect the 3A2B-3 terminal block leads to the cable pairs, the unused leads should first be placed under the bottom washers of their respective binding posts and cut off as close as possible. Do not remove the insulation from the extra leads.

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3.13 When selecting cable pairs by color code, use the *center* binder group markers for identifying the required group. Slide the marker to one side and then select the required cable pair within the group.

3.14 The preferred method of joining the terminal block leads to the cable pairs assigned is with the SCOTCHLOK UG Bridging Connector. The use of UG Bridging Connectors eliminates the need to cut the cable conductors, thereby reducing the possibility of open conductors beyond the



Fig. 12—101B Wire Terminal

terminal and also improving housekeeping in the terminal. When bridging connectors are used, the second lead is not required and is cut off close to the lug (Fig. 24 and 25).

3.15 An alternate method of joining the terminal block leads to the cable conductors is with the use of B wire connectors. However, with this method the cable conductors must be cut, thereby increasing the possibility of open conductors beyond the terminal (Fig. 26).

3.16 When binding post leads already bridged to a cable pair with UG connectors are to be reassigned to another cable pair, proceed as follows:

- (1) Cut the binding post leads as near as possible to the connectors. *Do not attempt to remove the connectors from the cable pair conductors.*

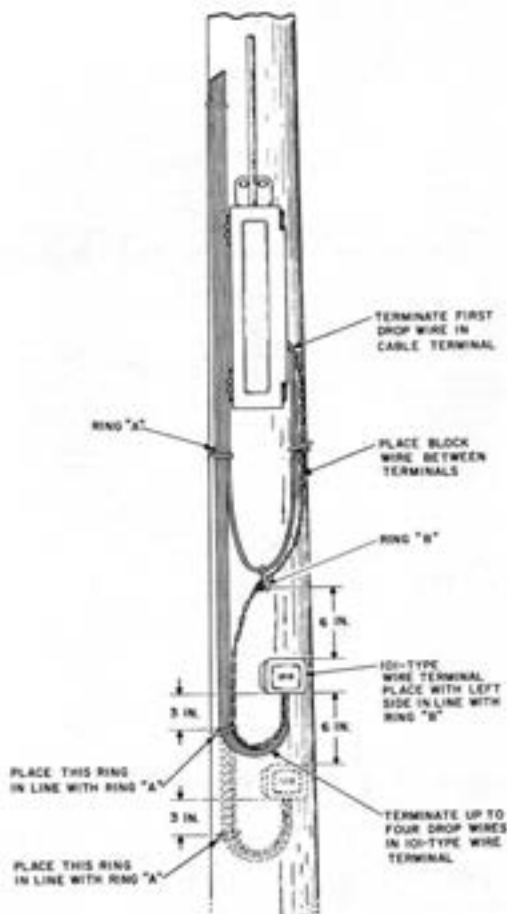


Fig. 13—Wiring 101-Type Terminal at Pole Mounted Terminal

- (2) Separate the newly assigned cable pairs from the preferred count binder group. Make certain these pairs are not damaged.

- (3) Reconnect the binding post leads to the newly assigned cable pair.

3.17 Additional drop wire terminations may be made in terminals already in plant by adding

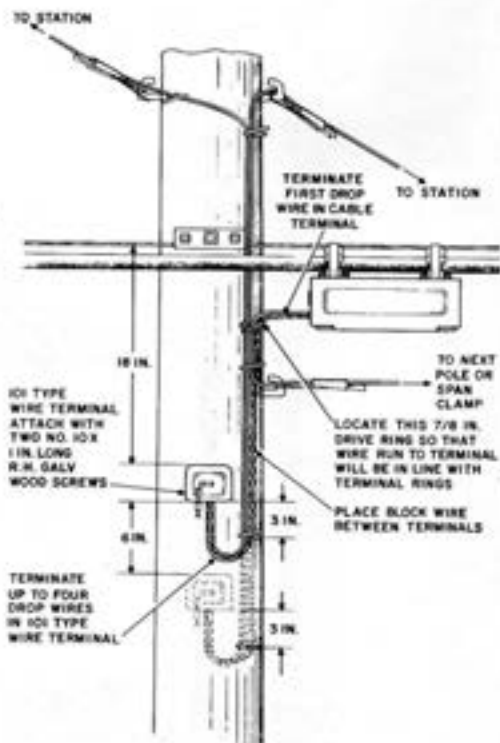


Fig. 14—Wiring 101-Type Terminal at Strand Mounted Terminal

a 3A3-3 or 3A4-3 terminal block (maximum of three blocks in a terminal).

- (1) Mount a 3A3-3 or 3A4-3 terminal block (3A2B-3 if protection is required) adjacent to the existing terminal block.
- (2) Loosen the B cable tie and fold the previously joined conductors aside to facilitate selection of the cable pairs assigned.
- (3) Loop the binding post leads through the pair clip on the right side of the terminal.
- (4) Join the binding post leads to the cable pairs assigned with SCOTCHLOK UG Connectors, or B wire connectors. Stagger the position of the connectors.

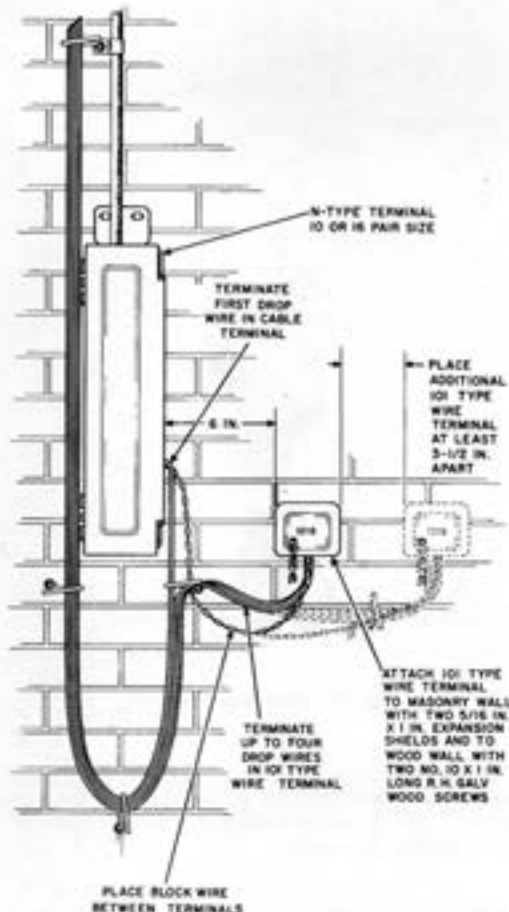


Fig. 15—Wiring 101-Type Terminal With Vertical Wall-Mounted Terminal

- (5) Replace the B cable ties around the conductor bundle and tie rod.

A completed installation with eight drop wire connections is shown in Fig. 27.

4. BINDING POST CAPS AND INSULATORS

4.01 These instructions cover the placing of binding post caps in cable and wire terminals as protection against accidental contacts on special

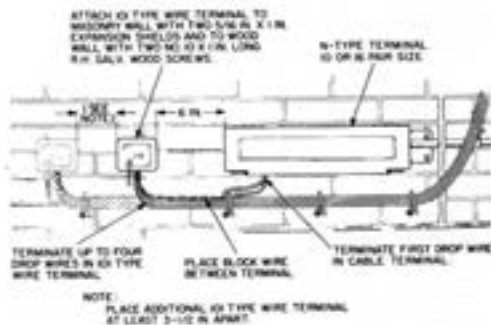


Fig. 16—Wiring 101-Type Terminal With Horizontal Wall-Mounted Terminal

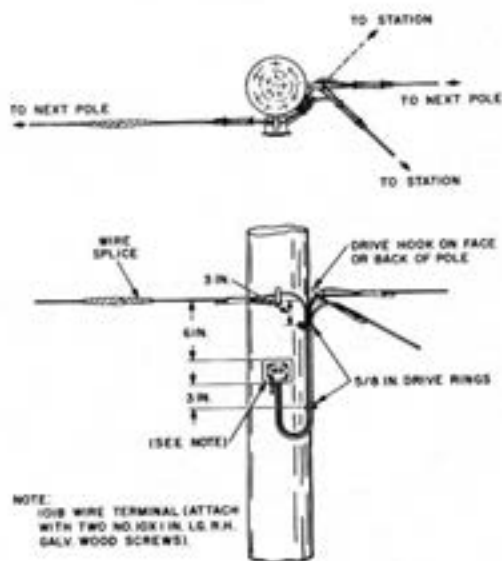


Fig. 17—Wiring Party Line Tap

service lines and as a means for minimizing faceplate leakage in distributing cable terminals. Table B lists the binding post caps and usage.

Caution: Check with local test desk to make sure no cable breakdown tests are in progress before working in terminals.

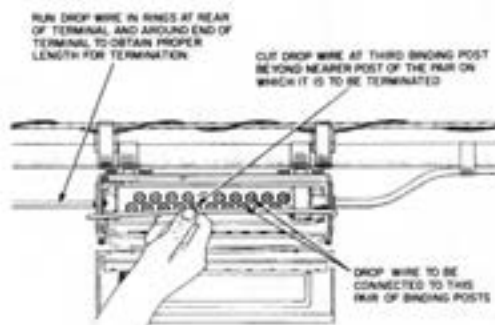


Fig. 18—Obtaining Proper Length of Wire for Termination

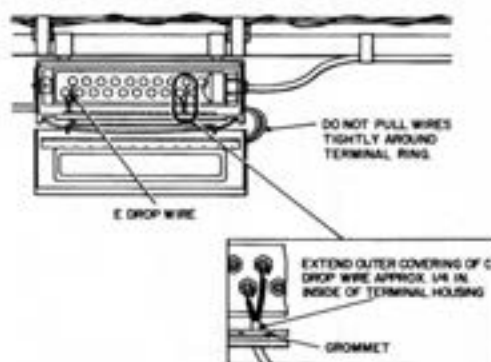


Fig. 19—Terminating Wires at Terminals

Note: Special service lines cover such circuits as program supply, radio and television network services, picture transmission, teletypewriter, fire, police, power remote control, burglar alarm, etc. (See 4.06.)

4.02 Binding post caps are supplied in red and black colors as a means of identifying the types of circuits on which they are being used. The red cap is intended for use on special service lines as protection against accidental contacts and the black for minimizing faceplate leakage and other purposes.

4.03 When installing the B binding post caps, first turn down the nut of the binding post

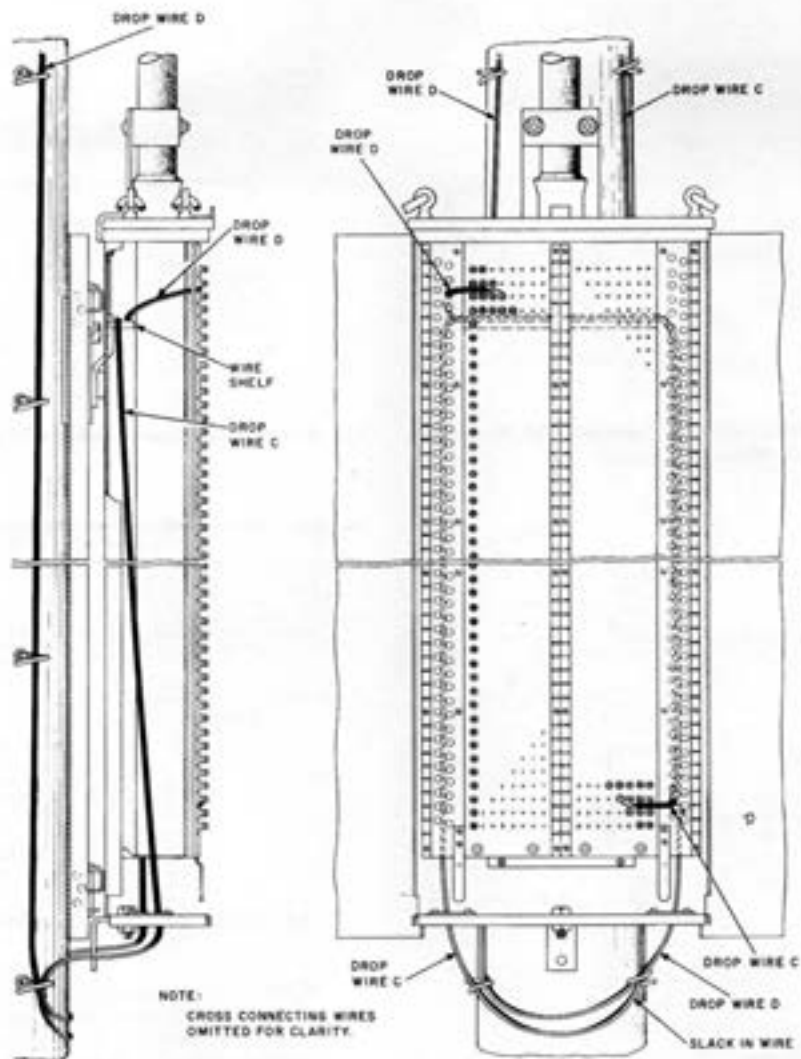


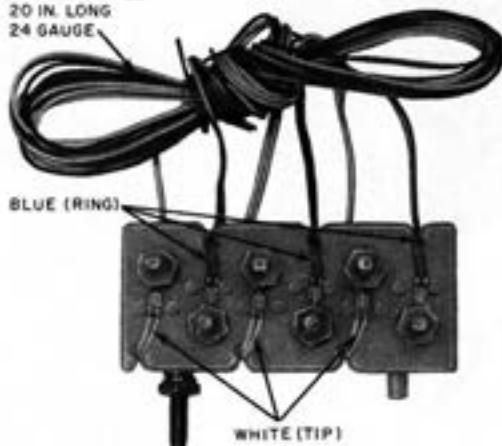
Fig. 20—Terminating Drop Wire—BD and BE Terminals

finger-tight. Force the cap over the binding post, without twisting, until the skirt of the cap is in good contact with the faceplate. If the cap is twisted while being forced over the binding post, the skirt of the cap may fold under instead of seating squarely on the faceplate as desired. Fig. 28 shows a properly placed binding post cap.

4.04 In normal usage of binding post caps, clean the binding posts and faceplate thoroughly before placing caps. Install the caps after all moisture is removed from around the binding posts.

4.05 Place the C binding post caps over the binding post with the slit in the line with

APPROXIMATELY
20 IN. LONG
24 GAUGE



♦ Fig. 21—3A4-3 Terminal Block ♦

APPROXIMATELY 20 IN. LONG,
24 GAUGE

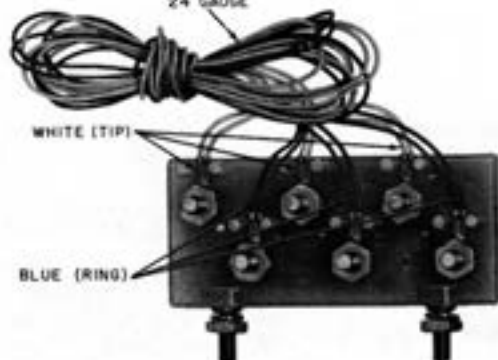


Fig. 22—3A3-3 Terminal Block

the terminated wire. Force the cap down over the binding post with terminated wire in the slit until the skirt of the cap is in good contact with

the faceplate. Adjust terminated wire so that it is positioned inside the hole of the cap as indicated in Fig. 29.

TABLE A
TERMINAL BLOCK LEAD COLORS

| | | P-18A7B2 BLOCK | | 3A4-3 3A3-3 BLOCK |
|--------|---|----------------|-----|-------------------------|
| | | OLD | NEW | |
| Pair 1 | T | W | W | W |
| | R | R | BL | BL |
| Pair 2 | T | W | W | W |
| | R | BL | O | BL |
| Pair 3 | T | W | W | W |
| | R | Y | G | BL |
| Pair 4 | T | W | W | |
| | R | G | BR | |
| Pair 5 | T | W | W | |
| | R | BR | S | |
| Pair 6 | T | W | W | |
| | R | S | BL | |

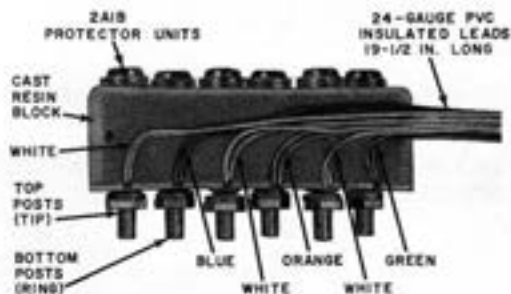
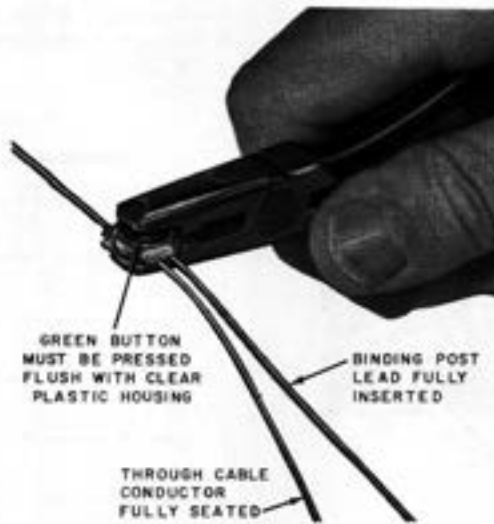


Fig. 23—3A2B-3 Terminal Block, Top View

4.06 Refer to Section 460-110-100 if more information on Special Service Protection is required.



¶ Fig. 24—Pressing UG SCOTCHLOK Connector with C Pressing Pliers ¶

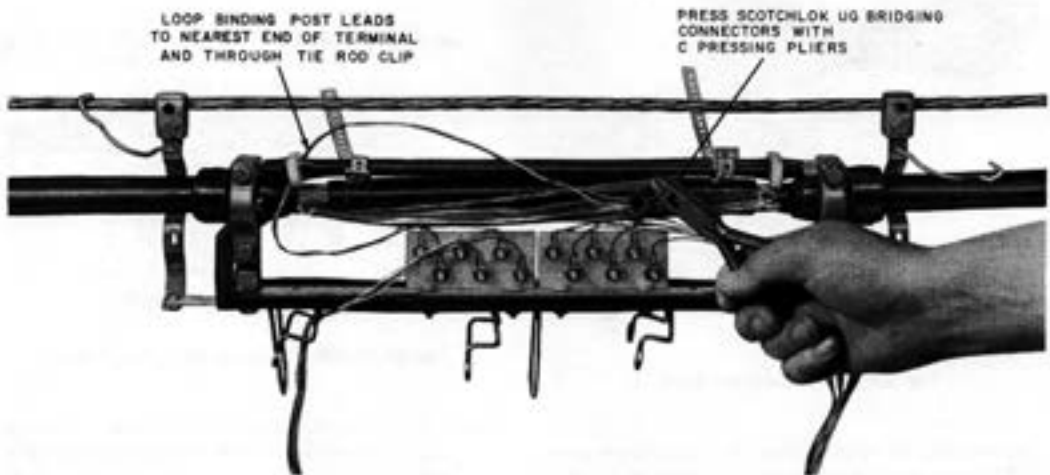


Fig. 25—Bridging Binding Post Leads to Cable Conductors

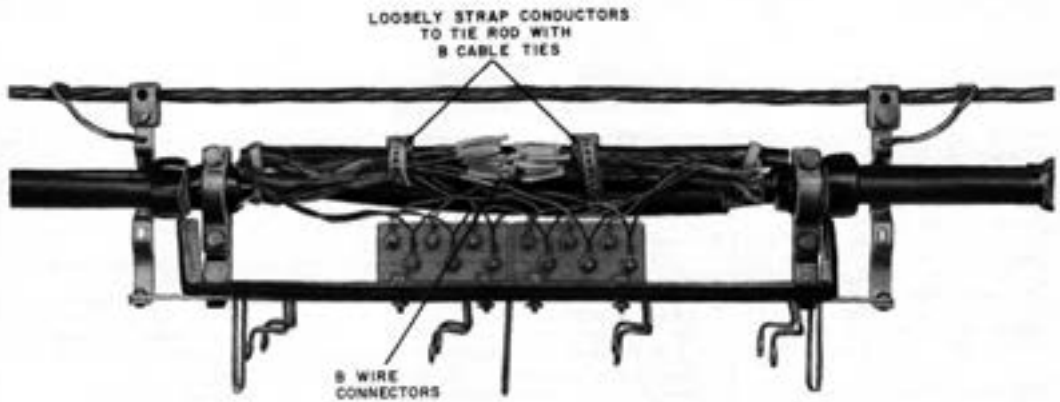


Fig. 26—Completed Installation Using B Wire Connectors

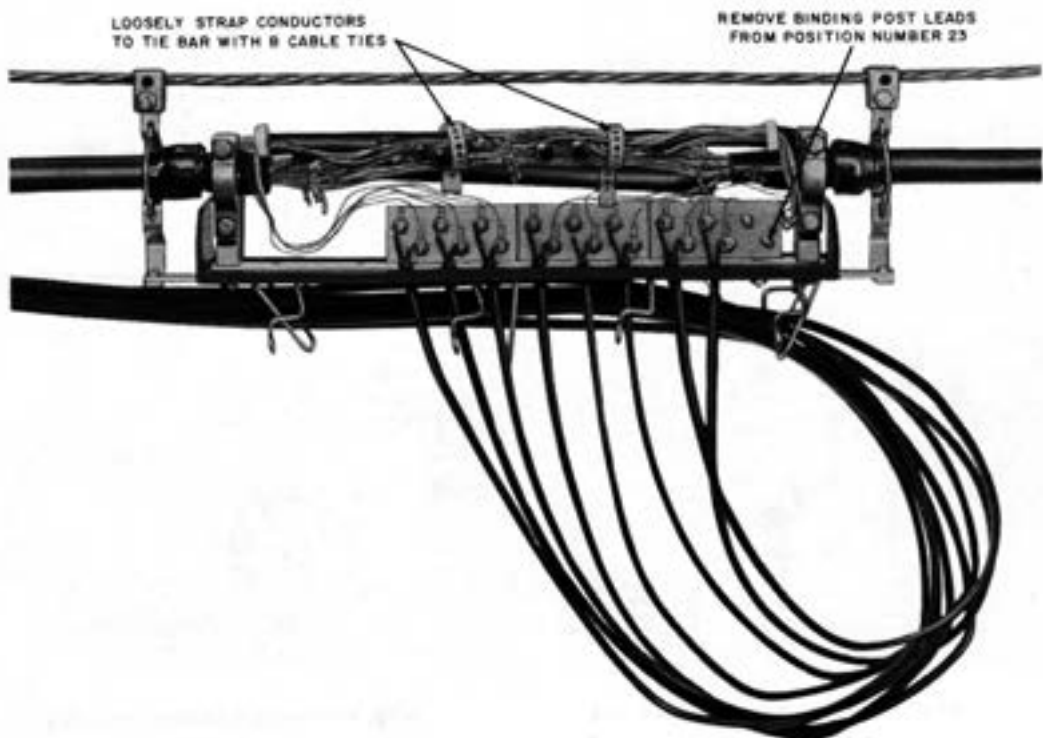


Fig. 27—49-Type Terminal With Eight Drop Wire Connections

TABLE B
BINDING POST CAPS

(SEE BSP 460-110-100 FOR DETAILED INFORMATION)

| BINDING POST CAP | COLOR | USAGE |
|------------------|--------------|--|
| B | Red or Black | On nonworking posts of N, T, and 61-type cable terminals |
| C | Red or Black | On working posts of N, T, and 61-type cable terminals |
| D | Red or Black | On 7A fuses installed in L type fuse chambers |
| E | Red or Black | On 49-type cable terminals |
| F | Red or Black | On B buried cable terminals and connecting blocks equipped with insulation crushing washers — 30-2, 57B, and 59A types |
| G | Red or Black | On 30-type connecting blocks |
| H | Red or Black | On 31-type connecting blocks |



Fig. 28—Placing B Binding Post Caps

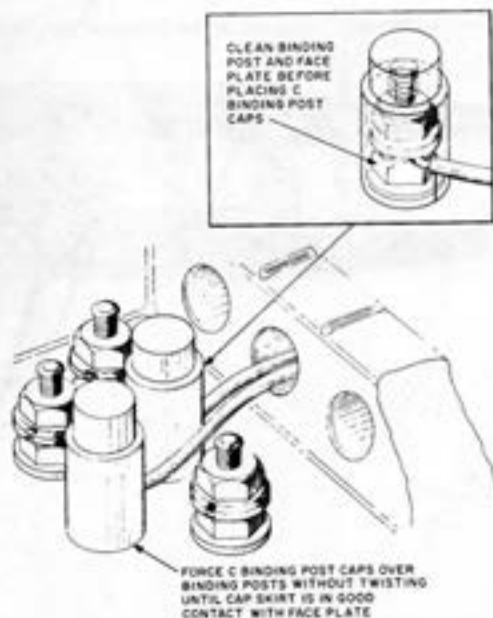


Fig. 29—Placing C Binding Post Caps

SEPARATION AND MECHANICAL PROTECTION FOR WIRE AND CABLE

1. GENERAL

1.01 In general, the separations are required for electrical reasons. However, uncovered steam and hot water pipes, stationary metal gratings, etc, also must be considered because of excessive heat and abrasion.

1.02 This section is reissued to update Tables A, B, and C to agree with Section 462-450-205.

1.03 All station wires or cables installed in explosive atmospheres shall be placed in accordance with the instructions pertaining to that equipment.



Wire or cable shall not be placed in pipe, conduit, or compartment containing electric light and power wires or cables, nor in the same outlet box, junction box, or compartment unless separated from the electric light and power wires by a suitable partition.

1.04 Whenever practicable, avoid running telephone wire or cable in the same conduit, molding, or runway with foreign signal circuits which are operated by battery or from a stepdown transformer. Strict adherence to this recommendation will minimize the possibility of interference by either or both parties during placing or maintenance activities.

2. SEPARATIONS



The separations shown in Tables A, B, and C are minimum requirements. Greater separations shall be provided where readily obtainable.

2.01 Separations of less than 6 feet between drop, block, station wiring, station cabling, or telephone ground wires and lightning wires or rods are permissible under the following conditions. **In**

no case shall the separation be less than 4 inches.

(a) Where telephone, power, and lightning rod ground connections are made to a common grounding medium such as a cold water pipe.

(b) Where separate driven ground rods are used for telephone, power, and lightning rod installations, **and the ground rods are bonded together.**

3. DEFINITION OF TERMS

3.01 Terms used in Tables A, B, and C are defined below:

- Bare Wire—A conductor having no covering or insulation whatsoever.
- Open Wiring—A wiring method using cleats, knobs, tubes, and flexible tubing for the protection and support of insulated conductors run in or on buildings, and not concealed by the building structure.
- Service Drop—The overhead service conductors between the last pole or other aerial support and the first attachment to the building.
- Nonmetallic Sheathed Cable—An assembly of two or more insulated conductors having an outer sheath of moisture resistant, flame retardant, nonmetallic material.

4. WIRE PROTECTION

4.01 A protective covering is required (Fig. 1) where it is not practicable to obtain the minimum separation at crossings shown in Tables A and B or where wire and cable runs are subject to mechanical damage, abrasion, or excessive heat. Where Tables A and B list **No Alternative**, the minimum separation must be maintained. P wire

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guard, plastic tube, or two layers of friction tape shall be used in all cases where telephone wiring is subject to abrasion or mechanical damage. E wire guard (plastic tubing) may be used in place of friction tape or P wire guard on station wiring within buildings where improved appearance is desired (Fig. 2).

4.02 Where plastic insulated station wire or cable passes through wall or floor adjacent to wall or baseboard, protection with friction tape or E wire guard is not required unless wire is subject to mechanical damage or abrasion.

4.03 Where station wiring passes over floor away from wall or baseboard, protect it from mechanical damage with overfloor ducts and associated fittings as covered in the section entitled Overfloor Ducts, Identification and Installation.

4.04 Fig. 3 through 12 are typical examples of wiring requiring protection.



Do not run wires or cables through removable gratings.

**TABLE A — SEPARATION AND PHYSICAL PROTECTION FOR WIRING BETWEEN
PROTECTOR AND TELEPHONE EQUIPMENT**

This table applies only to telephone wiring from fuseless or fused protector to telephone equipment and to telephone wiring requiring no protector. Minimum separations between telephone wiring outside or inside buildings, and type of plant involved, are as follows. Separations apply to crossings and to parallel runs.

| TYPE OF PLANT INVOLVED | | MINIMUM SEPARATIONS | PROTECTION REQUIRED IF MINIMUM SEPARATIONS CANNOT BE OBTAINED (Note 1) |
|---|--|---|---|
| Electric Supply | <i>Bare light or power wire of any voltage</i> | 5 ft (Note 2) | No Alternative (Note 2) |
| | Open wiring not over 300 volts | 2 in. | See Note 3 |
| | Wires in conduit, or in armored or nonmetallic sheath cable, or power ground wires | None | |
| Radio and Television | Antenna lead-in and ground wires | 4 in. | See Note 3 |
| Signal or Control Wires | Open wiring or wires in conduit or cable | None | |
| Communication Wires | Community television systems coaxial cables with shields at ground potential | None | |
| Telephone Drop or Block Wire | Using fused protectors | 2 in. | See Note 3 |
| | Using fuseless protector or where no protector required | None | |
| Telephone Ground Wire | | None | |
| Sign | Neon signs and associated wiring from transformer | 6 in. (Note 4) | SK station wire with shield grounded or lead cable with sheath grounded. Ground requirements same as for signaling ground. See Section 638-210-100. |
| Lightning System | Lightning rods and wires | 6 ft | See 2.01 |
| Pipe | Steam or hot water or heating ducts | See Note 5 | See Note 5 |
| Stationary Grating, Metal Shutter Grillwork, etc. | | P Wire Guard, or two layers of vinyl tape required in all cases to resist abrasion. | |

Note 1: Applies only to crossings. For parallel runs the indicated minimum separations must be maintained.

Note 2: *Power is to be turned off if working above bare wire.* Ladders shall be placed to maintain a 5-foot minimum clearance.

Note 3: B Plastic tube; E or P wire guard; or two layers of vinyl tape extending 2 inches beyond each side of object being crossed.

Note 4: To prevent accidental breakage, avoid neon sign location if alternate run is possible.

Note 5: Excessive heat may damage plastic-insulated wires, therefore, avoid heating ducts and other heat sources.

TABLE B — WIRING BETWEEN BUILDING ATTACHMENT AND TELEPHONE PROTECTOR

This table applies only to telephone wiring (drop or block) attached to buildings and feeding a fuseless or fused protector. Minimum separations between telephone wiring outside or inside buildings, and type of plant involved, are as follows. Separations apply to crossings and to parallel runs.

| TYPE OF PLANT INVOLVED | | MINIMUM SEPARATIONS | PROTECTION REQUIRED IF MINIMUM SEPARATIONS CANNOT BE OBTAINED (Note 1) |
|---|--|---|--|
| Electric Supply | <i>Bare light or power wire of any voltage</i> | 5 ft (Note 2) | No Alternative (Note 2) |
| | Service drops or open wiring not over 750 volts | 4 in. | P Wire Guard extending 2 inches beyond each side of object being crossed |
| | Wires in conduit, or in armored or nonmetallic sheath cable, or power ground wires | 2 in. | |
| Radio and Television | Antenna lead-in and ground wires | 4 in. | |
| Signal Wire | Open wiring or wires in conduit or cable | 2 in. | |
| Communication Wires | Foreign open wiring and wires in conduit or cable | 2 in. | |
| | Between exposed and unexposed Telephone Company wires | | |
| | Community television systems coaxial cables with shields at ground potential | None | |
| Metallic Object | Downspouts and gutters | 2 in. | |
| | Stationary Gratings, etc. | P Wire Guard or two layers of vinyl tape required in all cases to resist abrasion | |
| Telephone Ground Wire | | None | |
| Sign | Neon signs and associated wiring from transformer | 6 in. | P Wire Guard, 12 inches long (Note 3) |
| Lightning System | Lightning rods and wires | 6 ft | See 2.01 |
| Telephone Ground Rods to Other Ground Rods | | 6 ft | No Alternative |
| <p>Note 1: Applies only to crossings. For parallel runs the indicated minimum separations must be maintained.</p> <p>Note 2: Power is to be turned off if working above bare wire. Ladders shall be placed to maintain a 5-foot minimum clearance.</p> <p>Note 3: To prevent accidental breakage, avoid neon sign location if alternate run is possible.</p> | | | |

♦ TABLE C – MINIMUM SEPARATIONS BETWEEN DROP WIRE SPANS
AND OTHER EQUIPMENT OR WIRING ♦

Minimum separations between drop wire spans to buildings, and type of plant involved, are as follows:

| TYPE OF PLANT INVOLVED | | DROP WIRE SPAN TO BUILDING MINIMUM SEPARATION | |
|------------------------|--|--|----------|
| | | CROSSING | PARALLEL |
| Electric Supply | Service drops or open wiring not over 750 volts | 2 ft | 1 ft |
| | Wires in conduit, or in armored or nonmetallic sheath cable | 4 in. | 4 in. |
| Radio and Television | Antenna lead-in and ground wires | 2 ft | 1 ft |
| Signal Wires | Open wiring | 2 ft | 1 ft |
| | Wires in conduit or cable | 4 in. | 4 in. |
| Communication Wires | Foreign open wiring | 2 ft | 1 ft |
| | Foreign wires in conduit or cable | 4 in. | 4 in. |
| | Community television systems coaxial cables with shields at ground potential | 4 in. | 4 in. |
| Metallic Objects | Rain spouts, gutters, etc | 4 in. | 4 in. |
| Ground Wires | Ground wires (except radio, television, and lightning ground wires) | 4 in. | 4 in. |
| Lightning | Lightning wires and rods | 6 ft | 6 ft |
| Signs | Neon sign and associated wiring from transformer | 1 ft | 1 ft |

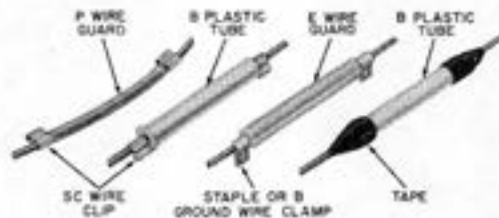


Fig. 1—Securing Plastic Tubes or E Wire Guard

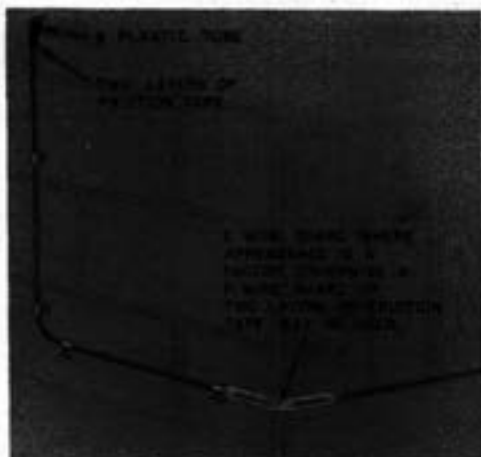


Fig. 2—Use of Tape or E Wire Guard



Fig. 4—Crossing Wood or Stucco on Wood Building Projection



Fig. 3—Crossing Masonry Building Projection



Fig. 5—Protecting Wire Run Through Stationary Metal Grating



Fig. 6—Wires Crossing Downspout on Masonry or Brick Surface



Fig. 8—Wires Crossing Downspout on Wood, Stucco, or Metal Surfaces

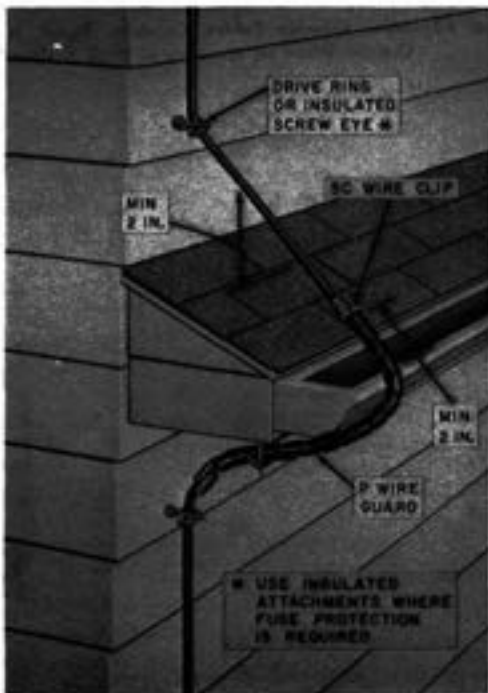


Fig. 7—Crossing Building Overhang and Metal Gutter



Fig. 9—Wires Crossing Power, Radio, or Television Wires on Wood, Stucco, or Metal Siding

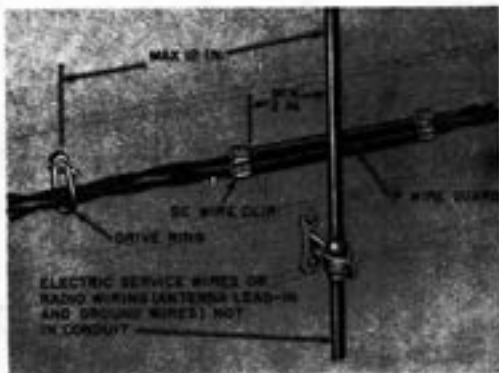


Fig. 10—Wires Crossing Power, Radio, or Television Wires on Masonry or Brick Surfaces



Fig. 12—Wires Crossing Cables, Conduits, Signal, or Ground Wires on Masonry or Brick Surfaces



Fig. 11—Wires Crossing Cables, Conduits, Signal, or Ground Wires on Wood, Stucco, or Metal Siding

INSIDE WIRE AND CABLE SELECTION

1. GENERAL

1.01 This section describes the selection of inside wire and cable.

1.02 This section is reissued to:

- (a) Add information on B plenum cable
- (b) Provide information from the National Electrical Code (NEC) that pertains to station wire and cable
- (c) Remove information pertaining to G manufacture discontinued (MD) and GS (MD) station wire.

Revision arrows are used to emphasize the more significant changes.

2. SELECTION

2.01 In selecting wire or cable, the following should be considered:

- (a) Type and gauge of wire or cable to meet the specific job requirements
- (b) Number of conductors necessary for service and providing an economical allowance for future requirements
- (c) Location of terminal, protector, connecting block, telephone set, conduit facilities provided, etc
- (d) Customer satisfaction with appearance and routing of wire and cable
- (e) Conformance with the National Electrical Code when wire is run in air plenum **or** riser shafts
- (f) Type surface material on which wire or cable is to be applied.



Do not use privately-owned wire or cable systems without the approval of a supervisor.

■ FIRE SAFETY CONSIDERATIONS

2.02 From the viewpoint of fire safety, inside wire and cable can be divided into three categories as follows:

- Plenum wire and cable
- Fire resistant — general use
- Flame retardant — restricted use.

A. Plenum Wire and Cable

2.03 Plenum cables are classified by Underwriters Laboratories per Section 800-3d of the National Electrical Code for use in air plenums without conduit. A typical air plenum is the space between a suspended ceiling and the floor above. The B plenum cable AT-8976 and KS-22084, List 1 through List 7 are available.

B. Fire Resistant General Use Wire and Cable

2.04 These general purpose wires and cables are insulated and jacketed with fire-resistant polyvinyl chloride (PVC) compounds. Their uses include installation in riser shafts, hung ceiling spaces not used for air transport, raceway, and conduit. The H station wire, D inside wiring cable, and connector cable are in this category. Other wires in this fire-resistant category, but with different uses, are E block wire, F cross-connecting wire, and flat cordage.

Note: Penetration and sealing of fire walls or firestops to permit the passage of wire and cable shall be the responsibility of the building owner or subscriber at their expense.

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C. Flame Retardant Restricted Use Wire and Cable

2.05 The D station wire, which has a fire-resistant PVC jacket and polyethylene insulation, is an example of such a wire. It can be used for surface wiring. It should not be used in plenums or riser shafts because it does not meet the requirements of the National Electrical Code. Bundles of three or more D station wires should not be run in buildings. Other wires in this fire-resistant category are SK station wire and B station wire.¶

ORDERING GUIDE**A. Inside Wiring**

2.06 Order inside wire as follows:

- Wire, Station, D (Note)
- Wire, Station, H (Note)
- Cordage, Flat, 4 Conductor, KS-7144 (Note)
- Wire, Station, SK (Note)
- Wire, Station, B
- Wire, Station, KS-22084, List 1 through List 7 (Note)
- Wire, Ground (Note)
- Wire, Block, E (Note)
- Wire, Cross-Connecting, F (Note).

B. Inside Wiring Cable

2.07 Order inside wiring cable as follows:

- Cable, Wiring, Inside, D (Note)
- ¶Cable, Plenum, B (AT-8976) (available in 25-pair only)
- Wire, Station, KS-22084, List 2 through List 7 (Note).¶

C. ¶Inside Wiring Cable (Shielded)

2.08 Order inside wiring cable (shielded) as follows:

- Cable, Wiring, Inside, D (shielded) (Note)

- Cable, Plenum, B (AT-8976) (shielded) (available in 25-pair only).¶

Note: Includes desired type, color, gauge, and/or size from Table A.

2.09 ¶Information for connector cables is provided in Section 461-200-101.¶

3. INSIDE WIRE

3.01 Inside wire type, size, gauge, color, and use are found in Table A.

3.02 The *D station wire* is intended for general use in station wiring subject to restrictions in paragraph 2.02. It is small in diameter and flexible. The plastic jacket has low frictional properties permitting placement without the aid of lubricants.

3.03 The D station wire can be used for indoor or outdoor runs and may be terminated on any terminals which will accommodate 22 or 24 AWG conductors. Do not use D station wire to span, eg, between buildings. The insulation of the individual conductors is distinctively colored to provide identification. Refer to Table B for color codes.

3.04 Wire runs should be limited to 250 feet for installations involving two talking circuits. Single-line installation length is determined by any signaling equipment used or by dial- and night-light loading. See Section 501-136-100 for lamp loading information.

3.05 The *H station wire* is intended for prewiring of single or multifamily residences during construction and for general use in station wiring. In most conduit or duct applications, the wire can be pulled without lubricants. It has three twisted pairs of PVC insulated 24 AWG copper conductors. Each conductor is distinctively colored (see Table C). The pairs have a different length of twist and are grouped together and jacketed with ivory-colored PVC underlaid by a nylon jacket-slitting cord.

3.06 The jacket and insulation of H station wire will withstand the stress of installation down to a temperature of -10°F, and the jacket will resist deterioration of outdoor exposure to sunlight.

3.07 Length of runs of H station wire is determined by any signaling equipment used or by dial-

and night-light loading. See Section 501-136-100 for lamp loading information.

3.08 The *B station wire* (adhesive-backed wire) is intended for use in areas where it is impossible or impractical to use D station wire and standard fasteners due to construction of buildings or building owner restrictions. All adhesive-backed wire should be used with the following precautions:

- (a) Installations are much more expensive than conventional D station wire installations and should be used only where absolutely necessary.
- (b) Mounting surfaces must be clean in order to obtain satisfactory adhesion.
- (c) Solvent-activated primers improve adhesion to slightly soiled surfaces but increases the cost of installation.
- (d) Never mount on damp surfaces, raw plaster, or a coarse surface such as cinder block or untreated concrete.
- (e) Wire runs should be limited to 100 feet for any single-line installation and 60 feet for installations involving two talking circuits.

3.09 The KS-7144 flat cordage is used for station wiring under rugs on subscriber premises. Insulation of individual conductors is colored red, green, yellow, and black for identification. Wire runs should be limited to 100 feet for any single-line installation and 60 feet for installations involving two talking circuits.

3.10 *Caution: The KS-22084, List 1 station wire must not be stapled due to jacket and insulation characteristics.* The KS-22084, List 1 wire is a highly fire-resistant plenum wire that is Underwriters Laboratories approved for use in air plenums without conduit per the National Electrical Code. It should not otherwise be used as general purpose station wire. It consists of four No. 22 AWG conductors, individually insulated and colored red, green, yellow, and black for identification.

3.11 The *SK station wire* is a shielded twisted-pair wire used as follows.

- (a) Where trouble is experienced with impulse noise between dc metallic teletypewriter loops and DATAPHONE* data set lines in the same run
- (b) In loudspeaker systems as amplifier output leads and associated wiring.

3.12 *Ground wire* is a single-conductor insulated wire. The No. 6 ground wire is used to make ground connections to protected cable, cable terminals, protector mountings, and to groups of station protectors. The No. 10 and 12 ground wires are used to make ground connections primarily in station wiring.

3.13 The *E block wire* is used on block distribution and in ring runs on buildings. It may also be used inside factories, freezing rooms, or for short runs in homes. It is available in 1- and 2-pair sizes. It may be used in spans not exceeding 35 feet in length. The inner layer of insulation on the individual conductor is distinctly colored to ease identification. Refer to Table D.

3.14 Wire runs should be limited to 250 feet for installations involving two talking circuits (2-pair size). Single-line installation length is determined by any signaling equipment used or by dial-and night-light loading. See Section 501-136-100 for lamp loading information.

3.15 The *F cross-connecting wire* is used for all indoor cross-connection applications between incoming cables and station equipment (not for use in central offices). It may be used for pedestal and aerial Serving Area Interfaces. Conductor identification is established through use of colored insulation in combination with single dashes of colored ink. Refer to Table E. The insulation will withstand the stress of installation down to a temperature of -10°F .

4. INSIDE WIRING CABLE

4.01 Inside wiring cable type, size, gauge, and use are found in Table A.

*Trademark of AT&T

- 4.02** The *D inside wiring cable* is for general use in customer telephone systems wiring. The plastic jacket has improved frictional properties, permitting placement without the aid of lubricants. Lubricants could eventually corrode and clog conduit, making it more difficult to place additional wire.
- 4.03** All pairs in the 4- and 6-pair size are laid parallel to one another. All pairs in the 12- to 25-pair sizes are made with a stranding lay; individually paired and twisted. The 50- to 100-pair is composed of 2 to 4 units of 25 pairs each. The units are stranded together to form the core. Each unit has a different color binder for unit identification. Refer to Table F.
- 4.04** The colored insulation in combination with single dashes of colored ink provide individual conductor identification.
- 4.05** Length of runs is determined by any signaling equipment used or by dial- and night-light loading. See Section 501-136-100 for lamp loading information.
- 4.06** ¶To prevent cracking of the jacket or insulation, D inside wiring cable should not be installed in locations where the temperature reaches below +15°F. It is available in a shielded version.¶
- 4.07** The KS-22084, List 2 through List 7 is a highly fire-resistant plenum cable that is Underwriters Laboratories approved for use in air return plenums without conduit per the National Electrical Code. It should not otherwise be used as general purpose station cable.
- 4.08** The cable is available in six sizes (see Table A) with all pairs stranded into a cable form. Cable pairs are identified with solid colors only, however, each pair has a unique color combination for identification (see Table G).
- 4.09** ¶The *B plenum cable* (AT-8976) is a fire- and smoke-resistant cable that is Underwriters Laboratories approved for use in air plenums without conduit per the National Electrical Code. It is designed specifically for use in plenums and should not be used as a general purpose cable. For cost considerations, the B plenum cable should be used in lieu of the KS-22084 teflon cable. The cable is available in 25-pair only.
- 4.10** Insulated conductor size and color code are identical to those of the D inside wiring cable. The B plenum cable is somewhat stiffer than D inside wiring cable, however, it can be installed in the same manner and can be used with all existing type connecting blocks.
- 4.11** The sheath and core of the B plenum cable consists of polyimide aluminum and fiberglass construction which imparts a high degree of thermal resistance. The aluminum sheath may be used for a coupled bonding conductor when used with the B bonding clip and B appliance wire. Refer to Section 081-852-120 for information on the B bonding clip and B appliance wire. It is available in a shielded version.¶

TABLE A (Contd)
SELECTION OF WIRE AND CABLE

| TYPE OF WIRE (NOTE) | SIZE | JACKET OR INSULATION COLOR | | | | CONDUCTOR IDENTIFICATION | USE | | | | | | | | | | | REMARKS | | | | |
|-----------------------|------------------------------------|----------------------------|------------------|-------|-------|--------------------------|-------|--------|------------------|--------|------|-----------|----------|-----|--|------------------|------------------|---------|--|--|------------------------------------|---------|
| | | GAUGE | LIGHT OLIVE GRAY | IVORY | BLACK | | WHITE | GROUND | CLASS OF SERVICE | | | | CIRCUITS | | | | CROSS-CONNECTION | | | | | |
| | | | | | | | | | INDIVIDUAL | PARITY | COIN | RESIDENCE | ALL | ALL | LENGTH RESTRICTION (SEE PARAGRAPHS 3.03, 3.08, 3.09) | EXTENSION RINGER | | | TELETYPE | LEASED WIRE | LOUDSPEAKER AND PAGING SYSTEM, ETC | PREMISE |
| E Block | Single | 21-1/2 | | • | | See Table D | • | | | | | | | | | | | | Used outdoors, in freezing rooms, factories, and for short runs in homes or offices. | | | |
| | Pair | | | • | | | | | • | | | | | | | | | | | | | |
| | Triple | | | • | | | | | | • | • | • | | | • | • | | | | | | |
| F Cross-connections | Pair | 24 | See Table E | | | | | | | | | | | | | | | | • | Use for all indoor cross-connections between incoming cables and station equipment. (Do not use in central office distributing frame.) It may be used for pedestal and aerial serving area interfaces. | | |
| | Triple | | | | | | | | | | | | | | | | | | | | • | |
| | 2 Pairs | | | | | | | | | | | | | | | | | | | | | • |
| | 3 Pairs | | | | | | | | | | | | | | | | | | | | | • |
| D Inside Wiring Cable | 4,6,12, 16,21, 25,50, 75,100 Pairs | 24 | | • | | | | | | | | | | | | | | | • | Annealed-copper conductors (plastic PVC insulated) color coded. General purpose cable, | | |
| Air Plenum Cable | KS-22084 | | | | • | See Table G | | | | | | | | | | | | | | Annealed-copper conductors (Teflon insulated) color coded. Used for air plenum, not general purpose cable. | | |
| | L2 | 4 Pairs | | | | | | | | | | | | | | | | | | | | |
| | L3 | 6 Pairs | | | | | | | | | | | | | | | | | | | | |
| | L4 | 12 Pairs | | | | | | | | | | | | | | | | | | | | |
| | L5 | 16 Pairs | | | | | | | | | | | | | | | | | | | | |
| | L6 | 21 Pairs | | | | | | | | | | | | | | | | | | | | |
| L7 | 25 Pairs | | | | | | | | | | | | | | | | | | | | | |

See note and footnotes at end of table. TCI Library: www.telephonecollectors.info

TABLE B

D STATION WIRE, KS-7144
FLAT CORDAGE, AND
KS-22084, LIST 1 CONDUCTOR
IDENTIFICATION

| SIZE | PAIR NO. | COLOR | |
|------|----------|-------|--------|
| | | TIP | RING |
| Quad | 1 | Green | Red |
| | 2 | Black | Yellow |

TABLE D

E BLOCK WIRE
CONDUCTOR IDENTIFICATION

| SIZE | PAIR NO. | COLOR | |
|--------|----------|-------|--------|
| | | TIP | RING |
| 1 Pair | 1 | Green | Red |
| | 2 | Black | Yellow |

TABLE C

H STATION WIRE
CONDUCTOR IDENTIFICATION

| TYPE WIRE | SIZE | PAIR NO. | COLOR | |
|-----------|---------|----------|-------|------|
| | | | TIP | RING |
| H | 3 Pairs | 1 | W-BL | BL |
| | | 2 | W-O | O |
| | | 3 | W-G | G |

TABLE E

F CROSS-CONNECTING WIRE
CONDUCTOR IDENTIFICATION

| SIZE | PAIR NO. | COLOR | | |
|---------|----------|-------|-------|------------------|
| | | TIP | RING | SLEEVE OR GROUND |
| Pair | — | Y-BL | BL-Y | — |
| Triple | — | O-BK | BL-BK | G-BK |
| 2 Pairs | 1 | R-BL | BL-R | — |
| | 2 | R-O | O-R | — |
| 3 Pairs | 1 | W-BL | BL-W | — |
| | 2 | W-O | O-W | — |
| | 3 | W-G | G-W | — |

TABLE F4
B PLENUM AND
D INSIDE WIRING CABLE
CONDUCTOR IDENTIFICATION
(NOTE)

| PAIR | TIP WIRE | RING WIRE | BINDER COLOR FOR 25, 50, 75, AND 100 PAIRS |
|--------|------------------------|-----------|--|
| 1 | W-BL | BL-W | BL-W |
| 2 | W-O | O-W | |
| 3 | W-G | G-W | |
| 4 | W-BR | BR-W | |
| 5 | W-S | S-W | |
| 6 | R-BL | BL-R | |
| 7 | R-O | O-R | |
| 8 | R-G | G-R | |
| 9 | R-BR | BR-R | |
| 10 | R-S | S-R | |
| 11 | BK-BL | BL-BK | |
| 12 | BK-O | O-BK | |
| 13 | BK-G | G-BK | |
| 14 | BK-BR | BR-BK | |
| 15 | BK-S | S-BK | |
| 16 | Y-BL | BL-Y | |
| 17 | Y-O | O-Y | |
| 18 | Y-G | G-Y | |
| 19 | Y-BR | BR-Y | |
| 20 | Y-S | S-Y | |
| 21 | V-BL | BL-V | |
| 22 | V-O | O-V | |
| 23 | V-G | G-V | |
| 24 | V-BR | BR-V | |
| 25 | V-S | S-V | |
| 26-50 | Repeat first 25 colors | | O-W |
| 51-75 | Repeat first 25 colors | | G-W |
| 76-100 | Repeat first 25 colors | | BR-W |

Note: The B plenum cable is available in 25-pair only.

TABLE G

 KS-22084 AIR PLENUM
 INSIDE WIRING CABLE
 PAIR IDENTIFICATION

| PAIR | TIP WIRE | RING WIRE | LIST NUMBER | | | | | BINDER |
|------|----------|-----------|-------------|--|--|--|--|--------|
| 1 | W | BL | | | | | | |
| 2 | W | O | | | | | | |
| 3 | W | G | | | | | | |
| 4 | W | BR | | | | | | |
| 5 | W | S | | | | | | |
| 6 | R | BL | | | | | | |
| 7 | R | O | | | | | | |
| 8 | R | G | | | | | | |
| 9 | R | BR | | | | | | |
| 10 | R | S | | | | | | |
| 11 | BK | BL | | | | | | |
| 12 | BK | O | | | | | | |
| 13 | BK | G | | | | | | |
| 14 | BK | BR | | | | | | |
| 15 | BK | S | | | | | | |
| 16 | Y | BL | | | | | | |
| 17 | Y | O | | | | | | |
| 18 | Y | G | | | | | | |
| 19 | Y | BR | | | | | | |
| 20 | Y | S | | | | | | |
| 21 | V | BL | | | | | | |
| 22 | V | O | | | | | | |
| 23 | V | G | | | | | | |
| 24 | V | BR | | | | | | |
| 25 | V | S | | | | | | |

LIST 2

LIST 3

LIST 4

LIST 5

LIST 6

LIST 7

 Corewrap of teflon TFE
 impregnated fiberglass. Color
 may vary according to
 manufacturer(s).

STATION WIRE AND CABLE INSTALLATION AND ROUTE SELECTION

1. GENERAL

1.01 This section provides recommended guidelines for routing and installing station wiring and cable.

1.02 This section is reissued to:

- (a) Provide changes that will place the information in this section in compliance with the 1981 edition of the National Electrical Code (NEC)
- (b) Change Fig. 4
- (c) Rearrange the section
- (d) Change title.

Since this reissue is a general revision, no revision arrows have been used to denote significant changes.

2. FIRE SAFETY

2.01 The fire safety requirements of this section meet or exceed the requirements of the National Fire Protection Association Standards 90A-1981 "Standard for the Installation of Air Conditioning and Ventilating Systems" and 70-1981 "National Electrical Code." In addition to the conditions outlined in this section, certain local electrical and building codes may add further restrictions to the placement of cables in buildings. If the local codes exceed the requirements of telephone company standards, the electrical and building codes will apply. If telephone company standards exceed the requirements of the local electrical and building codes, the telephone company standards will apply. Know the requirements of local electrical and building codes. These codes and the national and regional codes are revised periodically. If you have any questions, contact your local building industry consulting service (BICS).

2.02 Fire-resistant wire and cable are preferred to nonfire-resistant station wire and cable for all

building applications. Polyvinyl chloride (PVC) jacketed station wire and cable are fire resistant whereas polyethylene jacketed station wire and cable are not. The use of polyethylene jacketed cable in buildings should be avoided.

2.03 The 1981 National Electrical Code requires that all wire and cable penetrations through fire-resistant rated walls, partitions, floors, or ceilings shall be fire-stopped using approved methods.

Note: Penetration and sealing of fire walls or firestops to permit the passage of wire and cable shall be the responsibility of the building owner or the subscriber at their expense.

2.04 In Bell System buildings, use an Underwriters Laboratories (UL) classified fire-stop. A list of Underwriters Laboratories classified fire-stop assemblies is published in the Underwriters Laboratories Building Materials Directory under "Wall or Floor Opening Protective, Multiple-Cable Devices (ZCMU), and Wall or Floor Opening Protective, Multiple-Cable Systems (ZCOR)." If the penetration and fire-stop are part of an outlet box assembly, use an Underwriters Laboratories outlet box assembly. A list of classified outlet box assemblies is published in the Underwriters Laboratories Fire-Resistance Directory under "Outlet Boxes and Fittings Classified for Fire Resistance (CEYY)."

2.05 The 1981 National Electrical Code requires that riser wires and cables have a fire-resistant covering capable of preventing the carrying of fire from floor-to-floor. The H station wire and D inside wiring cable comply with this requirement. The D station wire, which has polyethylene insulation, does not comply and should not be used in riser shafts unless it is enclosed in conduit.

2.06 The air-conditioning code (NEPA 90A-1981) and the 1981 National Electrical Code require that cables run in plenums without conduit must be listed as having adequate fire-resistant and low-

NOTICE

Not for use or disclosure outside the
Bell System except under written agreement

smoke producing characteristics. The B plenum cable and KS-22084, List 1 through List 7 are Underwriters Laboratories classified for use in plenums. These cables also meet the requirements for use in riser shafts.

3. GENERAL INSTALLATION REQUIREMENTS

A. General

3.01 Many of the general notes pertaining to telephone facilities will apply to business and residence installations.

3.02 General notes pertaining to telephone facilities are given in paragraphs 3.03 through 3.12.

3.03 Seal all conduit ducts at each end between underground terminals or utility poles and the customer premises. A weatherhead may be used if the conduit terminates above ground.

3.04 Inside wire runs and outlets consist of a convenience outlet or plaster ring with a telephone coverplate and a suitable wiring channel as follows:

(a) Use conduit where inside wire runs have turns or terminate through a plastered ceiling, such as in a garage.

(b) Pull wires may be used instead of conduit where a run is short and is vertical to an unfinished readily accessible area, such as a basement, garage, etc. Pull wires shall be No. 14 single AWG or the equivalent.

(c) Because of unsafe conditions, attic runs should be avoided wherever possible.

3.05 Advance wiring may be provided when service orders have been issued in advance, pending the availability of facilities to connect service.

3.06 Various points which should be considered when selecting routes for wire and cable are shown in Fig. 4 and Table A.

3.07 The facilities to look for are existing conduits or raceways and existing wiring or cable.

3.08 The placement of wiring or cable is as follows:

(a) Run wire or cable horizontally or vertically in a straight line.

(b) Use baseboards or other trim where conduit is not provided.

(c) Make use of wooden surfaces in preference to others where possible.

(d) Keep runs short as possible.

3.09 After location of first attachment has been determined, consider the following factors:

(a) Locate the drop or block wire run on the building with a view to permanency and accessibility.

(b) On building walls finished with stucco, rigid composition shingles, brick veneer, and similar materials, locate attachments on wood trim where practicable.

(c) Locate preferably on the rear and side walls of a building.

(d) Place horizontal run above the reach of the public.

(e) Do not run wires in front of signs, doors, windows, fire escapes, awnings, etc.

(f) Do not place wire runs on walls which are likely to be built against.

(g) Avoid locating on intermediate structures of a deteriorated or temporary construction. Select alternate route.

(h) When making a wire run on a building wall near cable, proceed in one of the following ways:

(1) Use rings installed with cable clamps.

(2) Remove nails or screws that hold cable clamps and replace with drive rings.

(3) Install separate wire run paralleling cable.

3.10 Avoid the following locations when placing wire or cable:

(a) Damp locations

(b) Locked storerooms, etc

(c) Temporary structures

- (d) Runs that provide support for foreign objects
- (e) Excessively hot locations, steam pipes, etc
- (f) Locations where wires and cables will be subjected to abrasion.

3.11 In explosive atmospheres, locate and install wiring as covered by specific instructions in accordance with the equipment being installed.

3.12 The requirements for ground wire runs are as follows:

- (a) Make runs as short as possible.
- (b) Locate wire where it is least likely to be disturbed.
- (c) Run protector ground wire exposed, except where conduit has been provided.
- (d) Do not place protector ground wire in ring runs.
- (e) Signal ground wire may be placed in rings.
- (f) When existing protector ground wire has become enclosed by a ceiling or partition, reuse if continuity can be checked and ground clamp is accessible.
- (g) Refer to Section 460-100-400 for grounding information.

B. Unusual Building Entrances

3.13 Entrance requirements for station wire and cable at metal frame windows and doors are as follows:

- (a) Do not make entrance through metal door frames.
- (b) When metal window frame is set in masonry or bricks, enter as shown in Fig. 1.
- (c) Cut slot in seam of brick as shown in Fig. 2. Be sure slot is deep enough so wire is cleared when shutter or screen is operated.



Wires or cables shall not be placed in conduits or raceways which contain electric wires not properly separated by partitions from the space

provided for telephone wires or cables.

- (d) Locate hole as shown in Fig. 3 so as to avoid drilling through two shingles.

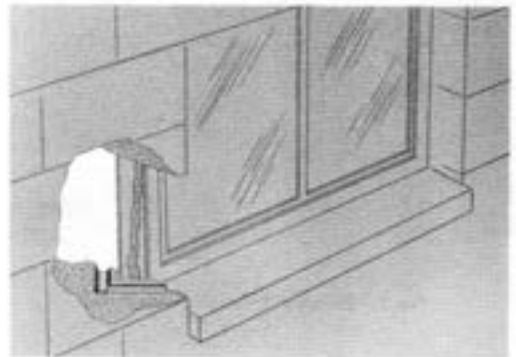


Fig. 1—Entrance at Metal Window Frame

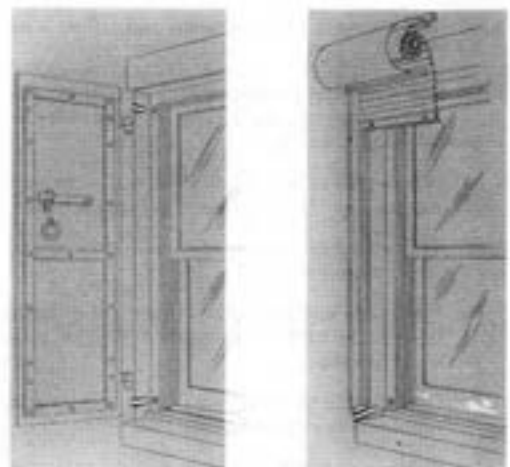


Fig. 2—Entrance at Shutter of Fire Screen

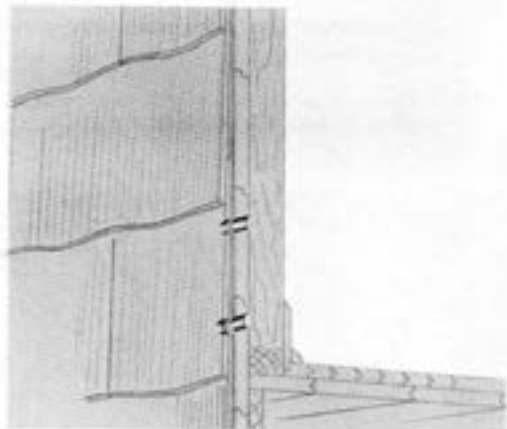


Fig. 3—Entrance Through Composition

C. Selection of Exposed Wiring Routes

3.14 In general, an exposed wire route should be used only where no concealing facilities are available.

3.15 The wiring in finished rooms and offices is as follows:

- (a) Run wires along baseboards or on door or window casings so they will be inconspicuous as possible (Fig. 5 and 6).
- (b) Where trim cannot be followed, run wires horizontally or vertically but not diagonally.

3.16 The wiring in cellars, factories, storerooms, etc. is as follows:

- (a) Place wire and cable where they will be least likely to be broken or detached. Provide protection if necessary.
- (b) Consider the shortest, most direct right-angle route unless otherwise specified.
- (c) Select a wire route which will be safe and accessible.
- (d) Follow the ceiling line rather than baseboard in heavily traveled passageways.
- (e) If necessary to follow chair rails, use the underside.

(f) When possible, follow joints.

(g) If necessary to span joists, run wiring not more than 3 inches from wall (Fig. 7).

4. BUSINESS PREMISE WIRING

A. Making Use of Wire Distributing Systems

4.01 Distribution systems in office buildings are as follows:

(a) Office buildings are generally provided with an exchange cable terminated in a main terminal on the ground floor and distributed to each floor through a building or house cable, or the exchange cable may be distributed directly to each floor.

(b) For information regarding the building conduit system, consult the plan at the main terminal or contact the building superintendent or your local building industry consulting service.

4.02 Distribution systems in apartment houses, hotels, and hospitals are as follows:

(a) Generally, these buildings provide a main terminal location in the basement or ground floor and a wall conduit system to each apartment or room.

(b) In large buildings, there may be house cable from the main terminal to each floor with a terminal on each floor and conduits to the various apartments or rooms from the floor terminal.

B. Using Concealed and Overfloor Conduits

4.03 Consider the following factors when using conduits:

(a) Whenever conduit is provided for telephone wires and it meets the prescribed specifications, it should be used.

(b) Check to be sure conduit does not contain electrical wires not associated with telephone equipment. If it does, follow local instructions.

(c) Consult the building people before extending wiring beyond the provided system.

(d) When necessary to provide wiring through concrete floors or similar construction from

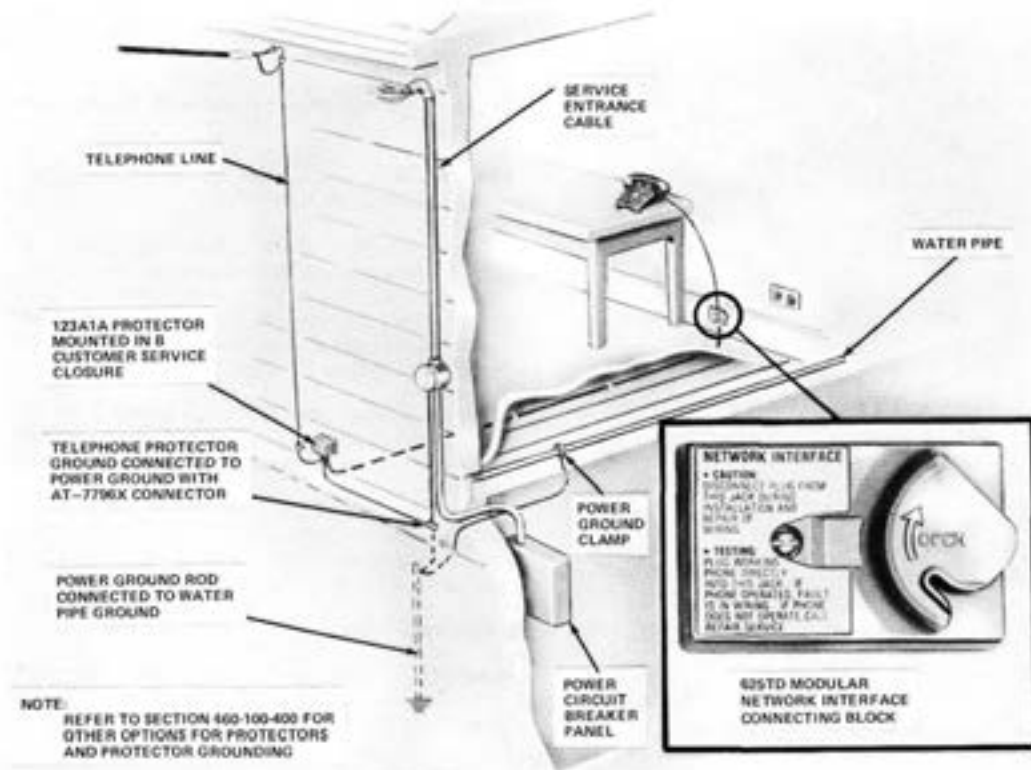


Fig. 4—Typical Wiring Routes

TABLE A

NO SERVICE ENTRANCE

| TYPE OF CONSTRUCTION | POINT OF ENTRANCE | | | | |
|---|---------------------|-------------------|-----------------|---------------------|--------------------|
| | WOODEN WINDOW FRAME | WOODEN DOOR FRAME | FOUNDATION SILL | OUTSIDE WALL (NOTE) | METAL WINDOW FRAME |
| Masonry or brick | • | • | | | • |
| Wood or stucco on wood (basement ceiling unplastered) | • | • | • | • | |
| | • | • | | • | |

Note: Direct wiring to telephone set or connecting block is optional.

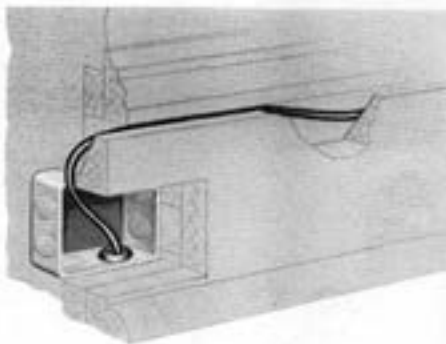


Fig. 5—Wiring From Conduit to Baseboard



Fig. 6—Wiring To Baseboards

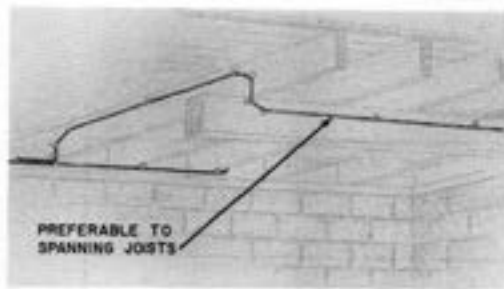


Fig. 7—Spanning Joist

floor to floor and conduit is not provided, inspect premises for pipes through floor which may be provided for such use.

C. Placing Station Wire and Cable in Building Riser Shafts

4.04 Building riser shafts are generally of the following two types:

(a) Closed riser shafts consist of a series of closets, aligned vertically one above the other, usually beginning in the basement and extending throughout the height of the building. The closets are interconnected by a cable slot or pipe sleeves through the floors.

(b) Open riser shafts usually extend from the basement to the roof of the building with no floor separations. They are similar in construction to elevator shafts.

4.05 To conform with the 1981 National Electrical Code, observe the following when placing wire and cable in building riser shafts.

Closed Riser Shafts

4.06 The closed riser shafts, under the 1981 National Electrical Code, require the following:

(a) Polyvinyl chloride jacketed cable is preferred to polyethylene jacketed cable.

(b) Polyethylene jacketed cable may be used in fireproof shafts having fire-stops at each floor. See Section 760-630-410 for fire-stop information.

Note: Penetration and sealing of fire walls to permit passage of wire and cable shall be the responsibility of the building owner or the subscriber at their expense.

(c) If Bell System standard polyvinyl chloride insulated and jacketed H station wire and D inside wiring cable are placed, fire-stops are not required.

Open Riser Shafts

4.07 The open riser shafts, under the 1981 National Electrical Code, require the following.

- (a) The use of polyethylene sheath cable is restricted unless it is enclosed in a noncombustible conduit.
- (b) Bell System standard polyvinyl chloride insulated and jacketed H station wire and D inside wiring cable may be placed with no restrictions.

D. Use of Area Above Suspended Ceilings

4.08 It is not recommended to use the area above a suspended ceiling for concealing telephone plant. Avoid it whenever possible because of the following disadvantages:

- (a) The necessity of working on ladders over desks or other objects creates a safety hazard.
- (b) The employees of the tenant lose working time while the telephone employee works over their desks to install, maintain, rearrange, and remove telephone plant.
- (c) Expenses are incurred by the owner and the tenant when opening and closing ceilings for access by telephone employees.
- (d) The telephone employee loses time while waiting for the ceiling to be opened.
- (e) It is difficult to avoid low beams, air ducts, power conduits, etc., when placing telephone plant after the ceiling has been installed.
- (f) There is a possibility of damaging or soiling ceilings.
- (g) There is a possibility of telephone cables picking up interference from induction and causing noise in working circuits.
- (h) There is a possibility of having to rearrange telephone cables due to the addition or rearrangement of air conditioning ducts or other services.

4.09 A ceiling distribution system is considered a last choice. An adequate underfloor raceway or conduit system is preferable. When it cannot be avoided, use the area above the suspended ceiling if the following conditions are agreed on by telephone company and builder/owner:

- (a) The area above a suspended ceiling is to be used only for telephone service on the same

floor so the occupants of one floor are not disturbed by telephone work for the occupants of another floor.

- (b) Whenever access is required, the ceiling shall be opened and closed by the building owner or subscriber.
- (c) Polyethylene jacketed cables and groups of D station wires require conduit.
- (d) Areas with solid or interlocking suspended ceilings require conduit.
- (e) Clear working space for placing wires and cables must be available and not blocked by vent ducts, pipes, supports, or other equipment.
- (f) Opening of fire walls to permit the passage of telephone wire and cable shall be completed and fire stopped by the building owner or the subscriber.
- (g) Telephone terminals properly sized and spaced to keep wire or cable runs to a maximum of 150 feet are required.
- (h) Suitable supporting structures of the type(s) outlined in paragraph 4.13 must be provided to support inside wires and station cables. Such supporting structures shall be placed by the building owner or subscriber.
- (i) Whenever possible, avoid disturbing other tenants on the same floor where telephone service is being installed.
- (j) No deviations from the preceding conditions shall be made without prior review by your local engineering department.

4.10 Because of the high flame spread characteristics of polyethylene cable and the high smoke characteristics of polyvinyl chloride cable, the 1981 National Electrical Code prohibits their use above suspended ceilings used as air plenums. The KS-22084 or B plenum cable (low flame and low smoke characteristics) is approved for cable installations in these areas. The following precautions should be considered when using this cable:

- (a) Consult the building industry consulting service in your area to make sure local building

codes allow this type of cable installations in air return plenums.

(b) The KS-22084 or B plenum cable is not provided in a shielded version and, therefore, should not be used where possible crosstalk conditions could occur.

(c) The KS-22084 or B plenum cable is similar to polyvinyl chloride inside wire cable and can be installed and connected in the same manner and with the same hardware. However, because of the creep characteristics of the jacket, the cable must not be stapled.

4.11 The KS-22084 or B plenum cable is provided to solve a particular problem. It must be placed in suspended ceilings which are used as air plenums but where no conduit is provided. This cable is not intended to replace polyvinyl chloride inside wiring cable or to replace conduit systems.

4.12 Refer to Section 461-200-100 for ordering information for the KS-22084 or B plenum cable.

E. Supporting Structures Above False Ceilings

4.13 Make every attempt to secure the following type(s) of supporting structure(s) when placing inside wires or station cables above suspended ceilings:

- Conduit
- Cable trays
- J-hooks
- Wire loops.

4.14 If none of these types of supporting structures can be obtained, inside wires or station cables can be placed directly on the main runners and/or cross runners (T-bars) of the false ceiling hardware, provided the conditions in paragraphs 4.15 through 4.19 are adhered to.

4.15 Inside wires and station cables that do not exceed a total of 500 pairs within a 4-foot section of the ceiling may be placed directly on the ceiling runners if the supporting structure(s) outlined in paragraph 4.13 cannot be obtained. Cable runs supported on the ceiling hardware should be placed as close as possible to the hangar wires.

4.16 Major runs of inside wires and station cables should be placed in the type(s) of supporting structures mentioned in paragraph 4.13 in new buildings or sections of existing buildings that have been completely renovated.

Note: A major run is a run that could ultimately exceed any combination of 500 total pairs.

4.17 In existing buildings, additional cables should not be added to any run supported on the ceiling runners if the combination of new and existing wires and cables will exceed 500 pairs within a 4-foot section of the ceiling. If the combination of new and existing wires and cables exceeds this limit, a route along another row of hangar wires should be selected.

4.18 Exercise care when working in false ceiling spaces to avoid distorting or damaging the ceiling.

4.19 Avoid blocking access tile in limited access type ceiling. Also avoid placing cables on or against any light fixtures.

5. TELEPHONE ZONES

5.01 The floor area to be served shall be divided into telephone zones consisting of not more than 400 to 600 square feet (between four adjacent columns).

5.02 To feed the telephone zone, the building will usually have a continuous length of 2-inch conduit in the ceiling space, properly supported, to permit the pulling-in of cables. This conduit should extend from the nearest telephone terminal or apparatus closet and left open ended at the midpoint of each telephone zone as illustrated in Fig. 8.

5.03 For floor areas where the 2-inch conduit to the telephone zones is not available and where a number of inside wiring cables are to be placed loosely in the ceiling, adequate open-top cable supports (J-hooks) are required. These cable supports should be located on 5-foot centers and must be provided by the building owner to avoid damage to the ceilings because of cable weight.

6. WIRING METHOD, CEILING-TO-DESK LOCATION

Utility Column

6.01 A utility column is a post placed between the ceiling and floor in conjunction with the ceil-

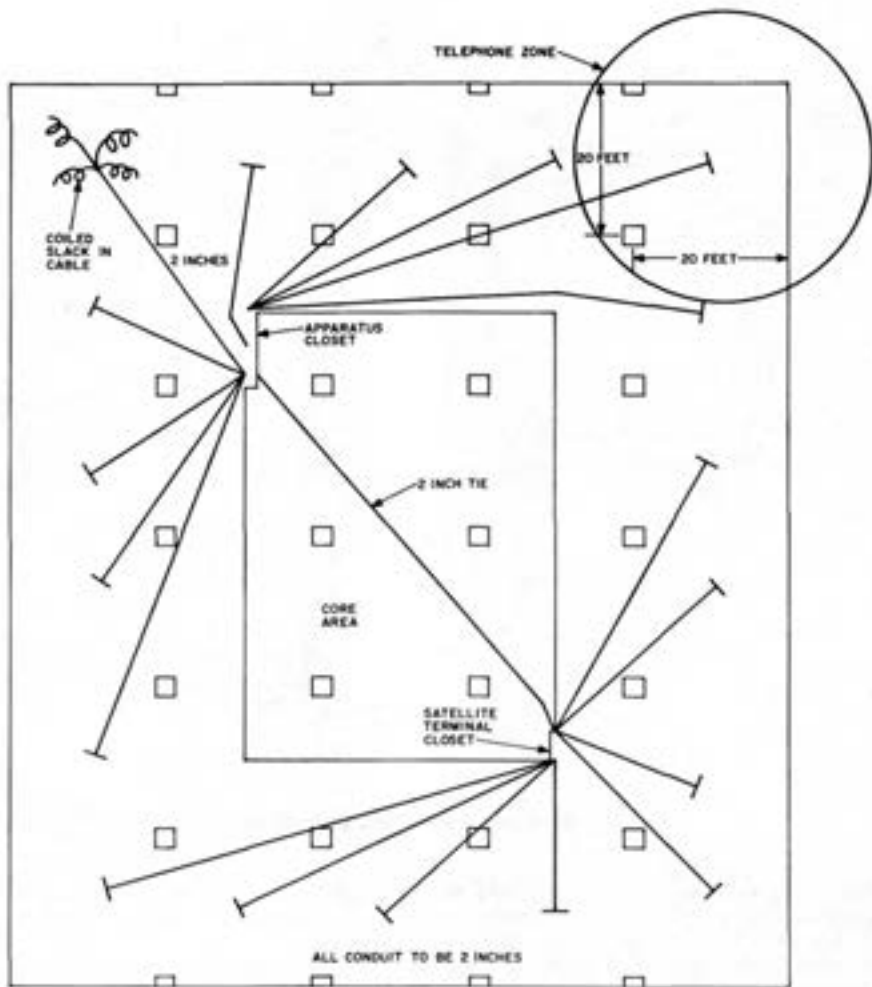


Fig. 8—Typical Ceiling Distribution System Using Conduit to Telephone Zones

ing distribution system as shown in Fig. 9. It is used for the concealment of communications wiring from the ceiling to the desk. It can also be used as an extension of electrical outlets for the same purpose.

6.02 The utility column is a commercial product and if used must be supplied and installed by

the customer. These utility columns must have been approved for Bell System use.

6.03 Interconnection with customer-owned wiring in utility columns is not permitted.

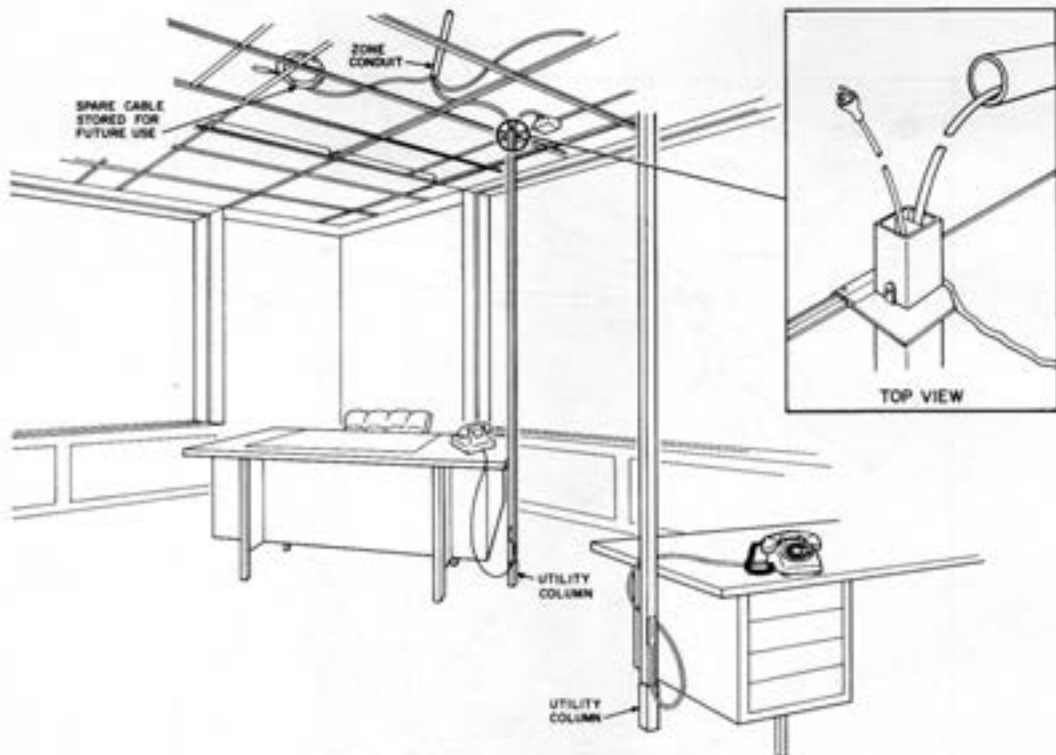


Fig. 9—Wiring Method With Utility Columns

6.04 The utility columns should be attached, or supported, by the main T rails in the ceiling as shown in Fig. 10. It is not recommended that these columns be attached to the transverse or cross rails unless these rails are rigidly anchored to the main T rails.

6.05 Usually when the utility columns are being placed or have been placed, they are subjected to being slightly shifted. Such movement invariably causes the T rail to become warped, marred, or bent. Excessive bending of rails may cause tile to fall down.

7. USE OF WALLS OR PARTITIONS

7.01 The following conditions apply if hollow core walls or partitions are used for concealing telephone wire and cables:

- (a) The hollow core walls or partitions must be clear and unobstructed.
- (b) Opening of walls and partitions and the installation of outlet boxes are the responsibility of the building owner or subscriber.
- (c) A pull wire is required from all outlet boxes to the approved supporting structure above the suspended ceiling.
- (d) Use only vertical pull wire runs. If bends or horizontal runs are necessary, conduit is required.

Note: Fulfilling the previous items shall not be at the expense of the telephone company.

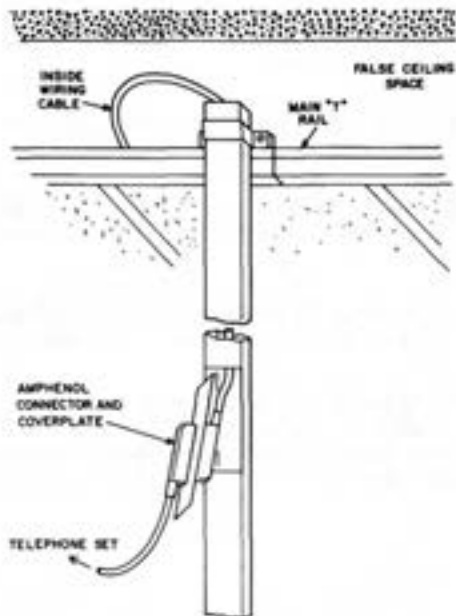


Fig. 10—Utility Column Installation

7.02 If fire blocks, sound deadening materials, or insulation is used in the construction of walls or partitions, conduit must be run from the outlet to the approved supporting structures above the suspended ceiling.

7.03 Telephone employees shall not fish walls or partitions in commercial buildings.

7.04 Where it is planned to use walls or partitions to conceal inside wiring cables down from ceilings, a minimum of 1-1/2 inch diameter space is required to permit the connector end of the cable to pass from the top of the wall to the outlet box above floor. The following are recommended:

- (a) A 1-1/2 inch conduit in wall or partition to outlet box (Fig. 11)
- (b) A 1-1/2 inch square clear space between partition sections with snap-in panel or cover (Fig. 12).



Fig. 11—Conduit Wall

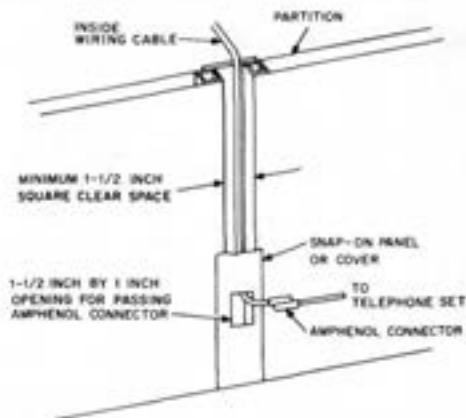


Fig. 12—Partition Design

8. RESIDENCE PREMISE WIRING

A. Outside Wiring

8.01 Plan station installations so the protector is mounted on the outside of the residence wherever possible (Fig. 4).

8.02 Locate the drop wire attachment and protector as close as possible to the protector ground source so the ground wire can be as short as possible. Refer to Section 460-100-400 for protector ground information.

8.03 When making drop wire attachments and running wire on the outside of the residence, make use of wooden surfaces in preference to other harder surfaces.

8.04 Run wire under the eaves and overhang making the wire run inconspicuous and neat.

8.05 Do not make attachments or wire runs on the front of residences if possible.

B. Inside wiring

8.06 When making building entrances, drill holes at an upward angle to prevent water from leaking into the premises. Use drip loops and caulking compound to seal holes to prevent leaks.

8.07 Use conduit if it is available.

8.08 Use the shortest, most direct route for the inside wire route.

8.09 Run inside wire on floor joists and baseboards wherever possible.

8.10 Run inside wire parallel with the floor joists to prevent the hanging or laying of objects on the wire.

8.11 Avoid inside wire runs where the possibility of physical damage to the wire may exist.

8.12 Do not use attic space to run inside wire unless they are easily accessed and provide safe working conditions, such as completed floors and ample head room.

HANDLING STATION WIRE AND CABLE

1. GENERAL

- 1.01 This section covers the general factors to be considered when handling wire and cable.
- 1.02 This section is reissued to add information on the B cable dispenser AT-8890.



Exercise care to protect wire and cable from damage. When transporting in vehicles, see that wire and cable are not subjected to crushing or abrasion by tools or other equipment.

2. DISPENSING WIRE OR CABLE FROM CARTONS AND COILS

- 2.01 To dispense D, G, or H station wire from the carton:
- (1) Remove large perforated knockout from carton.
 - (2) Remove free end of wire from slot in bottom. Do not remove plastic insert.
 - (3) Place carton on floor and feed wire from carton (Fig. 1).
 - (4) Replace wire in slot (in bottom of carton) after cutting.
- 2.02 To pay out station cable, remove cable from coil by paying it off from outside of coil (Fig. 2).

3. DISPENSING STATION WIRE FROM REELS

- 3.01 To dispense G and H station wire from carton-type spool, open top of carton and fold sides down to match holes in side of carton; then insert pipe or equivalent implement through holes in carton and hole in spool, using the carton as reel support (Fig. 3).
- 3.02 The G and H station wire or 4-pair D inside wiring cable may be dispensed most effi-

ciently with the AT-8903 B station wire reel (Fig. 4). Clamp B station wire reel to post, stud, or beam. Remove cardboard spool of wire from carton, place it within flanges of B station wire reel, and dispense as needed.

3.03 Inside wiring cable can be dispensed using the AT-8890 B cable dispenser (Fig. 5). The hub of the dispenser is designed to dispense 25- to 100-pair connector cable in loose coils up to 200 feet in length. The cable can be dispensed from the outside or inside of the coil. The top of the dispenser has a socket for mounting a warning flag. An adjustable friction brake is provided to prevent overruns.

4. STRIPPING CABLE

- 4.01 To strip plastic-jacketed inside wiring cable with jacket-slitting nylon cord:
- (1) Slit end of jacket with diagonal pliers for approximately 1 inch.
 - (2) Locate jacket-slitting nylon cord under jacket.
 - (3) Grasp cable firmly in one hand and, using long-nose pliers, pull nylon cord through cable jacket to the desired stripped length (Fig. 6).

5. STRIPPING JACKETED WIRE

- 5.01 To strip SK or G and H station wire:
- (1) Slit end of jacket with diagonal pliers for approximately 1 inch.
 - (2) Locate jacket-slitting nylon cord under jacket.
 - (3) Grasp wire firmly in one hand and, using long-nose pliers, pull nylon cord through jacket to the desired stripping length (Fig. 6 and 7).
- 5.02 To strip D station wire (desired stripped length exceeds 12 inches):
- (1) Use **diagonal pliers** to cut through jacket and insulation to expose conductors (Fig. 8).

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(2) Hold the wire firmly with one hand, grasp one or two of the exposed conductors with long-nose pliers, and pull, using the conductors to split the jacket to the desired stripped length (Fig. 8).

6. SKINNING 22- AND 24-GAUGE INSULATED CONDUCTORS

6.01 The recommended method for skinning the insulation from individual conductors is with the 6-inch diagonal pliers (Fig. 9). The new 6-inch diagonal pliers have separate notches for skinning 22-gauge, 24-gauge, and drop wires.



6.02 Avoid other methods of skinning insulation which result in nicks or cuts across the metal conductor. Such damage often causes the wire to break when flexed.

7. TERMINATING CONDUCTOR AT SCREW TERMINALS

7.01 To terminate conductor at a screw terminal, bend the wire clockwise in a hairpin loop around the screw. Push conductor away from the screw, especially finer gauge conductors, to prevent the wire from being caught in the threads and getting broken when the screw is tightened (Fig. 10).

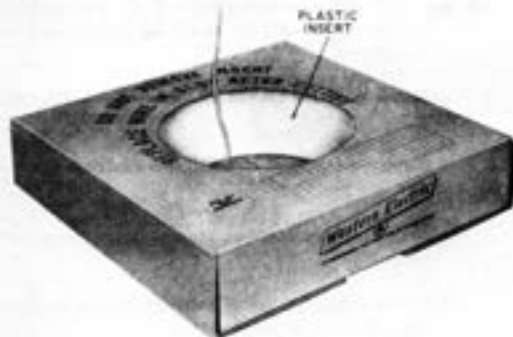


Fig. 1—Dispensing D, G, or H Station Wire



Fig. 2—Paying Out Cable

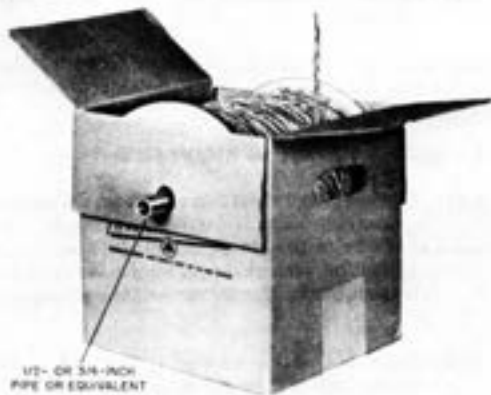


Fig. 3—Carton Used as Reel Support for G or H Station Wire

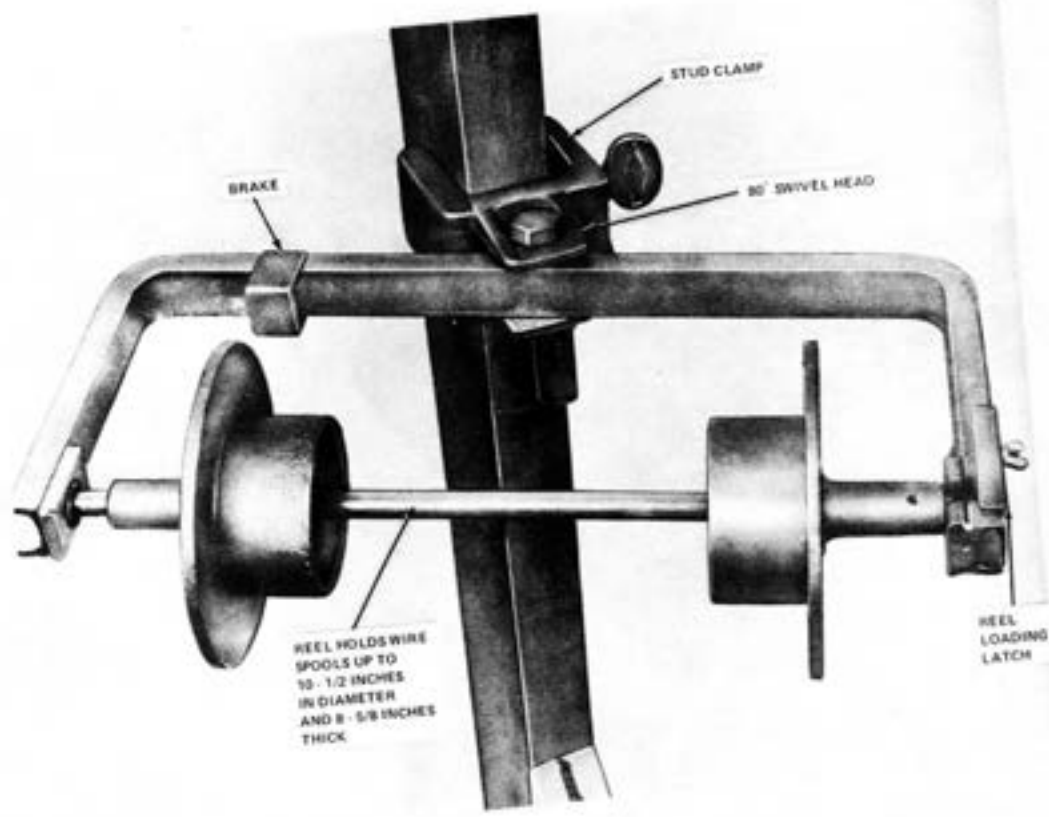


Fig. 4—AT-8903 B Station Wire Reel Mounted on Stud

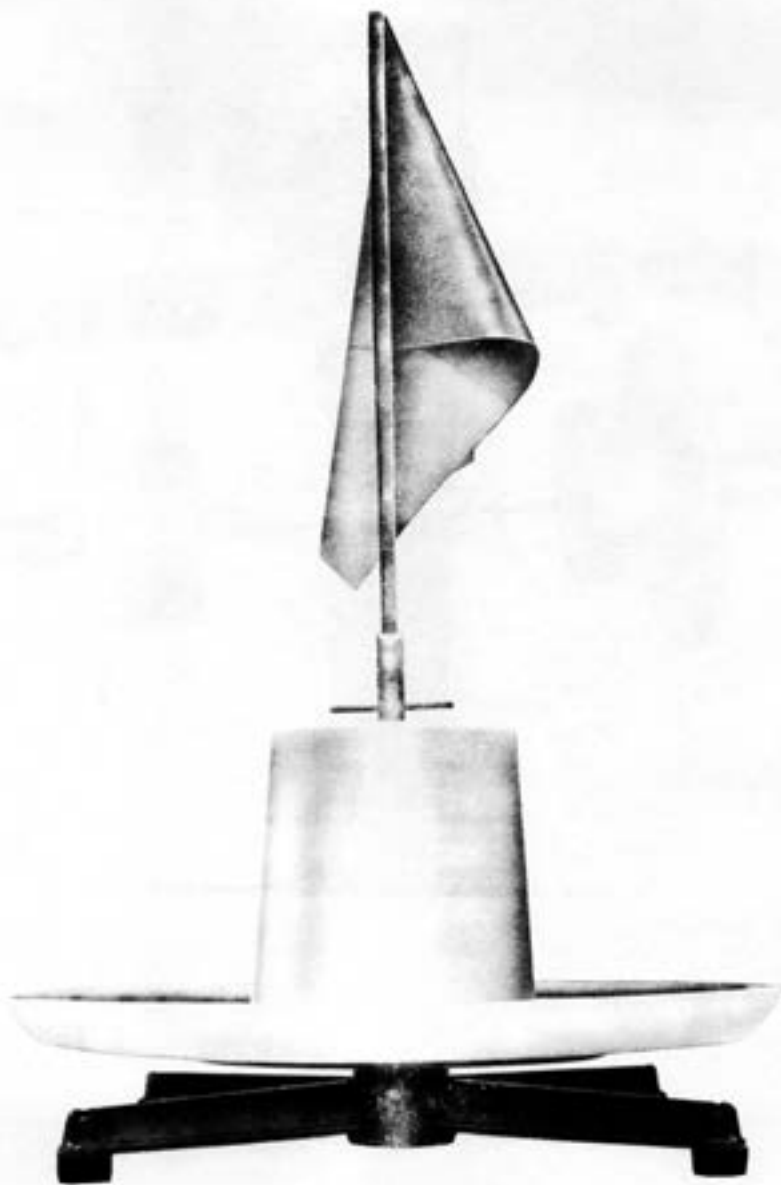


Fig. 5—AT-8890 B Cable Dispenser



Fig. 6—Stripping D Inside Wiring Cable or G and H Station Wire (With Jacket-Slitting Cord)



Fig. 8—Stripping D Station Wire



Fig. 7—Stripping SK Station Wire

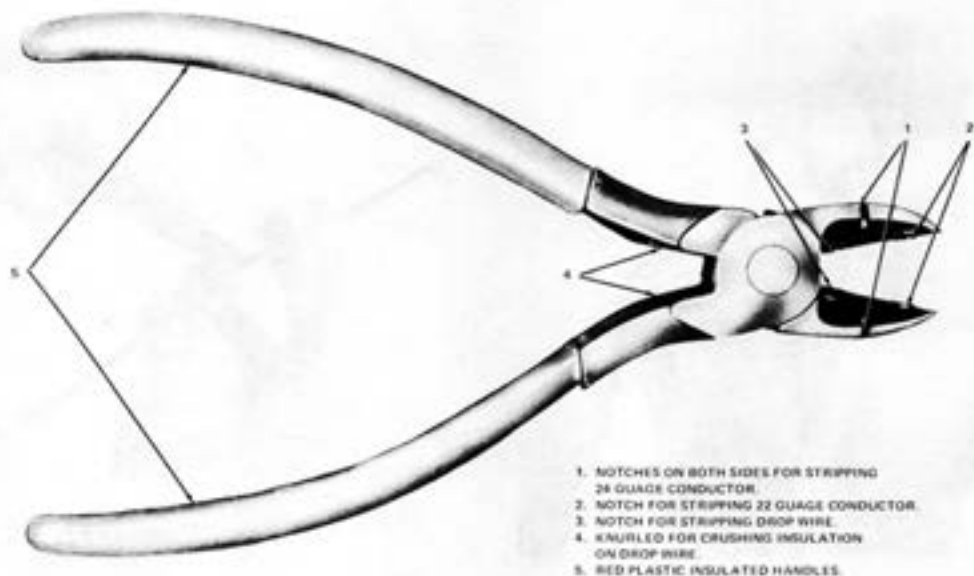


Fig. 9—Recommended Tool for Skinning Insulation From Conductors

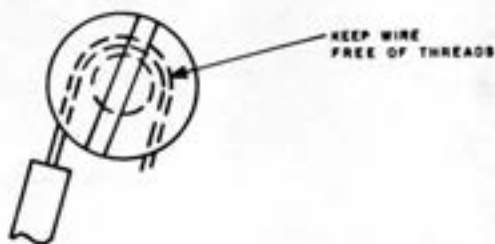


Fig. 10—Terminating Wire at Screw Terminals

B STATION WIRE AND ASSOCIATED APPARATUS
IDENTIFICATION AND INSTALLATION
STATION WIRING

1. GENERAL

- 1.001** This addendum supplements Section 461-200-206, Issue 3. Place this pink sheet ahead of Page 1 of this section.
- 1.002** This addendum is issued to revise information on shelf life of station wire.

2. CHANGE TO SECTION

- 2.001** On Page 1, Paragraph 2.02, revise Note to read as follows:

Note: Observe the "Use Before Date" on the zip-lock plastic bag in order to avoid wire adhesion problems.

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1 Page

B STATION WIRE AND ASSOCIATED APPARATUS

IDENTIFICATION AND INSTALLATION

STATION WIRING

1. GENERAL

1.01 The B station wire is for use in areas where it is impossible or impractical to use conventional station wire and standard fasteners.

1.02 This section is reissued to add information on:

- No. 723 terminal base
- No. 724 station wire cover
- No. 725 primer

Since this reissue is a general revision, arrows ordinarily used to indicate changes have been omitted.

2. DESCRIPTION

2.01 The B station wire consists of two pairs of parallel 26 AWG copper conductors covered with ivory colored PVC insulation and a pressure sensitive adhesive backing for fastening to most types of clean surfaces. The B station wire is not recommended for under carpet use.

2.02 The B station wire is supplied in 75-foot rolls contained in zip-lock type dated plastic bags.

Note: DO NOT USE WIRE DATED OLDER THAN 6 MONTHS.

2.03 Adhesive backed connecting accessories may be used for splices, taps, and terminations. Self-stripping, push-on-type contacts in each connector eliminate wire preparation and expedite installation.

2.04 **No. 724 Station Wire Cover:** The No. 724 station wire cover (Fig. 13) is a

heavy plastic strip with a channel down the center and pressure sensitive adhesive on the edges. It is made in 48-inch lengths and may be cut to any desired length. The No. 724 station wire cover is recommended for use whenever there is a possibility of abrasion or excessive wear on a wire run.

2.05 *Connecting Accessories Usage Guide:*

- No. 717 Terminal—binding post block for terminating conventional round station wire or cord conductors
- No. 718 Tap—for making a tap and/or splicing flat station wire
- No. 719 Jack—a receptacle which accepts a standard 4-prong telephone plug
- No. 721 Transition—Splices conventional round station wire to flat station wire
- No. 723 Terminal Base—provides modular telephone set termination when used with 625C connecting block.

2.06 *Ordering Guide:*

- Wire, Station B, AT-8115 (75-foot roll)
- Terminal, No. 717†
- Tap Splice Connector, No. 718†
- Jack, No. 719†
- Corner Cover, No. 720†
- Transition Connector, No. 721†
- Terminal Base, No. 723†

† Obtain from 3M Company

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- Station Wire Cover, No. 724†
- Primer, No. 725†
- Roller, Hand, Model E-14†

3. INSTALLATION

3.01 Installation Rules:



Limitations placed on the physical installation of B station wire and associated apparatus require strict adherence to the following rules.

- (1) Wire run should not exceed 100 feet for single-line installations and 60 feet for installations involving two talking circuits.
- (2) Temperature of wire and mounting surface **must** be above 50°F before installation.
- (3) The wire and associated apparatus must be accurately located initially, because the adhesive backing may damage the mounting surface when the wire is removed.
- (4) When applying B station wire to "easy clean" surfaces, such as vinyl wallpaper, acrylic, or epoxy paints, the area where wire is to be mounted must be primed with SCOTCHFLEX* PRIMER No. 725.

Danger: Keep primer and its vapors away from heat, sparks, and open flame—it is extremely flammable. Use in well ventilated areas with enough air movement to remove vapors and prevent vapor buildup. Avoid prolonged breathing of vapor. Avoid eye contact and prolonged or repeated contact with skin. For eye contact, flush immediately with plenty of water and seek medical aid. For cleaning purposes, use only B Cleaning Fluid (1,1,1-trichloroethane).

- (5) Avoid contacting foreign objects with adhesive side of B station wire to prevent picking

* Registered Trademark of 3M Company

† Obtain from 3M Company

up dust or dirt. If possible, do not touch adhesive side with hands.

- (6) Always match the wire pairs when making a tap, splice, or extending a wire run to ensure correct polarity of conductors.
- (7) Identification of individual conductors may be determined by locating the raised tracer dot on the surface of the B station wire and counting the conductors as shown in Fig. 1.



Fig. 1—Conductor Identification of B Station Wire

- (8) Conventional station wiring colors [(BK), (Y), (G), (R)] assigned to the conductors in relation to the tracer are shown in Fig. 1. The associated numbers relate to the designations in the terminals, terminal base, etc.



It will be necessary to orient No. 717 and No. 723 bases to maintain color and terminal designations.

3.02 Recommended Mounting Surfaces:

- Painted plaster
- Plasterboard (dry wall, sheet rock, and gypsum board)
- Hardboard (masonite)
- Wood (without wax)
- Metal (without wax)
- Tile (asphalt, vinyl, rubber, and ceramic—without wax)
- Concrete (smooth, trowled, and sealed)
- Marble

3.03 Mounting Surfaces Not Recommended:

- Damp, dirty, or greasy surfaces
- Flaking paint or poorly adhering paint
- Raw plastered walls
- Coarse surfaces (raw cinder block or untreated, rough trowled concrete, etc)
- Easy clean surfaces (vinyl wallpaper, epoxy paints) unless used with primer No. 725 (obtain from 3M Company)

3.04 Connecting to Standard Apparatus:

- (1) The B station wire may be connected directly to subsets, wall sets, or external ringers. It may also be connected directly to standard screw type terminals, jacks, and connecting blocks.
- (2) Strip insulation carefully, the 26 AWG conductors may be easily notched and broken.
- (3) To prevent wire from sticking to apparatus or existing wires in apparatus, fold wire as shown in Fig. 2 after it enters apparatus box.



Fig. 2—B Station Wire, Folded

3.05 Straight Wire Run:

- (1) Allow sufficient amount of B station wire for connecting to transition or terminal at beginning of run.
- (2) Apply adhesive side of wire to mounting surface and press firmly.
- (3) Continue to dispense wire, applying hand roller (Fig. 3) to adhere wire to mounting surface. **Finger pressure alone is insufficient.**

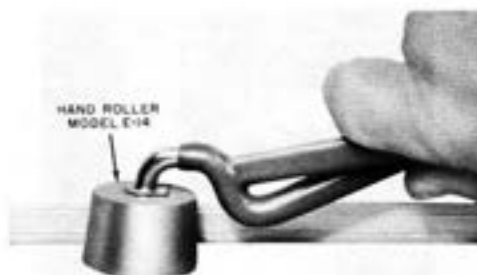


Fig. 3—Applying Roller to Wire Run

3.06 90° Turn in Wire:

- (1) Fold wire under with adhesive side up in direction opposite to intended run (Fig. 4A).
- (2) Fold wire back over in direction of intended run (Fig. 4B).
- (3) Remove paper liner from back of No. 720 corner. Place fold in corner and press corner firmly to mounting surface (Fig. 4C).

3.07 Installing No. 717 Terminal:

- (1) Remove snap-on cover and four screw terminal block.
- (2) Select desired location, remove paper liner from back of terminal base, and press base firmly against mounting surface.
- (3) Place wire in channel on terminal base and press firmly (Fig. 5). Placement of wire in channel must be accurate to eliminate possible short circuit or crossed wires.
- (4) Place terminal block over wire channel. Align block with guide pins in base for proper seating. Exert sufficient pressure with screwdriver so mounting screw will pierce wire insulation covering screw hole. Secure block to base.
- (5) Terminate D station wire or cord connectors on screw terminals (Fig. 6) and replace snap-on cover.
- (6) When wire run ends in a No. 717 terminal, extend wire approximately 2 inches beyond

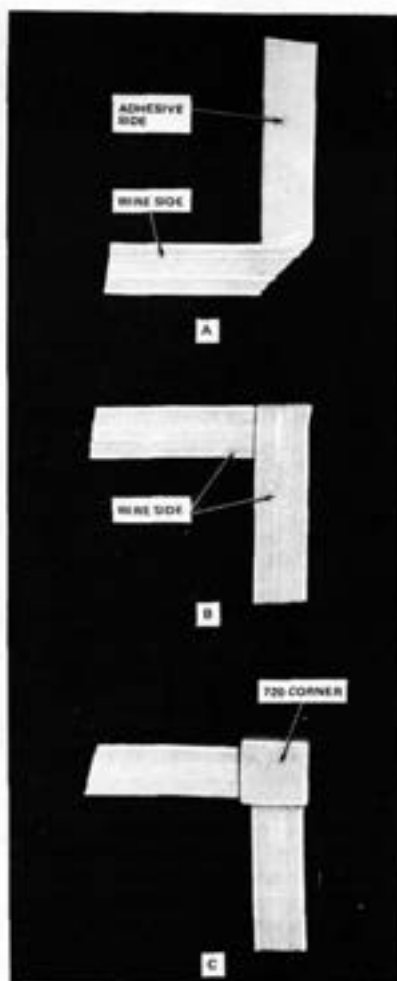


Fig. 4—90° Turn in B Station Wire

terminal (Fig. 7A) and then fold back over terminal block (Fig. 7B).

(7) A wire run can be extended from an existing run in the terminal by either of two methods:

- Splice the folded wire to the new wire using a No. 718 tap (Fig. 8)

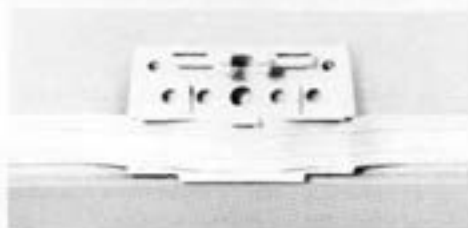


Fig. 5—Wire in Channel on Base of No. 717 Terminal



Fig. 6—Terminating Wire on No. 717 Terminal

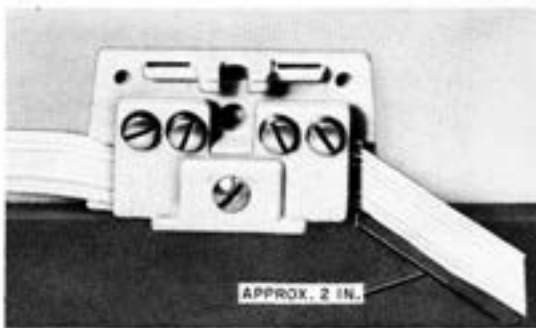
- Cut off wire at screw hole of No. 717 terminal and start new wire run on opposite side of screw hole.



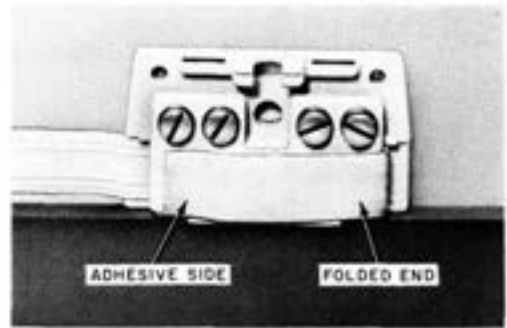
When using the latter method, place wire carefully in wire channel so that the prongs on the terminal block will seat over the four conductors on each side of screw hole when terminal block is placed.

3.08 Splicing With No. 718 Tap:

- (1) Install the tap in the same way as the No. 717 terminal.
- (2) When splicing a wire run, carefully place the ends of the wire over the prongs in the base of the tap. Do not cover the screw hole (Fig. 8).
- (3) When making a tap from a wire run, place end of tap wire over existing wire to the edge of the tap (Fig. 9). Cover-mounting screw



A



B

Fig. 7—Wire Ending in No. 717 Terminal



Fig. 8—Wire Splice Using No. 718 Top

must pierce wire insulation when securing cover to base.

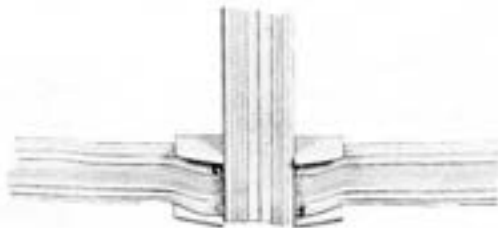


Fig. 9—Wire Tap Using No. 718 Tap

3.09 Splicing With No. 721 Transition:

- (1) Remove paper liner from back of transition.

- (2) Select location and press adhesive side of transition to mounting surface.
- (3) Remove cover.
- (4) Place B station wire in channel, butting end of wire against center stop (Fig. 10).
- (5) Remove approximately 3/4 inch of outer jacket from the D station wire. Insulation from individual conductors need not be removed. Match each conductor with the 3 station wire for correct polarity (Fig. 1) and place in wire grooves in base of transition (Fig. 10).
- (6) Place cover and tighten screw until cover is seated to base of transition.

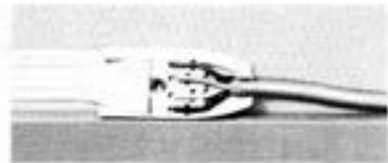


Fig. 10—Terminating Wire in No. 721 Transition

3.10 Terminating in No. 719 Jack:

- (1) Install the jack (Fig. 11) in the same way as the No. 717 terminal.
- (2) When wire run ends in jack, do not extend the wire and fold back. Cut off wire so it does not extend beyond cover of wire channel.



Fig. 11—No. 719 Jack

3.11 Installing No. 723 Terminal Base (Fig. 12): For use with 625C connecting block (Fig. 12) (modular telephone set termination).

- (1) Remove four screw connector body.
- (2) Select desired location, determine base orientation to maintain color and terminal designations, remove paper liner from back of terminal base, and press base firmly against mounting surface.
- (3) Place wire in channel of terminal base. Placement of wire in base must be accurate to eliminate possibility of short circuit or crossed wires.

(4) Place connector body over wire in channel. Align block with guide pins in base and seat firmly with finger pressure. Exert sufficient pressure with screwdriver so mounting screw will pierce insulation covering screw hole. Secure block to base.

(5) Attach spade tips of 625C connecting block.

(6) Align 625C connecting block with modular jack opening at bottom whenever possible. Otherwise, opening must face to side, never toward the top. This is to protect against residue buildup and contact contamination. Secure 625C connecting block to mounting post in center of base.

3.12 Installing No. 724 Station Wire Cover:

- (1) Cut cover to desired length with knife or cutters.
- (2) Remove paper liner from adhesive, center No. 724 station wire cover over wire, and press firmly in place.
- (3) Roll both edges of cover with E-14 roller (Fig. 14).

3.13 Installing Wire Through Wall:

- (1) Drill 1/4- or 3/8-inch hole through wall at desired location.
- (2) With a keyhole hacksaw, cut a slot on side of hole opposite direction of intended wire run (Fig. 15).
- (3) Carefully pass only a few inches of wire through wall, place a No. 718 tap, and splice wire at this point to extend wire run.

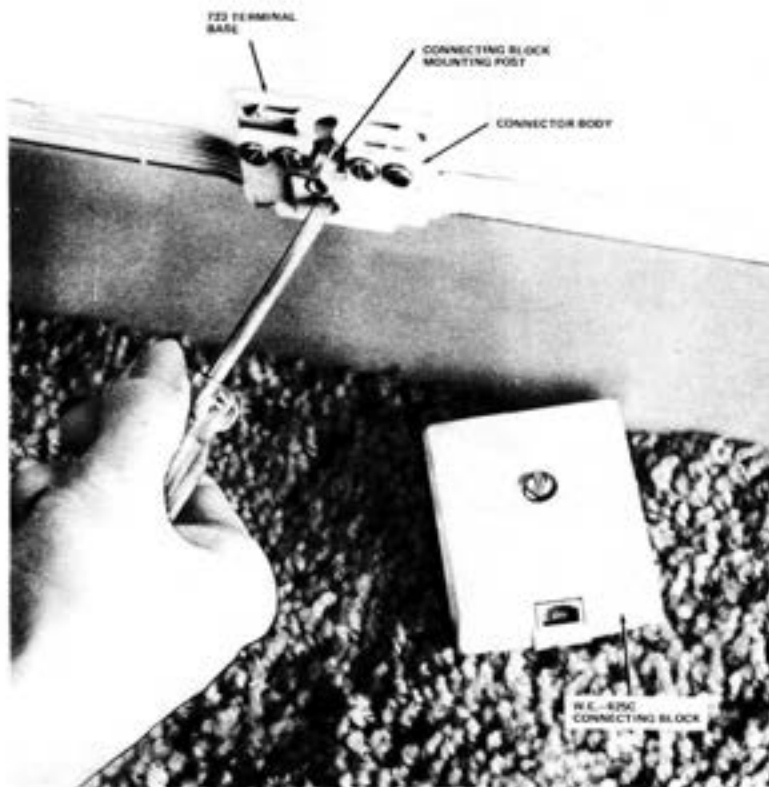


Fig. 12—No. 723 Terminal Base With W.E. 625C Connecting Block



Fig. 13—No. 724 Station Wire Cover

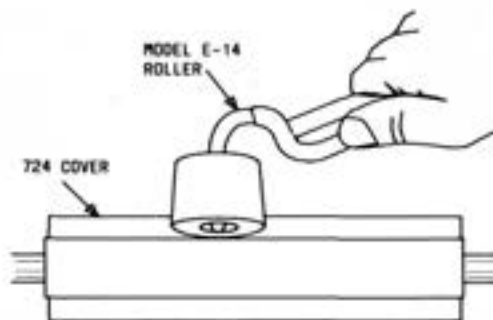


Fig. 14—Installing No. 724 Station Wire Cover



Fig. 15—Hole Through Wall for B Station Wire

STATION WIRE AND CABLE ATTACHING AND FASTENING DESCRIPTION

| | PAGE | | PAGE |
|---|------|--|------|
| 1. GENERAL | 1 | B. B Masonry Clips | 9 |
| 2. SURFACES ENCOUNTERED | 2 | C. C Wire Loop | 9 |
| A. Cement or Cinder Block | 2 | D. Toggle Bridle Ring | 9 |
| B. Masonry or Substantial Brick Veneer | 2 | 5. ATTACHING TO STEEL STRUCTURES | 9 |
| C. Thin Wall Brick Veneer | 2 | A. B Insulator Support | 9 |
| D. Wood | 2 | B. B Support Clip | 9 |
| E. Stucco on Wood | 5 | 6. CABLE TIES | 10 |
| F. Plaster on Lath or Rock Lath, Dry Wall, or Plasterboard | 5 | 7. ATTACHING AND FASTENING GROUND WIRE | 12 |
| G. Rigid Composition Shingles | 6 | 1. GENERAL | |
| H. Metal Siding | 6 | 1.01 This section provides information for attach- ing and fastening station wire and cable. Attachments and fasteners should be selected de- pending on the surface encountered. Use galvanized fasteners outdoors and enameled or nongalvanized fasteners indoors. Plastic may be used either indoors or outdoors. | |
| I. Metal Paneling or Decks | 7 | 1.02 This section is reissued to: | |
| 3. ATTACHMENTS USED IN FINISHED ROOMS AND OFFICES | 7 | (a) Add information on the B wallboard clamp | |
| A. Staples | 7 | (b) Change title | |
| B. B Station Wire Nail | 7 | (c) Add information on fasteners for ground wire. | |
| C. B Station Wire Clamp | 8 | Revision arrows are used to emphasize the more significant changes. | |
| D. Cable Clamps and Cable Clasps | 8 | 1.03 Table A lists spacing of attachments and Table B clearance and lead holes for fasteners. It is important to use correct size clearance and lead | |
| E. B Wallboard Clamps | 8 | | |
| 4. CELLARS, FACTORIES, OR WHERE APPEAR- ANCE IS GENERALLY LESS IMPORTANT | 8 | | |
| A. Drive Rings | 9 | | |

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holes for wall fasteners to prevent wall damage. To obtain secure attachments and to avoid damage to building surfaces, follow the instructions in this section for each type of surface.

1.04 The C wire loop replaces the B wire loop which is manufacture discontinued (MD) and will accommodate the same number of wires or cables.

1.05 The B adhesive clip is rated MD. Any existing stock is outdated and should be disposed of according to local regulations.

2. SURFACES ENCOUNTERED

A. Cement or Cinder Block

2.01 Recommended fasteners are as follows:

- B or C masonry fasteners
- B or C plastic anchors
- B, C, or D drive anchors
- D plastic anchors (used with galvanized wood screws)
- B masonry clips.

2.02 If the wall is old and the fastener is not secure, use toggle bolts and B wall screw anchors. If these attachments pull out, install a carriage bolt. Equip bolt with two washers — one under nut and other under head of bolt.

B. Masonry or Substantial Brick Veneer

2.03 In general, the same fasteners apply in making attachments to masonry and substantial brick veneer. Veneering is considered substantial when the veneer thickness is 3-3/4 inches (as observed at an outside corner) and the bricks are joined firmly with mortar.

2.04 On masonry and substantial brick veneer, drill holes for all attachments as close to the center of bricks as practicable and exercise care to avoid damaging and loosening the bricks. In the case of face brick or ornamental types of brick, holes for intermediate and last attachments may be drilled in the seam to avoid breakage. Wear safety goggles when drilling or hammering.

C. Thin Wall Brick Veneer

2.05 Thin wall brick veneer is considered as veneering having a thickness of less than 3-3/4 inches (as observed at an outside corner, some corners are mitered) or having bricks that loosen or crack easily when drilled. Make attachments to thin wall veneering as follows:

(a) **First Attachment:** Attach to suitable woodwork with galvanized wood screws. When suitable woodwork is not available, attach to the brick veneer surface by drilling a clearance hole in the seam to permit a galvanized wood screw to be passed through the brick portion of the wall and screwed into the wood backing or studding. The screw should penetrate at least 1 inch into the wood backing or studding.

(b) **Intermediate and Last Attachments:** Attach to brick veneer with suitable anchoring device. Drill holes in center of bricks; if bricks begin to crack or loosen, make the attachments in seams or to wood trim. On slab-type veneering (approximately 1-inch thick), secure intermediate and last attachments to the wood backing in the manner specified for first attachments.

D. Wood

2.06 Staples, galvanized wood screws, tapping screws, or nails are generally the standard fasteners on wood; however, B wall screw anchors, B and C plastic anchors, or toggle bolts are recommended as fasteners on plywood and masonite when a more substantial fastener is needed for heavier apparatus. The B masonry clips are also acceptable fasteners on wood surfaces.

2.07 On woodwork, drill lead holes for fasteners and screw-type fixtures to avoid splitting the wood and to obtain maximum holding power. Locate fasteners in studding where practicable.

2.08 Studs in buildings of wood frame construction may usually be located by one of the following methods:

(a) Buildings finished with clapboards by location of heads of nails used in fastening clapboards to studding, or where clapboards join.

(b) Buildings finished with shingles or stucco by sounding, locating studs in cellar or attic, and

TABLE A
SPACING REQUIREMENTS OF ATTACHMENTS

| FASTENERS | | SPACING | | | | | |
|-----------------------|-------------------------------|-------------|--------|--------------|--------|------------------|---|
| | | HORIZONTAL | | VERTICAL RUN | | FROM CORNER | |
| | | FEET | INCHES | FEET | INCHES | INCHES | |
| Cable Clamps | more than 12-pair cable | | 16 | 4 | | 2 | |
| | less than 12-pair cable | | | | 16 | | |
| Cable Clasps | more than 12-pair cable | | 14 | 3 | | | |
| | less than 12-pair cable | | | | 14 | | |
| B Masonry Clips | | | | | | | |
| B Station Wire Clamps | | | 16 | | 16 | | |
| B Station Wire Nail | | | | | | | |
| B Wallboard Clamp | | | | | | | |
| Staples | Station Wire | | 7-1/2 | | 7-1/2 | | 1 |
| | 25-pair D inside wiring cable | | 12 | | 12 | | 2 |
| Bridle Rings | | 4 | | 8 | | 2 through 8-1/2* | |
| Drive Rings | | | | | | | |
| Wire Loops | | | | | | | |
| Toggle Bridle Rings | | | | | | | |
| Insulator Supports | | | | | | | |
| B Support Clip | Used on Beams | | | | | | |
| | Used on Hanger Wires | As Required | | | | | |
| E Adhesive Cable Tie | | As Required | | | | | |

* When changing direction of wire or cable runs where wire loops, bridle rings, drive rings, toggle bridle rings, insulator supports, and B beam clips are used, the fasteners should be spaced to hold the wire or cable at approximately a 45-degree angle.

TABLE B

CLEARANCE AND LEAD HOLES FOR FASTENERS AND SCREW-TYPE FIXTURES

| FASTENER OR FIXTURE | CLEARANCE HOLE | | | LEAD HOLE | | |
|--------------------------------------|--|-------------------|--------------------------------|-----------------------|-------------------|--------------------------------|
| | SIZE AND TYPE OF DRILL (NOTES 1 AND 2) | | | | | |
| | INSTALLER (NOTE 3) | POINT (NOTE 4) | CARBON STEEL TWIST (NOTE 5) | INSTALLER (NOTE 3) | POINT (NOTE 4) | CARBON STEEL TWIST (NOTE 5) |
| | INCHES | | | | | |
| Toggle Bolt 3/16 | Clearance Hole 1/2 or 5/8 | | | | | |
| 1/4 | 5/8 or 3/4 | | | | | |
| 5/16 | 5/8 or 7/8 | | | | | |
| Toggle Bolt Ring 5/8 and 1-1/4 | 3/4 | | | | | |
| S and L Insulated Screw Eyes | 3/16 by 5-1/2 | | No. 12 or 3/16 | | 3/32 | No. 42 or 3/32 |
| C Bridle Rings 1-1/4—1-5/8—2 | | | | | 1/8 | No. 30 or 1/8 |
| 7/8 | | | | | 3/32 | No. 42 or 3/32 |
| Drive Rings 5/8 and 7/8 | | | | | 3/32 | No. 42 or 3/32* |
| 1-1/4 | | | | | 11/64 | |
| Angle Screw 5/16† | 5/16 by 7-1/2 | | 5/16 | | 11/64 | No. 18 or 11/64 |
| 3/8† | 3/8 by 8 | | 3/8 | 1/4 by 6-1/2 | | 1/4 |
| Tapping Screw† No. 7 | | 11/64 | No. 20 | | 5/64 | |
| No. 8† | | No. 13 | 11/64 | | 3/32 or No. 33 | |
| No. 10† | 3/16 by 5-1/2 | | No. 12 or 3/16 | | 3/32 | No. 42 or 3/32 |
| No. 14† | 1/4 by 6-1/2 | | 1/4 | | 1/8 | No. 30 or 1/8 |

See notes and footnotes at end of table.

TABLE B (Contd)

CLEARANCE AND LEAD HOLES FOR FASTENERS AND SCREW-TYPE FIXTURES

| FASTENER OR FIXTURE | CLEARANCE HOLE | | | LEAD HOLE | | |
|------------------------------|---|-------------------|--------------------------------|-----------------------|-------------------|--------------------------------|
| | SIZE AND TYPE OF DRILL (NOTES 1 AND 2) | | | | | |
| | INSTALLER (NOTE 3) | POINT (NOTE 4) | CARBON STEEL TWIST (NOTE 5) | INSTALLER (NOTE 3) | POINT (NOTE 4) | CARBON STEEL TWIST (NOTE 5) |
| | INCHES | | | | | |
| B and C Masonry Fasteners | The maximum holding power of these anchoring devices in any given quality of masonry depends upon obtaining a drilled hole corresponding to the outside diameter of the unexpanded anchor and of sufficient depth to allow the nail to be driven its full length. The diameter and length are generally indicated on the anchor. The depth of hole required varies with the thickness of the fixture to be installed at the point of support. In all installations, the minimum depth of hole required is equivalent to the length of the anchor plus the distance the nail or screw will extend beyond the anchor (approximately 3/16 inch). | | | | | |
| B, C, and D Drive Anchors | | | | | | |
| B and C Plastic Anchors | | | | | | |
| D Plastic Anchor | | | | | | |
| B Wall Screw Anchor | | | | | | |

Note 1: Use L masonry drills for drilling the seam between bricks.

Note 2: Use L masonry drills or star-faced stone drills in drilling holes for toggle bolts. Two sizes of holes are listed to cover the different types of approved toggle bolts. Drill the smaller hole if it will accommodate the toggle bolt.

Note 3: Installer drills are bit stock twist drills and are used in the ratchet brace.

Note 4: Drill points are used in the automatic drill and will drill lead holes approximately 1-1/2 inches deep. Where deeper holes are required, use twist drills in the hand drill.

Note 5: Carbon steel twist drills are straight shank drills and are used in the hand drill.

* Do not drill lead hole in poles.

† Apply paraffin wax or soap to the threads of wood screws or screw-type fixtures to facilitate turning them into wood.

‡ Tapping screws have an AB thread suitable for sheet metal or wood and are available with flat or pan head.

location of heads of nails used in fastening trim to studding.

E. Stucco on Wood

2.09 On stucco on wood building, attach to substantial wood trim with galvanized wood screws. Where required to install fixtures on stucco finished walls, drill a clearance hole for tapping screw or screw-type fixture, preferably via an installer drill in a ratchet brace. If there is a wood backing, the spring of a hammered drill will knock the stucco loose. Use care to avoid cracking the stucco. Locate screws in studding where practicable.

F. Plaster on Lath or Rock Lath, Dry Wall, or Plasterboard

2.10 Plastic anchors, B wall screw anchors, or toggle bolts are used to make attachments. However, when a substantial fastener is required for heavier apparatus, it will be necessary to locate the studding as in paragraph 2.08 and use tapping screws. The holding power of hollow wall fasteners is such that any movement or shifting of weight tends to loosen them. This must be considered at all times so that costly maintenance and hazards are not built into plant. If wood lath is used under plaster and can be entered by a slanting lead hole, a secure attachment can usually be made. Locate the lath before drilling the attachment hole.

2.11 The B wallboard clamp is used to attach jacketed station wire (D and H), inside wiring cable, and customer convenience cords to the dry wall or plasterboard surface.

G. Rigid Composition Shingles

2.12 In general, galvanized wood screws are required in making attachments through composition shingles.

2.13 On buildings finished with rigid composition shingles, make attachments to substantial wood trim where practicable. If suitable wood trim is not available, locate the clearance holes for fasteners on the shingles as outlined in the following:

- Rectangular shaped shingles installed with the long dimension horizontal: Locate the hole midway between the vertical edges of the shingle and approximately $3/4$ inch above the bottom edge.
- Rectangular shaped shingles installed with the long dimension vertical: Locate the hole at the midpoint of the visible shingle height and approximately $3/4$ inch from either vertical edge.
- Shingles installed in diamond formation: Locate the hole near a nail hole and approximately $3/4$ inch from either exposed edge of the shingle.

2.14 **Warning: Rigid composition shingles may be damaged.** Because of the brittleness of rigid composition shingles, and where mounting of attachments cannot be avoided, the following precautions shall be observed:

- Place ladder carefully against the shingles.
- Use only well sharpened drills.
- Never employ drills which require the use of a hammer on composition shingles.
- Do not apply excessive pressure to the brace when drilling clearance holes through the shingles.
- Wood screws should not be tightened excessively as the pressure on the shingle might cause it to break.

H. Metal Siding

2.15 **DANGER: It is possible for foreign voltage to be present on buildings or mobile homes covered with metal siding.** Test siding with B voltage tester or 188A test set. Refer to Section 081-705-101 for use of the B voltage tester or Section 081-705-102 for the 188A test set.

2.16 Be sure protrusion of fasteners will not cause damage or injury. Fasteners for siding can be of the following variety: tapping screw, B or C plastic anchor, toggle bolts, B wall screw anchors, or B siding clip (Fig. 1).

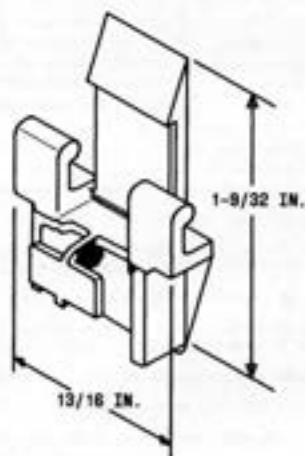


Fig. 1—B Siding Clip

2.17 Aluminum siding presents other problems.

The customer should be contacted to determine the type of siding and method used to install it. This will determine type of fastener or attachment to be used. Permission should be obtained at this time for proposed wire runs, etc.

2.18 When using an extension ladder against metal, vinyl, or aluminum siding, use a B ladder pad to prevent damage.

I. Metal Paneling or Desks

2.19 Be sure protrusion of fasteners will not cause damage or injury. Fasteners for paneling or desks can be of the following variety: tapping screw, B or C plastic anchor, toggle bolts, B wall screw anchors, or B or C cord clips. The B and C cord clips are shown in Fig. 2 and 3.

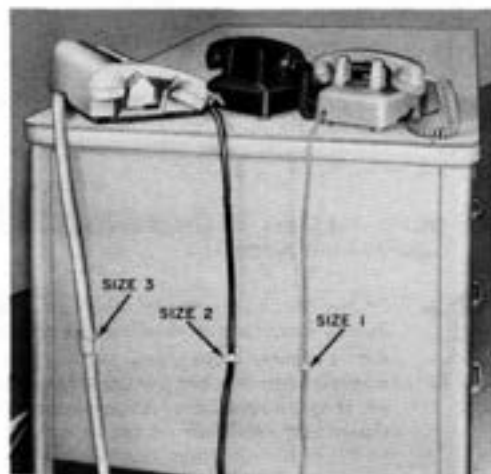
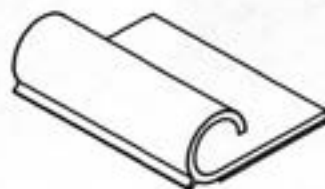
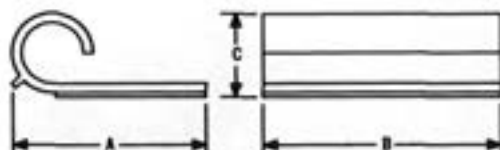


Fig. 2—B Cord Clip

2.20 The B and C cord clips are made of molded plastic and can be used to fasten wire and cable or mounting cords to a clean, dry surface. The clips are attached by the use of double-sided pressure sensitive backing.

2.21 The B cord clip (size 1) provides a means of attaching D station wire to 2012-type transformers to prevent accidentally pulling the wire from the transformer screw terminals.

2.22 Remove protective paper from adhesive of B cord clip and stick clip to bottom of 2012-type transformers as shown in Fig. 4. Terminate D station wire on screw terminals of 2012-type transformer and hook station wire through B cord clip as shown in Fig. 4.



| SIZE | DIMENSIONS (INCHES) | | | MAX. WIRE SIZE |
|------|---------------------|---------|---------|----------------|
| | A | B | C | |
| C1 | 1 | 1 | 5/32 | 1/8 |
| C2 | 21/32 | 1-1/4 | 3/8 | 3/16 |
| C3 | 1 | 1-1/2 | 3/8 | 1/4 |
| C4 | 1-7/32 | 1-25/32 | 15/32 | 5/16 |
| C5 | 1-7/32 | 2 | 1/2 | 3/8 |
| C6 | 1-13/64 | 2-17/64 | 1-11/32 | 1/2 |

Fig. 3—C Cord Clip

3. ATTACHMENTS USED IN FINISHED ROOMS AND OFFICES



Choose color of attachment to match wire or cable; refer to Table A for spacing requirements.

A. Staples

3.01 Table C shows the staples recommended for wood surfaces with finishes available and stapler machine used. Staples H (zinc or ivory), J, or G are available.

B. B Station Wire Nail

3.02 This nail is used to fasten station wire to plaster or wood surfaces. It can be used with D station wire if care is taken to ensure that the smaller diameter wire is sufficiently secure by the arm of the nail.

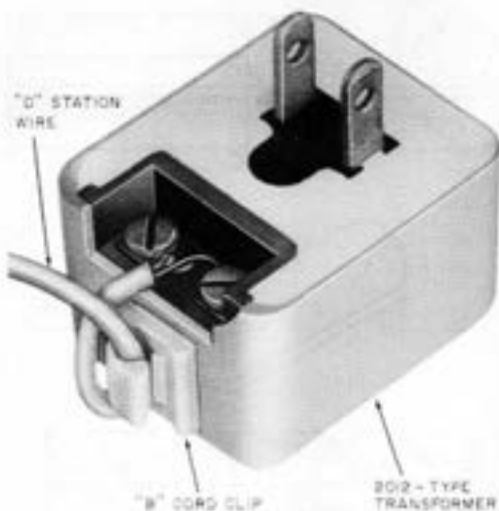


Fig. 4—Cord Clip Used to Secure Station Wire to 2012-Type Transformer

C. B Station Wire Clamp

3.03 This clamp is used to support station wire. Table D lists fasteners to be used with clamps.

D. Cable Clamps and Cable Clasp

3.04 These attachments are used to support inside wiring cable or one or more station wires. Table E lists fasteners to be used with clamps and clasps.

E. #B Wallboard Clamps

3.05 This clamp (Fig. 5) is used to support station wire (D and H), inside wiring cable, and customer convenience cords. Refer to Fig. 6 for installation procedures for the B wallboard clamp.¶

4. CELLARS, FACTORIES, OR WHERE APPEARANCE IS GENERALLY LESS IMPORTANT



In general, the same types of attachments used in finished rooms apply for cellars, factories, or where appearance is unimportant. However, they should be of an appropriate finish. In addition to these attach-

TABLE C

SELECTION OF STAPLES (NOTE)

| STAPLES | | | | | | STAPLER |
|---------|---------------|---------------|-------|----------------|--|----------------------------|
| TYPE | FINISH | SIZE (INCHES) | | SHAPE OF CROWN | USE | |
| | | LENGTH | WIDTH | | | |
| H* | Zinc or Ivory | 3/8 | 5/32 | Rounded | With D station wire and small gauge ground wire in all type wood | E or Heller TMN conversion |
| J† | Copper Coated | | | | | |
| G* | Zinc Coated | 5/8 | 1/2 | Flat | Inside wire cables up to 1/2 inch in diameter | D or T-75 |

Note: Staples are not recommended for use in plaster.

* For indoor use.

† For outdoor use or where appearance is unimportant.

TABLE D
FASTENERS FOR B STATION WIRE CLAMP

| SURFACE | FASTENER |
|---------------------------------|--|
| Metal or Asbestos Siding | No. 7 by 1/2-inch pan head tapping screw |
| | No. 6 by 5/8-inch galvanized wood screw and C plastic anchor, 3/16 by 1 inch |
| Wood, Indoors | No. 7 by 1/2-inch pan head tapping screw |
| Wood, Outdoors | No. 6 by 5/8-inch roundhead galvanized wood screw |
| Stucco (Wire and Paper Backing) | No. 8 by 1-inch pan head tapping screw or wall screw anchor (correct size) |
| Masonry | No. 2 B masonry fastener |

ments, drive rings, C wire loops, B masonry clips, and toggle bridle rings are also available for use at these locations. Drive rings should only be used above a height where they will not be a safety hazard.

A. Drive Rings

4.01 Drive rings are formed steel loops having a pointed shaft suitable for hammer-driven attachment to wood or masonry surfaces. On wood surfaces, attach drive rings to beams or studding (to avoid injury below the 6-foot level, use bridle rings). On masonry surfaces, use with D drive anchors. Table F shows sizes of rings and anchors.



The B masonry clips or wire loops with B masonry fasteners are preferred over drive rings in masonry surfaces because the fasteners are driven directly into the masonry surface without a predrilled hole.

B. B Masonry Clips (Fig. 7)

4.02 The B masonry clips are clear plastic fasteners having hardened steel pins which

can be driven into brick, block, or wood using a 1-1/4 pound drilling hammer. The clips are supplied in three forms. The B1 clip is for D or H station wire. The B2 is for straight runs of IW cable up to 25 pairs. The B3 is also for cable up to 25 pair but has one pin rather than two and is used at corners where lack of space prohibits the use of the B2 clip.

C. C Wire Loop

4.03 The C wire loops are formed sections of wire used with B masonry fasteners as an intermediate support for station wires and inside wiring cables attached to masonry surfaces. Table G shows sizes of C wire loops.

D. Toggle Bridle Ring (Fig. 8)

4.04 This attachment, available in two sizes, 5/8-inch and 1-1/4 inch, is used to attach station wire and cable to hollow surfaces. A predrilled 3/4-inch clearance hole is required.

Notes: For best results and a secure installation, clearance holes should be restricted to 3/4-inch diameter.

5. ATTACHING TO STEEL STRUCTURES

A. B Insulator Support (Fig. 9)

5.01 The B insulator support, equipped with a B, K, or M bridle ring, is used to support wire runs on I beams, angle irons, etc, on beam thickness up to 3/4 inch.

B. B Support Clip (Fig. 10)

5.02 The B support clip provides a means of attaching drive rings or bridle rings to hanger wires and rods used in false ceiling construction. It can also be used to grip the flanges of structural steel framework. It replaces the B beam clip and B hanger clip.

5.03 This notched spring steel clip has two loops, each providing a fit for the drive rings. In addition, two holes are provided in the face of the clip which will accommodate either a No. 10-24 threaded bridle ring, machine screw, or bolt or a 1/4-20 threaded machine screw or bolt. The clip is intended for inside use only.

5.04 This clip can be used on wire and rod from No. 12 through 3/8-inch diameter and on flanges from 1/8 inch thick to 3/8 inch thick.

TABLE E

FASTENERS FOR CABLE CLAMPS AND CABLE CLASPS

| SURFACE | CLAMP NO. | CLASP NO. | FASTENER | REMARKS |
|----------------------|-----------------------------------|------------------------|---|---|
| | COLOR | | | |
| | LIGHT OLIVE GRAY GALVANIZED | LIGHT OLIVE GRAY | | |
| Woodwork | No. 3 and 5* | No. 7 | No. 7 by 1/2-inch pan head tapping screw | |
| | No. 6, 8, 10, and 12* | No. 9 and 14 | No. 7 by 1/2-inch pan head tapping screw | |
| | No. 13 and 17 | | No. 10 by 1-inch galvanized wood screw | |
| Plywood, Masonite | No. 3 and 5* | No. 7 | No. 7 by 1/2-inch pan head tapping screw B wall screw anchor 1/8-inch by 3-inch toggle bolt | Make tapping screw attachments at stud locations. Use No. 1 B wall screw anchor on wall thickness 1/16 inch to 1/4 inch. Use No. 2 B wall screw anchor on wall thickness 1/4 inch to 3/8 inch. Use No. 3 B wall screw anchor on wall thickness 3/8 inch to 3/4 inch. |
| | No. 6, 8, 10, and 12* | No. 9 and 14 | No. 7 by 1/2-inch pan head tapping screw 3/16-inch by 1-inch C plastic anchor B wall screw anchor 1/8-inch by 3-inch toggle bolt | |
| | No. 13 and 17 | | No. 10 by 1-inch galvanized wood screw 1/4-inch by 1-inch C plastic anchor B wall screw anchor 3/16-inch by 3-inch toggle bolt | |

See footnote at end of table.

5.05 Early B support clips had only one hole in the face for a No. 8 tapping screw.

wires, cords, and inside wiring cables into orderly harnesses.

6. CABLE TIES

6.01 Cable ties are plastic or nylon straps or mounting devices designed for use in customer telephone and switchboard installations to group

6.02 Adhesive cable ties are intended for use where mounting by adhesion may be desirable or the only acceptable means. The E adhesive cable tie (Fig. 11) replaces both the B adhesive cable tie and the C adhesive cable tie.

TABLE E (Contd)

FASTENERS FOR CABLE CLAMPS AND CABLE CLASPS

| SURFACE | CLAMP NO. | CLASP NO. | FASTENER | REMARKS |
|--|-----------------------------------|------------------------|---|---|
| | COLOR | | | |
| | LIGHT OLIVE GRAY GALVANIZED | LIGHT OLIVE GRAY | | |
| Plasterboard, Plaster on Wood Lath, and Plaster on Metal Lath | No. 3 and 5* | No. 7 | No. 7 by 1/2-inch pan head tapping screw B wall screw anchor | Make tapping screw attachment at stud locations. Use No. 1 B wall screw anchor on wall thickness 1/16 inch to 1/4 inch. Use No. 2 B wall screw anchor on wall thickness 1/16 inch to 3/8 inch. Use No. 3 B wall screw anchor on wall thickness 3/8 inch to 3/4 inch. |
| | No. 6, 8, 10, and 12* | No. 9 and 14 | No. 8 by 1-inch pan head tapping screw 3/16 by 1-inch C plastic anchor B wall screw anchor | |
| | No. 13 and 17 | | No. 10 by 1-inch roundhead galvanized wood screw 1/4-inch by 1-inch C plastic anchor B wall screw anchor No. 10 by 1-inch pan head tapping screw | |

* Inside wiring clamp only.

6.03 The E adhesive cable tie consists of a molded plastic, self-locking, nonreleasing strap slipped through a fitment on a molded plastic, 1-inch square base. The base has a foam adhesive backing on the mounting surface. Screw holes are provided in the base where additional attaching strength is required. The tie is shipped with KS-20986, List 4 straps which will accommodate bundles up to 5/8 inch in diameter. Where larger bundles are encountered, a KS-20986 strap of the proper length may be substituted. The E adhesive cable tie is available in ivory and light olive gray colors.

6.04 Observe the following precautions in mounting adhesive cable ties:

(a) The temperature of the plate and mounting surface should be **above** 45 degrees fahrenheit.

(b) Initially, the plate must be located accurately as the adhesive backing may damage the mounting surface if removed.

(c) Mount only on clean, dry surfaces (remove wax or grease).

(d) Avoid touching foreign objects with adhesive side of plate to prevent picking up dust and lint; do not touch adhesive with hands.

(e) Apply plate to mounting surface and press firmly.

6.05 The C (MD) cable ties and D (MD) cable ties are plastic straps having ratchet buckle and tapered point ends. Detents allow a range of adjustments and permit easy release and reuse. The C cable ties are used as straps for the B adhesive cable tie. The C and D cable ties have been replaced by the KS-20986, List 4 cable ties (Fig. 12). The KS-20986,

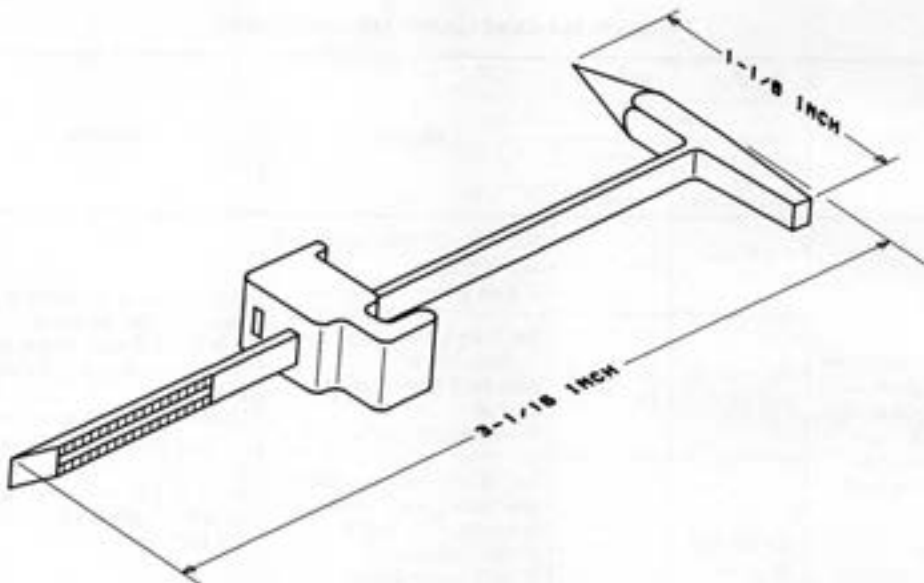


Fig. 5—#8 Wallboard Clamp

List 4 cable ties are used as straps for the E adhesive cable ties.

6.06 The KS-20986, List 1 through 8 cable ties are nylon self-locking straps which may be tightened over variable sizes of cable groups. They are available in eleven colors with natural and light olive gray (not requiring an ordering code suffix) as basic. Consult Table H for size, color availability, and ordering code suffix information. Their intended use is as follows:

- Lists 1, 2, and 3 — Banding and securing switchboard cables and vertical and horizontal cables on distributing frames.
- Lists 4 and 5 — Banding cables on power equipment. Fastening cover on B, C, or D customer service closures.
- List 6 — Reusable ties for securing switchboard cables on duct-type frames.

- List 7 — Securing keyshelf cable(s) in switchboards.
- List 8 — Binding and securing cables in switchboards, equipment cabinets, and central offices. Equipped with a tab on the buckle end having a No. 10 screw hole for securing the tie to woodwork, backboards, etc.

7. ATTACHING AND FASTENING GROUND WIRE (Fig. 13)

Note: When nails or tapping screws are used for fasteners, locate so they will enter studding if possible.

7.01 Space ground wire fasteners as follows:

- Space 21 inches apart on ordinary ground wire runs.
- Space 16 inches apart when wire is subject to displacement.

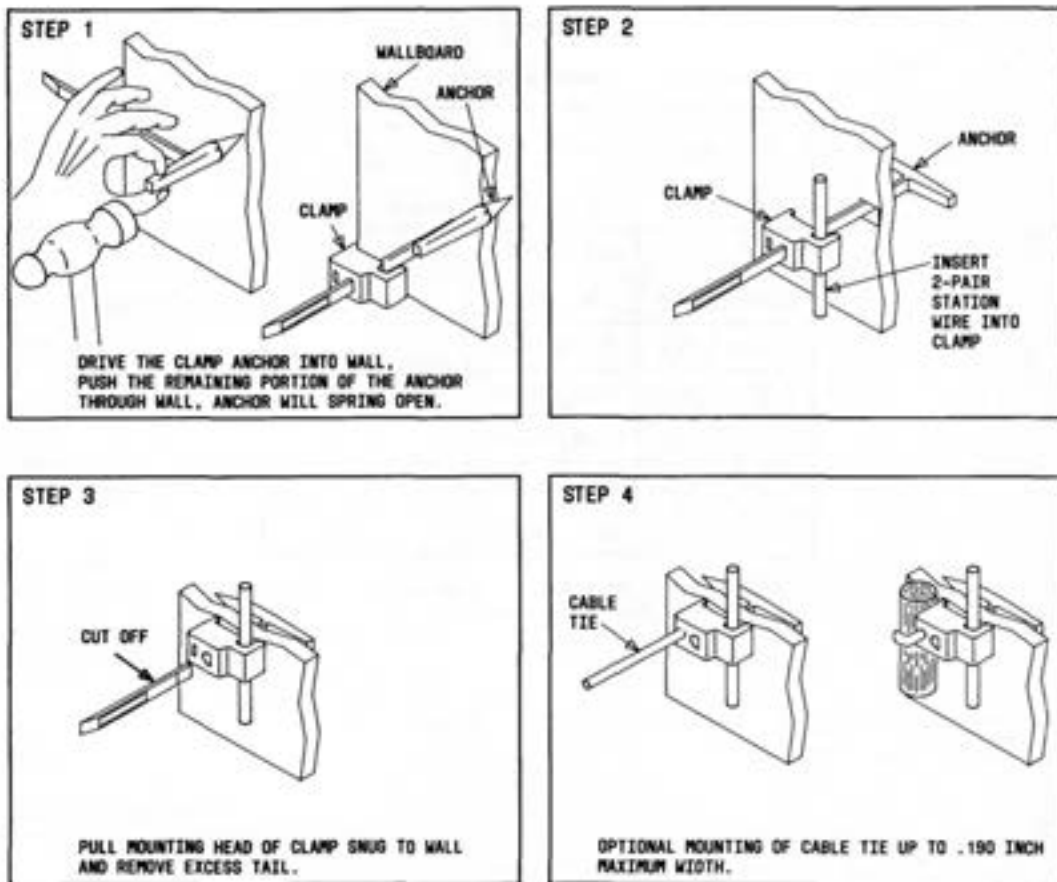


Fig. 6—Installation Instructions for B Wallboard Clamp

- Place on every beam when spanning beams.
- Place within 3 inches of wall when run parallel to wall on beams (to discourage articles being hung on wire).

Note: Staples are not recommended for use in plaster. The H and J staples replace the E- and F-type staples; the G staple replaces the T-75 staple.

TABLE F
DRIVE RINGS

| DIMENSIONS IN INCHES | | | | ANCHOR SIZE (INCHES) | |
|----------------------|-------|-------|----------|----------------------|----------|
| SIZE | D | W | L (NOTE) | DIAMETER | L (NOTE) |
| 1/2 | 1/2 | 1/2 | 2-1/16 | 3/16 | 7/8 |
| 5/8 | 5/8 | 3/4 | 2-1/4 | 1/4 | 1 |
| 5/8L | 5/8 | 3/4 | 2-3/4 | | |
| 7/8 | 7/8 | 1-1/2 | 2-9/16 | 1/4 | 1 |
| 7/8L | 7/8 | 1-1/2 | 3-1/16 | | |
| 1-1/4 | 1-1/4 | 2-3/8 | 2-15/16 | 5/16 | 1-1/4 |
| 1-1/4L | 1-1/4 | 2-3/8 | 3-7/16 | | |

Note: The L sizes have extra long shafts and cannot be used with B drive anchors.

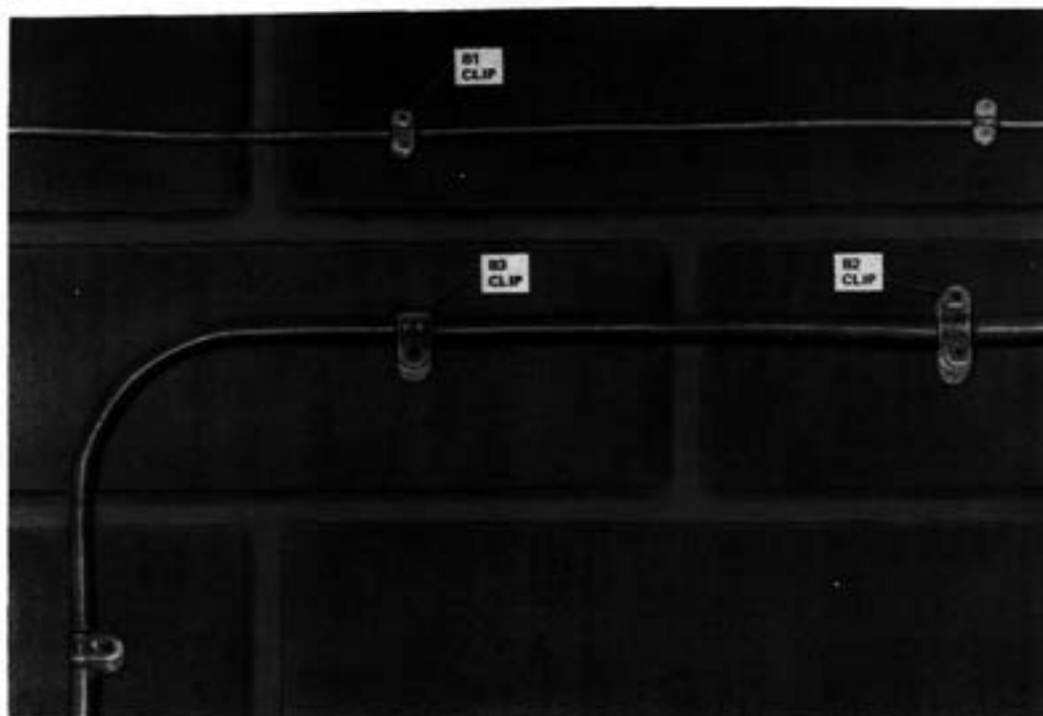


Fig. 7—B Masonry Clips

TABLE G

C WIRE LOOP

| C WIRE LOOP SIZE NO. | INSIDE DIAMETER | LENGTH OF LOOP (OUTSIDE) | B MASONRY FASTENER FOR | | |
|-------------------------|--------------------|-----------------------------|------------------------|--------|--------------|
| | | | CONCRETE | MORTAR | BLOCK (NOTE) |
| 1/2 | 1/2 inch | 15/16 inch | 3 | 4 | 5 |
| 5/8 | 5/8 inch | 1-1/4 inches | | | |
| 7/8 | 7/8 inch | 2-1/4 inches | | | |
| 1-1/4 | 1-1/4 inches | 2-7/8 inches | | | |

Note: Cement or cinder blocks.

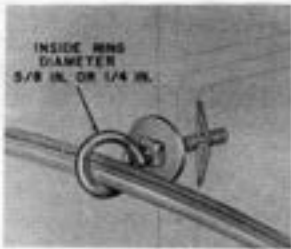


Fig. 8—Toggle Bridle Ring

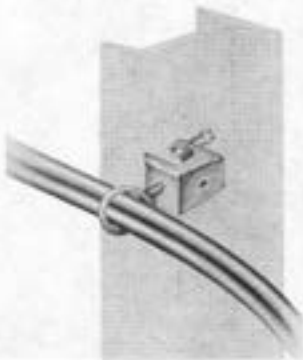


Fig. 9—B Insulator Support

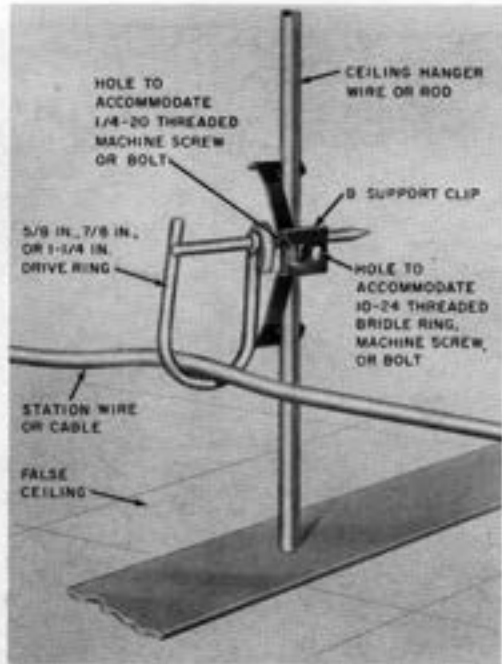


Fig. 10—B Support Clip, Installed



Fig. 11—E Adhesive Cable Tie



Fig. 12—K5-20986 Cable Tie

TABLE H

KS-20986 CABLE TIES — COLOR AVAILABILITY

| LIST NUMBER | MAXIMUM BUNDLE DIAMETER (IN INCHES) | BASIC COLOR (NOTE 1) | | OPTIONAL COLORS (NOTE 2) | | | | | | | | | | |
|-------------|-------------------------------------|----------------------|------------|--------------------------|----------|--------|-----------|-----------|----------|---------|-----------|-----------------|---|---|
| | | | | BLACK —0 | BROWN —1 | RED —2 | ORANGE —3 | YELLOW —4 | GREEN —5 | BLUE —6 | PURPLE —7 | CARBON BLACK —X | | |
| | | NATURAL | LIGHT GRAY | | | | | | | | | | | |
| 1 | 2 | | • | • | • | • | • | • | • | • | • | • | • | * |
| 2 | 3 | | • | • | • | • | • | • | • | • | • | • | | |
| 3 | 4 | | • | • | • | • | • | • | • | • | • | • | | |
| 4 | 5/8 | | • | • | • | • | • | • | • | • | • | • | | * |
| 5 | 1-1/4 | | • | • | • | • | • | • | • | • | • | • | | |
| 6 | 1-3/4 | | • | • | • | • | • | • | • | • | • | • | | |
| 7 | 4 | • | | • | • | • | • | • | • | • | • | • | | * |
| 8 | 1-3/4 | | • | • | • | • | • | • | • | • | • | • | | |

Note 1: No suffix required.

Note 2: Add color suffix if other than basic is required, eg, if List 2 in red is wanted, order as KS-20986, List 2-2.

* Weathering type (sun resistant).

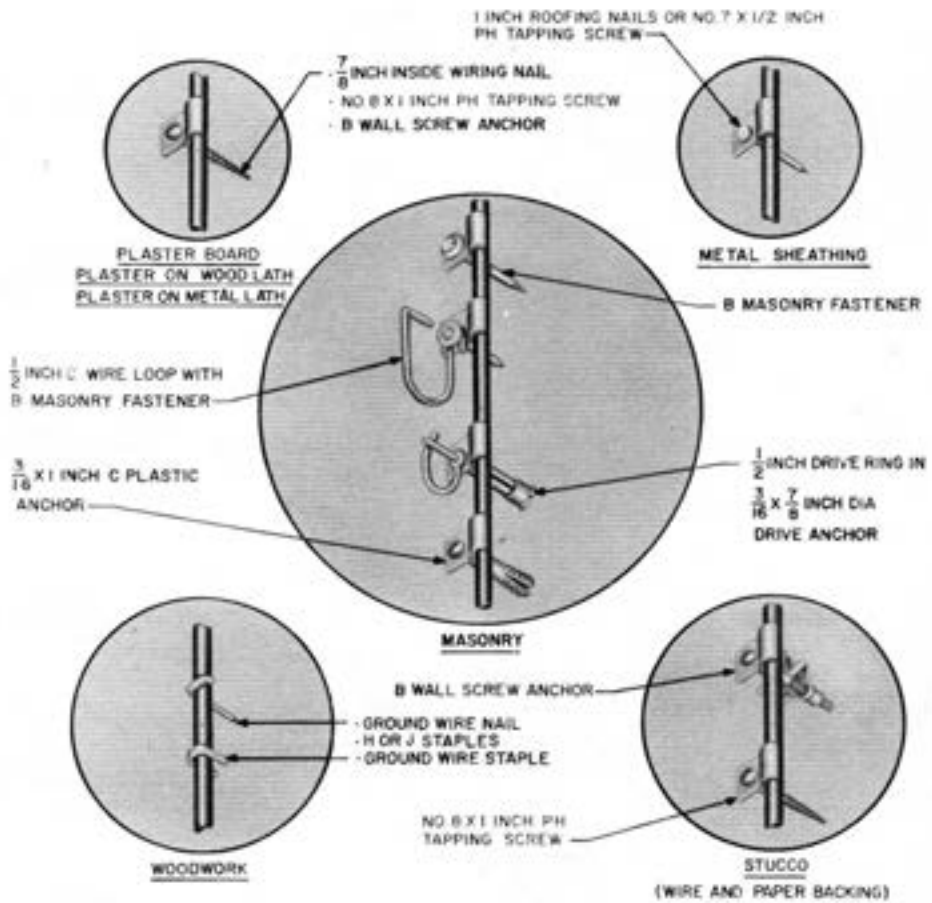


Fig. 13—Fasteners for Ground Wire

MOBILE HOME WIRING PERMANENT TYPE

1. GENERAL

1.01 This section provides wiring information for use in providing telephone service to mobile homes.

1.02 This section is reissued to:

- Remove use of No. 14 ground wire
- Add use of 188A test set
- Revise text.

Since this reissue covers a general revision, arrows ordinarily used to indicate changes have been omitted.

1.03 A permanent type mobile home is a full-time residential structure, seldom moved, usually set on supports such as jacks or concrete blocks, with or without decorative skirting. Sizes range from 8 feet, or more, wide (most often 12 or 14 feet) by 35 feet, or more, long. Some mobile homes may consist of two single units, situated side by side, with the exterior covering designed to give the appearance of a conventional home. Mobile homes are sometimes used as business or field offices and may be equipped with key telephone systems.

1.04 Refer to Section 518-010-105 for key telephone system grounding and special protection requirements. For telephone wiring information of recreational vehicles, which are smaller than mobile homes and designed to be frequently moved, refer to Section 461-220-101. Refer to Section 460-100-400 for additional information on station protection and grounding.



The following procedures must be followed in the order given when wiring a mobile home:

(1) Survey the site and make safety tests. Especially test the mobile home skin for foreign voltages using the 188A test set.

(2) Install the protector.

(3) Ground the protector. Bond the protector and power grounds.

(4) Bond the chassis of the mobile home to the protector ground terminal.

(5) Install service or drop wire, if necessary, and connect to the protector.

(6) Install wiring between the protector and the station.

1.05 The information in this section is provided in the order previously mentioned.

2. SITE SURVEY AND SAFETY TESTS



Defects in electrical equipment or wiring in a mobile home may energize the unit and present an electrical hazard to persons in or near it. If a hazardous condition is found to exist, the craft person must proceed no further until the supervisor has been informed and the condition corrected. Instances have occurred where the chassis of the mobile home has been connected to the "hot" side of the electrical wiring making it hazardous to touch or attempt to bond to a telephone ground. ALWAYS test the chassis and skin of a mobile home with the 188A test set or B voltage tester to detect foreign hazardous voltages. The craft person should inform the occupant or trailer

NOTICE

Not for use or disclosure outside the
Bell System except under written agreement.

park manager, if available, of any hazardous condition found.

2.01 Prior to proceeding with the installation, a preliminary survey of the area should be made. Make shift pole lines and nonstandard clearances should be avoided. If unsatisfactory conditions are found, refer them to your supervisor before proceeding with the installation. Typical service connections to mobile homes are shown in Fig. 1 and 2.

2.02 Determine how the power is fed to the mobile home and determine whether and how the power service is grounded. In trailer parks the power service is frequently grounded to a ground rod. Where the power is fed underground to the mobile home from the service equipment, note the approximate location of the feeder, so it can be avoided when it is necessary to bury service or ground wires or to drive ground rods or posts.

Caution: Before making contact with the mobile home, verify the presence or absence of hazardous voltage on the mobile home body and chassis, using the voltage tester. Where mobile homes consist of two single units that have been joined to form one unit, (double-wide mobile home) test the chassis and body of BOTH units. Refer to Section 081-705-101 for use of the B voltage tester or Section 081-705-102 for the 188A test set.

2.03 Select test points where paint will not act as an insulator, such as screwheads, chassis bolts, or unpainted areas. Avoid cutting through paint; select an inconspicuous location to avoid marring the appearance of the mobile home. **AVOID BODILY CONTACT WITH THE MOBILE HOME DURING THIS OPERATION.**

Warning: If the voltage tester indicates that any part of the mobile home is

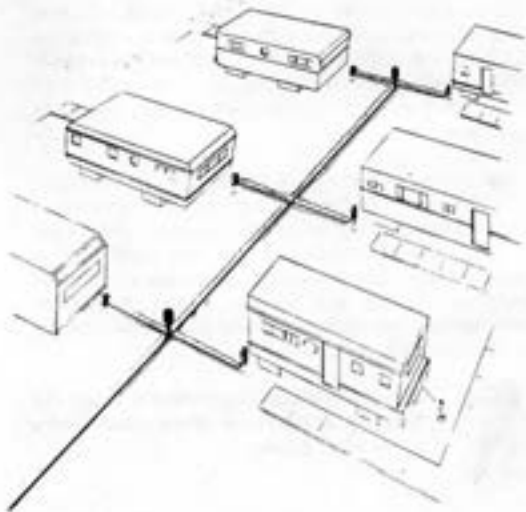
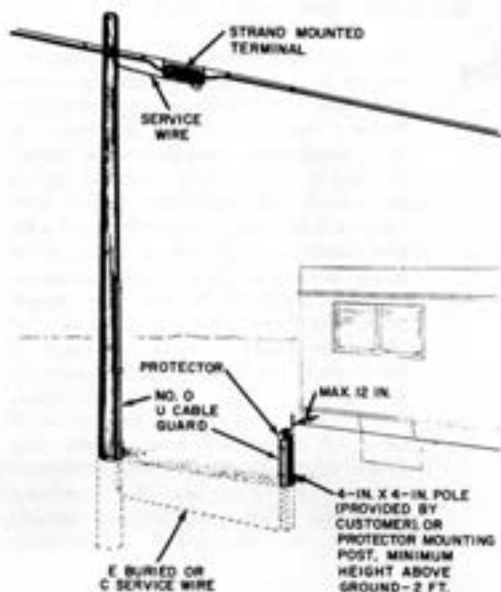


Fig. 1—Typical Buried Service Distribution

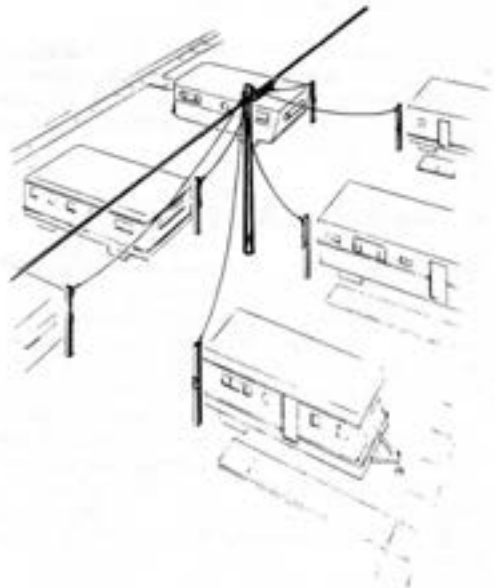
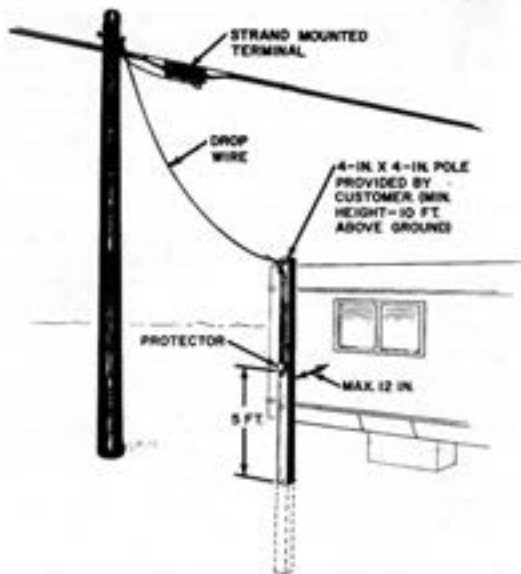


Fig. 2—Typical Aerial Service Distribution

energized, do not proceed until the supervisor is notified and the condition corrected. Also, inform the occupant and/or trailer park manager of any hazardous condition found.

2.04 If the power has not yet been connected to the mobile home, request that it not be connected until the telephone installation has been completed. Be aware of any connections being made while telephone work is in progress.

3. INSTALLING STATION PROTECTOR

3.01 The protector should be located as near as possible to the mobile home, preferably within 12 inches but not more than 15 feet away (Fig. 3, 4, and 5). Do not attach to or mount anything on the outside surface (skin) of the mobile home as the skin may be easily damaged and cause interior damage to the mobile home if penetrated.

3.02 When the service wire feeding the mobile home is buried service wire and it terminates more than 15 feet away, it will be necessary to extend it to the protector location. For below ground splicing, use the 15-type service wire splice enclosure, the C service wire closure, or other equivalent closure. For above ground splices, the RC 4/72 cable closure may be used.

3.03 The telephone protector may be mounted on the following:

- (a) A wood post that has been installed by the customer or construction
- (b) A wood post used for mounting the power service equipment or meter
- (c) A metal power service conduit
- (d) A telephone company-provided protector mounting post (PMP)

- (e) An acceptable metallic water pipe (at least 10 feet must be buried).

3.04 Use B or C customer service closures for mounting protectors. The B closure mounts one 123- or one 128-type protector. The C closure mounts two 123- or 128-type protectors, or one 106C (fused-type) protector.

4. GROUNDING PROTECTOR

4.01 Refer to Table A for selection of protector grounds. For a mobile home, the best ground is usually the power ground system since acceptable water pipes and other approved grounds frequently do not exist. Where the power system is not multigrounded neutral (MGN) and is grounded to a ground rod, it will be necessary to install a telephone ground rod for grounding the protector. To obtain the lowest resistance ground, the telephone ground rod should be driven at least 6 feet away from the power ground rod. The two ground rods **must** then be bonded together with No. 6 ground wire.

4.02 When a ground rod is installed for a protector ground, rubber gloves **must** be worn while driving the ground rod. Avoid bodily contact with the ground rod during this operation. After driving the ground rod, the voltage tester must be used to verify that no voltage condition exists on ground rod. If voltage is detected on the ground rod, do not proceed until the supervisor is notified and the condition corrected.

4.03 The protector should be grounded with No. 12 or larger ground wire. See Table B for the proper size wire. The ground wire should be run to the grounding electrode in as short and straight a line as possible. Where the grounding electrode is not located near the protector mounting post, the ground wire must be buried to protect it. See Section 460-100-400 for detailed information on grounding hardware.

4.04 Separate grounding electrodes should always be bonded together to limit potential differences between them and between their associated wiring systems. Whenever separate communication and power grounding electrodes are used, they should be bonded together with a No. 6 ground wire that is buried deep enough to protect it from physical damage (Fig. 4).



If the telephone and power grounding systems are not bonded, a potential difference (probably large) will exist between the telephone and power wiring which may cause arcing when a voltage or lightning surge raises the voltage on power and/or telephone wiring.

4.05 The customer telephone service may be installed where a power ground is not provided. However, the customer should be informed immediately of the need for a power ground and should be requested to notify the telephone company when the ground has been provided. The procedure for notifying the customer shall be covered by local instructions. Where telephone service is already being furnished and there is no power ground, the same procedure should be followed. The telephone protector grounding electrode must be bonded to the power ground rod as soon as the power ground rod has been installed and connected.

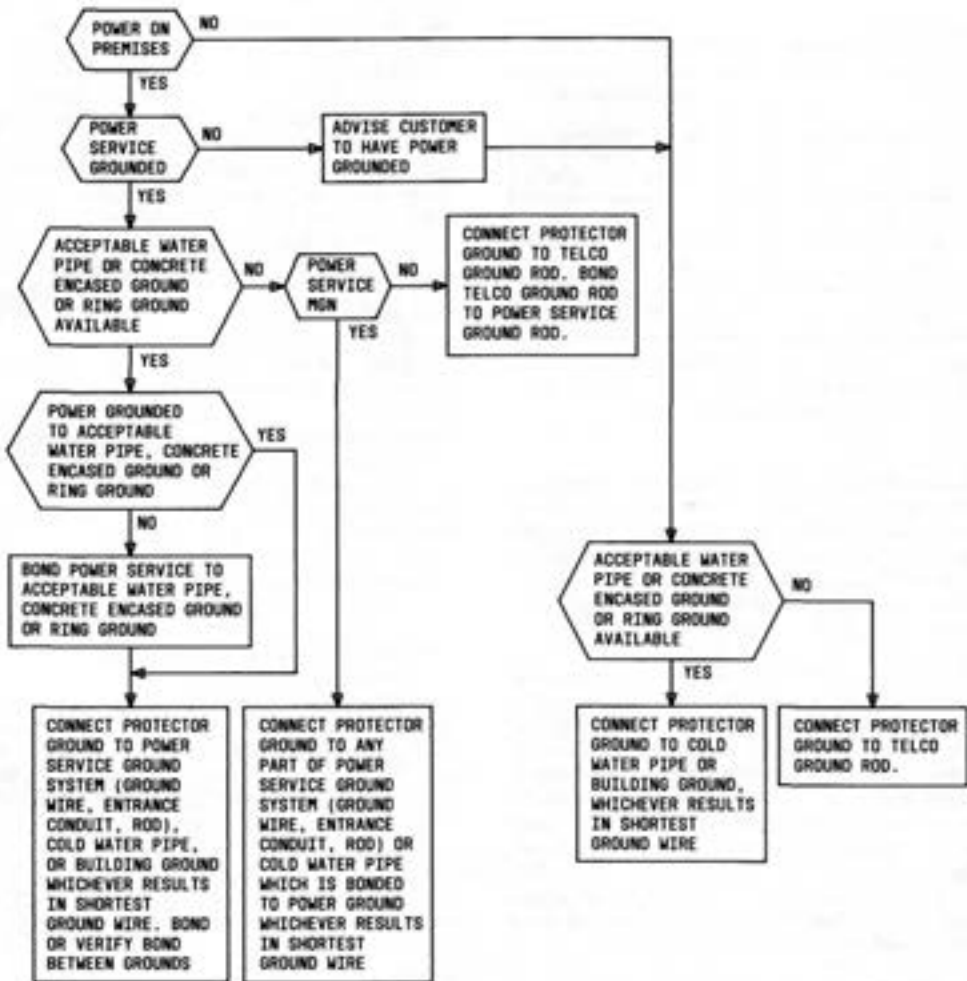
5. BONDING CHASSIS TO PROTECTOR GROUND

Caution: The mobile home chassis must be bonded directly to the ground terminal post on the protector. This bond must be placed before attaching any other wiring to the mobile home and after the mobile home has been tested with the voltage tester.

5.01 Use No. 12, or larger, ground wire for bonding the mobile home chassis to the protector ground terminal. For convenience, the bond wire can be the same size as the protector ground wire. This will permit the protector ground wire to be looped around the protector ground terminal and extended to the chassis to serve as a continuous bond wire as well. Use a B, C, or D insulator support (Fig. 6) to connect the bond wire to the chassis of the mobile home.

5.02 Where the protector is located within 12 inches of the mobile home, the bond wire may be run directly across the space between the mounting post and the mobile home (Fig. 3 and 4). However, where the protector is located more than 12 inches from the mobile home, the ground wire must be run down the post using approved fasteners and buried at least 4-inches deep between the bottom of the post and the mobile home (Fig. 5).

TABLE A



Leave the trench open when installing the bond wire because it can also be used for running the buried wire between the protector and the station. Make sure the bond wire and the wire to the station are buried far enough under the mobile home so they will not be damaged if the customer adds skirting or decorative blocks. If mobile home skirting or decorator blocks must be removed and replaced, this should be done by the customer.

Note: When digging is required to bury wire, use only tools with handles made of

wood or other insulating materials such as the B trenching tool to prevent electrical shock in case of contact with energized objects.

6. INSTALLING SERVICE OR DROP WIRE

6.01 Service to a mobile home may be a buried service wire or an aerial drop wire (Fig. 1 and 2).

6.02 Aerial drop wire must never be connected directly to the mobile home. Connections

TABLE B
GROUNDED WIRE CAPACITY

| GROUNDED WIRE SIZE | MAXIMUM NUMBER OF PROTECTED CIRCUITS | |
|--------------------|--------------------------------------|-----------|
| | FUSELESS | FUSED |
| No. 12 | 2 | 6 |
| No. 10 | 6 | 7 |
| No. 6 | 7 or more | 8 or more |

Note: The ground wire between protectors shall be the same size as the ground wire between the protector and the grounding electrode.

directly to the mobile home would require penetration of the skin permitting the entrance of moisture which could cause internal damage to the mobile home. The customer must provide a post having minimum dimensions of 4 inches by 4 inches and a minimum height of 10 feet above ground. All standard wiring clearances must be observed.

6.03 Buried service wire may be in place and terminated on a protector, or buried to within close proximity of the mobile home and coiled. In the latter case, it will be necessary to terminate the buried service wire on a protector as described in Section 3. Before handling the unterminated buried service wire, test the shield with the voltage tester to make sure it is not energized. Test the skin and chassis of the mobile home for the same reason. If voltage is detected, proceed no further until supervision has been informed and the condition corrected.

6.04 When terminating service or buried wire on the protector, connect the shield of the wire to the protector ground terminal with an F connector as shown in Fig. 7 and 8. Refer to Section 460-300-143 for detailed information on terminating buried wire.

7. WIRING BETWEEN PROTECTOR AND MOBILE HOME

7.01 Construction of a typical mobile home is shown in Fig. 9. It is similar to a frame building construction except it is mounted on a

metal chassis. Telephone prewiring is not necessary, and the same wiring methods used for single family dwellings, built on-site, can be used for mobile homes.

7.02 The heating ducts, sewer and water pipes, and sometimes the electrical wiring run down the center of the mobile home. Normally, the electrical wiring is in the outside walls of the mobile home, approximately 16 inches above the finished floor level or in the ceiling, leaving the floor area along the *outside* walls free for drilling for station wire entry. Drill straight down through plywood floor avoiding outriggers. Use care when drilling the soft insulating board (rodent barrier) covering the bottom of the mobile home as it tears easily. Seal holes with tape around station wire to prevent entrance of air and moisture. If it should be necessary to install a telephone on an interior wall of the mobile home, request the owner to provide the hole cautioning that prints of the floor area should be examined to determine where sewer lines, heating ducts, etc. are run. Since plastic pipes may be used, drills can easily penetrate them, causing damage.

7.03 Wiring runs should be attached to the outer edge of the outrigger so it will not be necessary to crawl under the mobile home. Fasten insulator supports equipped with K bridle rings (or equivalent) to outer edge of outriggers. Attach wire to mobile home by running through bridle ring, folding back and taping, or clamping to insulator support with a B ground wire clamp or E drop wire clamp. At the protector, use the E drop wire clamp to attach service wire, or use the B ground wire clamp to attach station wire and the bonding wire, if required.

7.04 Where the protector is mounted within 12 inches of the mobile home, inside wiring can be run directly to the protector and should be taped or fastened to the bond wire. Where the protector is located more than 12 inches from the mobile home, bury SK station wire or E buried wire at least 4-inches deep along with the bond wire between the protector and the mobile home. It is not necessary to connect the shield of the wire to the protector ground terminal. Cut off the metallic shield of the wire at both ends when terminating it. Tape any sharp edges of the shield to prevent personal injury.

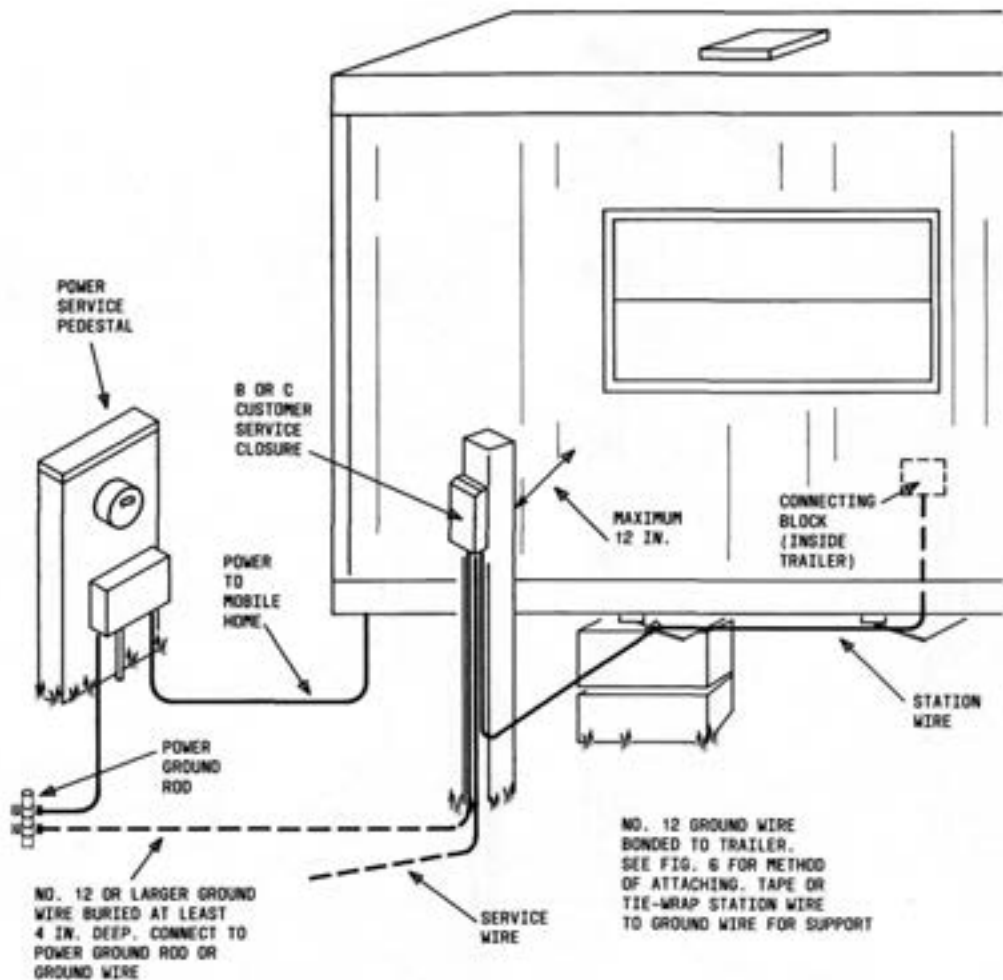


Fig. 3—Buried Service—Protector Located Within 12 Inches of Mobile Home—Protector Grounded to Power Ground

7.05 Wiring between the protector and the station should be terminated on a connecting block mounted inside the mobile home. Use the connecting block as a bridging point for any extensions.

7.06 Always mount the block on a stud, if possible, as the thin materials used for trailer walls may not hold the fasteners. Wall telephone sets

should also be mounted on a stud. Do not attempt to fish station wire through the mobile home walls as side rails and insulation will block passage of the wire. Studs can be located by sounding. A solid sound indicates a stud—a hollow sound indicates the area between studs. In the outrigger area, studs are 16 inches apart on centers.

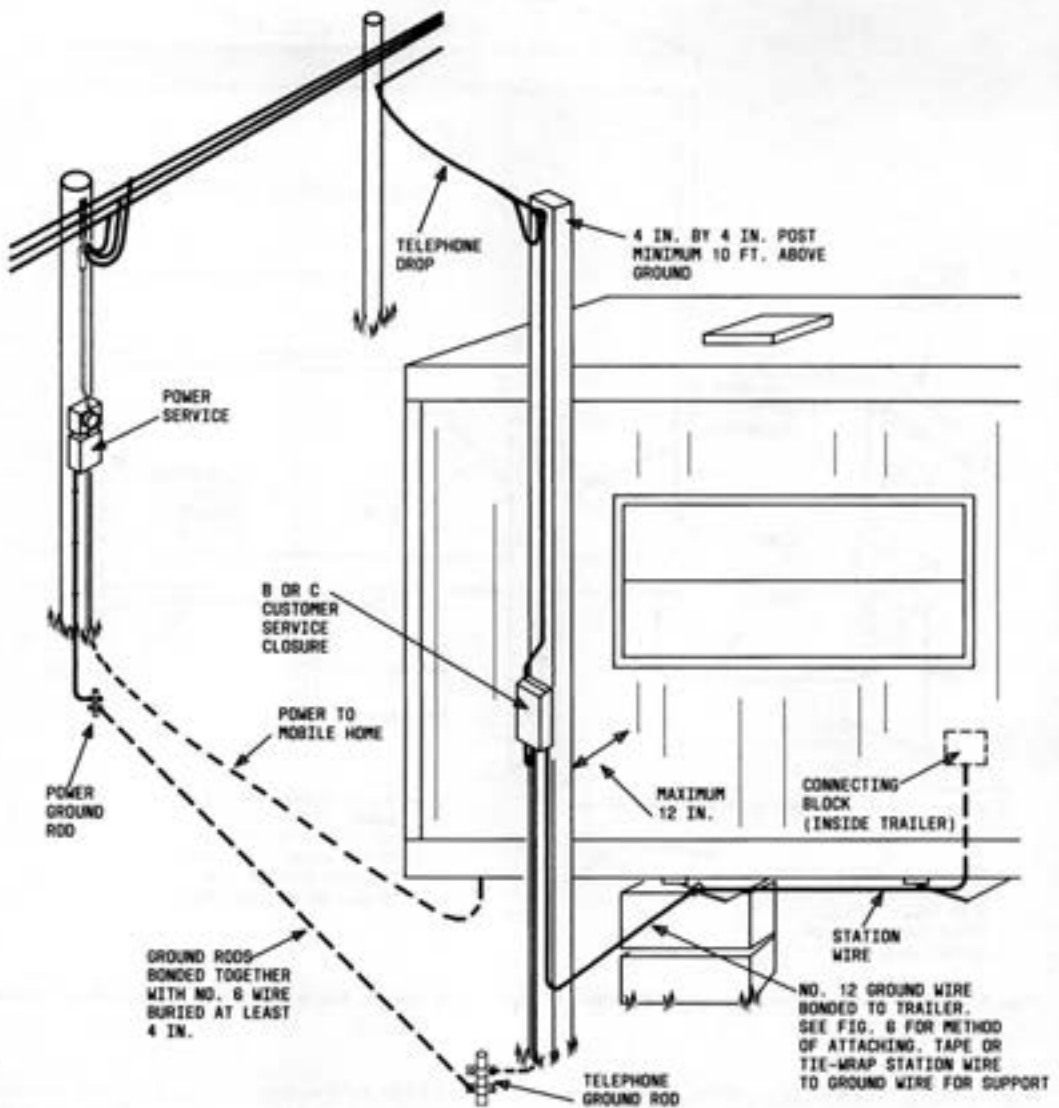


Fig. 4—Aerial Service—Protector Located Within 12 Inches of Mobile Home—Separate Bonded Power and Telephone Grounds

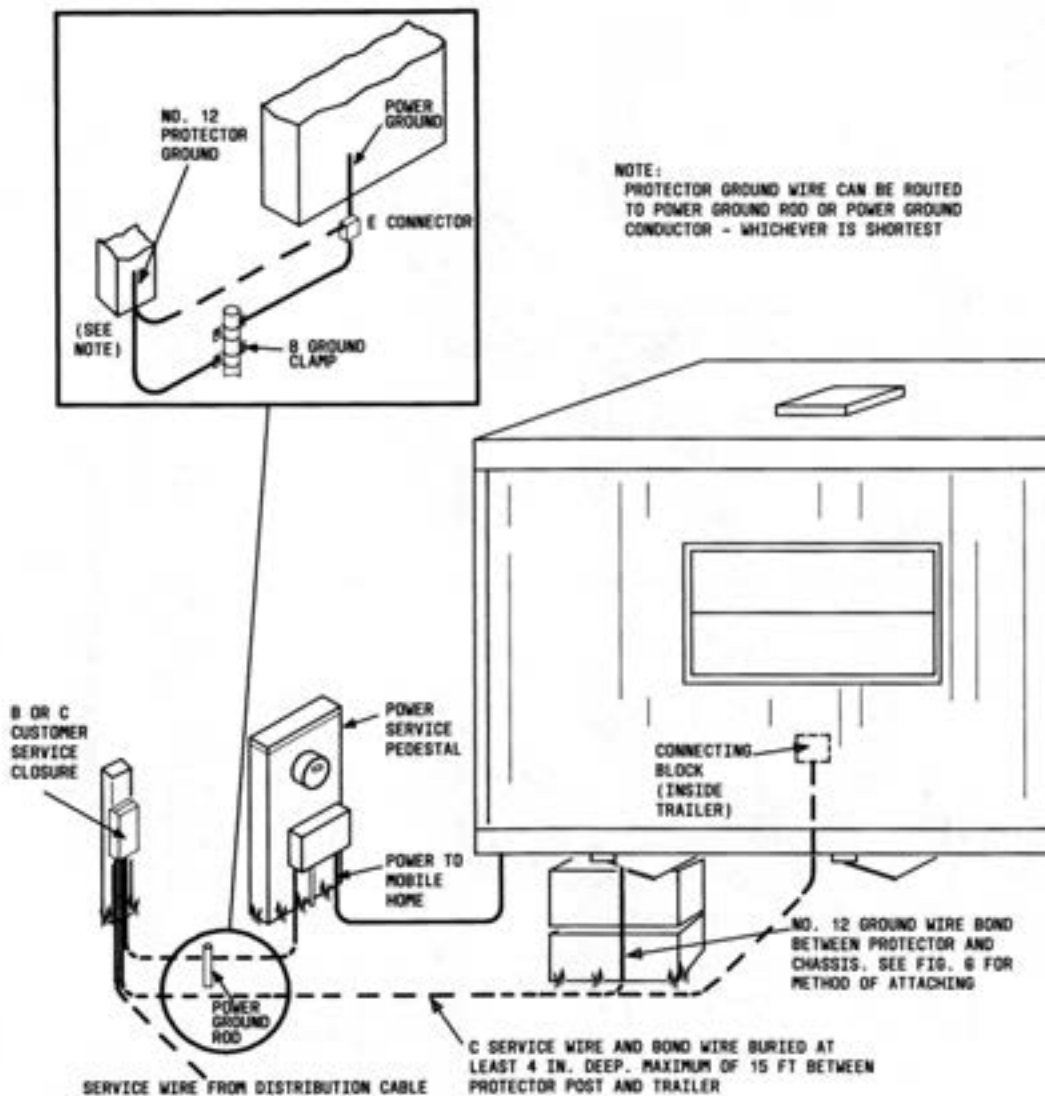


Fig. 5—Buried Service—Protector Located More Than 12 Inches From Mobile Home—Protector Grounded to Power Ground

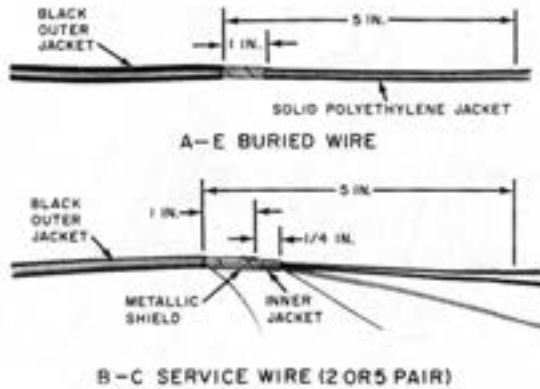


Fig. 7—Sheath Preparation for Placing F Connector

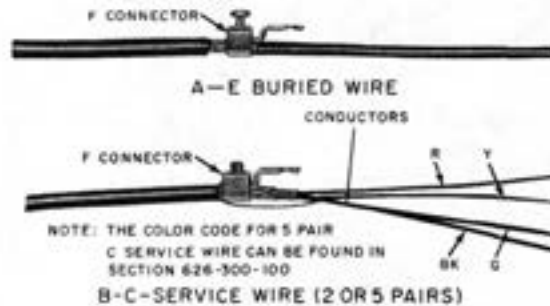


Fig. 8—F Connector on Service Wire

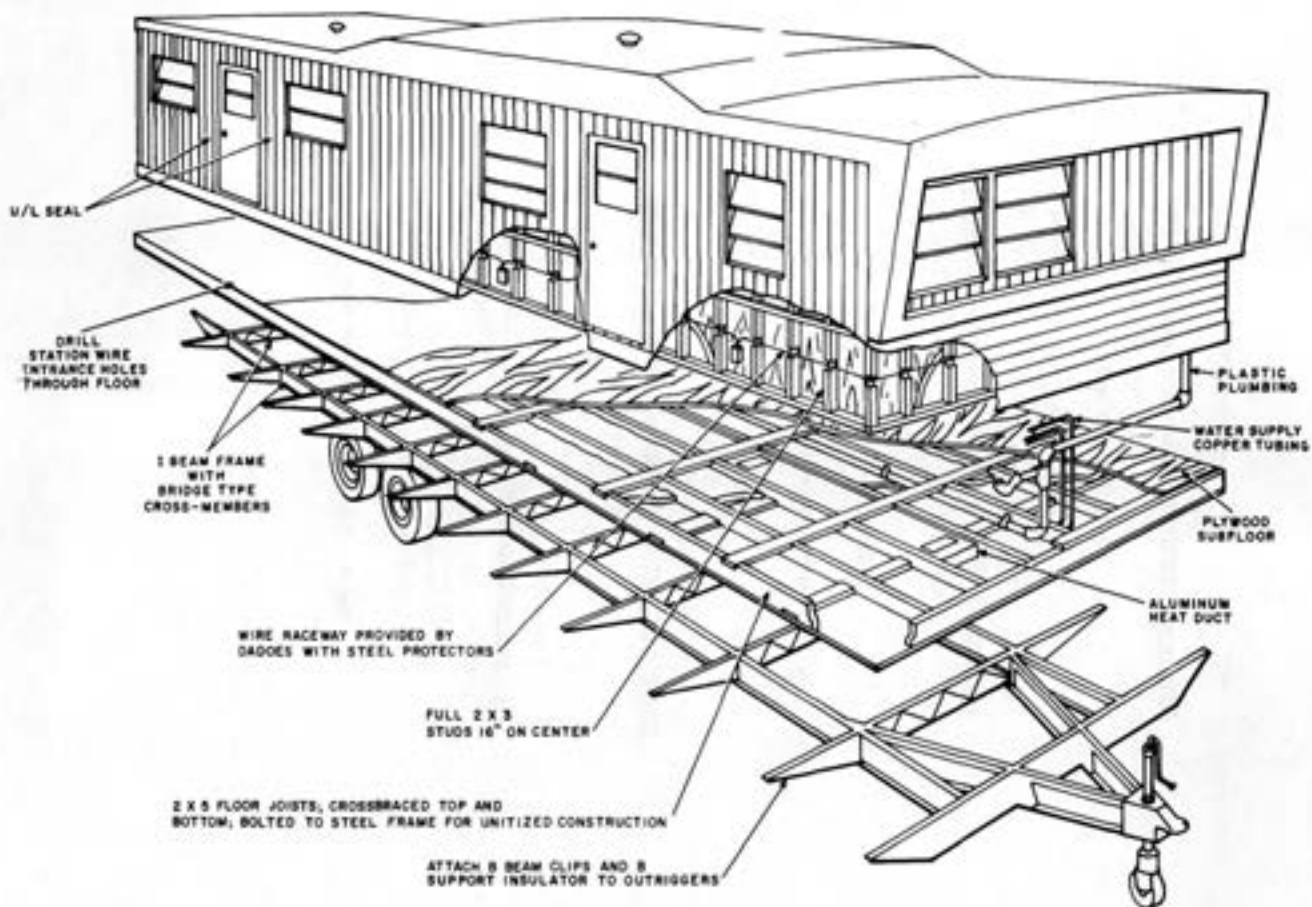


Fig. 9—Typical Mobile Home Construction

RECREATION VEHICLE AND BOAT WIRING (NONPERMANENT TYPE) DESCRIPTION

1. GENERAL

1.01 This section provides wiring information for use in providing telephone service to recreational vehicles and boats at marinas and does not apply to permanent-type installations such as mobile homes. Refer to Section 461-220-100 for wiring of permanent installations.

1.02 This section is reissued to:

- (a) Add information on B adapter plate (AT-8731)
- (b) Change title
- (c) Make minor corrections.

Revision arrows are used to emphasize the more significant changes. The Equipment Test List (ETL) is not affected.

Danger: Before making contact with any metal portion of a recreational vehicle, check for the presence of hazardous voltage on the body or chassis using the 188A test set.

1.03 A recreational vehicle (RV) is a unit mounted on a chassis designed for travel, camping, semipermanent home, vacationing, and other outdoor use. Wiring methods in this section cover travel trailers, truck-mounted campers, camping trailers, motor homes, and vans converted to campers and boats docked at marinas.

1.04 The same methods and procedures apply to the wiring of recreational vehicles as apply to mobile homes with the exception of the method of establishing a connection between the protector or terminal and the vehicle and the necessity of providing a ringer simulator (or equivalent) as required for test purposes. Refer to Section 460-100-400 for addi-

tional information on station protection and grounding.

1.05 Prior to proceeding with installation, necessary arrangements should have been made for the installation of jacks on vehicles or boats and provision of cable or wire facilities in the trailer park or on the dock.

1.06 Where attachments are made on joint-use poles and posts, the standard separations between power and telephone wires must be maintained as provided for permanent residences (see paragraph 3.12).

2. SELECTION

2.01 The equipment used to provide telephone service to recreational vehicles is identified and described in the following ordering guide.

ORDERING GUIDE

2.02 Order as follows:

- Adapter, Jack, Female, Weatherproof, B (for use with existing KS-8421 jack housing on docks, Fig. 1 and 2)
- Box, Outlet, B (for mounting male or female jacks on land, dock, or recreational vehicle, Fig. 3)
- Bracket, Mounting, B (for mounting outlet box on recreational vehicle, Fig. 4)
- Cord, Weatherproof, B (used with recreational vehicle and boats, Fig. 5)
- Cord, Weatherproof, C (used with recreational vehicle or boat for direct connection from telephone set to jack, Fig. 6)
- Jack, Male, Weatherproof, B (for use on recreational vehicle and boats, Fig. 7, 8, 9, 10, 14, and 15)

NOTICE

Not for use or disclosure outside the
Bell System except under written agreement

- Jack, Female, Weatherproof, B (for use at trailer service pad or dock area, Fig. 11 and 13)
- Adapter, Plate, B (used to adapt the B weatherproof jack to a boat where the KS-8420 jack had previously been mounted, Fig. 12)†
- Ringer, Simulator (or equivalent) as required
- Template, B (for use on boat, Fig. 16)
- Template, C (for use on RV, Fig. 17).

DESCRIPTION

2.03 The B weatherproof female jack adapter (Fig. 1 and 2) is mounted on an existing KS-8421 jack housing after the old jack and front plate are removed. It will receive the male plug of the B weatherproof cord to provide service to recreational vehicles or boats. A spring-loaded hinged cover protects the jack from weather when not in use. A rubber boot on the mating connector of the cord provides a weatherproof seal when in use. Three screw terminals stamped T, R, and GR are provided for connection to tip, ring, and ground, respectively. Four mounting screws and a cover gasket are provided.

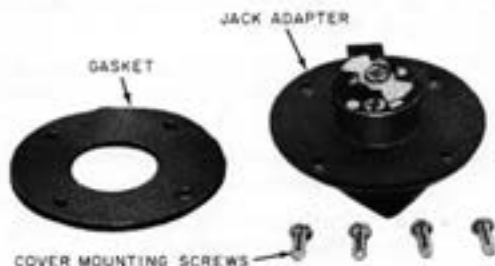


Fig. 1—B Weatherproof Female Jack Adapter



Fig. 2—B Weatherproof Female Jack Adapter Mounted on KS-8421 Jack Housing

2.04 The B outlet box (Fig. 3) is a molded box intended for mounting the B weatherproof male or female jack. It has a threaded knockout entrance at each end for use with an aluminum cord grip assembly or polyvinyl chloride (PVC) conduit adapter. The cord grip assembly and conduit adapter come with the outlet box.

2.05 The B mounting bracket (Fig. 4) is used to mount the B outlet box on recreational vehicles. It consists of a stainless steel angle bracket with three clearance holes on one side for mounting to trailer tongue and two threaded holes on the other side for mounting the B outlet box. Included are three stainless steel thread cutting screws for mounting the bracket and two stainless steel screws with spacers for mounting the B outlet box on the B mounting bracket. A pigtail lead is included to connect between the center ground terminal of the B weatherproof male jack and one of the outlet box mounting screws to provide a ground bond to the vehicle frame (Fig. 10).

2.06 The B weatherproof cord (Fig. 5) is used to provide a telephone connection between the post-mounted jack at the service pad and the jack on the recreational vehicle in a trailer park or between the dock and boat in a marina. It consists of a 50-foot, 16-gauge, 3-wire (ring, tip, and ground) yellow PVC insulated flexible cord with PHONE stamped on the cord at 1-foot intervals for identification. The cord is

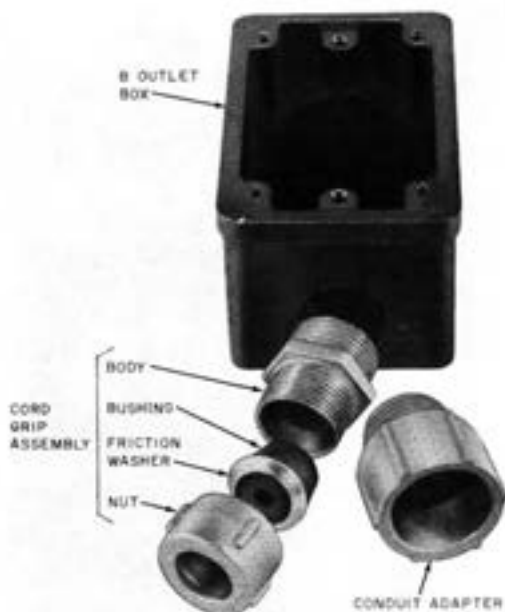


Fig. 3—B Outlet Box

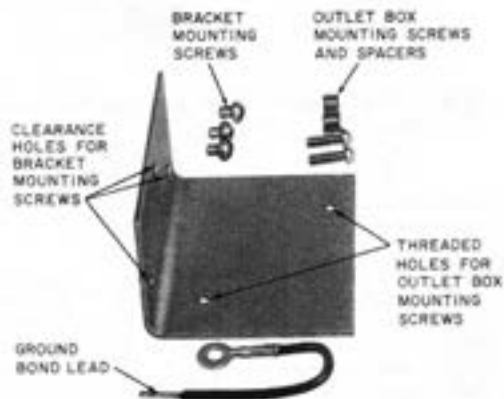


Fig. 4—B Mounting Bracket

terminated at one end in a male plug which engages a female jack at the service pad or dock. The other end is terminated in a female plug which engages a male jack on the recreational vehicle or boat. Rubber boots on the plugs mate with their respective jacks to provide weather protection. The 50-foot length has been adopted as the Bell System standard; since the cord is reusable, no attempt should be made to shorten it.

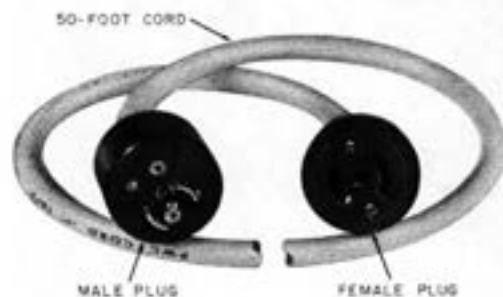


Fig. 5—B Weatherproof Cord

2.07 The C weatherproof cord (Fig. 6) is the same as the B weatherproof cord except that the female plug on the recreational vehicle or boat end is replaced with spade-tipped leads for terminating the cord directly in a 500- or 2500-type telephone set. An S hook assembly is provided for fastening the cord via the ringer mounting screw. Terminate leads (BK) for tip, (W) for ring, and (G) for ground.

2.08 The B weatherproof male jack (Fig. 7, 8, 9, and 10) mounts in the B outlet box on the recreational vehicle and receives the female plug of the B weatherproof cord to provide telephone service to recreational vehicles. The jack has a spring-loaded hinged cover to make it weatherproof when not in use. Three screw terminals stamped R, T, and GR on the rear of the jack provide connection to ring, tip, and ground, respectively.

2.09 The B weatherproof female jack (Fig. 11 and 13) mounts in the B outlet box located at the trailer service pad or on the dock at the marina. It receives the male plug of the B weatherproof cord. The jack has a spring-loaded hinged cover to make it weatherproof when not in use. Three screw terminals

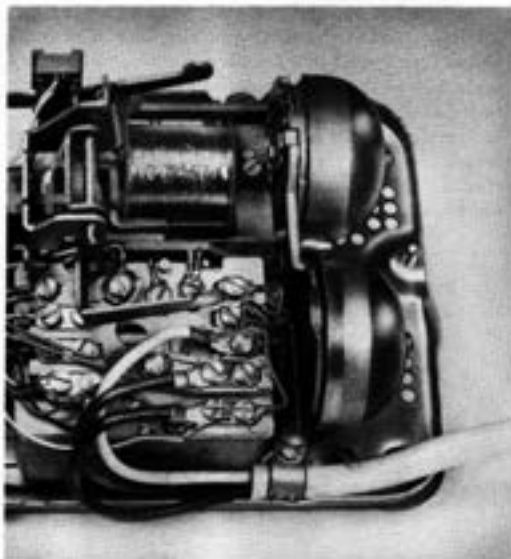


Fig. 6—Securing C Weatherproof Cord in Telephone Set

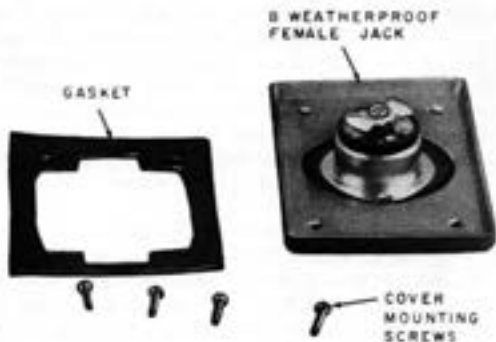


Fig. 7—B Weatherproof Male Jack



Fig. 8—B Weatherproof Male Jack on B Outlet Box (Cover Open)

stamped R, T, and GR on the rear of the jack provide connection to ring, tip, and ground.

2.10 The B waterproof male jack (Fig. 14 and 15) is mounted on a boat and receives the female plug of the B weatherproof cord to provide service to boats. It is chrome plated with a hinged screw cover which makes the jack waterproof when not in use. Three screw terminals stamped R, T, and GR on the rear of the jack provide connection to ring, tip, and ground. A rubber boot covers the screw terminals on the rear of the jack to minimize the possibility of accidental contact with these terminals.



Fig. 9—B Weatherproof Male Jack on B Outlet Box Showing Ground Lead Connected to B Mounting Bracket

2.11 The B adapter plate (Fig. 12) is used to adapt the B waterproof jack to a boat where the KS-8420 jack had previously been mounted.

Note: The B adapter plate has two sets of mounting holes. Only one set of holes is used. The second set is available in case the holes from the old KS-8420 jack interfere with adequate mounting of the adapter plate. The rubber gasket is made so when placed between the boat and the adapter plate, the holes in the gasket line up with one set of holes in the adapter plate. Turning the gasket over causes the gasket holes to line up with the second set of adapter plate holes. This provides a watertight seal.

2.12 The B template (Fig. 16) is used on the boat to locate the pilot holes for mounting screws and clearance hole for jack body for the B waterproof male jack. It is printed on index card stock and packed separately from the jack so that mounting holes may be prepared prior to jack installation.

2.13 The C template (Fig. 17) is used by the customer to locate the pilot holes on the recreational vehicle for the three thread cutting screws used to mount the B mounting bracket. It is printed

on index card stock and packed separately from the B mounting bracket so that mounting holes may be prepared prior to bracket installation.

3. INSTALLATION

RECREATIONAL VEHICLES

Danger: Do not install telephone in a location that will require wiring under vehicle and do not crawl under vehicle.

3.01 Installation of the service wire and station protector is the same as for mobile home wiring and is covered in Section 461-220-100.

3.02 The following items are required for a vehicle installation:

- One B weatherproof female jack (mounted on post at protector, Fig. 11)
- One B weatherproof male jack mounted on recreational vehicle (Fig. 7)
- Two B outlet boxes used to mount male and female jacks (Fig. 8 and 13)
- One B mounting bracket used to mount outlet box on vehicle (Fig. 10)
- One C template used to drill holes for mounting bracket on vehicle (Fig. 17)
- One B weatherproof cord (for making connection between post and vehicle, Fig. 5)
- One ringer simulator or equivalent (if required).

Note: If existing KS-8421 jack housing at utility pad is to be used, one B weatherproof female jack adapter (Fig. 1) is required instead of the B female jack, and only one B outlet box is required.

3.03 The cord will become the responsibility of the vehicle owner. The owner will connect and disconnect service at their convenience and keep the cord stored in the vehicle when away from location.

Warning: Bumpers on some recreational vehicles are used to store sewage

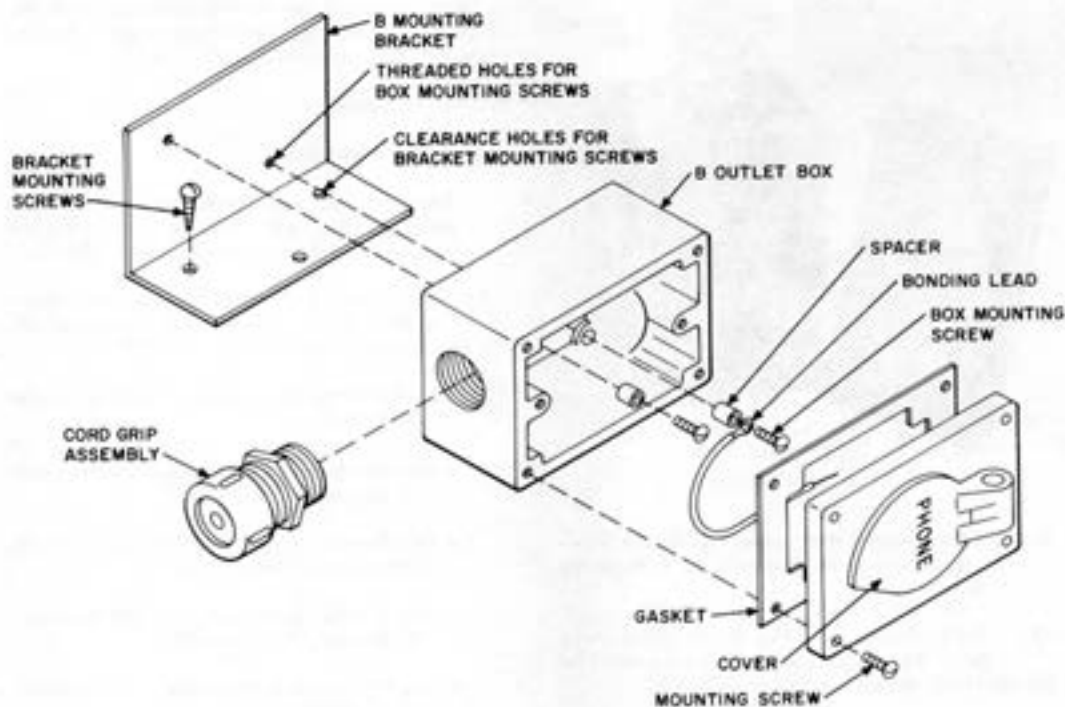


Fig. 10—Assembly of B Weatherproof Male Jack to B Outlet Box and B Mounting Bracket

hoses. Mounting screws that extend beyond the bumper surface may damage the hose or prevent the hose from entering.

3.04 The B outlet box and B mounting bracket should be mounted on the vehicle by the installer using the mounting holes provided by the customer. For trailers, the customer will use the C template to drill holes for the mounting bracket on top of the vehicle hitch as close to vehicle as possible. The box should be mounted on the same side as the other utilities with the jack on the outside (Fig. 18 and 19). For truck campers and motor homes, the customer will use the template to drill holes on the left side of the rear bumper (see Fig. 20). The outlet box should be mounted so it does not extend beyond the edge of the bumper. The cord grip assembly may be

attached to either end depending on existing space. The telephone installer will wire from the connecting block or the telephone set in the vehicle to the B outlet box on the trailer hitch or bumper. The bonding lead provided with the bracket must be connected as shown in Fig. 10 to provide a ground bond to the vehicle chassis.

3.05 Always install the telephone set on an outside wall if possible. The floor area along the outside walls are usually clear for drilling for station wire entry. The connecting block should be mounted on the baseboard or a stud, if possible, as the thin material used for recreational vehicle walls may not hold fasteners. Wall sets must also be mounted on a stud. Do not attempt to fish wire through trailer walls as side rails and insulation will cause interference. Drill the station wire entrance hole straight

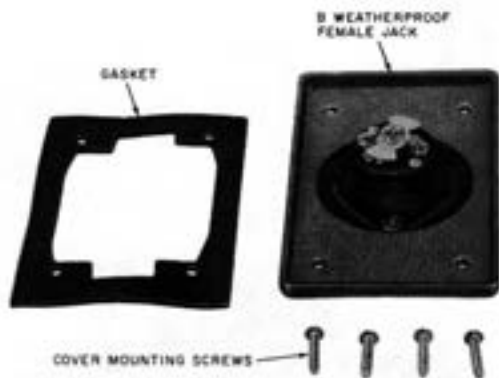


Fig. 11—B Weatherproof Female Jack

down through the floor avoiding outriggers and other obstructions. Use care when penetrating the soft insulating board covering the bottom of the trailer as it tears easily. Seal holes around station wire with duct seal or tape to prevent entrance of air, water, and insects. Run the D station wire to the jack so it will be protected and fasten securely every 12 inches. The D station wire must not come loose when the trailer is on the road.

3.06 Mount the B weatherproof female jack close to the protector on the post at the utility pad and provide a ringer simulator if required. Wire tip and ring of jack to tip and ring terminals of protector. Connect a 12-gauge ground wire from ground terminal of protector to center ground terminal of jack. Use similar wiring when retrofitting a B female jack adapter in an existing housing.

BOATS

Danger: When working on boats, consideration should be given to the type of footwear worn, both for safety reasons due to slippery decks and to avoid marking highly varnished teak or fiberglass decks.

3.07 For boat installations, the following equipment is required:

- One B waterproof male jack (mounted on boat to accept cord, Fig. 14 and 15)

- One B template (for cutting mounting holes for jack on boat, Fig. 16)
- One B weatherproof female jack (mounted on post on dock or pier to accept other end of cord, Fig. 11 and 13)
- One B outlet box (for mounting jack on dock or pier, Fig. 13)
- One B weatherproof cord (for connection between boat and dock, Fig. 5)
- One ringer simulator (or equivalent), if required.

Note: If existing KS-8421 jack housing at dock is to be used, one B weatherproof female jack adapter (Fig. 1 and 2) is required instead of the B weatherproof female jack and the B outlet box is not required.

3.08 The owner of the boat should be given the B template to drill the mounting and clearance holes for the B waterproof male jack adjacent to the power plugs in the cockpit coaming or in the outer hull of the boat (see Fig. 21 through 24). The installer should not drill any holes on boats either for mounting or running wire.

3.09 The installer will mount the B waterproof jack and wire from the jack to the telephone set connecting block in the boat.

Note: Do not bond ground wire to boat ground as undesirable electrolysis reaction may develop.

3.10 If holes are required, they should be provided by the boat owner (seal holes to prevent seepage if necessary). In most cases, there will be sufficient room to run concealed wiring to the telephone location without drilling holes or without attaching fasteners to the boat. The wire should be run between the hull and inside bulkhead. If wires require fastening, use B-cord clips (AT-8598, Section 461-210-200) fastened to inside dry surfaces. Use size 1 cord clips for D station wire and size 2 for B or F-59307 service wire. Use B or F-59307 service wire for wire runs exposed to saltwater, brackish water, and oil. Do not use staples to fasten wire in boats. Conduit may be used when provided. When disconnecting service, do not remove wiring, cord clips, or connecting blocks.

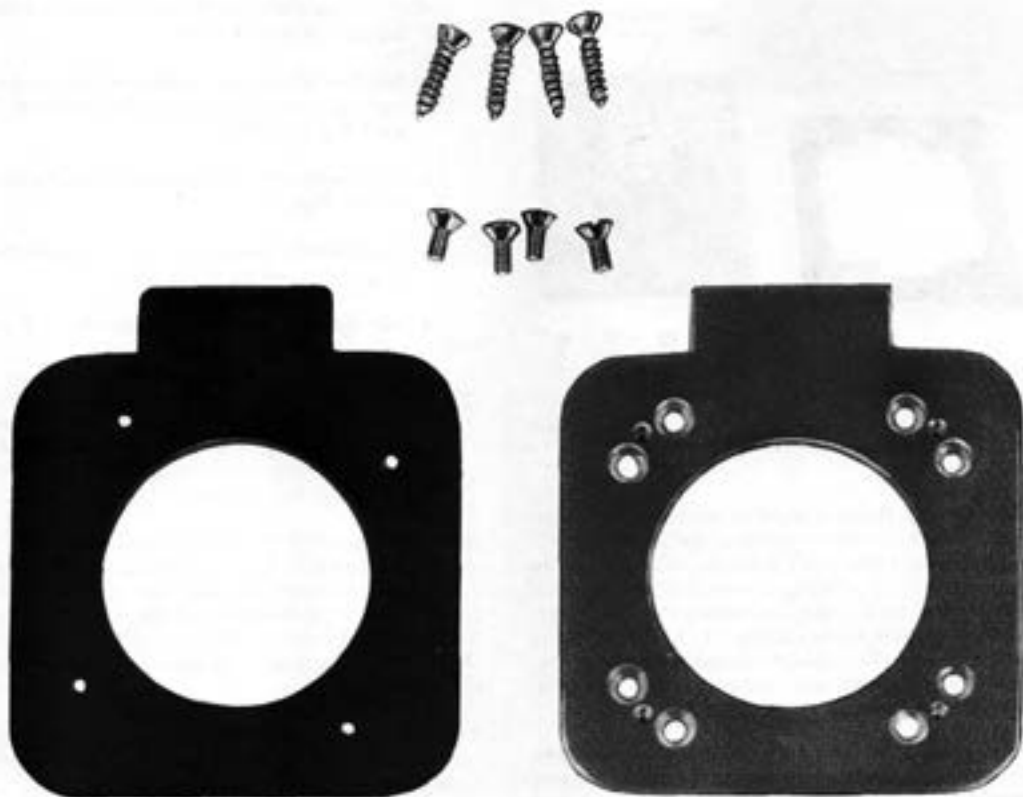


Fig. 12—#8 Adapter Plate

MARINAS (Fig. 25 and 26)

3.11 Jacks on docks should be mounted on posts or in wells provided by the marina owner. To prevent damage, do not mount the jack on the water or walkway side. Usually the post or pedestal will be the same one on which power is mounted. No station protector or bonding is to be placed on the boat. Mount the protector at the last permanent terminal or housing (which will usually be ashore) so an adequate ground may be obtained. Refer to the sections on station protection and grounding in Division 460. Where individual protectors are required, use the 123- or 128-type with the 305A mounting (or equivalent).

Provide a ringer simulator or equivalent at the dock jack if required.

3.12 The marina owner should provide rigid non-metallic conduit for wiring to the dock jacks. Where conduit is not provided, a wire run will have to be made in a location not subject to damage. This may be adjacent to water pipes, power conduit, or in some cases, beneath the dock. If marina owners will not provide conduit, request raceways in which wires may be fastened. Use only galvanized brass, bronze, or stainless steel hardware; other types deteriorate too rapidly. When establishing a run, use bridle rings or galvanized wire or cable clamps. Use B or F-59307



Fig. 13—B Weatherproof Female Jack on B Outlet Box (Cover Open)

service wire for all individual wire runs. Entrance of the service wire into the outlet box containing the jack should be through conduit. If conduit is not provided, protect the wire run from the deck of the dock to the box with a U guard or short piece of nonmetallic conduit.

3.13 If cable and terminals are not provided from the shore to the docks, wiring should be attached to the gangway. A typical method for floating docks is shown in Fig. 26. Rigid nonmetallic pipe should be fastened to the gangway. Flexible metal conduit should be used at the shore and dock ends to allow for motion due to rise and fall of docks. Where the docks are rigid, no flexible metal conduit is required.



Fig. 14—B Waterproof Male Jack (Front View)

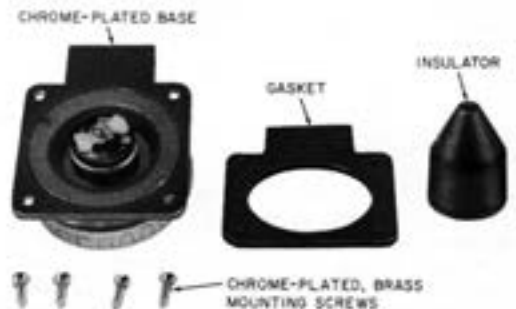


Fig. 15—B Waterproof Male Jack (Rear View, Gasket, and Insulator Removed)

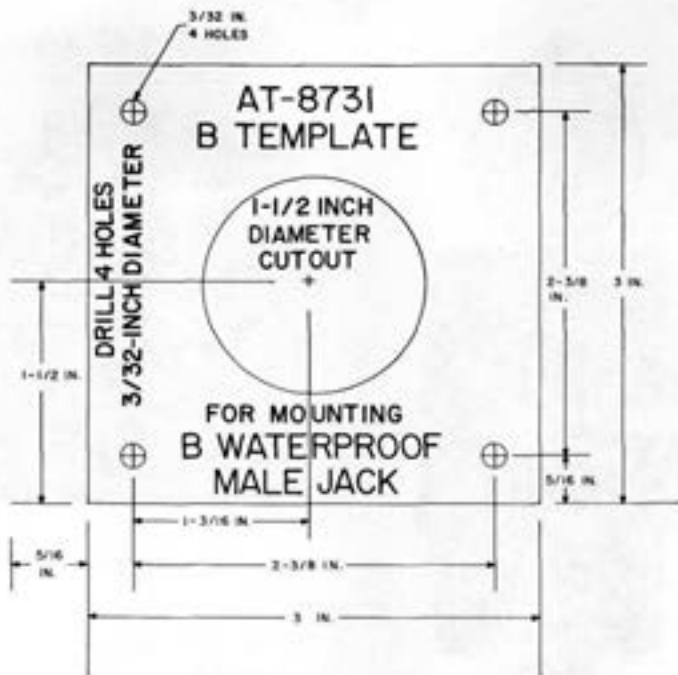


Fig. 16—B Template for Use on a Boat

3.14 At piers designed for large ships, telephone jacks should be located in the covered wells used to protect water and electrical connections. Conduit must be used into the wells to prevent water damage. The wells protect the jacks and the portable telephone cord to the ship is protected since it is adjacent to the larger power cables.

3.15 Service to a boat may be PBX Station Service, Centrex Service, individual line, or extension service on an individual line. The type of service usually depends on the extent to which the marina owner wishes to become involved in providing service to boat owners.

3.16 When providing new telephone service to a dock, plan for more than the initial service required. It may be desirable to cable the dock to reduce the number of individual wires run from dock to shore and allow for future expansion.

3.17 Due to the many types of boats, docks, piers, marinas, trailer parks, and camp grounds, no attempt is made to establish one procedure to be followed. Good planning of cabling facilities, conduit, and local installation procedures will determine what is best for each installation.

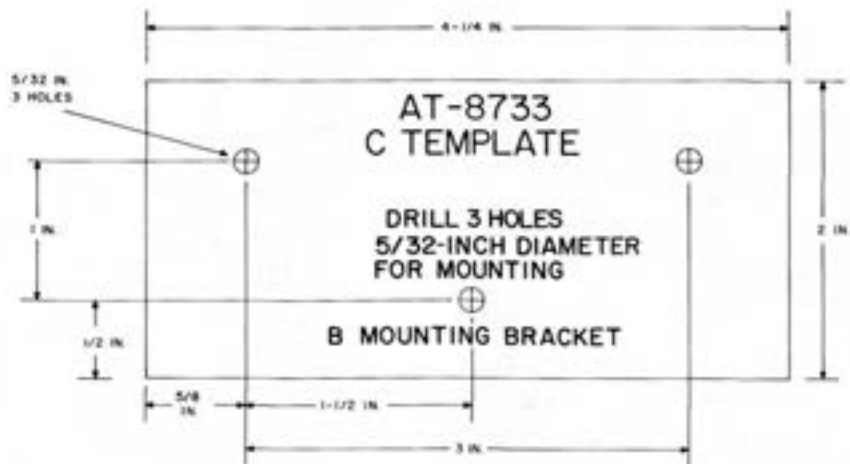


Fig. 17—C Template for Use on a Recreational Vehicle

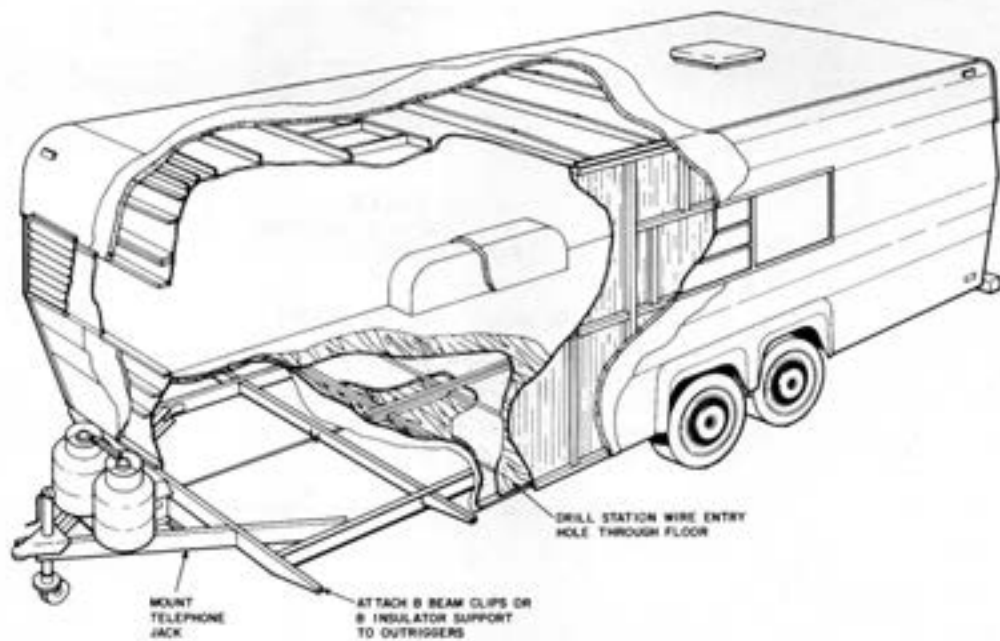


Fig. 18—Typical Recreational Trailer Construction

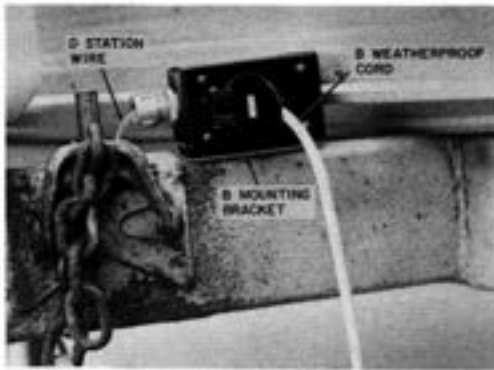


Fig. 19—B Weatherproof Male Jack Mounted on Trailer Hitch

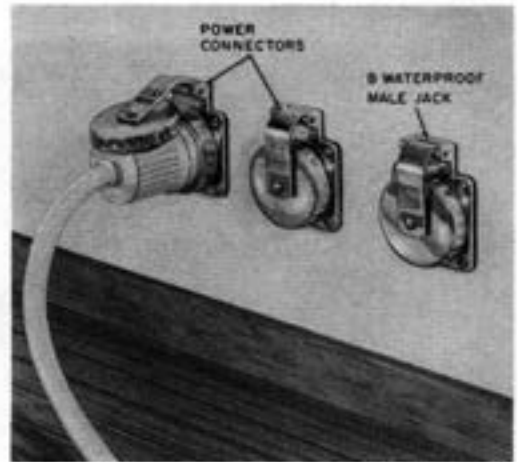


Fig. 21—B Waterproof Male Jack Mounted on Boat— Typical Installation

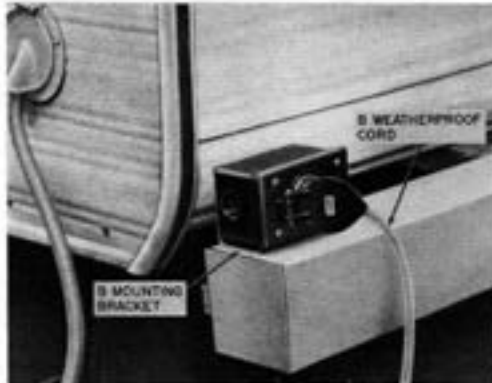


Fig. 20—B Weatherproof Male Jack Mounted on Rear Bumper of Trunk Camper or Motor Home



Fig. 22—Typical Outer Hull B Waterproof Male Jack Installation



Fig. 23—Typical Cockpit Coaming B Waterproof Male Jack Installation



Fig. 24—Typical Boat Coaming B Waterproof Male Jack Installation

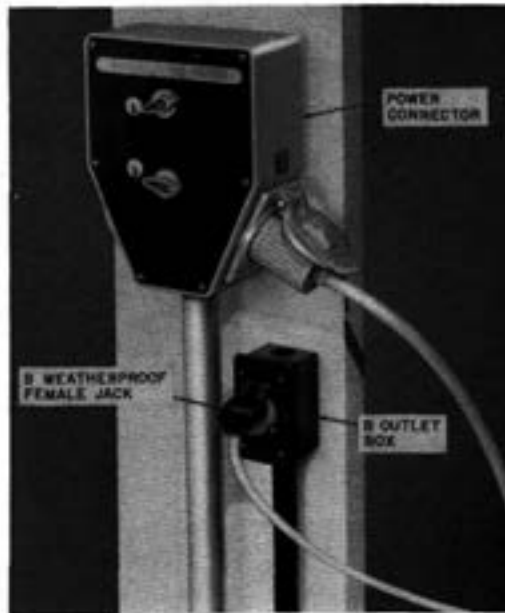


Fig. 25—B Weatherproof Female Jack on B Outlet Box Mounted on Post at Dock—Typical Installation

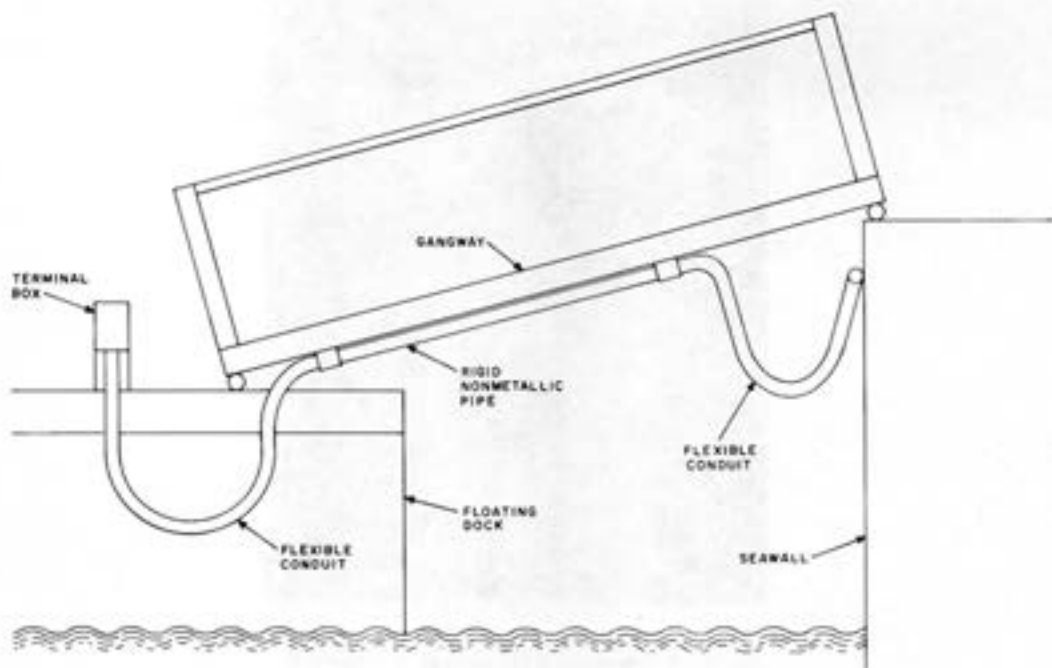


Fig. 26—Typical Shore to Dock Installation

42-TYPE, 44A, AND 47-TYPE CONNECTING BLOCKS IDENTIFICATION, INSTALLATION, AND WIRING

1. GENERAL

1.01 This section provides information on 42-type, 44A, and 47-type connecting blocks.

1.02 This section is reissued to:

- (a) Add information on the 42B-type and 42E connecting blocks
- (b) Change Fig. 17
- (c) Change title.

Revision arrows are used to emphasize the more significant changes. The Equipment Test List (ETL) is not affected.

2. IDENTIFICATION

2.01 Identification and ordering information for connecting blocks is covered in this section in Fig. 1 through 4, Tables A and B, and in paragraphs 2.02 and 2.03.

2.02 The 42A connecting block is primarily intended for use as a base with the 625A connecting block to provide a point for plugging in a single-line modular telephone set. The combination of 42A block and 625A block is ordered as a 625C connecting block. For nonmodular applications, the 42A block (with cover) can be used alone. For modular conversion, discard the 42A cover and add a 625A connecting block (see Part 3A).

2.03 The 42B-type connecting block is available with four screw terminals (42B4) and six screw terminals (42B6). Each version is intended for use as a base with the 625T-type "swinger" connecting block. The combination of a 42B4 and a 625T is ordered as a 625SA connecting block; the combination of a 42B6 and a 625T is ordered as a 625S6 connecting block. The 42B-type base fits tightly against the 625T block to resist dust, moisture, corrosive

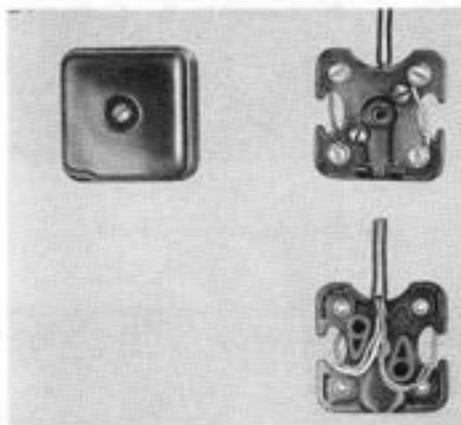


Fig. 1—42A Connecting Block

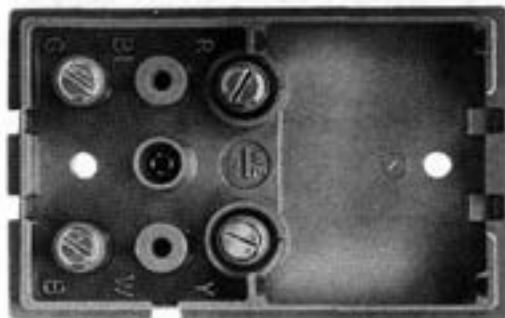


Fig. 2—42B4 Connecting Block

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Fig. 3—42B6 Connecting Block

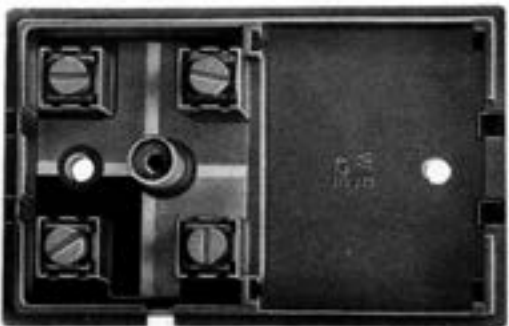


Fig. 4—42E Connecting Block

chemicals, and insects. Refer to Section 461-610-100 for complete information on 625SA and 625S6 connecting blocks.

2.04 The 42E connecting block is similar to the 42B except that it contains four split-beam 990A connectors instead of ordinary screw terminals. These allow inside station wire to be connected without stripping the insulation. The 42E block is primarily intended for use as a base with the 725T connecting block in installations where connections will be made by the customer. Refer to Section 461-400-141 for complete information on the 725T connecting block.

3. INSTALLATION AND WIRING

3.01 The 42-type, 44A, and 1044A connecting blocks (Fig. 5) may be mounted on all types of surfaces. Backboards should be used only when mounting on damp walls and when the use of a backboard will facilitate installation.

3.02 Termination of cables, wires, and cords is shown in Fig. 8 and 9 and Tables C, D, and E.

Caution: Avoid pulling the conductor against the terminal screw threads, as the screw, when tightened, may pinch the conductor between the screw and washer.

A. 42A Connecting Block (Fig. 1)

3.03 Install the 42A connecting block as follows:

- (1) Strip jacket back approximately 4 inches from end and separate conductors.
- (2) Place block over conductors and secure with two fasteners.
- (3) Dress conductors and make connections as shown in Table C and Fig. 1.

3.04 To attach the D3BU and D4BP mounting cord to the 42A block, make a slight bend in the flat eyelet stay band in the direction of the cord conductors. Place the hole in the stay band over the hole in the block into which the cover screw fits (Fig. 10). Position cover onto block with cover screw through the stay band hole; tighten cover screw.

3.05 To convert the 42A block for modular installations, a 625C connecting block (Fig. 11 and 12) must be connected as follows:

- (1) Remove cover from existing 42A block.
- (2) Connect leads from miniplug connector in 625C connecting block to terminals on 42A connecting block.
- (3) Dress leads as shown in Fig. 12.
- (4) Terminate leads of connecting block as shown in Table F.
- (5) Attach connecting block cover to the block using center captive screw in cover.

TABLE A4

42-TYPE, 44A, 1044A, AND 47-TYPE CONNECTING BLOCKS

| CONNECTING BLOCK | NUMBER OF CONDUCTORS | TYPE OF MOUNTING | FURNISHED WITH | COLOR | DIMENSIONS (APPROXIMATE INCHES) | | REMARKS |
|------------------|----------------------|------------------|---------------------------------------|---------------------------------------|---|------------------------|--|
| | | | | | DEPTH | DIAMETER OF FRONT BOSS | |
| 42A* | 4 | Nonflush | Cover | Light Olive Gray (-49) or Ivory (-50) | | | |
| 42B4 | | | | | | | |
| 42B6 | 6 | | | Gray | | | Part of 625S6 connecting block‡ |
| 42E | 4 | | | | | | Used with 725T connecting block |
| 44A* | 10 | | | | | | |
| 1044A* | | Cover | Light Olive Gray (-49) or Ivory (-50) | | Consists of 44A connecting block and 101A cover | | |
| 47C† (MD) | 12 | Flush | | Light Olive Gray (-49) or Ivory (-50) | 2 | 1-1/4 | Replaced by 47E |
| 47D† (MD) | 4 | | | | 1-3/16 | | Replaced by 47F |
| 47E* | 12 | | | | 1-3/8 | | |
| 47F‡ | | | | | 2/8 | | |
| 625C | 4 | Nonflush | | | | | Converts 42A connecting block for modular installation |

* Early production equipped with 6-32 size terminal screw; later production will be equipped with 6-40 size terminal screw.

† Equipped with 6-32 size terminal screw.

‡ Equipped with 6-40 size terminal screw.

§ 42B-type connecting block can also be ordered separately.

Note: It is recommended that surface-mounted connecting blocks be mounted 12 inches or more above the floor (electrical outlet height) to prevent contamination by rug fibers, rug cleaning agents, and insect sprays.

B. #42B Connecting Block (Fig. 2 and 3)

3.06 The 42B connecting block is normally ordered and installed as the base portion of the 625S-type connecting block (see Section 461-610-100). However, the 42B can be ordered separately and used to replace an existing 42A installed with a 625T con-

necting block to provide a more contamination-resistant terminal as follows:

- (1) Disassemble and disconnect the existing combination of 42A and 625T connecting blocks.
- (2) Mount the 42B connecting block in a horizontal position with the screw terminals on the left side.



Locate the 42B connecting block in a convenient place to permit easy modular connection. Avoid hiding it behind furniture or drapes.

TABLE B4

ASSOCIATED APPARATUS FOR 42-TYPE, 44A, 1044A, AND 47-TYPE CONNECTING BLOCKS
(ORDER SEPARATELY IF REQUIRED)

| CONNECTING BLOCK | NONFLUSH MOUNTING | | | FLUSH MOUNTING | | | | FACEPLATE (NOTE) |
|------------------|---------------------------------------|-------------|---|-----------------------|--|------------------|----------------------------|------------------|
| | BACKBOARD | COVER | COLOR | IN OUTLET BOX | | ON WALL STUD | IN COMPLETED WALL | |
| | | | | BRACKET | COVERPLATE | BRACKET | | |
| 42A | 100A (MD) or 100B | Furnished | Light Olive Gray (1-89) or Ivory (1-50) | | | | | |
| 42B | | | Gray | | | | | |
| 42C | | | | | | | | |
| 1044A | | Furnished | | | | | | |
| 44A | | 101A | | | | | | |
| 625C * | | | | | | | | |
| 625T † | | | | | | | | |
| 725T ‡ | | | | | | | | |
| Two 44A | 100B (MD) or 100C | 101A | Light Olive Gray (1-89) or Ivory (1-50) | | | | | |
| Three 44A | | | | | | | | |
| Four 44A | 100C (MD) or 100D | 101D | | | | | | |
| Five 44A | Two 100B (MD) or two 100C | Two 100C | | | | | | |
| 47C (MD) | | | | 43A (MD) or 43B | 8100C090 (Light Olive Gray) or 8100C098 (Ivory) or 8100C040 (Brown) | 63H (Fig. 17) | KS 20502, 1,2 (Fig. 18) | 10A |
| 47D (MD) | | | | | | | | |
| 47E | | | | | | | | |
| 47Y | | | | | | | | |

Note: Furnished in the following colors: Light Olive Gray (1-50) and Brown (1-54). Furnished with ring retainer and mounting screws.

* Converts 42A connecting block to modular installation.

† Used with 42B connecting block.

‡ Used with 42E connecting block.

(3) Trim any corroded or damaged parts off the existing inside station wire and dress the leads for connection to the new block.

(4) Break out one of the wire entrance notches of the 42B block.

(5) Arrange the end of the station wire in the 42B block with at least 1 inch of jacket inside the block.

(6) Connect the individual leads to the proper screw terminals.

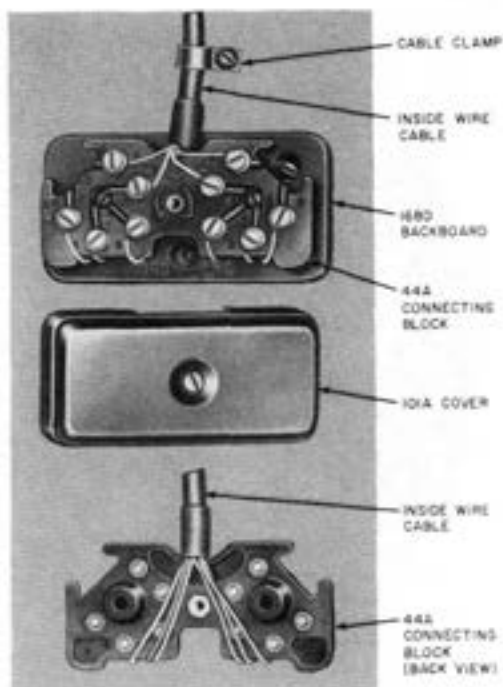


Fig. 5—1044A Connecting Block (44A Connecting Block and 101A Cover) With 168D Backboard

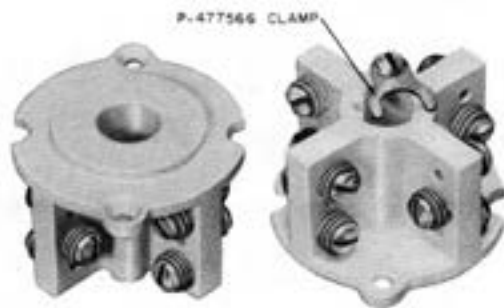


Fig. 6—47E Connecting Block

(7) Connect the spade tips of the 625T connecting block to the screw terminals of the new 42B block.

(8) Screw the 625T block to the 42B block.

C. 42E Connecting Block (Fig. 4)

3.07 Installation of the 42E connecting block is the same as the 42B except for the method of connecting the station wire conductors (Fig. 9). It is not necessary to strip the insulation from the conductors before inserting them into the notches under the split beams of the screw terminal assemblies. ●

D. 44A Connecting Block (Fig. 5)

3.08 When installing 44-type connecting blocks, it may be desirable to use a backboard.

3.09 For size and type of fasteners used to mount backboards, see Section 463-130-100.

3.10 Backboards accommodating three and four blocks require four fasteners; backboards accommodating one block require only two fasteners.

3.11 The 168E and F plastic backboards are notched to permit mounting with both set cord and cable entering from the same end (Fig. 13). Backboards and 44A connecting blocks may be mounted in either a vertical or a horizontal position. When mounted vertically, telephone set cord should always enter from the bottom.

3.12 The 168D plastic backboard is unnotched. When mounted vertically, the telephone cord enters from the bottom and the inside wiring cable must enter from the top. When mounted horizontally, cable should enter from the direction of the cable run.

3.13 Terminate conductors and cords on 44A connecting blocks as shown in Fig. 14, 15, and 16. Cord conductors are of the proper length to allow terminating in sequence. Short length conductors are terminated on Block 1, next in length on Block 2, etc. (Fig. 15). In fabric-covered mounting cords of earlier manufacture, this sequence was reversed.

3.14 The 44A connecting blocks are used for connecting a maximum of ten conductors as indicated in Table D. At installations requiring a series

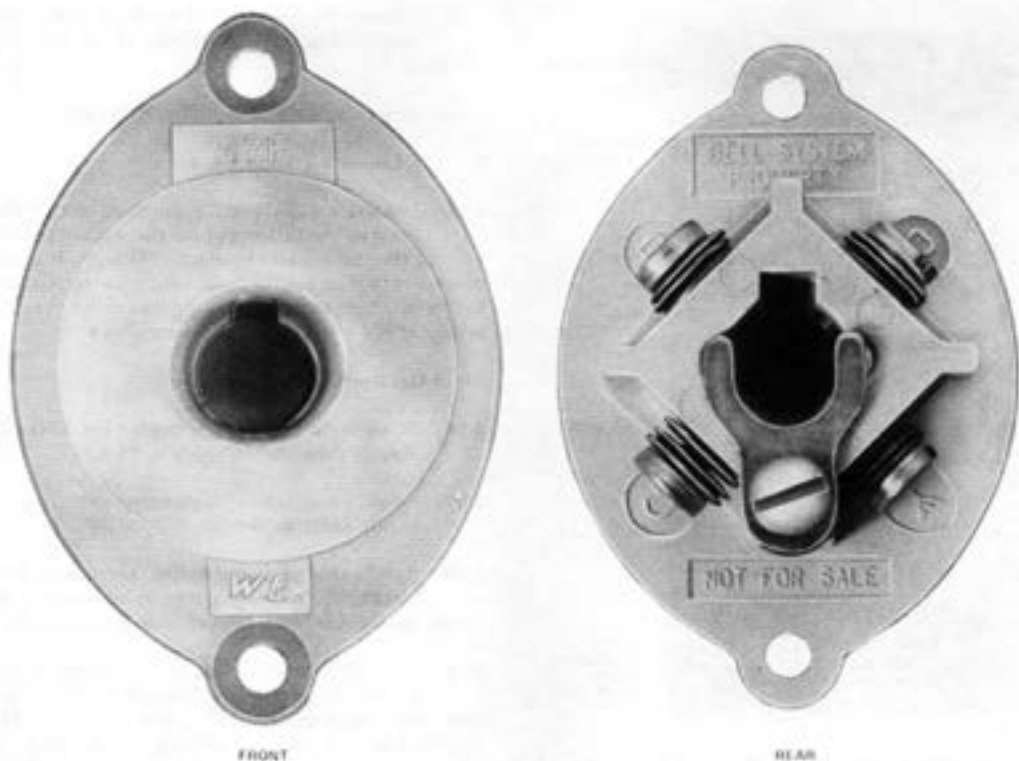


Fig. 7—47F Connecting Block

of 44A connecting blocks, terminate inside wiring cable or connector cable as shown in Table E.

E. 47-Type Connecting Blocks

3.15 The 47-type connecting block may be flush-mounted in a standard electrical outlet box, on a 63B metal bracket (Fig. 17), or a KS-20502, L2 bracket (Fig. 18).

3.16 Install 47-type connecting block in a standard electrical outlet box as follows:

- (1) Mount connecting block on bracket using screws furnished with bracket (Fig. 19)

- (2) Connect station wire or cable to connecting block as indicated in Table C or D.

- (3) Pass mounting cord through hole in faceplate and connecting block.

- (4) Terminate mounting cord on connecting block.

- (5) Mount block equipped bracket in outlet box using screws furnished with bracket.

- (6) Mount faceplate using screws furnished with faceplate (Fig. 19).

- 3.17** The 63B metal bracket is intended for use as a receptacle for 47-type connecting blocks

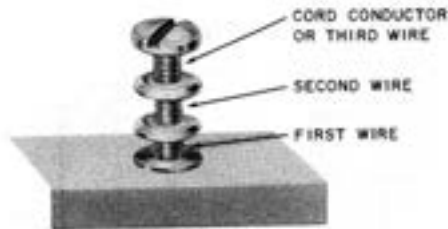


Fig. 8—Standard Screw Terminal Connections

(Fig. 17) and is mounted on the wall stud when homes are prewired.

3.18 Install 47-type connecting block on 63B bracket (Fig. 20) as follows:

- (1) Mount ring retainer on 63B bracket using screws furnished with faceplate.
- (2) Connect station wire or cable to connecting block as indicated in Table C or D.

- (3) Pass mounting cord through hole in 16-type faceplate and connecting block.
- (4) Terminate mounting cord on connecting block.
- (5) Mount connecting block on ring retainer using screws furnished with faceplate.
- (6) Mount 16-type faceplate on ring retainer. Mounting screws are furnished with faceplate.

3.19 The KS-20502, L2 bracket (Fig. 18) can be used for wall mounting 47-type connecting blocks where the wall material has already been applied to the studs. The bracket can be used on wall material up to 1-1/8 inches thick. For thin wall construction, it may be necessary to remove the breakoff portions of the bracket.

3.20 Install KS-20502, L2 bracket as follows:

- (1) Drill a 2-1/4 inch hole in wall surface.
- (2) Loosen inner clamps. Insert clamps and bracket into hole until outer flange bears against wall surface.

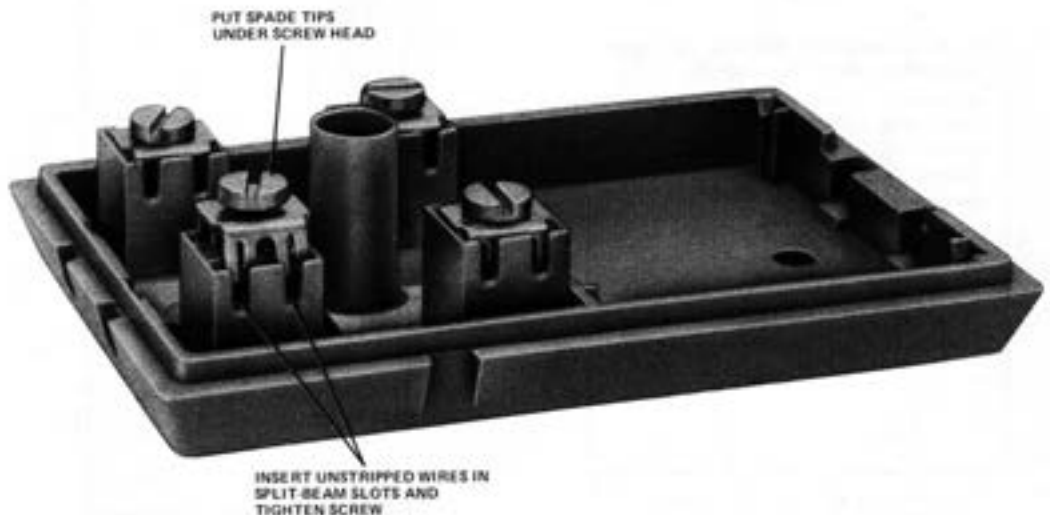


Fig. 9—Split-Beam Terminal Connections on 42E Connecting Block

TABLE C

STATION WIRE CONNECTIONS

| STATION WIRE | | CONNECTING BLOCK TERMINAL DESIGNATIONS (NOTE) |
|-----------------|--------------------|---|
| TYPE | CONDUCTOR COLOR | 42-TYPE, 47B (MD), 47D (MD), AND 47F |
| Pair | Red | R |
| | Green | G |
| Triple | Red | R |
| | Green | G |
| | Yellow | Y |
| Quad | Red | R |
| | Green | G |
| | Yellow | Y |
| | Black | B |
| 3-Pair (42B) | Red | R |
| | Green | G |
| | Yellow | Y |
| | Black | B |
| | Blue | BL |
| | White | W |

Note: When terminating more than four conductors, use a 47C (MD) or 47E connecting block.

TABLE D

CABLE CONNECTIONS FOR 44A, 47C (MD),
AND 47E CONNECTING BLOCKS (NOTE)

| INSIDE WIRING CABLE CONDUCTOR COLOR | CONNECTING BLOCK TERMINAL DESIGNATIONS | |
|--|---|--------------------|
| | 44A | 47C (MD) OR 47E |
| BL-W | 1 | 1 |
| W-BL | 2 | 2 |
| O-W | 4 | 3 |
| W-O | 5 | 4 |
| G-W | 6 | 5 |
| W-G | 7 | 6 |
| BR-W | 9 | 7 |
| W-BR | 10 | 8 |
| S-W | 3 | 9 |
| W-S | 8 | 10 |
| BL-R | — | 11 |
| R-BL | — | 12 |

Note: For E wiring cable, see section on selection of wire and cable.

TABLE E

CABLE TERMINATIONS

| COLOR | BLOCK NO. | TERMINAL |
|-------|-----------|----------|
| BL-W | 1 | 1 |
| W-BL | | 2 |
| O-W | | 4 |
| W-O | | 5 |
| G-W | | 6 |
| W-G | | 7 |
| BR-W | | 9 |
| W-BR | | 10 |
| S-W | | 3 |
| W-S | | 8 |
| BL-R | 2 | 1 |
| R-BL | | 2 |
| O-R | | 4 |
| R-O | | 5 |
| G-R | | 6 |
| R-G | | 7 |
| BR-R | | 9 |
| R-BR | | 10 |
| S-R | | 3 |
| R-S | | 8 |
| BL-BK | 3 | 1 |
| BK-BL | | 2 |
| O-BK | | 4 |
| BK-O | | 5 |
| G-BK | | 6 |
| BK-G | | 7 |
| BR-BK | | 9 |
| BK-BR | | 10 |
| S-BK | | 3 |
| BK-S | | 8 |
| BL-Y | 4 | 1 |
| Y-BL | | 2 |
| O-Y | | 4 |
| Y-O | | 5 |
| G-Y | | 6 |
| Y-G | | 7 |
| BR-Y | | 9 |
| Y-BR | | 10 |
| S-Y | | 3 |
| Y-S | | 8 |
| BL-V | 5 | 1 |
| V-BL | | 2 |
| O-V | | 4 |
| V-O | | 5 |
| G-V | | 6 |
| V-G | | 7 |
| BR-V | | 9 |
| V-BR | | 10 |
| S-V | | 3 |
| V-S | | 8 |



Fig. 10—42A Connecting Block With D3BU Mounting Cord

- (3) Realign inner clamps and tighten screws until clamps are tight against inner surface of wall.

3.21 Install 47-type connecting block on KS-20502, L2 bracket as follows:

- (1) Connect station wire or cable to connecting block as indicated in Table C or D.
- (2) Pass mounting cord through hole in 16-type faceplate and connecting block.
- (3) Terminate mounting cord on connecting block.
- (4) Mount connecting block on bracket using screws furnished with faceplate.
- (5) Mount 16-type faceplate on bracket using screws furnished with faceplate.

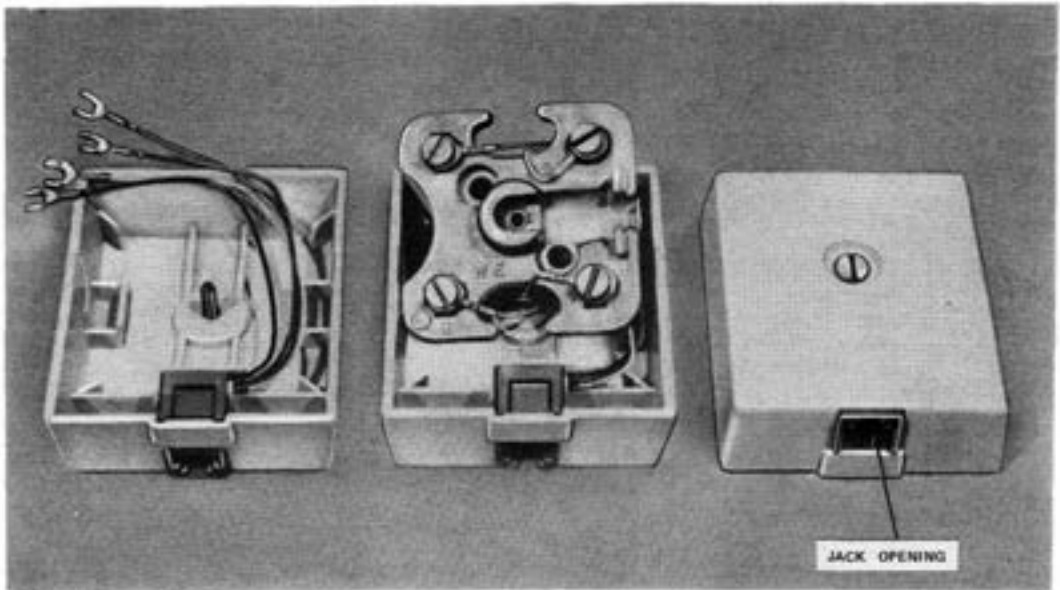


Fig. 11—625C Connecting Block

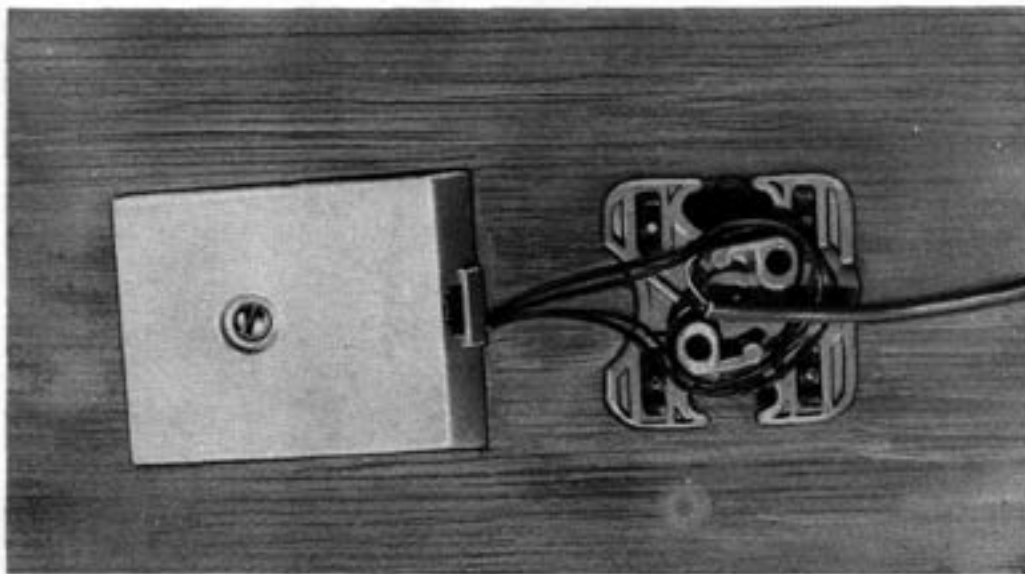
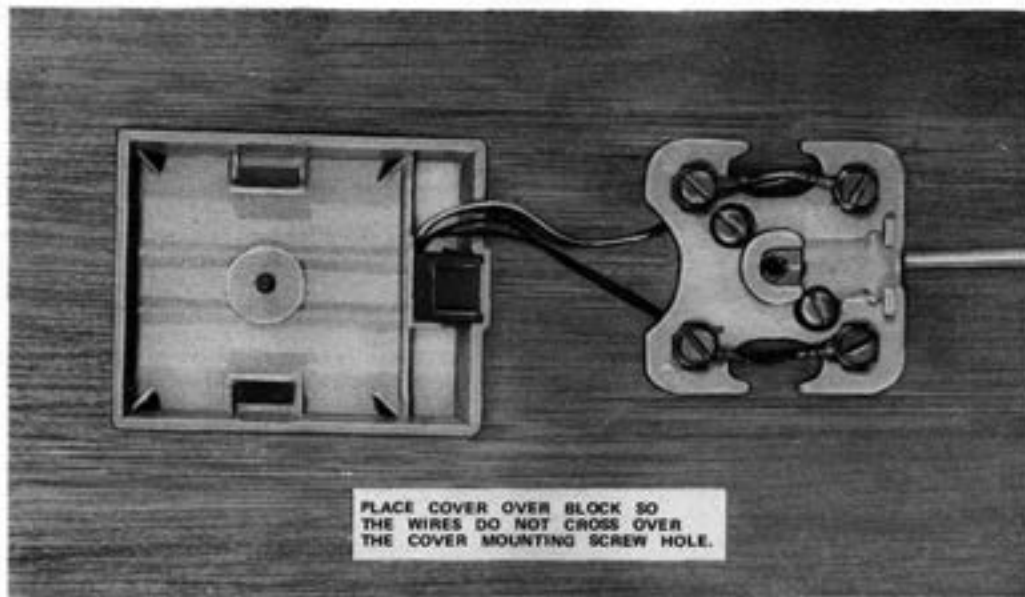


Fig. 12—625C Connecting Block, Method of Wiring

TABLE F

MODULAR CONNECTING BLOCK CONNECTIONS

| 1A1 OR 1A2 KTS | INSIDE WIRE | | | CONNECTING BLOCK | |
|-------------------|------------------|------------|---------------------|------------------|---------------|
| | ONE-LINE SERVICE | | TWO-LINE SERVICE | TERMINAL | LEAD COLOR |
| | NO DIAL LIGHT | DIAL LIGHT | | 625-TYPE | |
| Tip | Tip | Tip | Line 1 Tip | G | Green |
| Ring | Ring | Ring | Line 1 Ring | R | Red |
| A | | TRNSP | Line 2 Tip | B | Black |
| A1 | | TRNSP | Line 2 Ring | Y | Yellow |

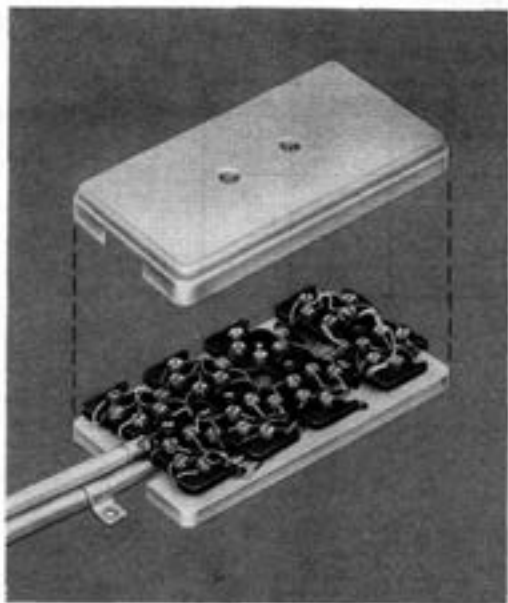


Fig. 13—Four 44A Connecting Blocks Mounted on 168F Backboard With Cable and Cord Entering Same End

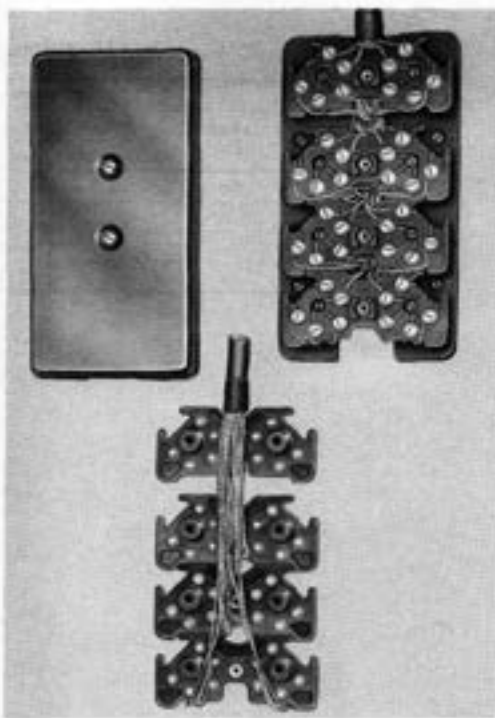


Fig. 14—Four 44A Connecting Blocks Mounted on 168F Backboard and Equipped With 101D Cover

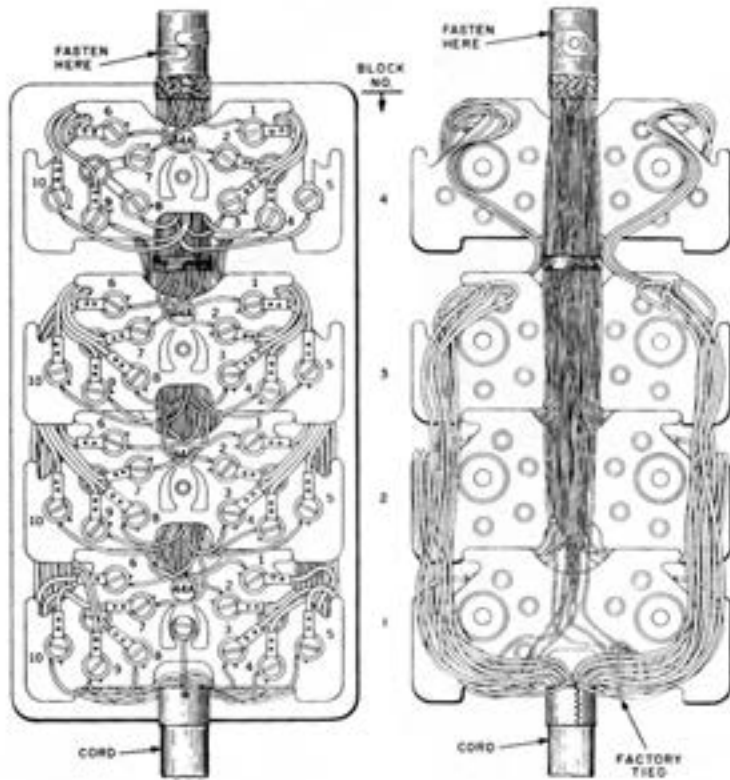


Fig. 15—Arrangement of Four 44A Connecting Blocks Used With 500 Series Key Telephone Sets Equipped With Vinyl-Jacketed Mounting Cord

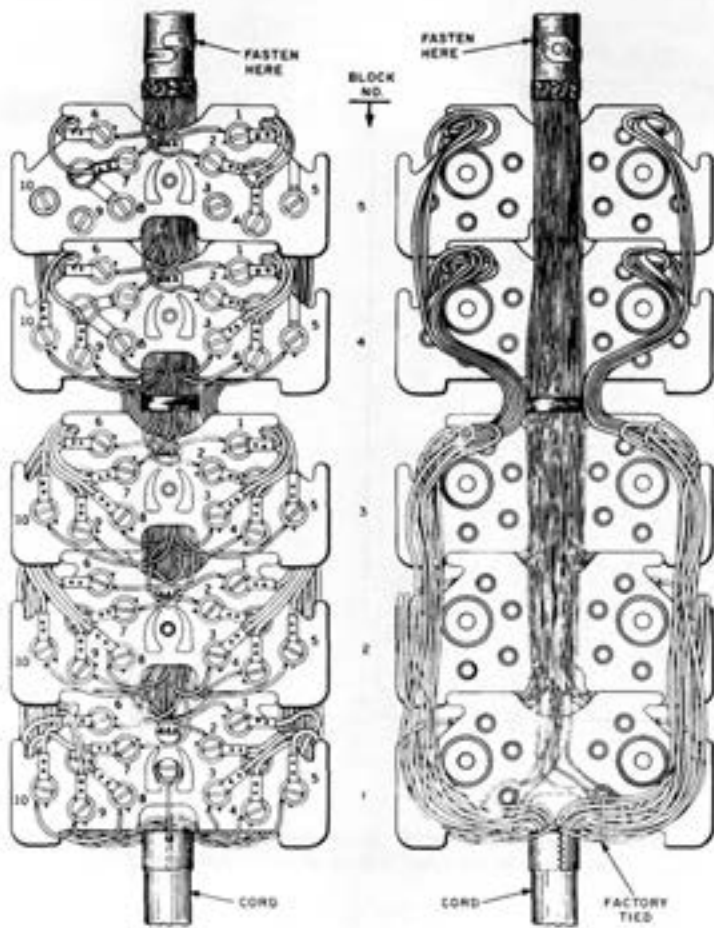


Fig. 16—Arrangement of Five 44A Connecting Blocks Used With 565 Key Telephone Sets for 3A Speakerphone System

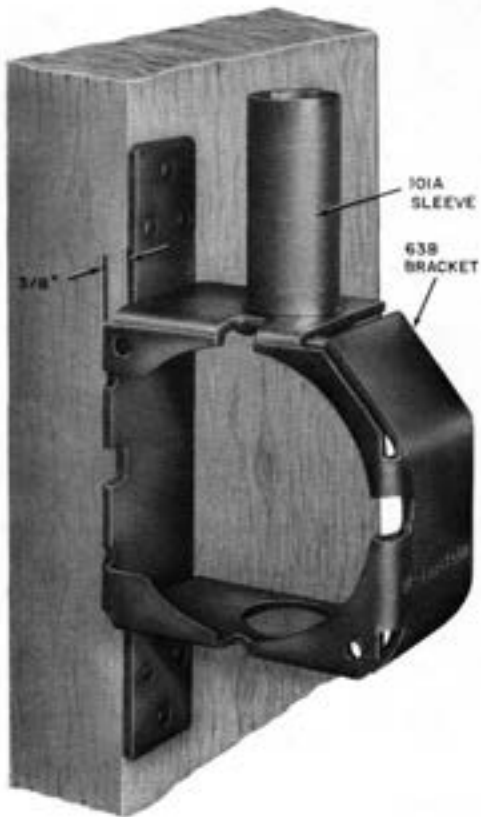


Fig. 17—#63B Bracket With 101A Sleeve Installed

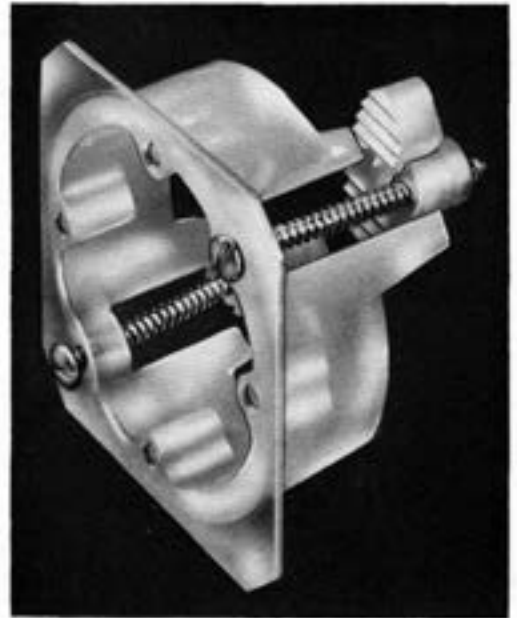


Fig. 18—K5-20502, L2 Bracket

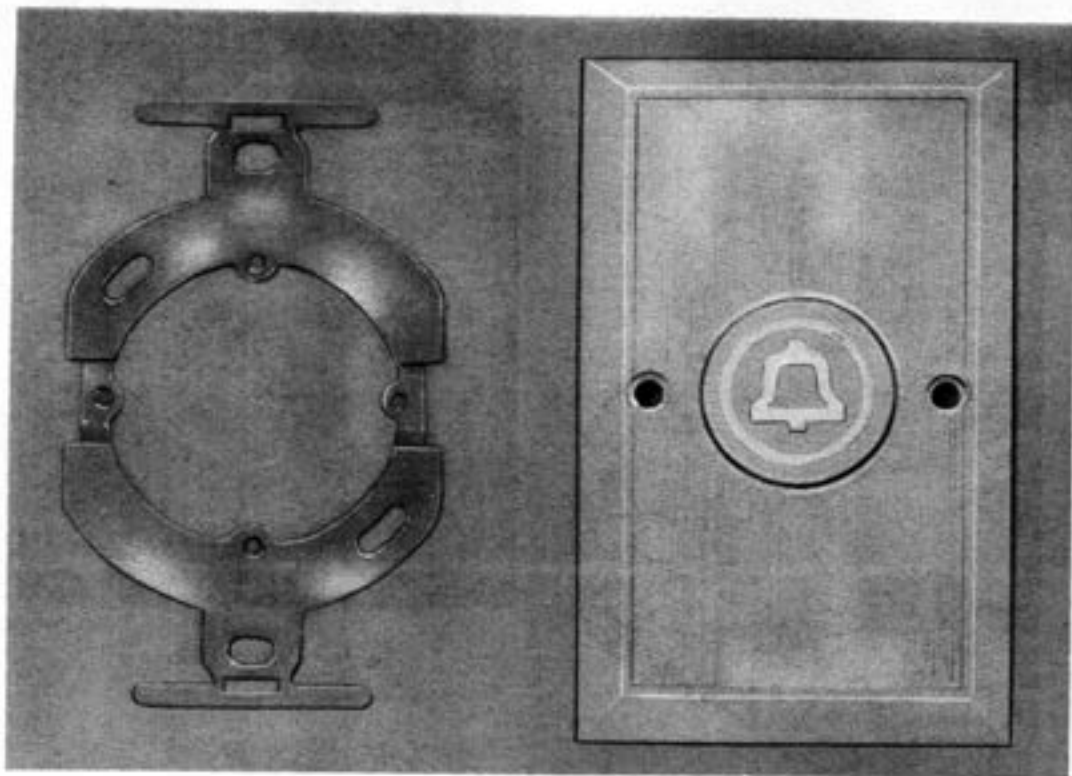
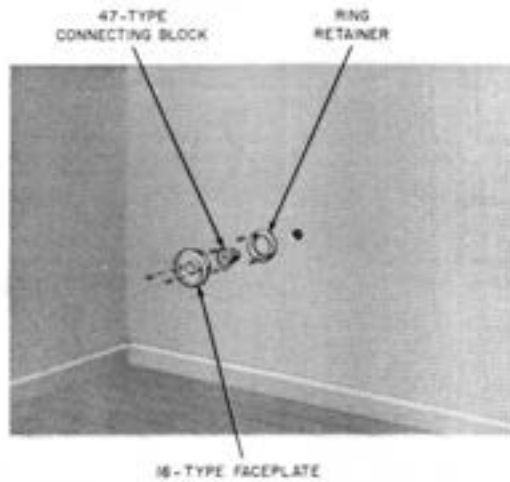


Fig. 19—65A Faceplate



**Fig. 20—Faceplate, Connecting Block, and Ring Retainer
Associated With 63B Bracket**

625-, 630-, AND 635-TYPE CONNECTING BLOCKS IDENTIFICATION, INSTALLATION, AND CONNECTIONS

1. GENERAL

1.01 The 625-, 630-, and 635-type connecting blocks are wall-mounted connectors that provide a plug-in type termination for modular type telephone sets and ancillary devices equipped with a miniplug-ended mounting cord. This type of installation allows the customer to move the modular-portable telephone set to any location equipped with this type connecting block. The 630-type connecting block also provides for installation of a plug-equipped modular wall telephone set. The 635-type connecting block is designed to place equipment such as exclusion sets, alarm dialers, and automatic dialers in series with the telephone line and the station set when an 8-position modular plug on the series device is inserted. The 635A connecting block manufacture discontinued (MD) must be used only with an 8-position plug — inserting a 6-position plug will distort the contacts. However, the 635B connecting block may also be used with a 6-position plug to provide subsequent service. This permits initial series service to be converted to bridged service without requiring replacement of the block. The 74D connecting block (Section 461-606-100) is also available for telephone sets requiring 6-conductor mounting cords.

1.02 This section is reissued to:

- (a) Add information on the 625SA and 42B4 connecting blocks
- (b) Add information on the 625S6 and 42B6 connecting blocks which replace the 74D connecting block (MD)
- (c) Change Fig. 6 to show the horizontal preferred mounting position of the 625S-type connecting blocks and 625T swinger assembly
- (d) Change 635B connecting block to show the metal base replaced by the plastic base
- (e) Add information on the 625FS6 flush-mounted swinger with 6-conductor jack

(f) Add information on the 625TD-type connecting block

(g) Rearrange title.

Revision arrows are used to emphasize the more significant changes.

1.03 Use of the 625-, 630-, and 635-type connecting blocks as registration interface devices, as provided for under the Federal Communications Commission (FCC) Registration Program, is covered in:

- Section 463-400-120: Registration Interface — RJ11C, RJ11W, RJ12C, RJ12W, RJ13C, RJ13W, RJ17C, RJ18C, RJ19C, and RJ1DC — Bridged Single Line Tip and Ring Arrangements
- Section 463-400-130: Uniform Service Order Codes (USOCs) — RJ16X, RJ31X, RJ32X, RJ33X, RJ34X, RJ35X, RJ36X, RJ37X, and RJ38X — Identification and Maintenance — Series Single Line Tip and Ring Arrangements
- Section 463-400-140: Uniform Service Order Codes (USOCs) RJ14C and RJ14W — Identification and Maintenance — Bridged 2-Line Tip and Ring Arrangements
- Section 463-400-142 — RJ25C — Identification and Maintenance — Registration Interface Bridged 3-Line Tip and Ring Arrangements

Table C lists the type connecting block used with a particular USOC.

2. IDENTIFICATION

ORDERING GUIDE

2.01 Order connecting blocks as follows.

NOTICE

Not for use or disclosure outside the
Bell System except under written agreement

- Backboard, 191C (for use with 630A4, if required)
- Backboard, 168D (for surface-mounted blocks on masonry walls)
- Block, Connecting, 625A (Fig. 1)
- Block, Connecting, 625B (Fig. 2)
- Block, Connecting, 625C (Fig. 3)
- Block, Connecting, 625D6 (Fig. 4)
- Block, Connecting, 625F (Fig. 5)
- Block, Connecting, 625FS (Fig. 6)
- Block, Connecting, 625FS6 (Fig. 6)♦
- Block, Connecting, 625H (Fig. 6)
- Block, Connecting, 625SA (Fig. 7)
- Block, Connecting, 625S6 (Fig. 7)

Note: The 625S6 is identical to the 625SA except it is equipped with six terminals.♦

- Block, Connecting, 625T (Fig. 7)
- Block, Connecting, 625TD (Fig. 8)
- Block, Connecting, 625TD2 (Fig. 8)

Note: The 625TD2 is identical to the 625T except it is equipped with two line terminating units.♦

- Block, Connecting, 625WP (Fig. 9)
- Block, Connecting, 630A4 (Fig. 10, 11, and 12)
- Block, Connecting, 635A (MD) (Fig. 13)
- Block, Connecting, 635B (Fig. 14)
- Assembly, Faceplate, 65A (Fig. 15)
- Blade, 8762D-630 (metal lead insertion tool for 630A4)
- Set, Test, 934B (Fig. 20)♦
- Tool, Impact D, AT-8762 (for holding blade, 8762D-630)

- Tool, Handle, 788A1 (also for holding blade, 8762D-630, or 797A tool)
- Tool, 797A (plastic lead insertion tool for 630A4).

CONNECTING BLOCKS

2.02 The **625-type** connecting blocks provide a termination for the D4BU ♦or D6BU♦ miniplug-ended mounting cord used with the modular telephone sets.

2.03 The **625A** connecting block (Fig. 1) is intended for new installations and is surface mounted. It contains a 42A connecting block ♦with four screw terminals and♦ is used to terminate inside wire and spade-tipped leads from the jack in the cover. This connecting block replaces the 42A connecting block and the 549A jack. When mounting the 42A connecting block, leave at least 1/16-inch clearance between the bottom of the cover and the molding, carpet, or floor. ♦The 625A connecting block is available in olive gray (-49) and ivory (-50).♦

Note: It is recommended that connecting blocks be mounted 12 inches or more above the floor where possible. In areas of high corrosion, it is also recommended the 625S-type connecting block be used. The increased height also makes for easier customer plug orientation.

2.04 The **625B** connecting block (Fig. 2) includes the 625F connecting block, 65A faceplate package, and two mounting screws. It is intended for new installations or modular replacement of 548A jacks or 47F connecting blocks. ♦The 625B connecting block is available in ivory (-50) and brown (-54).♦

2.05 The **625C** connecting block (Fig. 3) is the same as the 625A connecting block except the 625C connecting block does not include the 42A connecting block. The 625C connecting block may be used to convert the 42A connecting block in existing installations to modular installation ♦or to replace a defective modular jack.♦

2.06 The **625D6** connecting block (Fig. 4) consists of two 645A6E jacks molded into a plastic faceplate. Twelve screw terminals are provided on the rear of the block for connections. A bracket and all necessary screws for flush mounting are also provided. The 625D6 connecting block is intended for use

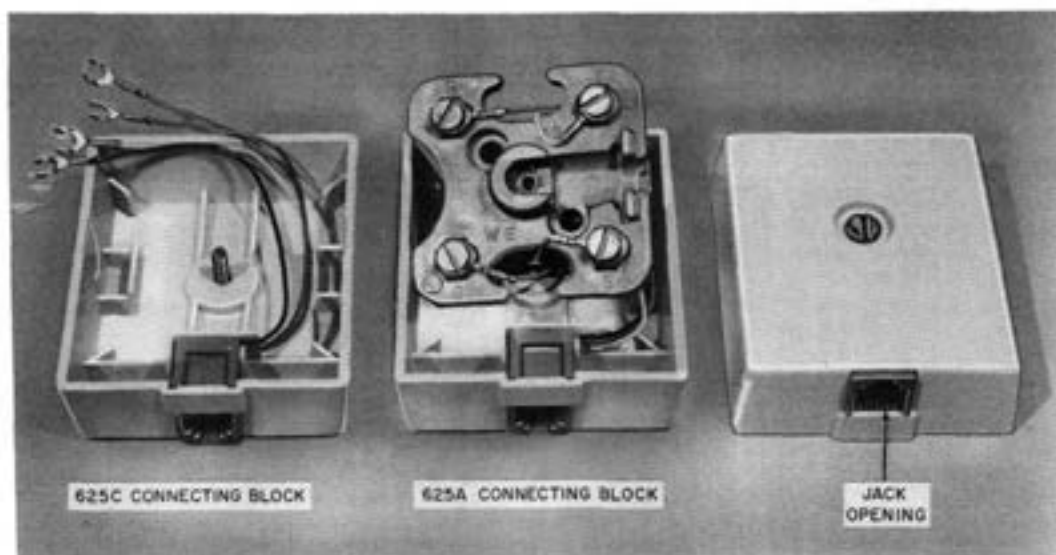


Fig. 1—625A- and 625C-Type Connecting Blocks

in nursing homes and hospital patient rooms where two lines enter through a single outlet and terminate in separate jacks. The 625D6 connecting block can also be used in single-line service to provide for connection of a telephone set and adjunct at the same service outlet. The 625D6 connecting block is available in ivory (-50) and brown (-54).

2.07 The **625F** connecting block (Fig. 5) is equipped with four screw terminals and is intended for use in new installations requiring a flush-type connecting block or for modular replacement of 548A jacks or 47F connecting blocks. It does not include the 65A faceplate and mounting bracket (Fig. 15) which must be ordered separately. The 625F connecting block is available in olive gray (-49), ivory (-50), and brown (-54).

2.08 The **625FS** connecting block (Fig. 6) is flush mounted and has a molded faceplate and a customer-operable spring-loaded cover which protects the interior telephone line contact springs from contamination. It is intended for use in areas subject

to high humidity and condensation or locations exposed to spray painting, washing, or foreign matter.

2.09 The 625FS6 connecting block (Fig. 6) is identical to the 625FS connecting block except it is equipped with six screw terminals.

2.10 The **625H** connecting block (Fig. 6) is constructed the same as the 625FS connecting block except for the modular jack which is a 645H2 jack. The tip and ring are provided on contacts 1 and 6 and will be designated GN and R. The 625H connecting block is intended for use in hospital critical care areas to provide connection by specially wired instruments to transmit electrocardiogram (EKG) signals or voice signals (using a TRIMLINE® telephone set with AD3H or AC2PH telephone set base) on the telephone network.

Note: The 625H connecting block is not applicable to wall-mounted TRIMLINE telephone sets.

2.11 The 625S connecting block consists of a 625T (Fig. 7) swinger-type connecting block and a

- 4 CONTACTS
- FLUSH MOUNTED:
FOR USE IN STANDARD ELECTRICAL
OUTLET BOX
- NOTE:
MOUNTING SCREWS, BRACKET, AND
FACEPLATE PROVIDED
- MATES WITH D-4BU MOUNTING CORD PLUG
- FOR NEW INSTALLATIONS OR MODULAR
REPLACEMENT OF 548-TYPE JACKS

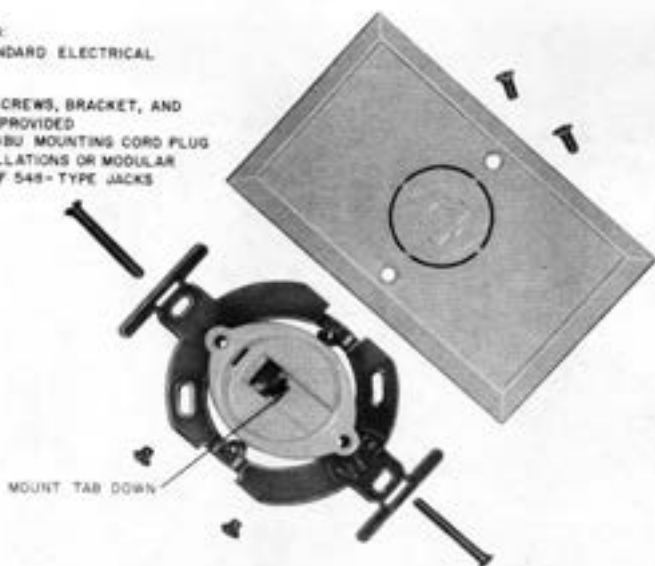


Fig. 2—625B Connecting Block (With Mounting Hardware)

four screw terminal 42A connecting block. The 625T connecting block has a customer-operable spring-loaded cover that automatically swings shut over the miniature jack outlet and protects the interior line contact springs from contamination. It is intended for use in areas subject to high humidity and condensation or locations exposed to dripping, washing, or foreign matter. The 625S connecting block is available in ivory (-50) or brown (-54).

2.12 The 625SA connecting block (Fig. 7) is similar to the 625S connecting block. It consists of a 625T swinger-type connecting block and a four screw terminal 42B4 connecting block base. The 42B-type base fits tightly against the 625T connecting block to resist contamination from the surrounding area. The 625SA connecting block is the preferred connecting block to be used in areas where excessive dust, moisture, insects, and other contaminants are present. The 625SA connecting block is available in ivory (-50) or brown (-54).

2.13 The 625S6 connecting block (Fig. 7) is identical to the 625SA connecting block except that it is

equipped with a six screw terminal 42B6 connecting block base. It replaces the 74D connecting block (MD).♦

2.14 The 625T swinger assembly (Fig. 7) is the cover for the 625S connecting block. It is used to convert existing 42A or 625-type connecting blocks to modularity where extra protection is needed.

2.15 ♦The 625TD connecting block (Fig. 8) consists of a 625T swinger assembly, 42B4 connecting block base, and a line terminating unit. The 625TD connecting block is the standard single-line network interface between customer premise wiring and Bell System Telephone Company network facilities. The 625TD connecting block is available in ivory (-50) only. Refer to Section 461-400-150 for additional information.

2.16 The 625TD2 connecting block is similar to the 625TD connecting block except it is equipped with a second 3A line terminating unit for terminating a second line in the same connecting block. The 625TD2 connecting block is available in ivory (-50).

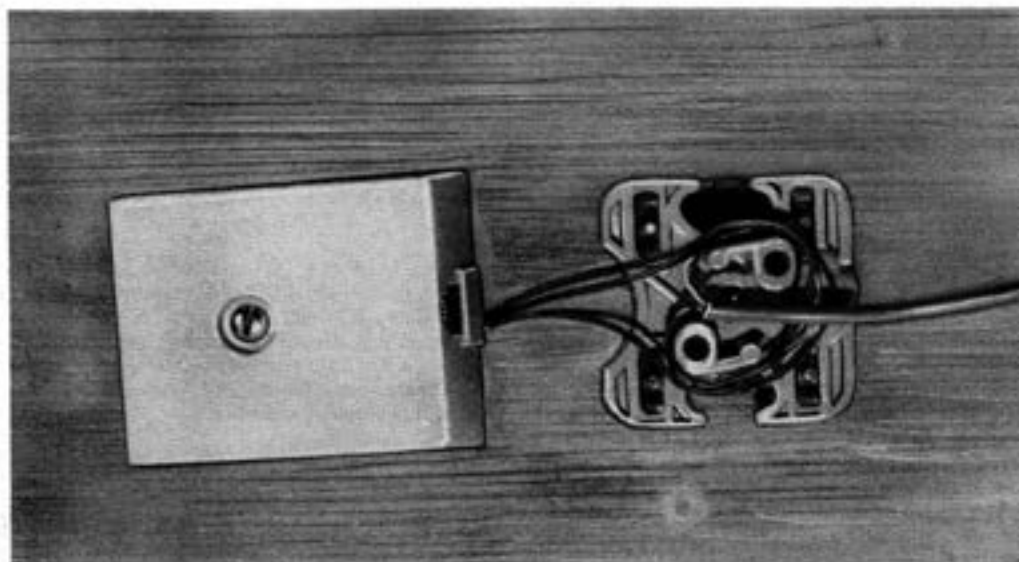
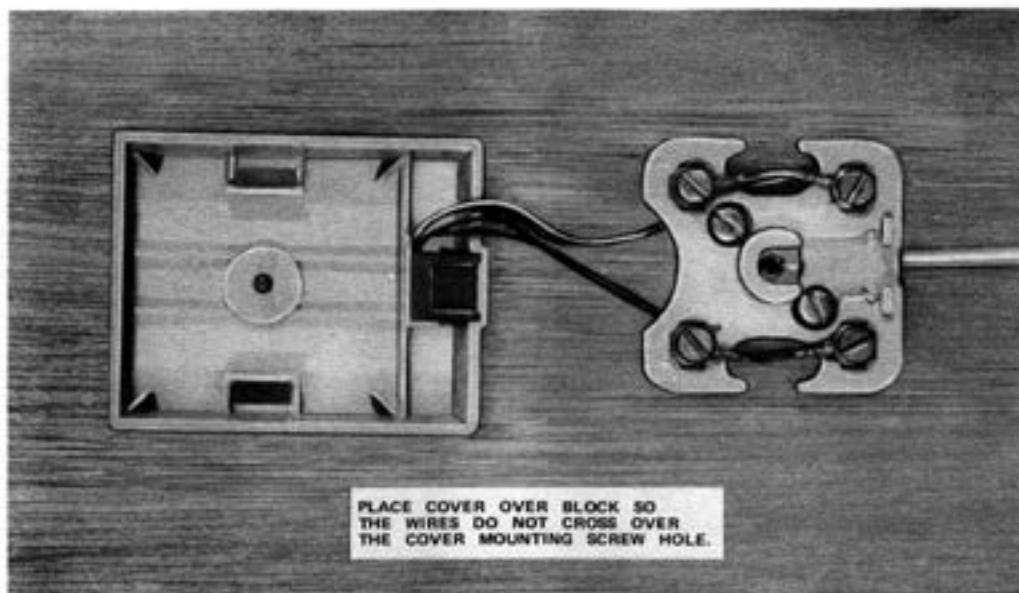


Fig. 3—625C Connecting Block

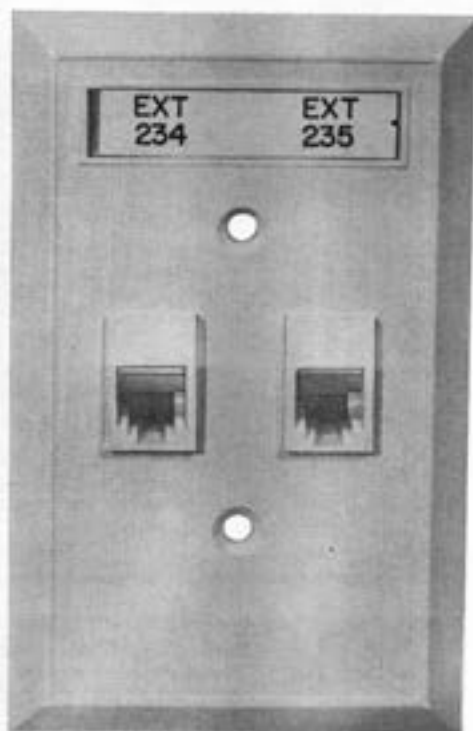
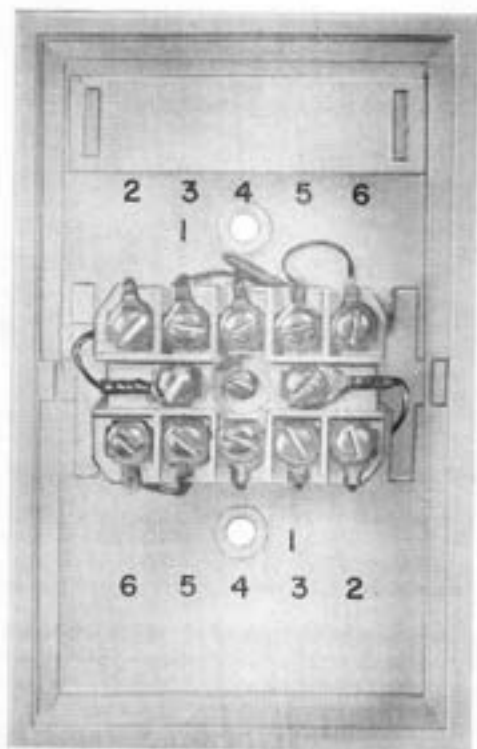


Fig. 4—625D6 Connecting Block

Refer to Section 461-400-150 for additional information.♦

2.17 The **625WP** connecting block (Fig. 9) is for use in outdoor locations and where severe environmental conditions exist. It is intended to mount on a B outlet box AT-8732. A gasket is provided to seal the faceplate assembly and box. A plastic screw-on cap, plastic washer, and split rubber grommet is provided to seal the connection between the telephone mounting cord and jack. ♦It is not intended for use at marinas or for recreational vehicle service.♦

2.18 The **630A4** connecting block (Fig. 10) is a plug-in wall set mounting and will also accept a modular-type mounting cord. It consists of a con-

necting block (Fig. 11) and 1034A mounting plate. Two 3/16-inch 800413577 cover mounting screws, two 5/16-inch 840705008, and two 1-1/8 inch 841065529 flathead machine screws are included in a fastener package. The 630A4 connecting block is now available as a replacement for the 630A6 connecting block and should be ordered accordingly.

2.19 The 797A or 8762D-630 insertion tool head is used for terminating conductors on the 630A4 connecting block. The 8762D insertion tool is adaptable to either the 714B tool handle or the AT-8762 D impact tool; the 797A tool is used with the 714B tool handle **only**. The construction of the blade tips is the same except the 8762D-630 is made of steel instead of plastic. Termination will be the same as shown in Fig. 12.

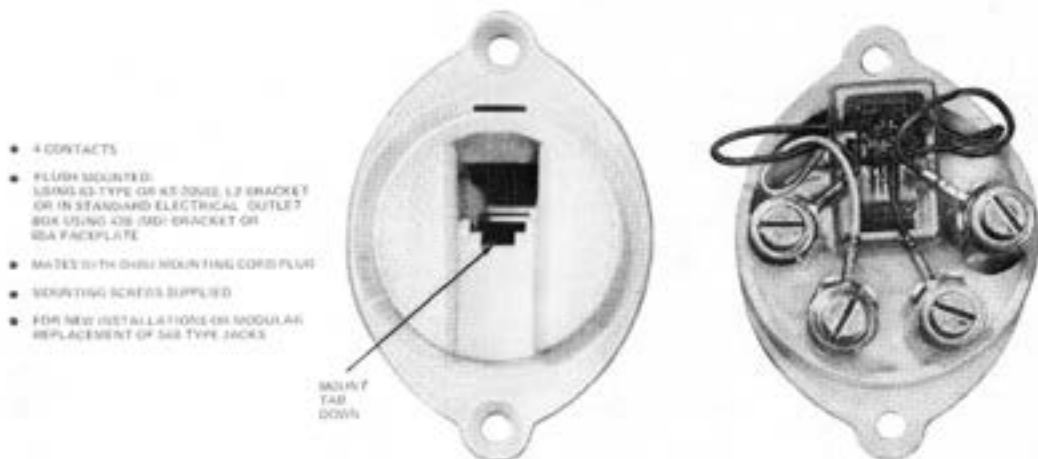


Fig. 5—625F Connecting Block (Without Mounting Hardware)

2.20 The **635A** connecting block (MD) contains a 650-type, 8-contact modular jack which is wired to eight screw terminals (Fig. 13). The 8-position plug on the series equipment is plugged into the modular jack, and the line and controlled station connections are made at the screw terminals. When a plug is not inserted, lead 1 is shorted to lead 4, and lead 5 to lead 8. Insertion of the 8-position plug removes the shorts and puts leads 1 and 4 and 5 and 8 in series with the series or exclusion equipment (Fig. 17). In this mode, continuity to the downstream equipment must be maintained through the series or exclusion equipment. Do not use this connecting block with a 6-position plug, doing so will distort the jack contacts.

2.21 The **635B** connecting block (Fig. 14) which replaces the 635A connecting block (MD) is used to permit company-owned and customer-provided equipment using the D8AA mounting cord to be placed in series with telephone company equipment. This connecting block is equipped with a 651A series-bridged jack and 8 terminal lugs (Fig. 18 and 19).

2.22 The **635B** connecting block has an optional feature which provides the field installation of a 652A jack. This arrangement is used where the con-

trolled device and the series device are both at the same location. The 652A jack is intended to be used with the series device (Fig. 18 and 19).

2.23 When a plug is not inserted in the 651A jack, lead 1 is shorted to lead 4, and lead 5 to 8. Insertion of an 8-position plug removes the shorts and puts leads 1 and 4 and 5 and 8 in series with the series or exclusion equipment (Fig. 19). In this mode, continuity to the downstream equipment must be maintained through the series or exclusion equipment. If a 6-position plug is inserted, the short is not removed and the cord picks up tip and ring on a bridged basis.

3. INSTALLATION

3.01 To protect against contamination, 625- and 630-type connecting blocks are to be installed as follows:

Warning: Never mount with jack-opening up (surface-type) or spring-contacts at the bottom (flush-type).

(a) **Surface-type:** Jack-opening on the bottom is shown in Fig. 1. Narrow baseboards will require mounting connecting block opening to left or right side and should be avoided whenever pos-

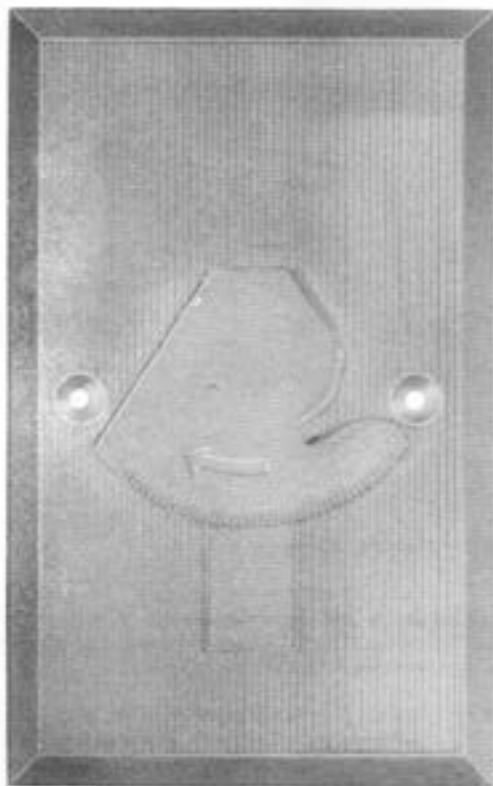


Fig. 6—625FS or 625H Connecting Block

sible. Where permissible, mount the connecting block higher, affording easier jack-plug orientation and less troubles reducing exposure to corrosion due to humidity, dust, chemicals etc. Mount block 12 inches or higher above floor (about electrical outlet height). Blocks mounted higher will substantially reduce troubles. ♦Locations to be avoided when installing connecting blocks are under or near windows, behind curtains or draperies, behind furniture (especially beds). Provide a longer cord to meet customer needs rather than mount the connecting block where it will cause trouble. ♦

BRACKET
(PROVIDED WITH CONNECTING BLOCKS)

NOTE:
BRACKET IS USED TO MOUNT 625FS OR 625H TO GEM
BOX, 63A, OR 63B MOUNTING BRACKET.

(b) **Flush-type:** Jack-opening oriented with spring contacts at the top and tab down is shown in Fig. 2, 4, and 10.

(c) **Spring Cover-type** installation is as follows:

- ♦(1) Install the flush-mounted swingers with the pivot point of the spring-loaded cover up (Fig. 6).
- (2) Install the surface-mounted swingers in the horizontal position so the OPEN label is oriented for correct reading (Fig. 7) and place where convenient for ease of connecting and disconnecting the miniplug.

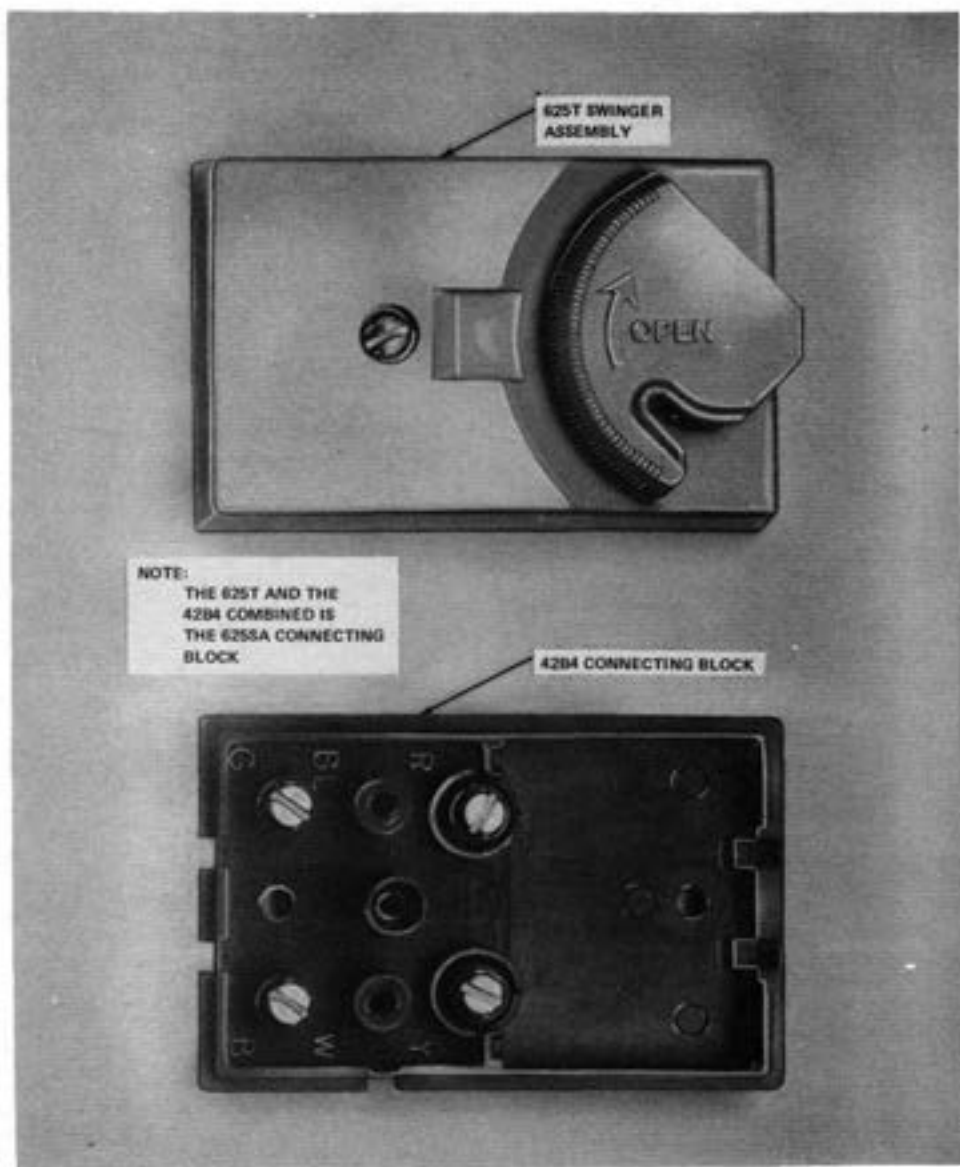


Fig. 7—6255A Connecting Block

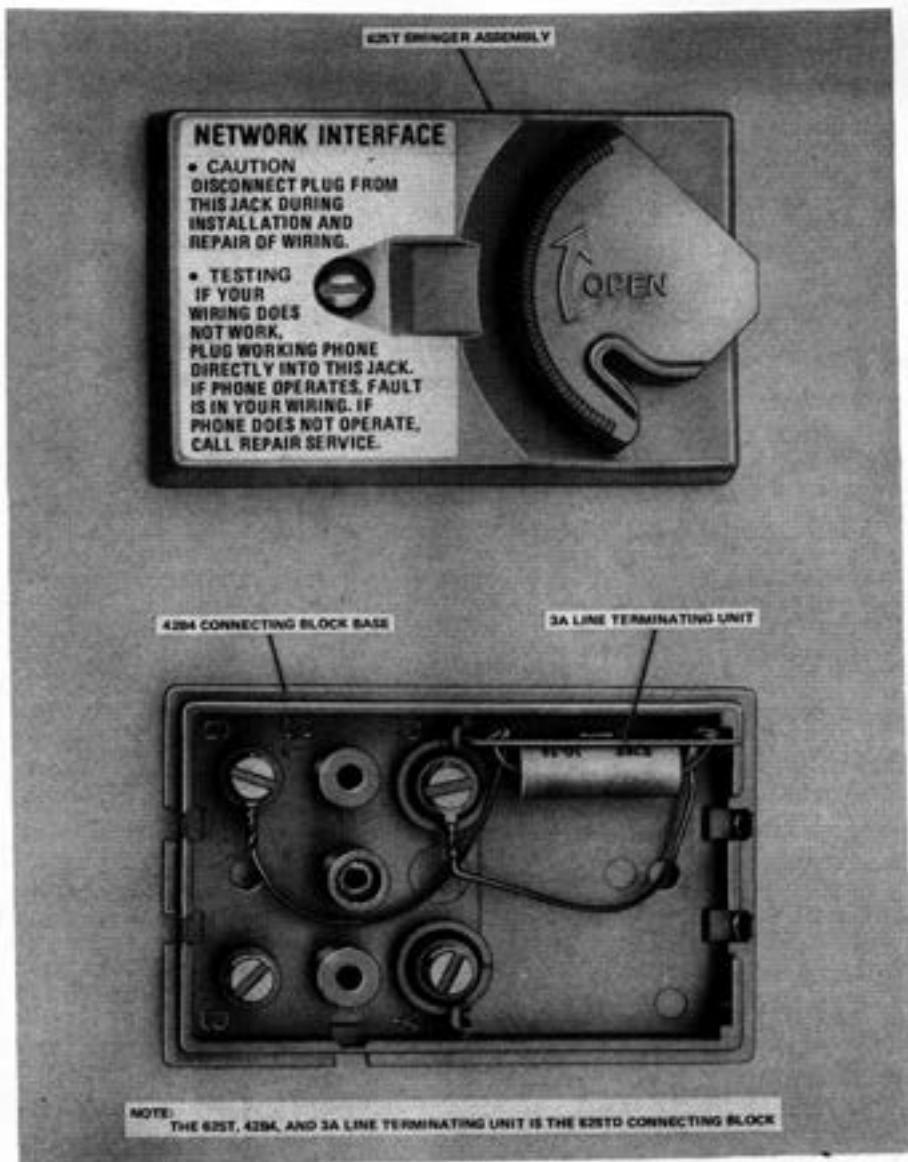


Fig. 8—625TD Connecting Block



Fig. 9—625WP Connecting Block

(3) The jacket of the inside wiring must be contained inside the block. The entrance to the connecting block must be sealed to prevent dust, insects, and other contaminants from entering the block. If the existing wire is corroded, replace the wire.⚡

3.02 625A Connecting Block: Mount the terminal block on a wall (preferred) or baseboard. Terminate the station wire and dress leads as shown in Fig. 3. Terminals on the connecting block are lettered R, G, Y, and B as shown in Table A. When mounting on masonry walls, a backboard should always be used. ⚡A backboard is not necessary with blocks such as the 625TD and 625SA because they standoff the mounting surface.⚡

Note: Do not use on damp external walls (see paragraph 3.08).

3.03 625B Connecting Block: Mount the bracket on a standard electrical outlet box, 63B bracket, or directly to the wall (must have recessed area) using the mounting screws supplied

(Fig. 2). Feed the station wire through the center mounting hole of the bracket and terminate the leads on the connecting block as shown in Table A. Mount the connecting block on bracket and fasten with the two screws supplied. Attach faceplate with the two screws supplied. Where a KS-20502, L2 bracket is used, the 625F connecting block and rectangular faceplate mount directly on the KS-20502, L2 bracket. The bracket supplied with the connecting block is not used.

3.04 625C Connecting Block: Remove cover from existing 42A connecting block. Connect leads from miniplug connector in 625C connecting block to terminals on 42A connecting block. Dress leads as shown in Fig. 3; terminate leads of connecting block as shown in Table A. Attach the connecting block cover to the block using center captive screw in cover. Orient cover in same manner as 625A (see paragraph 3.01). ⚡Face the connecting block face down, left or right, but never up.⚡

3.05 625D6 Connecting Block: Mount the bracket shipped loose with the connecting

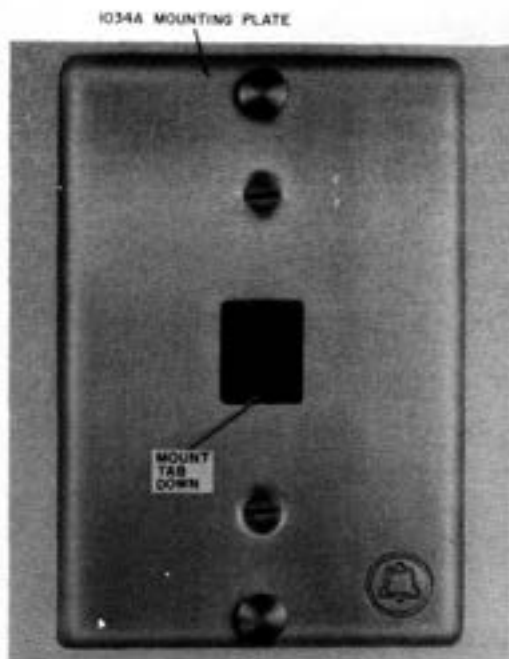


Fig. 10—630A4 Connecting Block (With Mounting Plate)

block to a standard electrical outlet box or 63B bracket with two flathead machine screws supplied. Bracket can also be mounted directly on wall if recessed. Feed station wires through bracket and terminate on screw terminals per Fig. 16. A 625D6 connecting block can be mounted directly on a KS-20502, L2 bracket without using the shipped loose bracket. The terminal strip is wired so the top row of terminals is associated with the right-hand jack and the bottom row with the left-hand jack when the connecting block is viewed from the front with the designation card up. Mount the faceplate to the bracket using oval-head machine screws. Properly identify stations on card and install with card retainer.

3.06 625F Connecting Block: Connect station wire to terminals on rear of 625F connecting block as shown in Table A. Mount 625F connecting block on bracket and attach faceplate.

Note: The 625A, B, C, and F connecting blocks are provided with a protective gummed

MOUNTING HOLE ASSIGNMENT:

- (1) 63 - TYPE BRACKET
- (2) OEM BOX AND NORMAL WALL SURFACE
- (3) OR (4) WEAK WALLS, OVERSIZE WIRING HOLE, LOCAL DAMAGE, ETC
- (5) 1034A MOUNTING PLATE

NOTE:

IF MORE THAN TWO FASTENERS ARE NECESSARY, USE ADDITIONAL MOUNTING HOLES AS REQUIRED

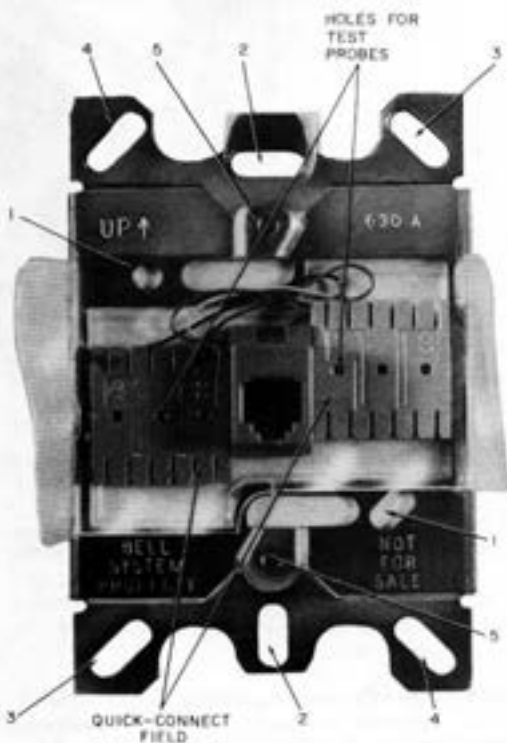


Fig. 11—630A4 Connecting Block (Current Model Without Mounting Plate)

label which is to be attached over the jack entrance if the connecting block is not in use.

3.07 625FS or 625H Connecting Block: Connect station wire to terminals on rear of connecting block as shown in Table A. Mount the block as shown in Fig. 6.



Fig. 12—Terminating Wire With Lead Insertion Tool in 630A4 Connecting Block

3.08 On damp external walls, the 625FS connecting block should be wall mounted at the same height as electrical outlets. Where practical, the 625FS connecting block should be used for this application mounted on either the KS-20502, L2 bracket or the bracket provided.

3.09 625S Connecting Block: Mount the 42A connecting block on the wall (preferred) or baseboard so the 625S connecting block cover is positioned as shown in Fig. 7. When mounting on masonry walls, a backboard should always be used.

3.10 ¶The 625SA and 625S6 connecting blocks are designed to be used in areas where dust, moisture, insects, and other contaminants are present.

The horizontal position (Fig. 7) is the preferred position to mount these connecting blocks.¶

3.11 625T Connecting Block (Swinger Assembly): This connecting block is the cover for the 625S and 625SA connecting blocks. It contains the jack and spade-tipped leads. This connecting block is to be positioned over existing 42-type connecting blocks.

3.12 ¶625TD and 625TD2 Connecting Blocks: Refer to Section 461-400-150 for installation information.¶

3.13 625WP Connecting Block: This block (Fig. 9) should be mounted on a B outlet box or equivalent. A parts package is provided with the 625WP connecting block consisting of a rubber gasket and four mounting screws to seal the mounting block to the outlet box. Also provided is a plastic screw-on cap, a plastic washer, and a split rubber grommet. The cap, washer, and grommet are installed on the mounting cord of the telephone to be used with the jack to seal out moisture. See Table B for appropriate fastener.

3.14 630A4 Connecting Block: This block may be mounted on a 63-type bracket or electrical type outlet box or mounted directly on a wall. In all cases, the block should lie flat against the wall with connector springs oriented to the top and tab to the bottom (Fig. 10). ¶When installing the 630A4 connecting block with the 1034A mounting plate, remove the plastic protection film from the mounting plate.¶

Warning: When installing on an underflush outlet box or plaster ring, the connecting block bracket should be tightened just enough so the assembly is tight on the wall once mounting plate is attached and tightened down. Further tightening will distort the bracket excessively.

(a) A fastener package is provided with the 630A4 connecting block consisting of two 3/16-inch 800413577 cover mounting screws, two 5/16-inch 840705008, and two 1-1/8 inch 841065529 flathead machine screws. Depending on mounting arrangement, select proper fasteners from Table B and mount connecting block using holes designated in Fig. 11. The connecting block should be straight before tightening screws.

(b) The 191B (MD) or 191C backboard snaps over the 630A4 connecting block to cover wall imperfections when necessary.

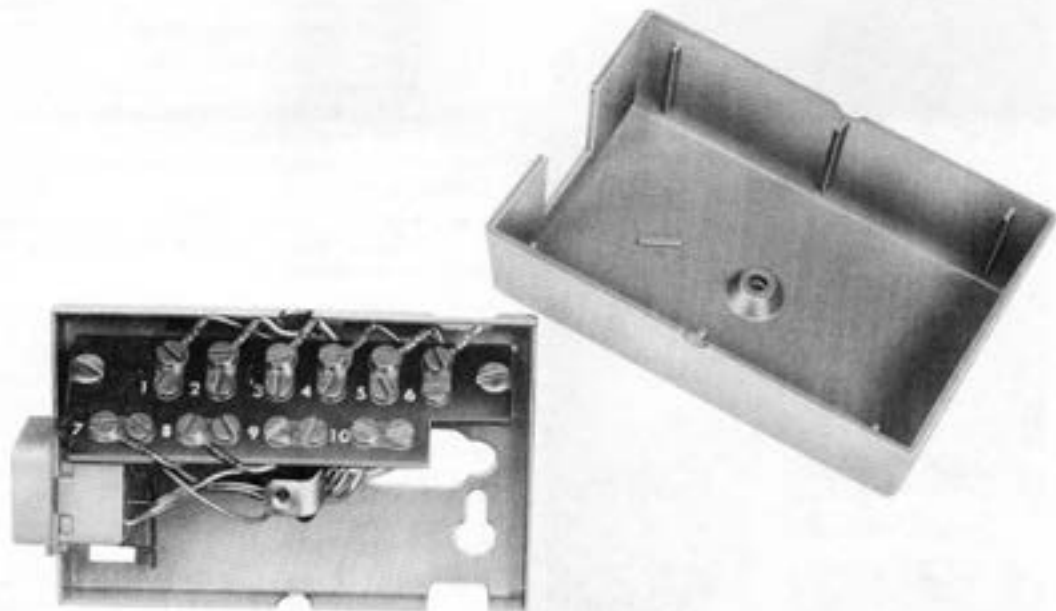


Fig. 13—635A Connecting Block (MD)

(c) The 630A4 connecting block with the old and new bracket now contains an item called the spring block assembly 840696678 (not shown). This spring block assembly is inserted into the jack and is connected to the station wire by the quick-connect field. The four wires of the assembly have been placed in small slots (combs) to prevent shorting.

3.15 635A Connecting Block (MD): Remove the cover from the block by loosening the screw in the center. Mount the block on a suitable vertical surface. Connect the line and control station leads (Fig. 17) to the screw terminals. Replace the cover. Connection of the series or excluded equipment is to be made by inserting the plug into the series jack.

3.16 635B Connecting Block: Remove the cover from the block by loosening the screw in the center. Mount the block on a suitable vertical surface. Connect the line and control station leads to the

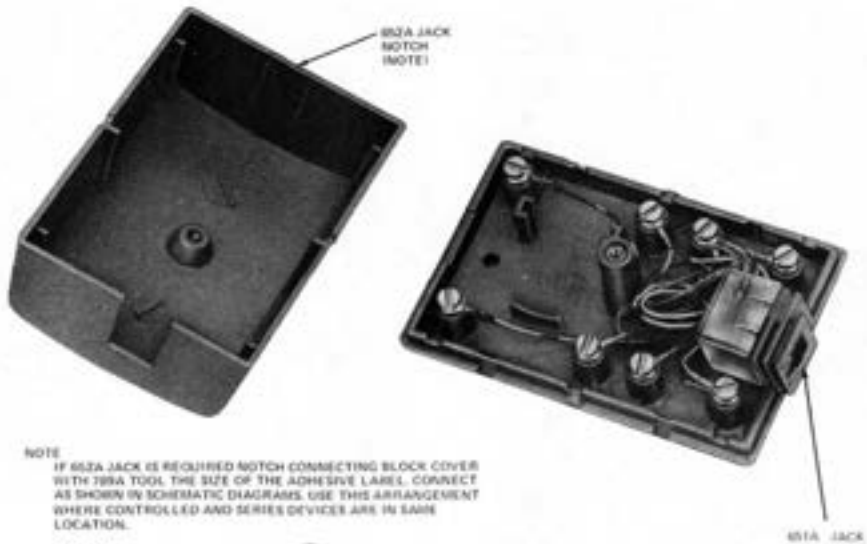
screw terminals (Fig. 18). If the optional 652A jack is to be installed, connect as shown in Fig. 18 or 19.

4. CONNECTIONS

630A4 CONNECTING BLOCK

4.01 The 630A4 connecting block may be used with exposed or concealed station wire. Each quick-connect terminal (total of four) provides three station wire terminations per lead. One termination is required for the jack conductor. An access for a test point is also provided (Fig. 11).

Note: The 630A4 connecting blocks manufactured after March 1977 are received from the factory with a plastic protective wrapper folded around the quick-connect terminals. To connect station wire, fold out the front and side flaps, make connections and dress leads (Fig. 12), then refold wrapper across terminals. This wrapper protects the terminals from foreign matter and



NOTE
IF 632A JACK IS REQUIRED NOTCH CONNECTING BLOCK COVER WITH 789A TOOL THE SIZE OF THE ADHESIVE LABEL. CONNECT AS SHOWN IN SCHEMATIC DIAGRAMS. USE THIS ARRANGEMENT WHERE CONTROLLED AND SERIES DEVICES ARE IN SAME LOCATION.



Fig. 14—#635B Connecting Block

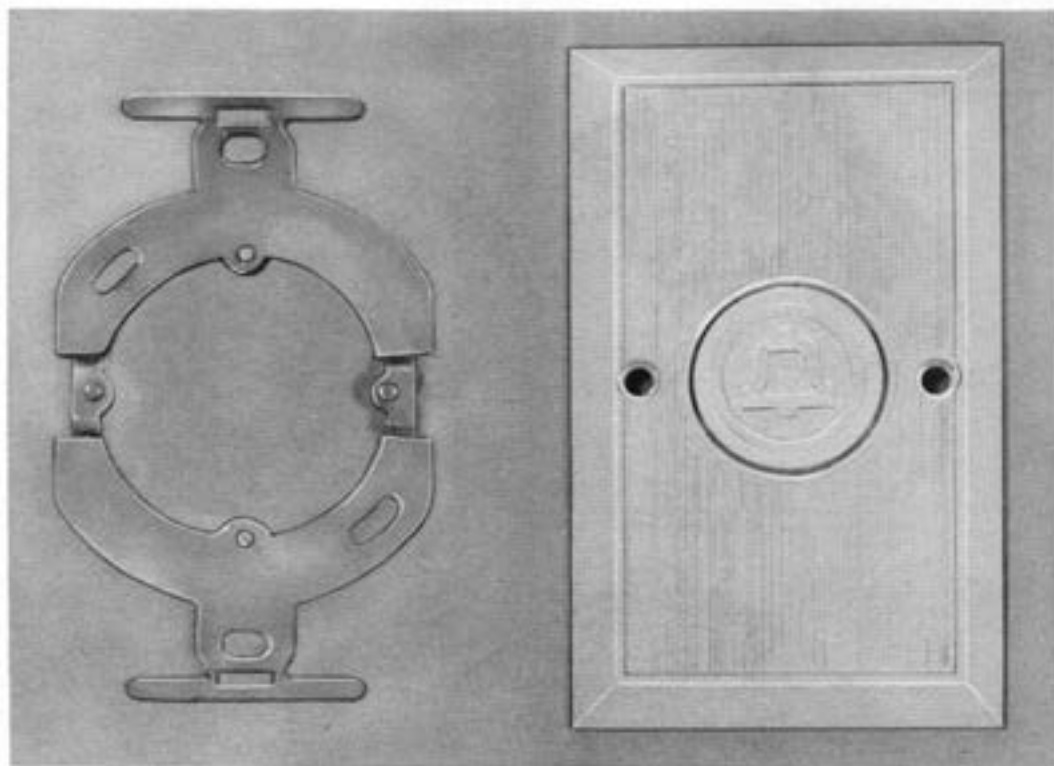
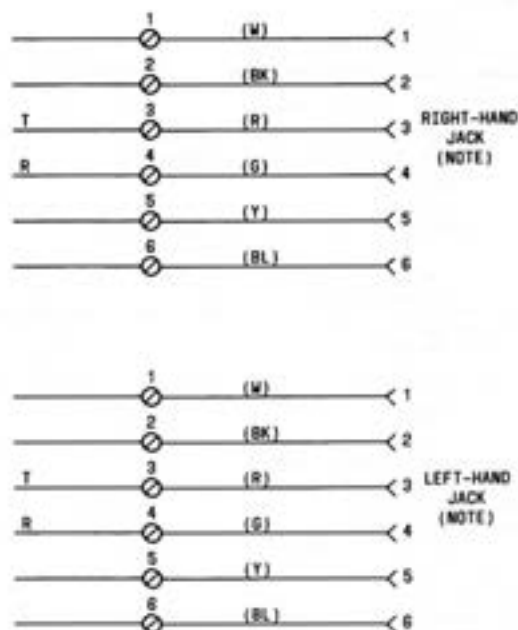


Fig. 15—65A Faceplate

TABLE A

MODULAR CONNECTING BLOCK CONNECTIONS

| HOSPITAL EKG LINE | INSIDE WIRE | | | | CONNECTING BLOCK | | |
|-------------------------|-------------------------|------------------|---------------|---------------------|------------------|-------|---------------|
| | 1A1 OR 1A2 KTS | ONE-LINE SERVICE | | TWO-LINE SERVICE | TERMINAL | | LEAD COLOR |
| | | NO DIAL LIGHT | DIAL LIGHT | | 625 TYPE | 630A4 | |
| Tip | Tip | Tip | Tip | Line 1 Tip | G | 1 | Green |
| Ring | Ring | Ring | Ring | Line 1 Ring | R | 2 | Red |
| | A | | TRNSF | Line 2 Tip | B | 4 | Black |
| | A1 | | TRNSF | Line 2 Ring | Y | 3 | Yellow |



NOTE: TOP ROW OF TERMINALS IS ASSOCIATED WITH RIGHT-HAND JACK AND BOTTOM WITH LEFT-HAND WHEN VIEWED FROM FRONT OF CONNECTING BLOCK WITH DESIGNATION CARD UP.

Fig. 16—Schematic Diagram, 625D6 Connecting Block

also prevents wire ends from making contact with 1034A mounting plate. If a 630A4 connecting block without this protective wrapper is used, insulating tape should be applied to the inside surface of the 1034A mounting plate to prevent any wire ends from making contact with the plate.

4.02 Make connections as shown in Table A as follows:

- (1) Leave station wire conductors unstripped.

- (2) Dress the conductors so they will not be pinched or cross over each other.

Warning: Use no other tool (eg, a screwdriver) than approved insertion tool to insert leads lest connectors be damaged, resulting in noisy connections.

- (3) Use the lead insertion tool to seat conductors in bottom of slots (Fig. 12). Do not twist or rock insertion tool and allow sufficient slack. Do not insert more than one conductor in each slot. Trim the terminated leads approximately 1/4 of an inch from the connecting surface and bend downward in such a manner that the conductor tips do not make contact with the mounting plate.

- (4) Attach mounting plate (Fig. 10) using the two 3/16-inch 800413577 cover mounting screws or two 5/16-inch 840705008 flathead machine screws from the fastener package.

- (5) Remove the protective mylar cover from the stainless steel plate.

- (6) Check for continuity on each lead by inserting 934A tool or 523A4 plug and connecting test set.

Note: Use of heavy gauge (greater than No. 22 AWG), such as JKT station wire or heavily insulated GS-type station (MD) wire, may cause difficulty in installation and/or damage to the connecting block. Such wire should be used only where it is impossible to provide appropriate types (D, G, or H station wire or E inside wire). Do not strip insulation from conductors.

5. TESTING

934B TEST SET (Fig. 20)

5.01 The 934B test set is designed for accessing telephone lines accessed by modular termination.

5.02 The 934B test set has four brass terminals extending from it, one for each lead of the 4-wire modular jack it is testing to which hand telephone test set, other test set, tone generator, etc, leads can be clipped.

TABLE B

FASTENERS FOR MOUNTING 630A4 CONNECTING BLOCK

| TO FASTEN CONNECTING BLOCK TO | QUANTITY (NOTE) | TYPE OF FASTENERS |
|----------------------------------|--------------------|---|
| 1034A Mounting Plate | 2 | 3/16-Inch 800413577 Flathead (No. 6-32) Machine Screw or 5/16-Inch 840705008 |
| 63-Type Bracket or Gem Box | 2 | 1-1/8 Inch 841065529 Flathead (No. 6-32) Machine Screw |
| Stucco | 2 | No. 8-15 by 1-Inch Tapping Screw (840502744), Type AB* |
| Plaster on Wood Lath | 2 | B Wall Screw Anchor, Size 4 or 6† |
| Plaster on Metal Lath | 2 | Molly Screw |
| Paneling on Furring Strips | 2 | No. 6 by 1-Inch Wood Screw‡ |
| Plaster Board on Studs | 2 | Screw Anchor, Size 4 or 6† |
| Hollow Masonry | 2 | B Wall Screw Anchor, Size 4 or 6† |
| Solid Masonry | 2 | Size 10 D Plastic Anchor with No. 8-15 by 1-Inch Tapping Screw, Type B or AB* Steel Anchors |

Note: If connecting block is not securely fastened, additional fasteners should be used.

- * Equivalent size and thread engagement or greater. Tapping screws must always be sunk into lath, furring strips, or studs.
- † Use size 4 anchors for walls up to 5/8-inch thick and use size 6 anchors for walls from 5/8-inch to 1-1/4 inch thick.
- ‡ Wood screws into stud or furring strip is required method.

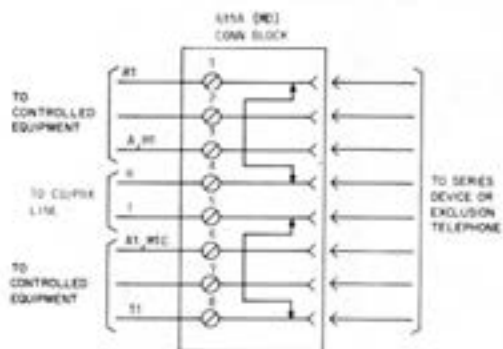


Fig. 17 — Schematic Diagram, 635A Connecting Block (MD)

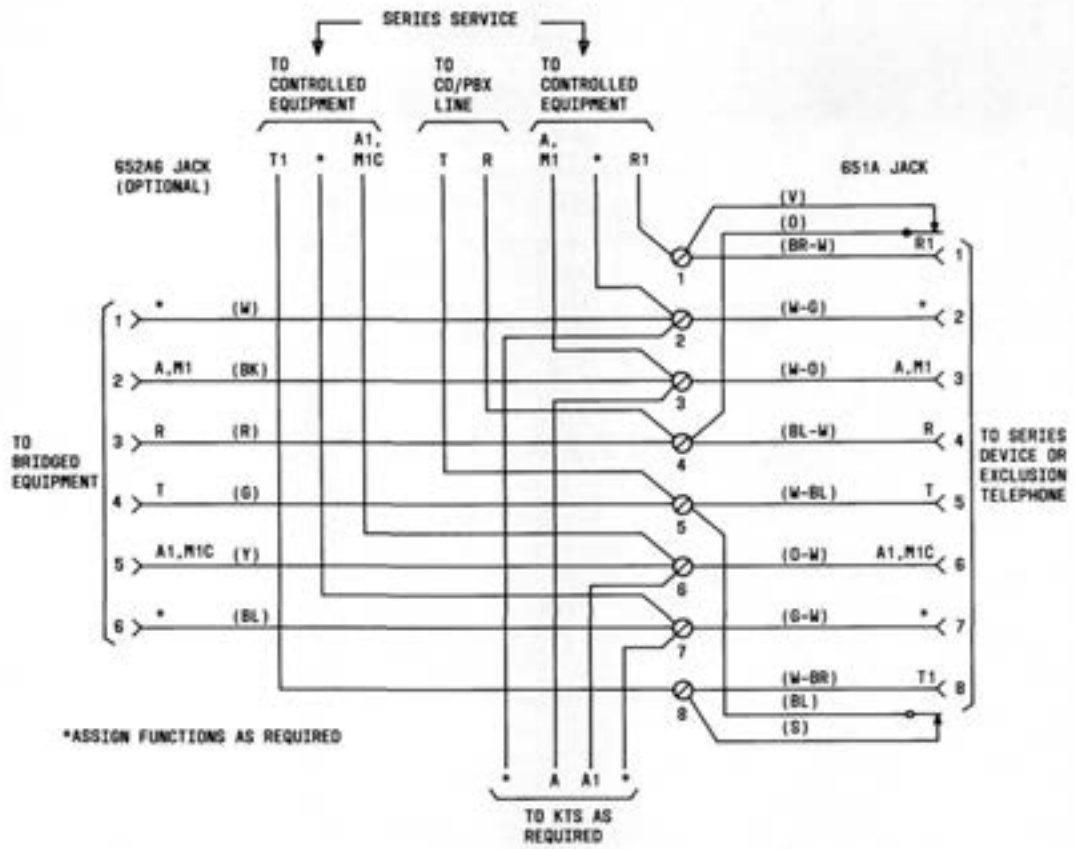


Fig. 18—Schematic Diagram, 635B Connecting Block (Series and/or Bridged Service)

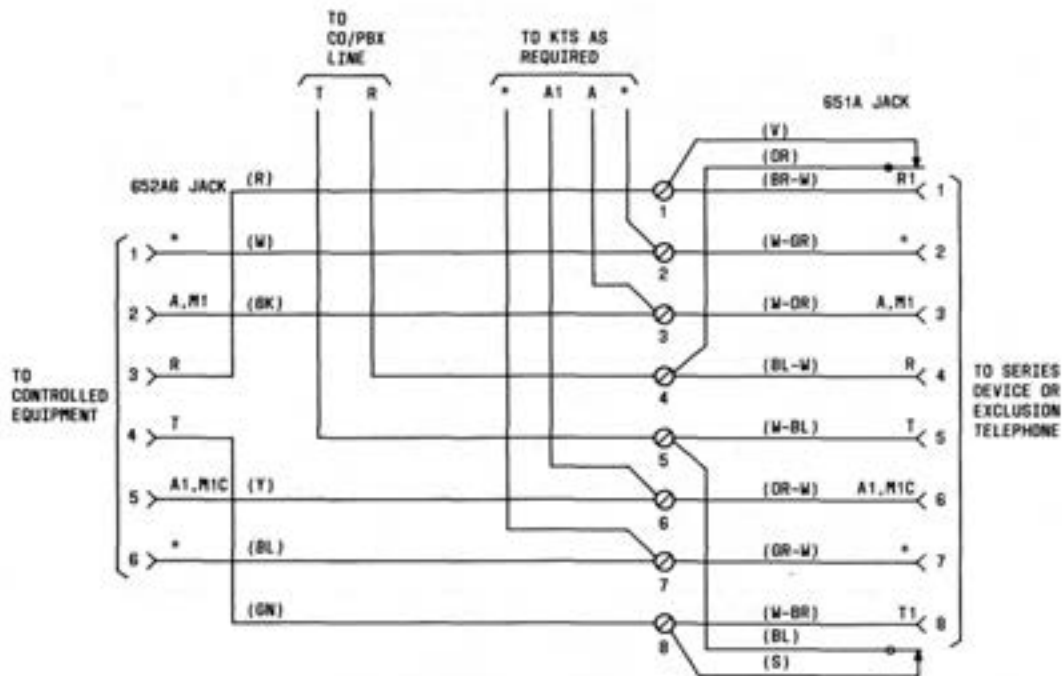


Fig. 19—Schematic Diagram, 635B Connecting Block (Series Service Same Location)

TABLE C
EQUIPMENT REQUIRED—BY USOC CODE

| USOC CODE | 625A, 625C, 625S, 625T (NOTE 1) | 625B, 625F, 625F/S, 625D, 625WP (NOTES 2 AND 3) | 625H | 630A | 635-TYPE |
|--|---------------------------------|---|------|------|----------|
| RJ11C | • | • | | | |
| RJ11W | | | | • | |
| RJ12C | • | • | | | |
| RJ12W | | | | • | |
| RJ13C | • | • | | | |
| RJ13W | | | | • | |
| RJ14C | • | • | | | |
| RJ14W | | | | • | |
| RJ17C | | | • | | |
| RJ31X, RJ32X, RJ33X, RJ34X, RJ35X, RJ36X, RJ37X, RJ38X | | | | | • |

Note 1: For surface-mounted installations.

Note 2: For flush-mounted installations.

Note 3: The 625WP is mounted in a B outlet box which can be either surface- or flush-mounted.

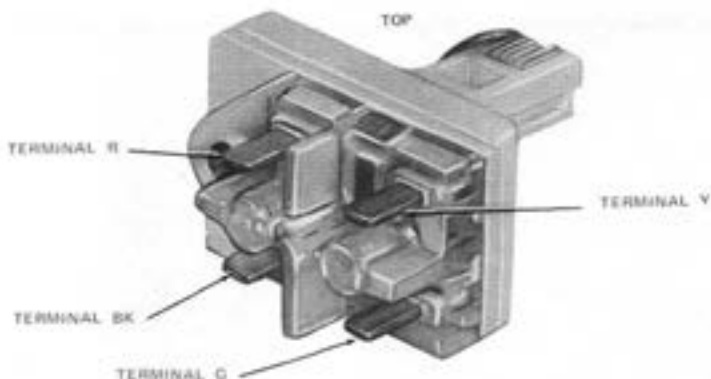


Fig. 20—#934B Test Set

TERMINALS—OUTDOOR WIRING

1. GENERAL

1.01 These terminals are used to terminate multiple drop wire or drop and block wires on the exterior of multifamily dwellings in areas where no station protection is required. They may also be used at other locations as a bridging point.

2. IDENTIFICATION

2.01 The 104A wire terminal shown in Fig. 1 employs a mounting similar to a 10-pair, N-type distribution terminal, but is equipped with a terminal block having facilities for connecting 6-pair multiple drop wire. Two binding posts on the extreme right are strapped together internally and are used for station signaling grounds.

2.02 The 104B wire terminal shown in Fig. 2 employs a mounting which is an aluminum die cast box, with a toggle-type cover similar to the cover on the 104A. It is equipped with a terminal block having facilities for connecting 6-pair multiple drop wire. Two binding posts, one at each end of the block, are strapped together internally and are used for signaling grounds.

3. INSTALLATION

3.01 104A: The 104A wire terminal is provided with a 45A bracket for mounting the terminal. It may be mounted either horizontally or vertically as follows:

- (1) Attach the 45A bracket to mounting surface with No. 14 RH galvanized wood screws or equivalent. Screws shall be of sufficient length to mount securely.
- (2) Set the terminal in position on the 45A bracket and secure with four self-tapping screws.

3.02 104B: The 104B wire terminal can be mounted either horizontally or vertically. Two mounting holes are provided. (Fig. 2). Use No. 14 RH galvanized screws of sufficient length to mount securely.

4. WIRING

4.01 The multiple drop wire or the drop and block wires may be inserted from either end. Two end grommets are provided, one with an open center for the entrance of wires and the other a solid grommet to seal the opposite end.

4.02 The ground wire should be terminated underneath the bottom washer and nut on the ground binding part. No strap need be placed between the two ground posts, since they are wired together internally.

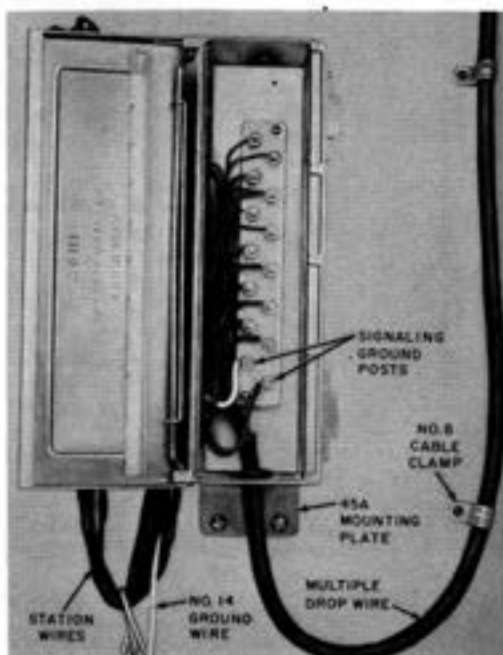


Fig. 1—Wiring of 104A Wire Terminal

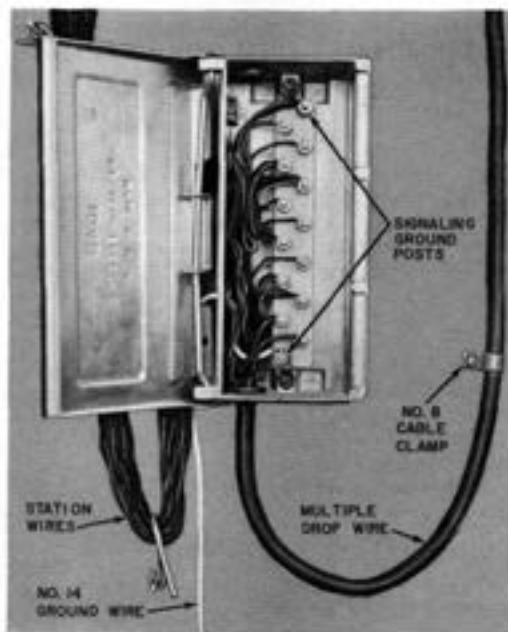


Fig. 2—Wiring of 104B Wire Terminal

JACKS AND PLUGS

IDENTIFICATION AND SERVICE

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| 2. | IDENTIFICATION | 1 |
| 3. | PLUGS | 6 |
| 4. | JACKS AND JACK MOUNTINGS—INDOOR | 14 |
| 5. | JACKS AND JACK MOUNTINGS—OUTDOOR | 21 |
| 6. | PLUGS—INDOOR AND OUTDOOR | 26 |

1. GENERAL

1.01 This section provides identification, installation, and service of jacks and plugs for indoor and outdoor use.

1.02 This section is reissued to:

- Provide information on the 338A adapter
- Rate the 281A adapter manufacture discontinued (MD)
- Delete information pertaining to the following equipment that is MD:

- 391A Jack (MD)
- 392A Jack (MD)
- KS-16151, List 1 Jack (MD)
- 74A bracket (MD)
- KS-19407, List 1 bracket (MD)
- 274A plug (MD)
- 283B plug (MD)
- Early model D4BP cord and adapter
- Early model D3BU cord connected to 505A plug.

2. IDENTIFICATION

2.01 Table A lists jacks and mating plugs for telephone set use. The table shows indoor and outdoor location, contacts, and method of mounting.

2.02 For detailed information covering the installation of B weatherproof-type jacks, refer to Section 461-220-101 entitled Recreational Vehicle Wiring—Nonpermanent Type.

2.03 Adapters for the D4BU mounting cord are used as follows when it is not desirable to replace existing jacks:

- The 224A adapter (Fig. 10) is used to adapt the D4BU mounting cord to the 541A and 551A jacks (12-pin jack).
- The 225A adapter is used to adapt the D4BU mounting cord to 404B (MD), 493A (MD), 497A (MD), 548A, and 549A jacks (4-pin jacks). The 541A, 551A, 548A, and 549A jacks should not be mixed with 625-type connecting blocks where telephone service is required. The current design of the 225A adapter is shown in Fig. 11. The adapter will be available in white (-121) only—former versions were available in ivory or translucent.
- The 1A converter (Fig. 19) is used to convert the 404B (MD), 493A (MD), 497A (MD), 548A, and 549A jacks (4-pin jacks) to the modular system. The 1A converter, when plugged into a 4-pin jack, is designed to be nonremovable.
- The 281A adapter (MD) (Fig. 14) is used to plug into the 623-type line cord jack in the base of the PRINCESS® telephone. This adapter allows the installation of dial illumination transformers without connecting the power to the inside station wiring. See Fig. 15 for wiring of adapter.
- The 338A adapter (Fig. 16) connects at the 625-type connecting block and has two modu-

NOTICE

Not for use or disclosure outside the
Bell System except under written agreement.

TABLE A4

JACKS AND MATING PLUGS—SELECTION

| LOCATION | NO. PINS | MOUNTED | JACK | MATING PLUG |
|----------|---------------|-------------------|--|--------------------------|
| Indoor | 4 | Nonflush | 404B (MD) 549A | 283B (MD) or 505A |
| | | Outlet Box | 493A (MD) 497A (MD) 548A 550A | |
| | 12 | Nonflush | 551A | 504A |
| | 12 | Outlet Box | 541A 547A (MD) 547B | 504A |
| Outdoor | 3 | Includes Housing | KS-8420 (MD) KS-8421 (MD) | KS-8419 (MD) |
| | 3 | B Outlet Box | B Weatherproof Type | B or C Weatherproof Cord |
| | 3 | Flush Mounted | B Waterproof | B or C Weatherproof Cord |
| | 4 or 12 | KS-19316, List 4* | 493A (MD) 541A 548A | 504A 505A |
| | | KS-20202, List 1* | 541A 548A | |

* Will also accept a 625F connecting block in modular installations.

lar jacks, either of which may be used to connect the 2012C transformer (required for a PRINCESS dial light) or the telephone set. The adapter is wired internally to prevent transformer power from being connected to the service wiring (Fig. 17).♦

2.04 The 65A faceplate (Fig. 35) is used when flush-mounted wall jacks and connecting blocks are installed. This faceplate has a knockout to cover the hole when the faceplate is used in wired installations and a jack or connecting block is not installed.

2.05 The B adapter plate (Fig. 18) is used to adapt the B waterproof jack (AT-8731) to a boat where the KS-8420 jack had previously been mounted.

Note: The B adapter plate has two sets of mounting holes. Only one set of holes is used.

The second set is available in case the holes from the old KS-8420 jack interfere with adequate mounting of the adapter plate. The rubber gasket is made so that when placed between the boat and the adapter plate, the holes in the gasket line up with one set of holes in the adapter plate. Turning the gasket over causes the gasket holes to line up with the second set of adapter plate holes. This provides a watertight seal.

2.06 The 158A cover (Fig. 57) is a molded rubber cover to be placed over the screw terminals on the rear of the 625F and 47F connecting block and the 548A jack.

2.07 The 101A sleeve (Fig. 31) is used to protect the prewiring while the drywall is being cut around the 63B bracket as the drywall is being in-

stalled on the studding. The metal tube snaps into either access hole of the bracket before the wiring is placed.

2.08 The 43B bracket is rerated MD and is replaced by the 842615544 bracket which is supplied as part of the 65A faceplate (Fig. 35). The 842615544 bracket will also be supplied as a component of the 547B jack, 550A jack, and 625B connecting block.

2.09 Illustration Index

Fig. 1—404B Jack (MD)

Fig. 2—497A Jack (MD)

Fig. 3 and 4—541A Jack

Fig. 5—547B Jack

Fig. 6—548A Jack

Fig. 7—549A Jack

Fig. 8—550A Jack

Fig. 9—551A Jack

Fig. 10—224A Adapter

Fig. 11—225A Adapter

Fig. 12—267A Adapter

Fig. 13—Schematic Diagram, 267A Adapter

Fig. 14—281A Adapter (MD)

Fig. 15—Schematic Diagram, 281A Adapter (MD)

Fig. 16—~~338A~~ Adapter~~†~~

Fig. 17—~~Schematic Diagram, 338A Adapter~~†~~~~

Fig. 18—AT-8731 B Adapter Plate

Fig. 19—1A Converter

Fig. 20—KS-8420 Jack (MD)

Fig. 21, 22, and 23—KS-8421 Jack (MD)

Fig. 24—KS-19316, List 4 Housing

Fig. 25—KS-19316, List 5 Cover

Fig. 26 and 27—KS-19316, List 6 Housing

Fig. 28—KS-20302, List 1 and List 2 Housing

Fig. 29—43-Type Bracket (MD)

Fig. 30—63A Bracket (MD)

Fig. 31—63B Bracket

Fig. 32—KS-20502, List 1 Bracket (MD)

Fig. 33—KS-20502, List 2 Bracket

Fig. 34—16-Type Faceplate

Fig. 35—65A Faceplate

Fig. 36—423A Plug

Fig. 37—478-Type Plug

Fig. 38 and 39—504A Plug

Fig. 40, 41, and 42—505A Plug

Fig. 43—KS-8419 Plug (MD)

Fig. 44, 45, and 46—B Weatherproof Jack

Fig. 47 and 48—B Waterproof Jack

Fig. 49 and 50—B Weatherproof Female Jack Adapter

Fig. 51—B Outlet Box

Fig. 52—B Mounting Bracket

Fig. 53 and 54—Assembly of B Waterproof Jack to B Outlet Box and B Mounting Bracket

Fig. 55—B Weatherproof Cord

Fig. 56—C Weatherproof Cord

Fig. 57—158A Cover

Fig. 58 and 59—652WP4 Jack

2.10 Ordering Guide

- Adapter, 224A

- Adapter, 225A
- Adapter, 267A
- Adapter, 338A*
- Adapter, Jack, Female, Weatherproof, B
- Box, Outlet, B
- Bracket, 43B (MD)
- Bracket, 63A (MD)
- Bracket, 63B
- Bracket, Mounting, B
- Bracket, KS-20502, List 2
- Converter, 1A
- Cord, Weatherproof, B
- Cord, Weatherproof, C
- Cordage, Flexible, KS-15153 (3-conductor, 18-gauge) Specify length†
- Cover, KS-19316, List 5 (cast aluminum)
- Housing, KS-19316, List 4 (cast aluminum)
- Housing, KS-19316, List 5 (cast aluminum)
- Housing, KS-19316, List 6 (cast aluminum)
- Housing, KS-20202, List 1 (cast aluminum)
- Jack, 541A- (*)
- Jack, 547B- (*)
- Jack, 548A- (*)
- Jack, 549A- (*)
- Jack, 550A- (*)
- Jack, 551A- (*)
- Jack, KS-8420 (MD) (Brass)
- Jack, KS-8421 (MD) (Brass)
- Jack, Male, Weatherproof, B
- Jack, Female, Weatherproof, B
- Jack, Male, Waterproof, B
- Plate, B Adapter, AT-8731
- Plate, Face, 16A- (*)
- Plate, Face, 16B- (*)
- Plate, Face, 16D- (*)
- Plate, Face, 65A- (*)
- Plug, 423A- (*)
- Plug, 478A- (*)
- Plug, 478B- (*)
- Plug, 504A- (*)
- Plug, 505A- (*)
- Plug, KS-8419 (MD) (Brass only)
- Template, B
- Template, C

Replaceable (Optional) Components

- Plate, Cover, 818839490
- Plate, Cover, 818839508
- Plate, Cover, 818839540

2.11 Color: See Table B for color ordering information on jacks. See Table C for color ordering information on plugs.

2.12 Application

- Fig. 1 through 9 and 19 through 23 show jacks used in indoor and outdoor installations.
- Fig. 10 through 18 show adapters used with plug-ended mounting cords.

* Add color suffix, Table B or C.

† Used with KS-8419 plug.

TABLE B

COLOR ORDERING GUIDE—JACKS

| JACK AND FACEPLATE | LIGHT OLIVE GRAY (-49) | IVORY (-50) | BROWN (-54) |
|--------------------|------------------------|-------------|-------------|
| 541A | • | • | • |
| 547B | •* | •* | •* |
| 548A | • | • | • |
| 549A | • | • | • |
| 550A | •* | •* | •* |
| 551A | • | • | • |
| 16A | • | • | • |
| 16B | • | • | • |
| 16D | • | • | • |
| 65A | • | • | • |

* Additional faceplates in colors corresponding to jack.

TABLE C

COLOR ORDERING GUIDE—PLUGS

| COLOR | | TYPE PLUG | | | | |
|------------------|-----|-----------|------|------|------|------|
| | | 423A* | 478A | 478B | 504A | 505A |
| Black | -3 | | • | | | |
| Light Olive Gray | -49 | | | | • | • |
| Ivory | -50 | | • | • | • | • |
| Green | -51 | | | | | |
| Red | -53 | | | | | |
| Brown | -54 | | | | | |
| Yellow | -56 | | | | | |
| White | -58 | | • | | | |
| Rose Pink | -59 | | | | | |
| Light Beige | -60 | | | | | |
| Light Gray | -61 | | | | | |
| Aqua Blue | -62 | | | | | |
| Turquoise | -64 | | | | | |

* This plug is inside the 750 telephone set and may be any color as it is made from scrap plastic.

- Fig. 24 through 35 show housings, brackets, and faceplates used.
- Fig. 36 through 50 show plugs used with jacks.
- Fig. 51 through 54 show B weatherproof-type jacks and other apparatus for outdoor installations. (Replaces the KS-8419 and KS-8421 jacks.)
- Fig. 55 and 56 show B and C weatherproof cord used with telephone set.
- Fig. 57 shows 158A cover used for the protection of the screw terminals on rear of 625F and 47F connecting blocks and 548A jack.
- Fig. 58 and 59 show the 652WP4 modular outdoor jack.



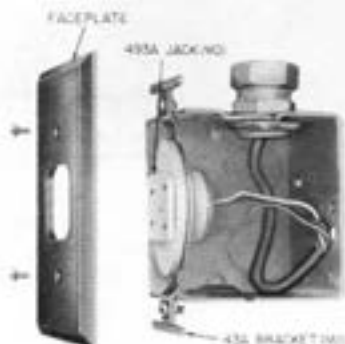
- REPLACED BY 549A JACK
- 4 CONTACTS
- NONFLUSH MOUNTED
- MATES WITH 505A PLUG
- MOUNTING HARDWARE SUPPLIED

Fig. 1—404B Jack (MD)

3. PLUGS

A. 423A Plug

3.01 The 423A plug (Fig. 36) is a 2-piece, 4-contact molded plastic plug for use inside the 750-type panel telephone set. U-shaped projections are molded



- REPLACED BY 550A JACK
- 4 CONTACTS
- FLUSH WALL MOUNTED
- MATES WITH 505A PLUG
- MOUNTING HARDWARE SUPPLIED

Fig. 2—497A Jack (MD) Mounted in Standard Electrical Outlet Box

in the base for securing the mounting cord. Refer to Table C for color availability.

B. 478A Plug

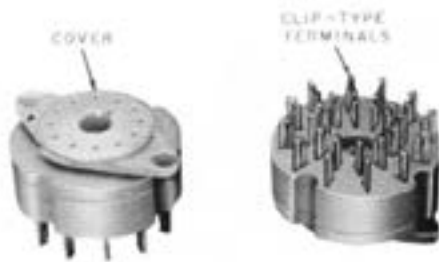
3.02 The 478A plug (Fig. 37) is a flexible twin-double conductor plug. It contains a 616P miniature modular jack and a 100-ohm 1-watt resistor. It is arranged so each plug finger may be turned 90 degrees in the shell to present a new surface for wear. It is intended to be used with G15- and K1-type headsets in place of the G3CR- and G3L-type headsets.

C. 478B Plug

3.03 The 478B plug is identical to the 478A plug except it is not equipped with the 100-ohm 1-watt resistor.

D. 504A Plug

3.04 The 504A plug (Fig. 38) is a 12-terminal plug consisting of a molded plastic block, cord tip guide, and cap assembly held together by one screw.



- 12 CONTACTS
- FLUSH MOUNTED USING 63-TYPE OR XS-20502, L2 BRACKET AND 16A FACEPLATE
- MATES WITH 504A PLUG

Fig. 3—541A Jack

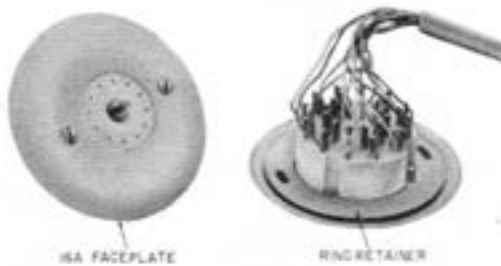
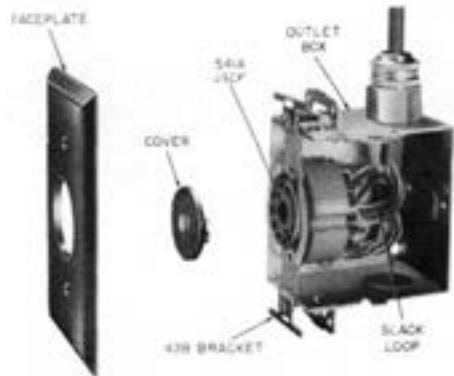


Fig. 4—541A Jack With Faceplate and Terminated 541A Jack Using Retainer



- 12 CONTACTS
- FLUSH WALL MOUNTED
- MATES WITH 504A PLUGS
- MOUNTING SCREWS AND FACEPLATE SUPPLIED
- OPTIONAL COLOR FACEPLATES

Fig. 5—547B Jack Mounted in Standard Electrical Outlet Box



- 4 CONTACTS
- FLUSH MOUNTED:
USING 63-TYPE OR K5-20502, LIST 2
BRACKET AND 16A FACEPLATE OR IN
STANDARD ELECTRICAL OUTLET BOX
USING 43B BRACKET OR IN WOODWORK
USING 1-1/4 INCH HOLE
- MATES WITH 505A PLUG
- MOUNTING SCREWS SUPPLIED
- REPLACES 493A JACK (MD)

Fig. 6—548A Jack



- 4 CONTACTS
- COMPONENTS:
548A JACK
43B BRACKET
FACEPLATE
- EARLY PRODUCTION SUPPLIED
WITH 43A BRACKET (MD)
- MATES WITH 505A PLUG
- 6 MOUNTING SCREWS SUPPLIED

Fig. 8—550A Jack Mounted



- 4 CONTACTS, DOUBLE
TERMINAL
- NONFLUSH BASEBOARD
MOUNTED
- MATES WITH 505A PLUG
- MOUNTING SCREWS SUPPLIED

Fig. 7—549A Jack

Each terminal is equipped with a socket-type connector to receive the cord tip. A cord tip guide covers the terminals. The terminals are numbered 1 through 12 and match numbering on the 541A jack. The plug can be inserted into the jack in only one position. It is available in colors shown in Table C. Included with the plug is a metal cord stay designed for use with cords equipped with a wire S hook (Fig. 39). The S hook is removed and discarded. The cord stay, inserted into the vacated band hole, serves as a wing band. Slots are provided on the plug block and shell to hold a wing band or the cord stay. The wing band or cord stay seated in the slot prevents the mounting cord from slipping out of the plug.

E. 505A Plug

3.05 The 505A plug (Fig. 40, 41, 42) is a 4-contact plug similar to the 504A plug; in addition, however, it has a cord fastener which holds the cord



- 12 CONTACTS
- NONFLUSH BASEBOARD MOUNTED
- MATES WITH 504A PLUG
- MOUNTING SCREWS SUPPLIED

Fig. 9—551A Jack



Fig. 11—225A Adapter

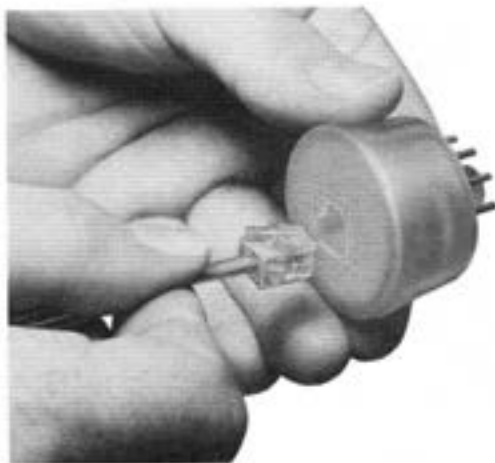


Fig. 10—224A Adapter

in place while spade tips are being connected. The cord fastener also anchors the mounting cord in the assembled plug. The plug is available in colors shown in Table C. The current model cord tip guide provides a cutout to permit the use of a cord equipped with a flat eyelet stay band.

F. KS-8419 Plug (MD)

3.06 The KS-8419 plug (Fig. 43) is a 3-contact, brass plug intended for connecting telephone sets installed on boats, trains, or auto trailers to outdoor jacks of PBX or CO lines. This plug is intended for use with KS-8420 jacks. This plug has been replaced by the B and C weatherproof cords which have plugs attached and are intended to be used with B weatherproof, B waterproof jacks, and B weatherproof jack adapter.

G. B Weatherproof Male Jack

3.07 The B weatherproof jack (Fig. 44 and 45) mounts in the B outlet box on the recreational vehicle, houseboats, etc. and receives the female plug of the B weatherproof cord to provide telephone service to recreational vehicles. The jack has a

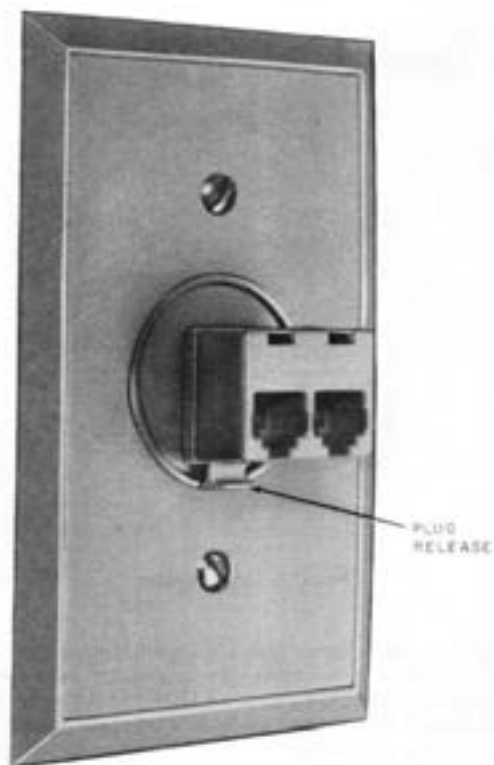


Fig. 12—267A Adapter (Plugged Into 625B Connecting Block)

spring-loaded hinged cover to make it weatherproof when not in use. Three screw terminals stamped R, T, and GR on rear of jack provide connection to ring, tip, and ground.

H. B Weatherproof Female Jack

3.08 The B weatherproof female jack (Fig. 44 and 46) looks the same as the male jack except for the pins, and mounts in the B outlet box *at the trailer service pad or on the dock at the marina*. It receives the male plug of the B or C weatherproof cord.

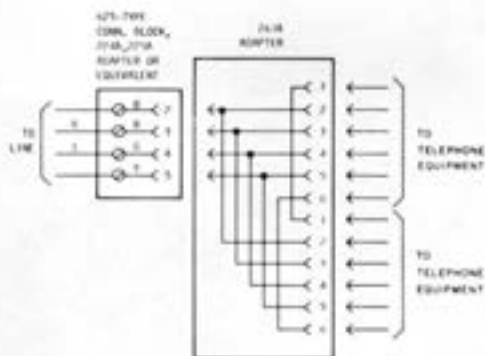


Fig. 13—Schematic Diagram, 267A Adapter



Fig. 14—281A Adapter (MD)

I. B Waterproof Male Jack

3.09 The B waterproof male jack (Fig. 47 and 48) is mounted on a boat and receives the female plug of the B weatherproof cord to provide telephone service to boats. It is chrome plated with hinged, threaded cover to make the jack waterproof when not in use. Three screw terminals on the rear of the jack stamped R, T, and GR provide connections.

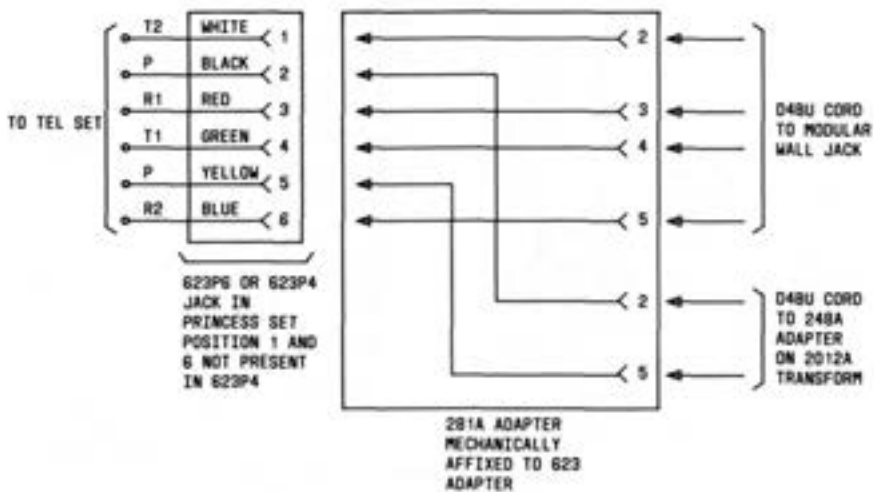


Fig. 15—Schematic Diagram, 281A Adapter (MD)

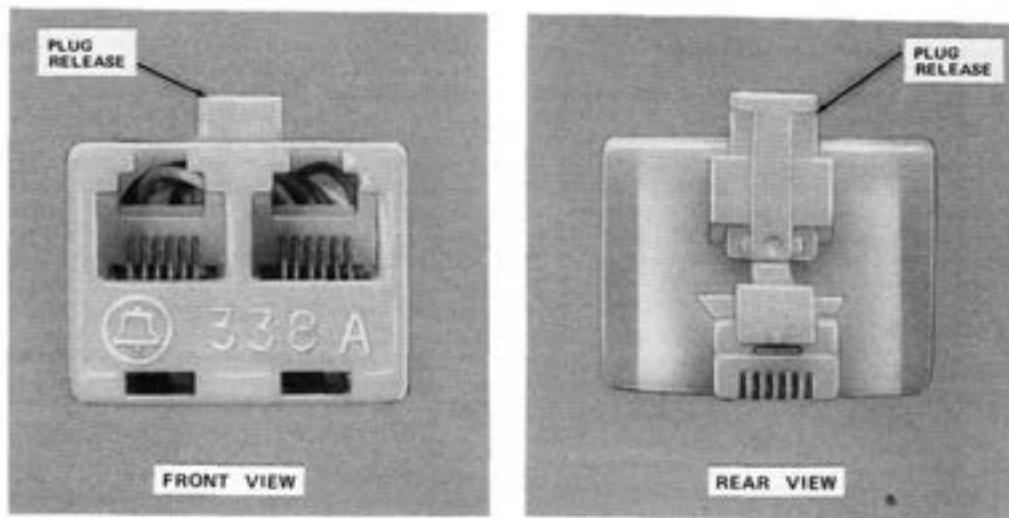


Fig. 16—338A Adapter

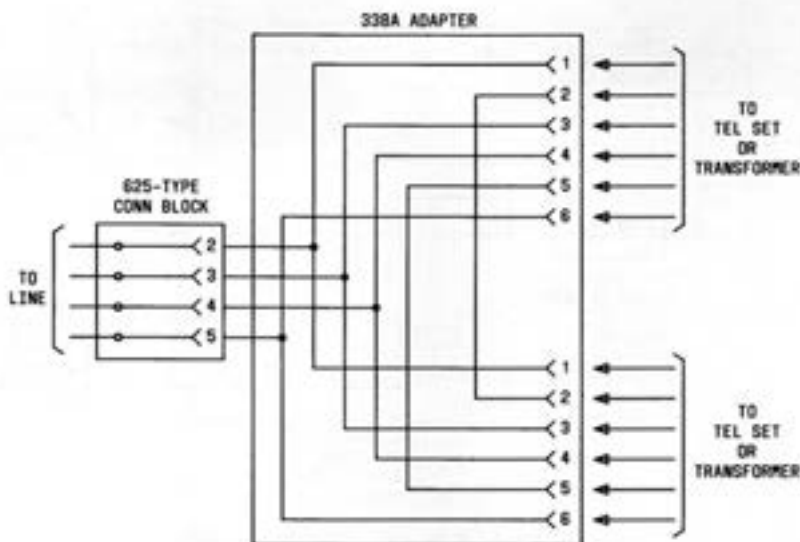


Fig. 17—Schematic Diagram 338A Adapter

J. B Weatherproof Female Jack Adapter

3.10 The B weatherproof female jack adapter (Fig. 49 and 50) mounts on an existing KS-8421 jack housing after the old jack and front plate are removed. It will receive the male plug of the B or C weatherproof cord to provide telephone service to recreational vehicles or boats. A spring-loaded hinged cover protects the jack from weather when not in use. A rubber boot on the mating connector of the cord provides a weatherproof seal when in use. Three screw terminals on rear of jack stamped T, R, and GR provide connections.

K. B Outlet Box

3.11 The B outlet box (Fig. 51) is a phenolic box for mounting the B weatherproof male or female jacks. It has a threaded knockout entrance at each end for use with an aluminum cord grip assembly or PVC conduit adapter. The cord grip assembly and conduit adapter ship with the outlet box.

L. B Mounting Bracket

3.12 The B mounting bracket (Fig. 52 and 53) is used to mount the B outlet box on trailers and

other recreational vehicles. It consists of a stainless steel angle-bracket with three clearance holes on one side for attaching the bracket to the trailer hitch and two threaded holes on the other side for mounting the B outlet box. Included are three stainless steel thread-cutting screws for attaching the bracket and two stainless steel screws with spacers for mounting the outlet box on the bracket. A pigtail lead is included to connect between the center ground terminal of the B weatherproof male jack and one of the mounting screws for the outlet box to provide a ground bond to the vehicle frame.

M. Assembly of B Weatherproof Jack to Outlet Box

3.13 The B weatherproof male or female jack mounts in the B outlet box on the B mounting bracket as shown in Fig. 54. The B weatherproof male and female jack both use the B outlet box but the mounting bracket is used only on the vehicle, which is always the male jack.

N. B Weatherproof Cord

3.14 The B weatherproof cord (Fig. 55) is used to provide connection between the post-mounted

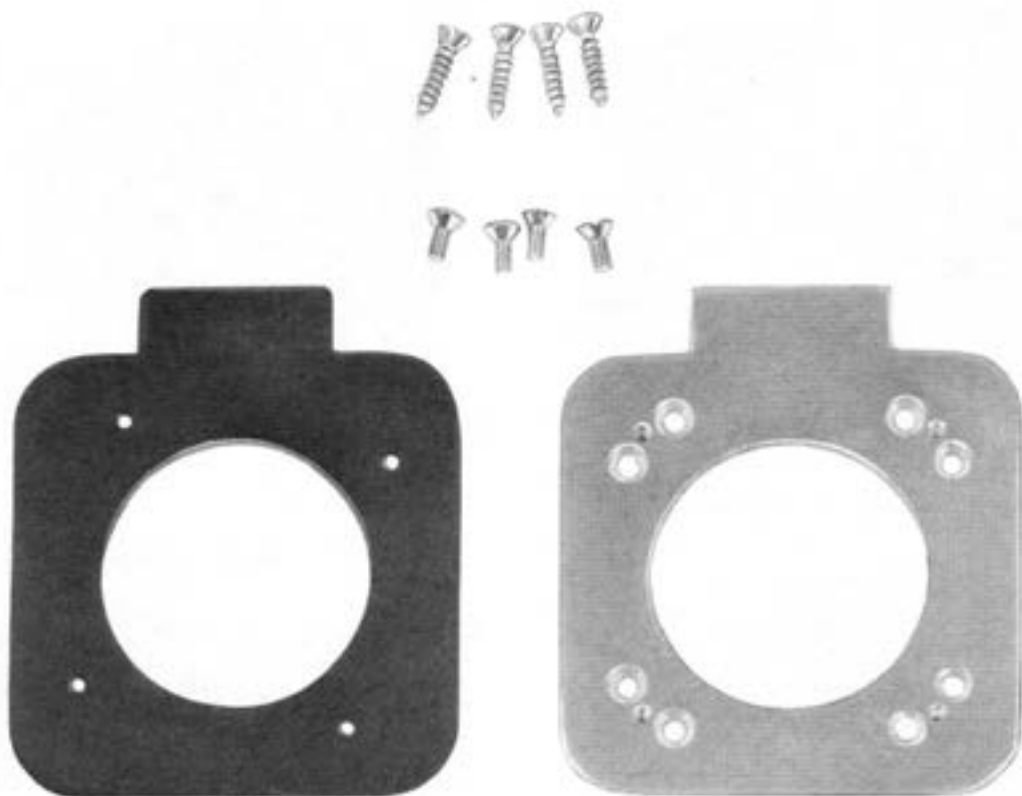


Fig. 18—AT-8731 B Adapter Plate

jack at the service pad and the jack on the recreational vehicle at the trailer park or between the dock and boat in a marina. It consists of a 50-foot, 16-gauge, 3-wire (ring, tip, and ground) yellow PVC insulated flexible cord, equipped with one male and one female plug. PHONE is stamped on the cord at 1-foot intervals for identification. Rubber boots on the plugs mate with their respective jacks to provide a weatherproof seal.

O. C Weatherproof Cord

3.15 The C weatherproof cord is similar in construction to the B weatherproof cord except,

that instead of a female plug, one end is equipped with an "S" hook assembly and spade-tipped leads for connection to a telephone set (Fig. 56).

P. B Template

3.16 The B template (not shown) is used on the boat to locate the pilot holes for mounting screws and clearance hole for jack body for the B waterproof male jack. It is printed on index card stock and is packed separately from the jack so that mounting holes may be prepared in advance by the boat owner.



Fig. 19—1A Converter



- SURFACE MOUNTED JACK
- USES KS-8419 PLUG

Fig. 21—KS-8421 Jack (MD)



- FLUSH MOUNTED JACK
- USED KS-8419 PLUG

Fig. 20—KS-8420 Jack (MD) Installed

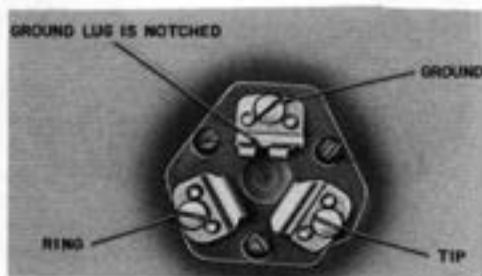


Fig. 22—Connections for KS-8420 and KS-8421 Jacks (MD)

Q. C Template

3.17 The C template (not shown) is used on the recreational vehicle to locate pilot holes for the three thread-cutting screws used to mount the B mounting bracket. It is printed on index card stock and packed separately from the B mounting bracket so that mounting holes may be prepared by the vehicle owner prior to bracket installation.

4. JACKS AND JACK MOUNTINGS—INDOOR

4.01 Only one conductor shall be connected to a single clip of a clip-type jack terminal. The loop-through method for terminating IW cable may be used on jacks which have dual clip-type terminals.

4.02 Connect conductors as indicated by the color designators stamped next to the terminals.

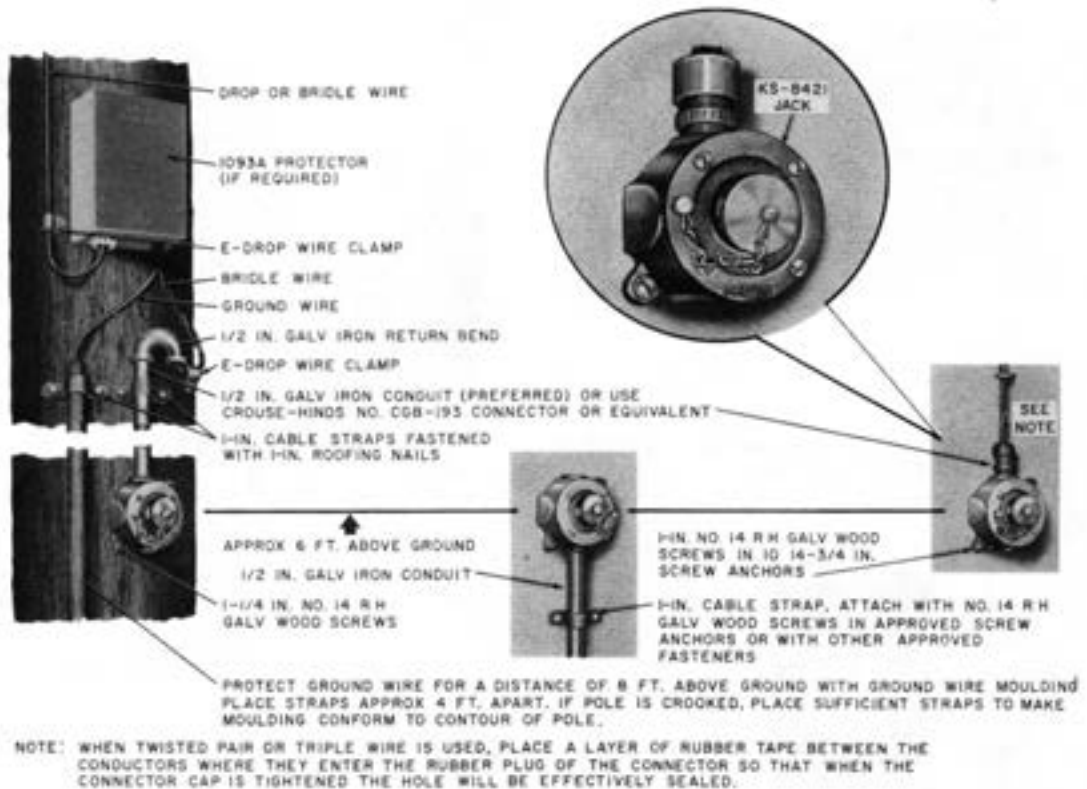


Fig. 23—KS-8421 Jack (MD), Typical Installation

The red conductor is terminated at the R terminal, etc. Table D shows the connections for 4-conductor jacks.

4.03 Table E shows the connections for 8- and 12-conductor jacks.

Caution: Test each jack location for correct circuit operation.

INSTALLATION OF NONFLUSH JACKS

A. 404B (MD) and 549A Jacks

4.04 Install as follows:

- (1) Connect station wire to jack and dress wiring inside shell.
- (2) Fasten jack to mounting surface with furnished screws.

B. 551A Jack

4.05 Install as follows:

- (1) Connect station wire or cable conductors to clip terminals of jack using 714-type tool. Conductors may be loop-through terminated.
- (2) Fasten jack to mounting surface with furnished screws.

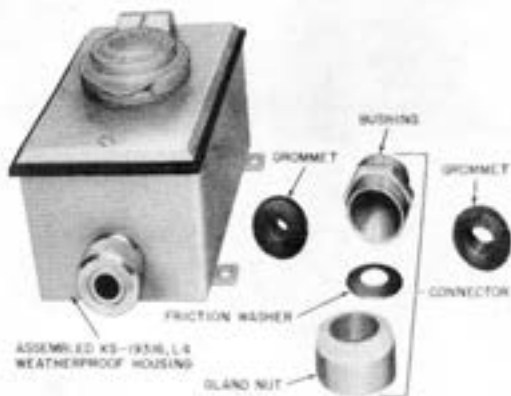
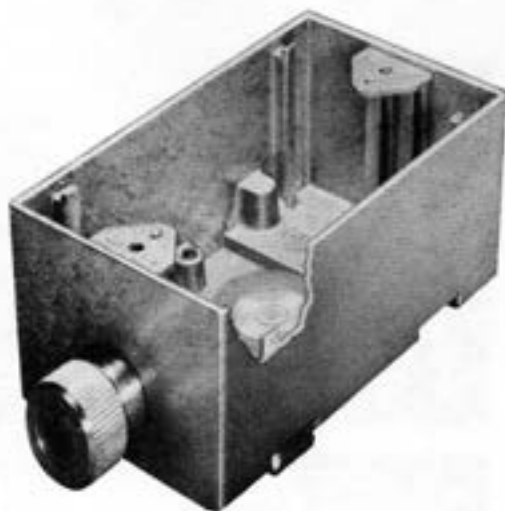
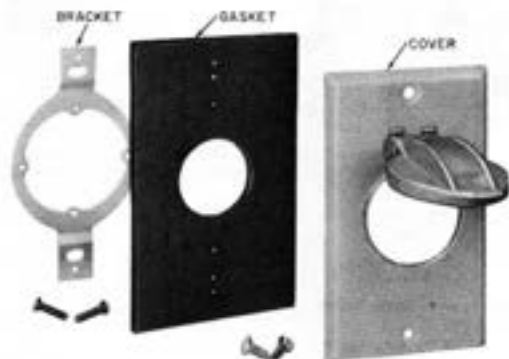


Fig. 24—KS-19316, List 4 Housing and Components (2 of 3 Grommets Shown)



- FURNISHED WITH LATER PRODUCTIONS OF KS-19316, LIST 6 HOUSING
- WITH REVERSIBLE MOUNTING LUGS

Fig. 26—KS-19316, List 6 Housing Box



• FOR USE WHERE BOX FOR JACK HAS BEEN INSTALLED OR REPLACEMENT PARTS FOR KS-19316, LIST 4.

• ACCEPTS:
493A JACK (MD),
541A JACK, 548A JACK,
625F CONNECTING BLOCK

• MOUNTS TO STANDARD ELECTRICAL OUTLET BOX

• MOUNTING SCREWS SUPPLIED

Fig. 25—KS-19316, List 5 Cover

INSTALLATION OF FLUSH-TYPE JACKS IN STANDARD ELECTRICAL OUTLET BOXES

A. 497A (MD) Jack

4.06 The 497A (MD) jack is mounted in standard electrical outlet box as follows:

- (1) Mount 493A jack on 43A bracket.
- (2) Connect station wire to jack.
- (3) Mount jack-equipped bracket in outlet box.
- (4) Fasten faceplate with furnished screws.

B. 547A (MD) or 547B Jack

4.07 Install as follows:

- (1) Attach 541A jack on 43B bracket.
- (2) Connect station wire or cable to jack.

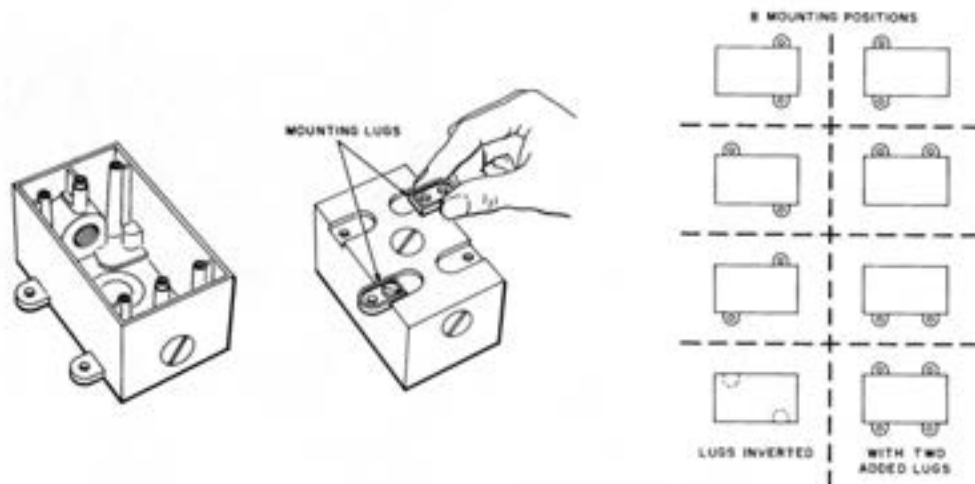


Fig. 27—KS-19316, List 6 Housing Box Showing Reversible Mounting Lugs

- (3) Mount jack and bracket assembly in outlet box.
- (4) Install faceplate. (The cover must be on jack before placing faceplate.)

C. 493A (MD) or 548A Jack

4.08 Install as follows:

- (1) Attach jack to 43-type bracket (MD) (Fig. 29) or to the bracket supplied with the 65A faceplate.†
- (2) Connect station wire or cable to jack.
- (3) Attach bracket to outlet box and install suitable faceplate.

D. 550A Jack

4.09 The 550A jack is assembled in the same manner as the 497A (MD) jack. It consists of a 548A jack, 65A faceplate, and mounting screws.

INSTALLATION OF FLUSH-TYPE JACKS IN 63-TYPE OR KS-20502 TYPE BRACKET

4.10 The 493A (MD), 541A, and 548A jacks can be mounted on 63-type or KS-20502-type bracket

(Fig. 30, 31, 32, and 33) with a 16-type or 65A faceplate. Use the same color faceplate as the jack.

4.11 When mounting jacks on the 63-type bracket, the 16-type faceplate ring retainer is required. The 16-type or 65A faceplate can be mounted to the KS-20502-type bracket without a ring retainer.

(a) The 493A (MD) or 548A jack is installed on the 63-type bracket as follows:

- (1) Mount the ring retainer on bracket.
- (2) Connect station wire to jack.
- (3) Mount jack on ring retainer.
- (4) Mount faceplate on ring retainer.

(b) The 493A (MD) or 548A jack is installed on the KS-20502-type bracket as follows:

- (1) Connect station wire to jack.
- (2) Mount jack on bracket using screws supplied with bracket.
- (3) Mount faceplate to bracket using screws supplied with bracket.

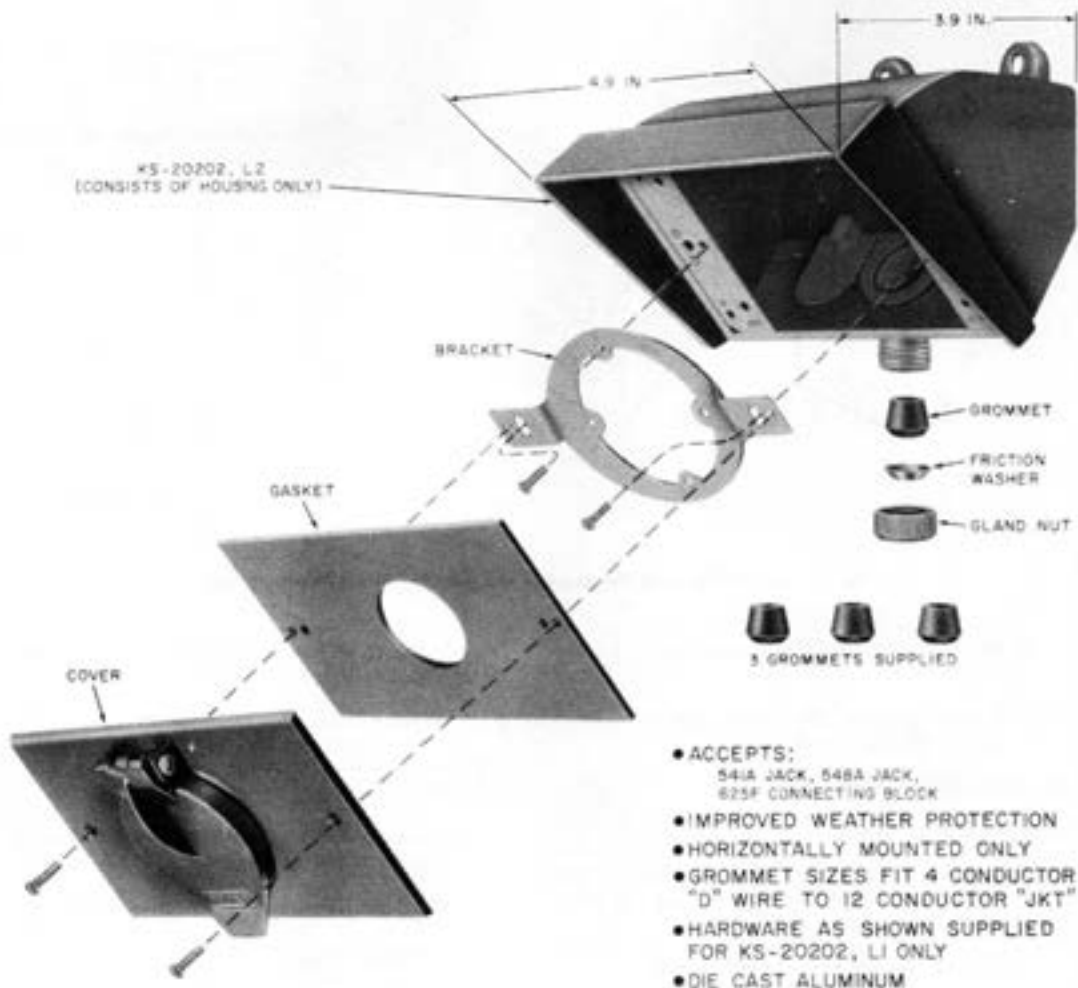


Fig. 28—Assembly of KS-20202, List 1 and 2 Waterproof Housing

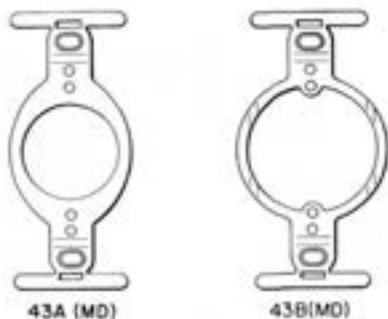
A. KS-20502 Type Bracket

4.12 The KS-20502, List 2 plastic bracket (Fig. 33) is a replacement for the KS-20502, List 1 (MD) plastic bracket (Fig. 32). This bracket is intended to mount the 541A or 548A jack, the 625F connecting block, and 16-type or 65A faceplate.

4.13 This bracket may be installed in a 2-1/4 inch

diameter hole with a wall thickness of 1-1/4 inch maximum as follows:

- (1) Make sure the wall behind the bracket is hollow.
- (2) Fasten bracket in wall opening by first placing the self-aligning clamps behind interwall material and tightening the two screws.



- TO MOUNT JACKS IN STANDARD ELECTRICAL OUTLET BOX
- BREAK-OFF WINGS
- REPLACED BY 43B BRACKET
- TO MOUNT
493A JACK (MD)
548A JACK
- COMPONENT OF
497A JACK (MD)
550A JACK (OLD)
- TO MOUNT
493A JACK (MD)
541A JACK
548A JACK
625F CONNECTING BLOCK
REPLACES 43A BRACKET (MD)
- COMPONENT OF
547B JACK
550A JACK
625B CONNECTING BLOCK

Fig. 29—43-Type Bracket (MD)

(3) Bring concealed building wire through opening of bracket and make connections to 541A or 548A jack.

(4) Position jack and faceplate on bracket so two screw holes opposite each other align. Fasten jack and faceplate to bracket using two screws furnished with bracket. These are special thread-cutting screws. The use of any other screws could overstress the polycarbonate bracket and seriously affect its life.



- USE TO PREWIRE BUILDING DURING CONSTRUCTION
- MOUNTED TO STUDDING
- USE WITH 16-TYPE FACEPLATE
- FOR MOUNTING
493A JACK (MD)
541A JACK
548A JACK
625F CONNECTING BLOCK

Fig. 30—63A Bracket (MD)

B. 541A Jack

4.14 The 541A jack is installed in the 63-type bracket as follows:

- (1) Mount ring retainer on 63-type bracket.
- (2) Connect station wire or cable leads to clip terminals of jack.
- (3) Mount jack on ring retainer.
- (4) Place cover on jack.
- (5) Mount faceplate on retainer ring.

4.15 The 541A jack is installed in the KS-20502-type bracket as follows:

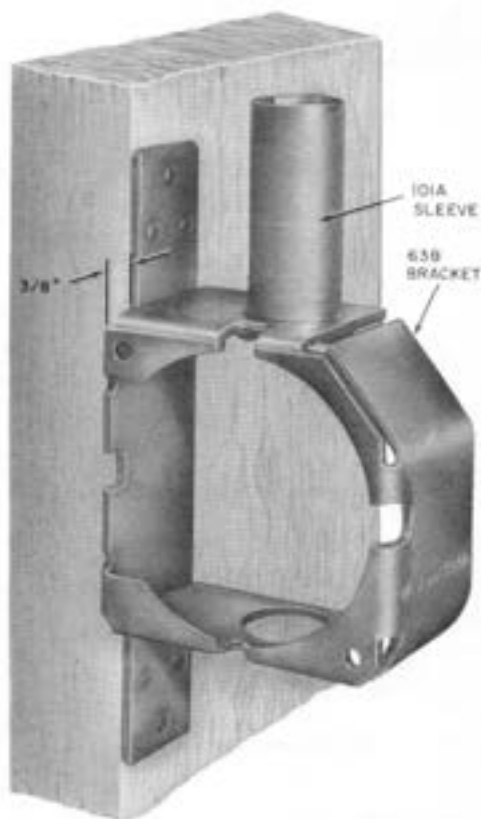


Fig. 31—63B Bracket With 101A Sleeve Installed

- (1) Connect station wire or cable leads to clip terminals of jack.
- (2) Place cover on jack.
- (3) Position faceplate over cover and fasten faceplate and jack to bracket.

ADAPTERS

- 4.16 Adapters are intended for use where it is not desirable to replace existing jacks.

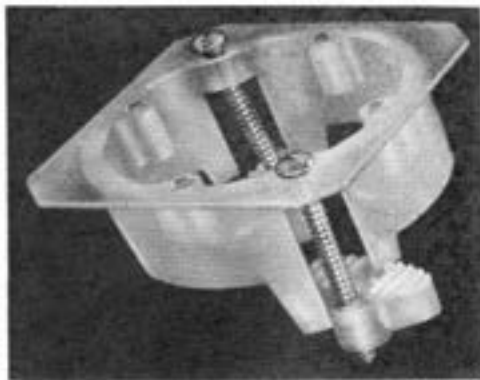


- SELF-EXTINGUISHING PLASTIC
- USE FOR EXISTING WALLS
- WALL HOLE 2-1/4 INCH DIAMETER
- WALL THICKNESS LIMIT 1-1/4 INCH

Fig. 32—KS-20502, List 1 Bracket (MD)

- (a) The 224A adapter (Fig. 10) is used to adapt the D4BU or D6-type mounting cord to the 541A and 551A jacks (12-pin jack). The adapter brings out connections from 6 of the 12 connections in the jack.
- (b) The 225A adapter (Fig. 11) is used to adapt the D4BU mounting cord to 404B (MD), 493A (MD), 497A (MD), 548A, and 549A jacks (4-pin jack).
- (c) The 267A adapter (Fig. 12) consists of two modular jacks connected to a single modular line cord-type plug. It can be mounted piggy-back on a 224A or 225A adapter or plugged directly into an existing modular jack.

Caution: Because of the possibility of installing more than one transformer on the same inside wiring pair, the 267A adapter should not be used to connect dial illumination transformers to modular systems.



- PLASTIC BRACKET, REPLACEMENT FOR STEEL KS-19407 LI BRACKET AND PLASTIC KS-20502 LI BRACKET.
- FOR EXISTING WALLS (POST WIRING)
- FOR MOUNTING 541A, 548A JACK OR 625F CONN. BLOCK AND 16-TYPE FACEPLATE.
- WALL HOLE 2-1/4 IN. DIAMETER.
- WALL THICKNESS LIMIT 1-1/4 IN.

Fig. 33—KS-20502, List 2 Bracket

4.17 Where portable telephone service is required, 541A, 551A, 548A, and 549A jacks should not be mixed with 625-type connecting blocks.

5. JACKS AND JACK MOUNTINGS—OUTDOOR

5.01 For a 4-conductor jack, connect conductor as indicated by the color designator stamped next to the terminals. The red conductor is terminated at the R terminal, etc.

A. KS-8420 (MD) Jack

5.02 Install as follows:

- (1) Arrange for the customer to provide a 2-11/16 inch hole at location selected for jack installation.

- (2) Temporarily insert jack in hole and mark fastener holes.
- (3) Remove jack and drill fastener holes.
- (4) Connect wire as shown in Fig. 22.
- (5) Secure jack to mounting surface with four No. 8 PH or FH cadmium plated tapping screws.

B. KS-8421 (MD) Jack

5.03 Install as follows:

- (1) Arrange drop wire or bridle wire and conduit at location selected for installation (Fig. 23).
- (2) Secure the jack housing to the mounting surface using suitable fasteners.
- (3) Connect wire to terminal block as shown in Fig. 22.
- (4) Mount terminal block to jack housing.
- (5) Install cover on housing.

C. KS-19316, List 4 or List 6 Housing

5.04 Install as follows:

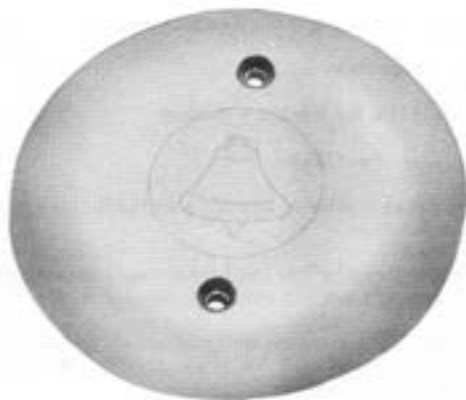
- (1) Arrange cable at location selected for jack installation.
- (2) Use housing box with positioned mounting lugs to mark lug mounting holes (Fig. 27).
- (3) Drill holes and secure housing box to mounting surface with No. 8 PH or FH cadmium plated tapping screws.
- (4) Place gland nut, friction washer, and grommet on cable.
- (5) Run cable inside housing and adjust grommet and friction washer for watertight fit with gland nut.
- (6) Attach bracket to housing box.
- (7) Connect wire or cable to jack.
- (8) Install jack to bracket. The cover supplied for the 541A jack is not required and may be discarded.



16A



16B



16D



RING RETAINER

- MOUNTS TO 63-TYPE BRACKET USING RING RETAINER K5-20502, L2 BRACKET (RING NOT REQUIRED)
- MOUNTING SCREWS AND RING RETAINER SUPPLIED

Fig. 34—16-Type Faceplate

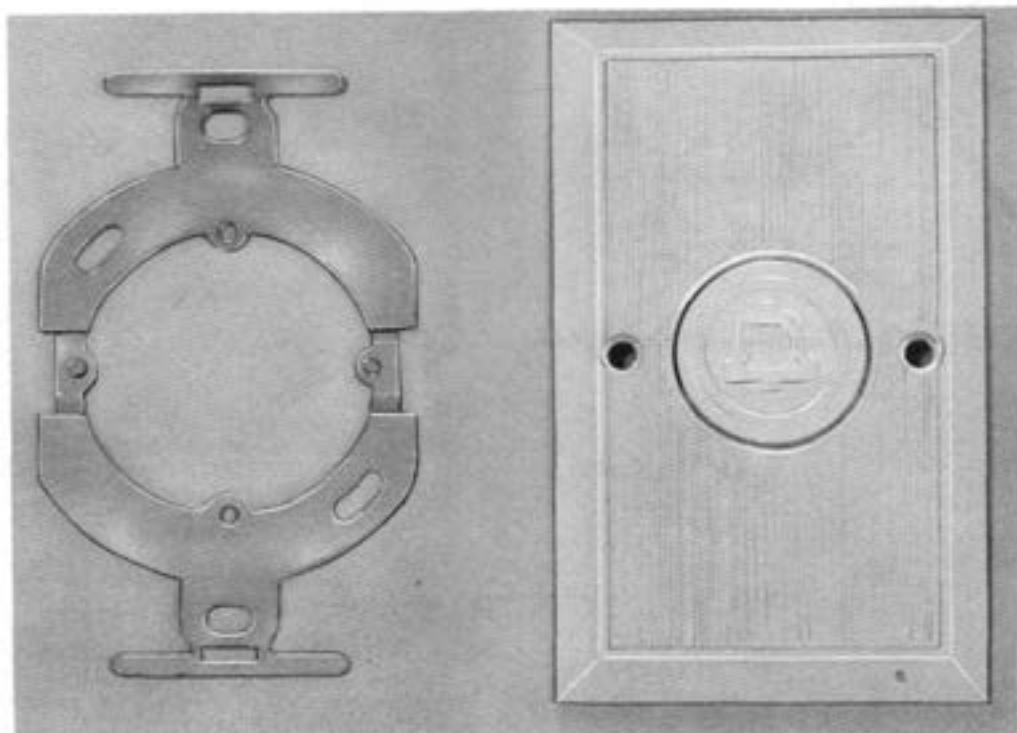


Fig. 35—65A Faceplate

(9) Install gasket and cover for watertight fit.

D. KS-20202, List 1 Housing (Fig. 28)

5.05 Install as follows:

- (1) Arrange cable or drop wire at location selected for installation.
- (2) Hold housing to mounting surface and mark fastener holes.
- (3) Remove housing and drill fastener holes.
- (4) Secure housing to mounting surface with No. 8 PH or FH cadmium plated tapping screws.
- (5) Place gland nut, friction washer, and grommet onto cable or drop wire.
- (6) Run cable or drop wire inside housing and adjust grommet and friction washer for watertight fit with gland nut.
- (7) Install bracket and arrange cable or drop wire through center of bracket.
- (8) Connect conductors to selected jack.
- (9) Install jack to bracket. The cover supplied for the 541A jack is not required and may be discarded.
- (10) Install gasket and cover.



Fig. 36—423A Plug, Front View and Rear View, Cover Removed



Fig. 37—478-Type Plug

E. B Weatherproof Jack Adapter

5.06 Mount the B weatherproof female jack adapter (Fig. 49 and 50) on an existing KS-8421 jack housing after the old jack and cover plate are removed. Use the four mounting screws and cover gasket provided. Three screw terminals stamped T, R, and GR provide for connection to tip, ring, and ground. Wire tip and ring of jack to the tip and ring terminals of the protector. Connect a 14-gauge ground wire from ground terminal of protector to center ground terminal of jack.

Note: Do not bond ground wire to boat ground as undesirable electrolysis reaction may develop.



Fig. 38—504A Plug

F. B Weatherproof Jacks

5.07 The B weatherproof male or female jacks (Fig. 44, 45, and 46) are mounted in the B outlet box using the four mounting screws and cover gasket provided. Three screw terminals stamped T, R, and GR are provided for connections. A cord grip assembly and conduit adapter are provided with the B outlet box for use with service wire or plastic conduit.

- (a) Mount the B weatherproof female jack and B outlet box close to the protector on the post at the utility pad and provide a ringer simulator if required. Wire tip and ring of jack to tip and ring terminals of protector. Connect a 14-gauge ground wire from ground terminal of protector to center ground terminal of jack. (See Note in 5.06.)
- (b) The B mounting bracket is used to mount the B weatherproof male jack and B outlet box on the recreational vehicle using the mounting holes provided by the customer. The customer will use the C template to drill pilot holes for the B mounting bracket on top of the trailer hitch or vehicle bumper. The cord grip assembly may be attached to either end of the B outlet box depending on existing space. Wire tip and ring of jack to tip and ring terminals of connecting block in the vehicle.

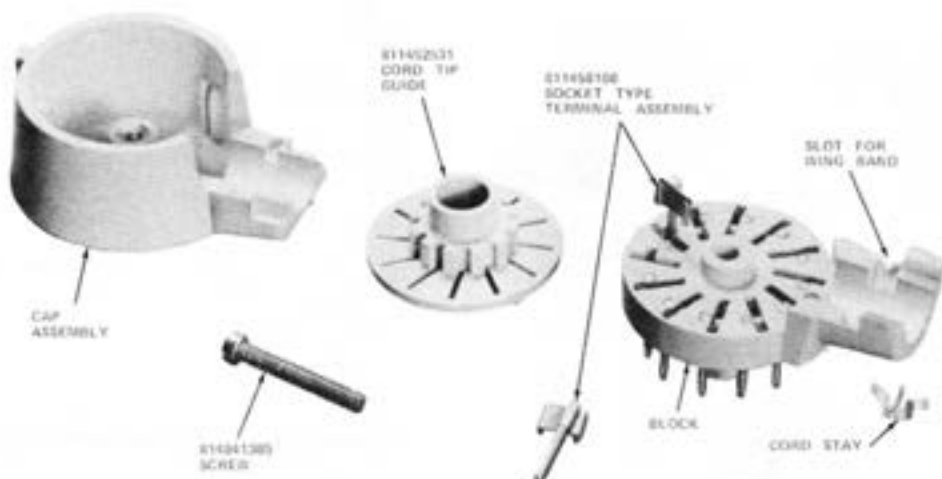


Fig. 39—504A Plug Disassembled

The ground lead provided with the B mounting bracket must be connected from center ground terminal of the jack to a mounting screw as shown in Fig. 53 and 54 to provide a ground bond to vehicle chassis.

Danger: *Before making contact with any metal portion of a recreational vehicle, check for the presence of hazardous voltage on the body or chassis using rubber gloves and B voltage tester.*

G. B Weatherproof Cord

5.08 The B weatherproof cord (Fig. 55) consists of a 50-foot, 16-gauge, 3-wire (tip, ring, and ground) yellow PVC insulated flexible cord, with PHONE stamped on the cord at 1-foot intervals for identification. The cord is terminated on one end with a male plug which engages the B weatherproof female jack at the service pad or dock. The other end is terminated in a female plug which engages the male jack on the recreational vehicle or boat. Rubber boots on the plug mate with their respective jacks to provide weather protection.

H. C Weatherproof Cord

5.09 The C weatherproof cord is constructed the same as the B weatherproof cord except that

the female plug is replaced with a stay hook and spade-tipped conductors for termination in a telephone set.

I. B Waterproof Male Jack

5.10 The B waterproof male jack (Fig. 47 and 48) is mounted on a boat using mounting holes provided by the customer. The customer will use the B template to locate the pilot holes for mounting screws and clearance hole for the jack body for the B waterproof male jack. The jack is chrome plated with a hinged, threaded cover which makes the jack waterproof when not in use. Three screw terminals, stamped T, R, and GR, on the rear of the jack provide connection for ring, tip, and ground. Wire the tip and ring of the jack to tip and ring terminals of connecting block on boat.

Note: Do not bond ground wire to boat ground as undesirable electrolysis reaction may develop. Insulate and store ground conductor. Refer to Section 461-220-101 for routing wiring in boats.

J. 652WP4 Jack

5.11 The 652WP4 jack (Fig. 58) is intended for use with modular apparatus at outdoor locations



Fig. 40—505A Plug



Fig. 41 — Current Model D3BU Cord Connected to Current Model 505A Plug

but can also be used at indoor locations where severe environmental conditions exist such as steel mills, foundries, etc. The 652WP4 jack is not to be used as a replacement for the weatherproof, 3-conductor jacks used for marina and recreational vehicle installations. The 652WP4 jack can be used with all existing outdoor boxes or housing. A 3/4-inch No. 14 straight pipe thread is molded on the rear of the jack, permitting it to be mounted on the box or housing using a 3/4-inch conduit locknut (not supplied). The modular jack is effectively sealed from environmental effects with or without a modular plug installed. Without a plug installed, the jack opening is sealed by the spring-loaded, gasketed cover. To provide a

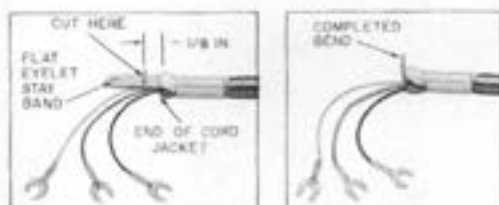


Fig. 42—Connecting Current Model D3BU or D4BP Cord to Early Model 505A Plug

seal with a modular plug inserted, the rubber grommet, plastic washer, and screw cap must be assembled on the cord as shown in Fig. 59. After the plug is inserted in the jack, the screw cap is threaded and tightened on the threaded projection molded on the jack frame.

6. PLUGS—INDOOR AND OUTDOOR (TABLE F)

A. 504A Plug

6.01 Included with the 504A plug (Fig. 38 and 39) is a metal cord stay designed for use with cords equipped with a wire S hook. The S hook is removed and discarded. The cord stay, inserted into the vacated band hole, serves as a wing band.

6.02 Assemble the 504A plug as follows:

- (1) Place cord tip guide on block.
- (2) Insert mounting cord tips into socket-type terminals of plug.

Note: For mounting cord conductor connections, refer to connection section for the telephone set.

- (3) Dress conductors so they will lie within the cap of plug.
- (4) Place wing band or cord stay of mounting cord in its proper slot.



Fig. 43—KS-8419 Plug (MD)

(5) Place cap on plug so cord and wing band or cord stay will seat properly. Be sure no leads are pinched.

(6) Snap two sections of neck together.

(7) Insert screw and tighten.

B. 505A Plug

6.03 The 505A plug is a 4-contact plug similar to the 504A plug; in addition, however, it has a cord fastener which holds the cord in place while spade tips are being connected. The cord fastener also anchors the mounting cord in the assembled plug.

6.04 Connect current model D3BU or D4BP mounting cord to a current model 505A plug as follows:

(1) Position flat eyelet stay band in the cord channel so that the screw hole is over the screw hole in the center of the cord tip guide (Fig. 41).

(2) Fit cord fastener into groove in the cord channel and press until it snaps into position.

(3) Connect the mounting cord space tips in the socket-type terminals.

(4) Insert screw through hole in block and stay band.

(5) Dress conductors so they will not obstruct the center of the cord tip guide.

(6) Position cap assembly on cord tip guide and block; check that no cord leads are pinched and tighten screw.

6.05 Connect current model D3BU or D4BP mounting cord to an early model 505A plug as follows:

(1) Cut flat eyelet stay band approximately 1/8 inch from end of cord jacket using 8-inch sidecutters, or equivalent (Fig. 42).

Caution: When cutting the stay band, take precautions to prevent the severed end from striking personnel or apparatus.

(2) Make a right angle bend in the remaining length of stay band in the direction away from the cord conductors.

(3) Position the mounting cord into the cord channel of the block, as shown in Fig. 42.

(4) Fit the cord fastener into the groove in the cord channel and press until it snaps into position.

(5) Connect the mounting cord spade tips in the socket-type terminals.

(6) Dress the conductors so they will not obstruct the center of the cord tip guide.

(7) Position the cap assembly on the block so that the right angle bend of the stay band is supported by the inner surface of the cap assembly; check that no cord leads are pinched.

(8) Insert cover screw and tighten.

6.06 Connect 505A plug to a cord equipped with a wing band as follows:

(1) Fit the cord tip guide into place on the top of the block.

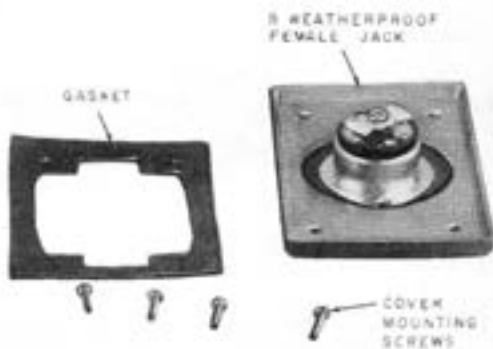


Fig. 44—B Weatherproof Male (or Female) Jack

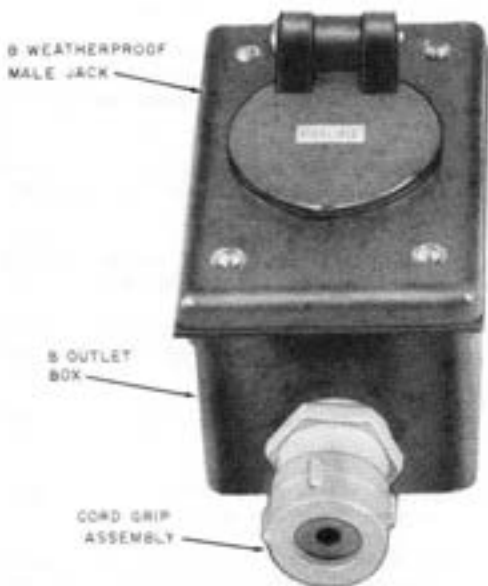


Fig. 45—B Weatherproof Male Jack on B Outlet Box

(2) Position the mounting cord into the cord channel of the block so the cord wing band fits into the wing band slot. One ear of the wing band will extend into the wing band slot of the cord fastener.

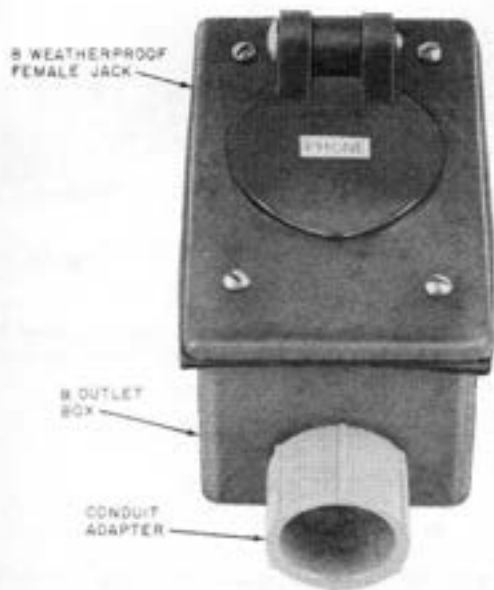


Fig. 46—B Weatherproof Female Jack on B Outlet Box

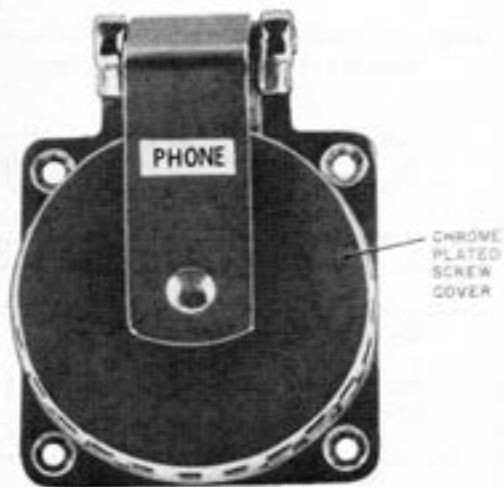


Fig. 47—B Waterproof Male Jack (Front View)

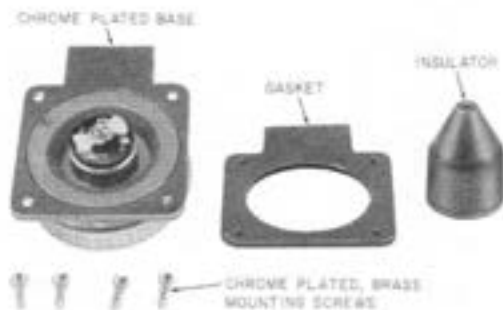


Fig. 48—B Waterproof Male Jack (Rear View, Gasket and Insulator Removed)

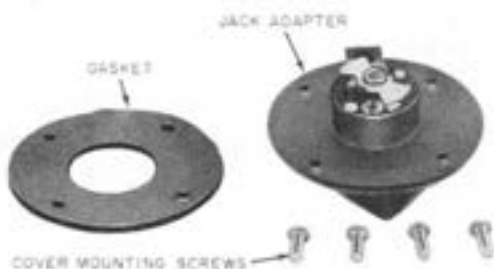


Fig. 49—B Waterproof Female Jack Adapter

- (3) Fit the cord fastener into the groove in the cord channel and press until it snaps into position.
- (4) Arrange the mounting cord spade tips in the socket-type terminals.
- (5) Adjust the conductors so they will not obstruct the center of the cord tip guide.

C. 423A Plug

6.07 Connect the 423A plug as follows:

- (1) Connect as indicated by color designations stamped adjacent to terminals.
- (2) Lay jacketed portion of cord in the two molded U-shaped projections.



Fig. 50—B Weatherproof Female Jack Adapter Mounted on KS-8421 Jack Housing

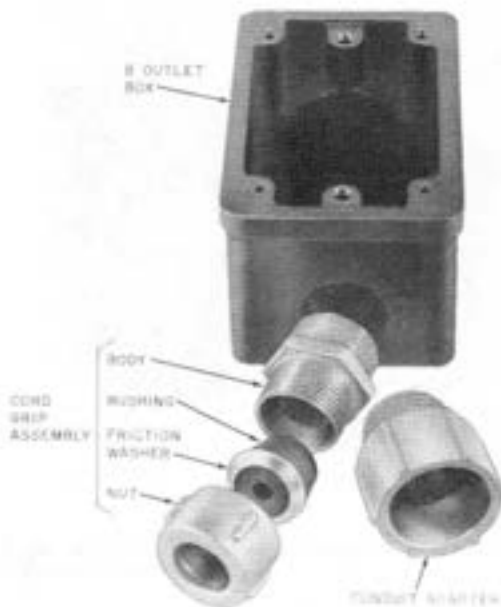


Fig. 51—B Outlet Box (for Mounting B Weatherproof Jacks)

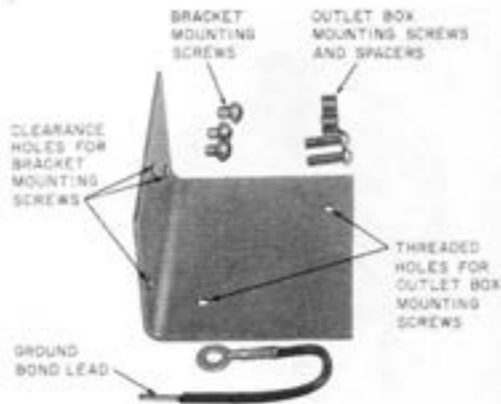


Fig. 52—B Mounting Bracket (for Mounting B Outlet Box)

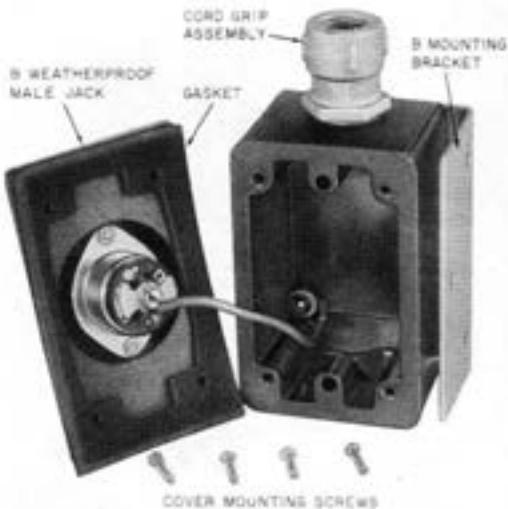


Fig. 53—B Weatherproof Male (or Female) Jack on B Outlet Box Showing Ground Lead Connected to B Mounting Bracket

(3) Place cover on base and tighten screw.

D. KS-8419 (MD) Plug

6.08 The KS-8419 plug (Fig. 43) is a 3-contact, brass plug intended for connecting telephone sets installed on boats, trains, or auto trailers to outdoor jacks of PBX or CO lines. This plug is intended for use with KS-8420 or KS-8421 jacks.

6.09 Connect the KS-8419 (MD) plug as follows:

(1) Plug components are assembled to KS-15143 3-conductor, 18-gauge cord, or equivalent (Fig. 43).

(2) In KS-15143 cord, or equivalent, the black conductor should be used for the ring (negative) side of the line. The white conductor should be used for tip (positive) side of the line. The green conductor is the ground conductor.

(3) One terminal of the KS-8419 plug has a small lug protruding from the contact. This lug and the notched terminal on KS-8420 and KS-8421 jacks are provided to ensure that the plug is inserted in one position only.

(4) When ground is necessary for service, the green conductor should be terminated on the notched terminal.

E. 478A and 478B Plug

6.10 The 478A or 478B plug is used to connect a modular plug-ended cord to a jack-equipped console or a CALL DIRECTOR® telephone.

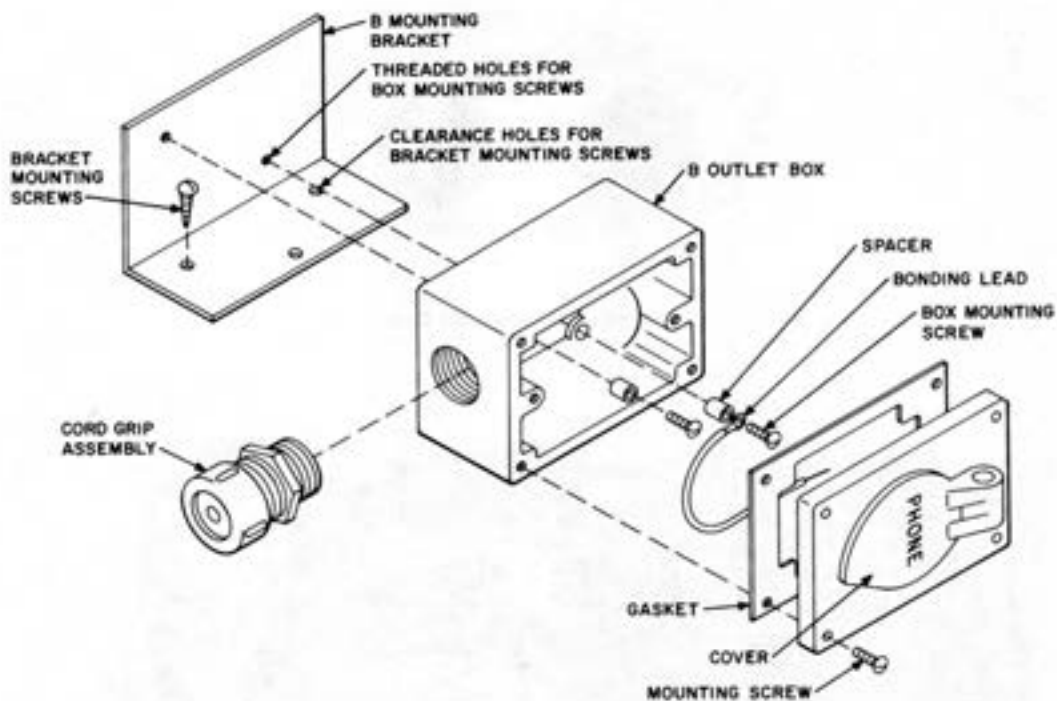


Fig. 54—Assembly of B Weatherproof Male Jack to B Outlet Box and B Mounting Bracket

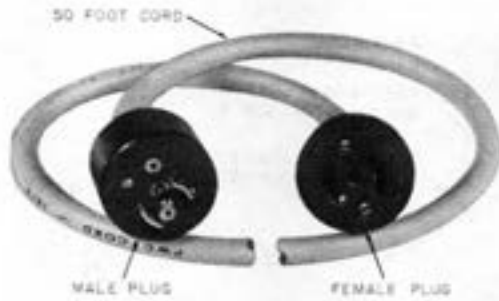


Fig. 55—B Weatherproof Cord

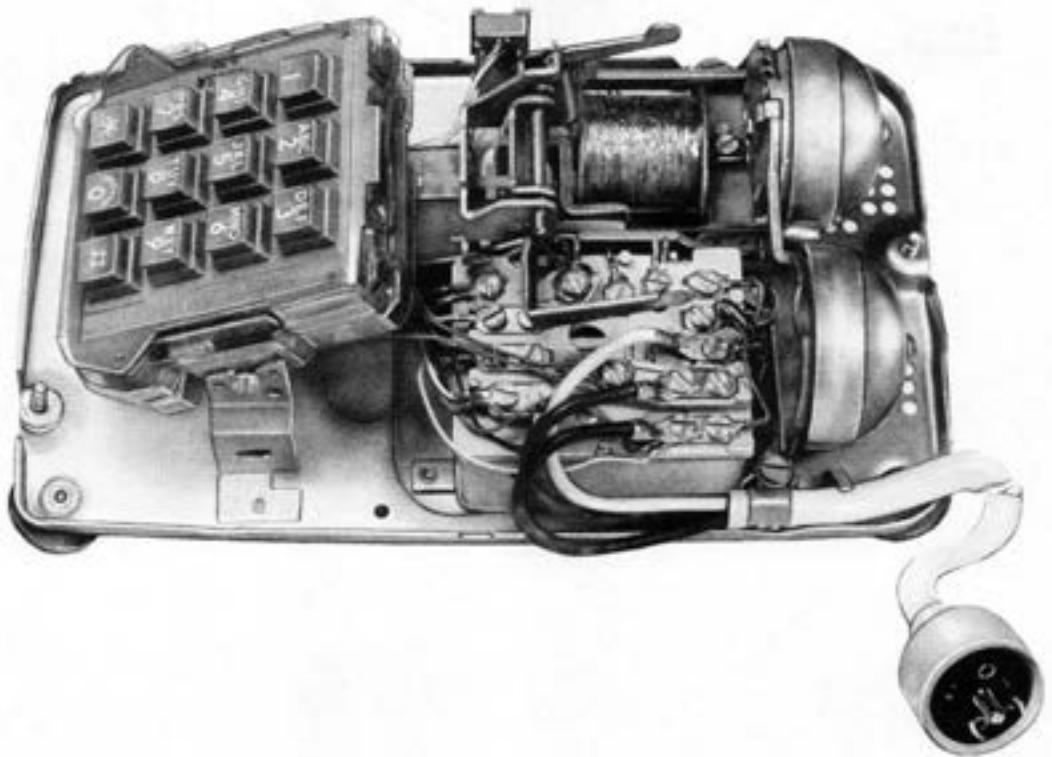


Fig. 56—C Weatherproof Cord

TABLE D

CONNECTIONS TO 4-PIN JACKS

| INSIDE WIRE | 4-PIN JACK |
|-------------------------------|------------|
| (G) Tip | G |
| (R) Ring | R |
| (Y) Ground and/or Transformer | Y |
| (B) Transformer | B |

TABLE E

CONNECTIONS TO 8- AND 12-PIN JACKS

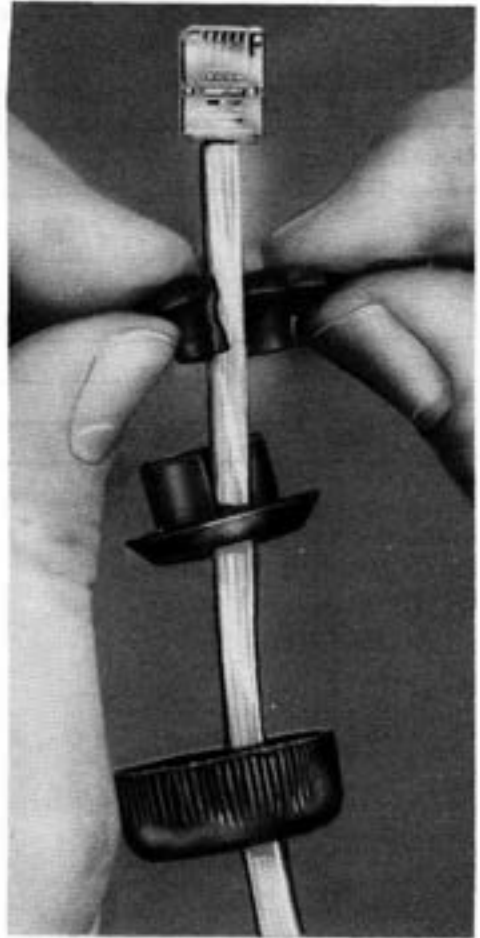
| INSIDE WIRE QUAD | | D AND E INSIDE WIRING CABLE | NO. TERMINALS | |
|---------------------|--------|--------------------------------------|--------------------------|----|
| | | | 8 | 12 |
| | | | TERMINAL DESIGNATIONS | |
| 1st | Red | BL-W | R | 1 |
| | Green | W-BL | G | 2 |
| | Yellow | O-W | Y | 3 |
| | Black | W-O | BK | 4 |
| 2nd | Red | G-W | W | 5 |
| | Green | W-G | R-R | 6 |
| | Yellow | BR-W | Y-Y | 7 |
| | Black | W-BR | BK-BK | 8 |
| 3rd | Red | S-W | | 9 |
| | Green | W-S | | 10 |
| | Yellow | BL-R | | 11 |
| | Black | R-BL | | 12 |



Fig. 57—158A Cover



Fig. 58—652WP4 Jack



NOTE:
 NOT FOR USE ON MOBILE HOMES,
 IN MARINAS OR ON RECREATIONAL
 VEHICLES. FOR SUCH APPLICATIONS
 SEE FIG. 55 AND 56.

Fig. 59—Installing 652WP4 Jack Parts on Modular Cord

TABLE F

PLUGS

| TYPE | NO. OF CONTACTS | FIGURE NO. | ASSOCIATED JACKS |
|--------------|-----------------|------------|---|
| KS-8419 (MD) | 3 | 43 | KS-8420 (MD) KS-8421 (MD) |
| 505A | 4 | 40, 41, 42 | 404B (MD), 493A (MD), 548A, 497A (MD), 549A, 550A, |
| 423A | | 36 | 814450550 mounting block and screw assembly |
| | | 8 | |
| 504A | 12 | 38 | 541A, 551A, 547B |
| 478A, 478B | 2 | 37 | 476A, 517A |

DROP WIRE CLEARANCES

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| 2. | TERMINOLOGY | 1 |
| 3. | DROP WIRE CLEARANCES | 3 |
| 4. | POWER SUPPLY VOLTAGES | 5 |

(See Section 462-400-200.) No additional clearance is required when placing a drop wire if the temperature is above 32°F.

1. GENERAL

1.01 This section has been revised to:

- (a) Identify power supply voltages.
- (b) Describe factors to be considered when determining drop wire clearances.
- (c) Combine all drop wire clearance sections into one practice. This information was formerly contained in Sections 460-300-120, 462-070-016, and 462-070-017.
- (d) Change the section title.

1.02 This section contains the recommended clearances for drop wires to be placed, or are already in place, which are exposed to vehicular travel, power facilities, buildings, or other conditions. The values specified are in accord with the requirements of the National Electrical Safety Code, with temperatures at 60°F.

1.03 Drop wire tends to elongate as the temperature rises and contracts as the temperature falls. Wire placed during cold weather will, therefore, always have a greater sag in warm weather, even if no permanent stretch is involved.

1.04 In order to avoid having inadequate clearances at 60°F, it is necessary to provide extra clearances in drop wires placed at temperatures below 32°F. This additional clearance is specified in the sag requirements for cold weather conditions.

1.05 When drop wire sags exceed two or three feet, it will generally be quite advantageous to locate poles to avoid having the middle of the span occur above the traveled part of a road, alley, or driveway. A pole located within 50 feet of the far edge of the road, alley, or driveway (distance A, Fig. 4) will permit the overhead clearance to conform to requirements related to Fig. 4.

1.06 Clearances shown in this section should be used unless the work order or local requirements call for other values. This may occur when engineering forces recognize factors not allowed for in this section or because of local requirements, etc. Clearances for span lengths, voltages, and conditions not covered in this section are an engineering responsibility and will be shown on the work order or detailed plans.

1.07 Clearances over public and private swimming pools are not covered by the National Electrical Safety Code. However, for reasons of safety, sanitation, and appearance, aerial drop wire crossings over swimming pools should be avoided.

2. TERMINOLOGY

2.01 The following is a brief description of conditions applicable to drop wire clearance requirements:

- (a) **Storm Loading Areas:** Figure 1 identifies the three storm loading areas based upon studies made from records of wire using companies and data from the United States Weather Bureau. The frequency, severity, and effects of ice and windstorms in various sections of the country were the elements considered in establishing the loading area zones. As a result of the weather differences, allowances must be made for the stretching of conductors in their respective loading zones when placing a drop wire.

NOTICE

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Bell System except under written agreement



Fig. 1—Storm Loading Areas

(b) **Drop Wire Sag:** The sag in a drop wire is measured by comparing the line of sight established by the drop wire attachments and the lowest point in the span. Stringing sags for drop wire is shown in Section 462-400-200.

(1) **Normal Drop Wire Sag:** Drop wires are to be strung with normal sags when adequate clearances can be attained. Workmen, on poles, can obtain these sags with normal hand pulling.

(2) **Minimum Drop Wire Sag:** A minimum sag in a drop wire can be strung where clearance is limited and normal sags cannot be attained. These smaller sags result in higher stringing tensions in the wire; hence, pulling tools are required to enable the workman to pull the wire up to tension.

(c) **Placing Clearances:** Placing value of clearance is the height the drop wire is to clear when placed or replaced.

(d) **Maintenance Clearances:** Maintenance value of clearance should exist, after the wire has been exposed to one or more cycles of storm loading and the temperature returns to 60°F.

(e) **Drop Wire Crossing Above Railroad Tracks:**

(1) **Generally:** Clearance required when the drop wire does not parallel a contact wire for a trolley or trackless trolley.

(2) **Special Case:** (Fig. 2) Clearance required when the drop wire parallels a contact wire used by a trolley or trackless trolley.

(f) **Drop Wire Crossing Above Public Roads, Public Alleys, or Residential Drives:**

(1) **Generally:** (Fig. 3) Clearance required when the drop wire is attached to a pole further than 50 feet from the far edge of the traveled roadway.

(2) **Pole at Road's Edge:** (Fig. 4) Clearance required when the drop wire is attached to a pole located within 50 feet of the far edge of the traveled roadway (distance A, Fig. 4).

(g) **Major Overhang:** (Fig. 5) A drop wire which passes over 6 feet or more of the ordinarily traveled part of a roadway.

(h) **Minor Overhang:** (Fig. 5) A drop wire which passes over less than 6 feet of the ordinarily traveled part of a roadway.

(i) **No Overhang—Back of Obstruction:** (Fig. 6) A pole line located in back of a fence, ditch, embankment, etc., so that the ground beneath the line can ordinarily be traveled by pedestrians only.

(j) **No Overhang—Not Back of Obstruction:** (Fig. 7) A pole line not back of a fence, ditch, embankment, etc., and does not overhang the normal traveled road. This category is meant to include ground not ordinarily traveled but can be reached by vehicles. If farm machinery is likely to pass under the line, provide sufficient clearance so that the drop wire will be 2 feet above the highest part of such machinery or the loads it will carry.

3. DROP WIRE CLEARANCES

3.01 The following factors must be considered when determining proper drop wire clearances:

(a) Placing or Maintenance Clearances

(1) Is the drop wire to be placed or replaced?

The clearances for drop wires to be placed or replaced are identified as *placing clearances*.

(2) Is the drop wire in place?

The clearances for existing drop wires, in place, are identified as *maintenance clearances*.

(b) The Storm Loading Area

What is the storm loading area applicable to the locality where the drop wire exists

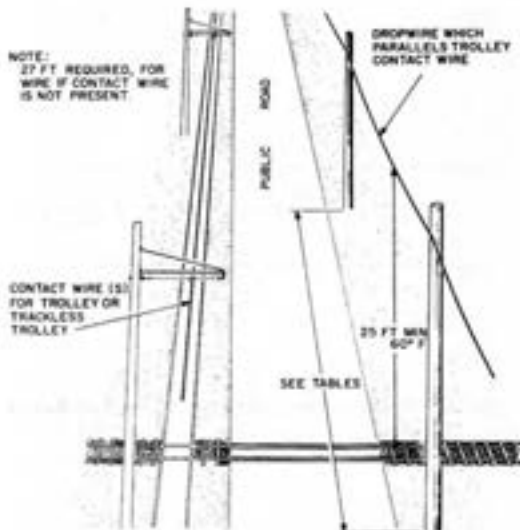


Fig. 2—Wire Crossing Railroad Tracks—Special Case



Fig. 3—Service Drop Over Residential Street

or is to be placed? Is it either a light, medium, or heavy loading area?

(c) The Drop Wire Sag

Is the drop wire to be placed or in-service strung with a normal or minimum sag?

(d) The Specific Condition Encountered

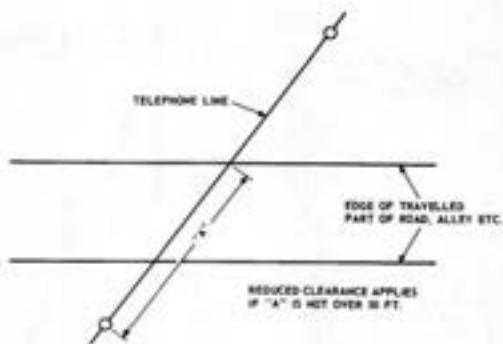


Fig. 4—Wire Crossing Public Road—Pole at Road's Edge

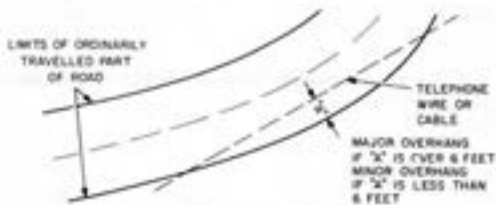


Fig. 5—Wire Running Along Public Roads

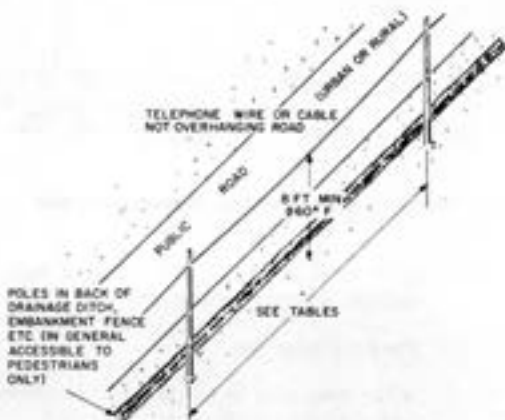


Fig. 6—Wire Running Along Public Roads (Back of Obstruction)

Page 4

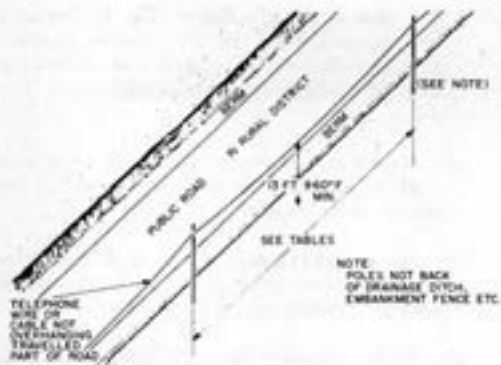


Fig. 7—Wire Running Along, But Not Overhanging Public Roads (Not Back of Obstruction)

Is the drop wire to be placed or in-service, crossing above or along roadways, rails, buildings, or above or below power facilities, foreign equipment, or neon signs?

3.02 Clearance Reference

(a) Above Ground or Rails:

Placing drop wire—see Table A.

Maintenance clearances—see Table B.

Note: The clearance height for span lengths not shown in Table A or B is obtained from the referred tables by locating the point where the span lengths (vertical lines) intersect the drop wire condition encountered. (See 3.03.)

(b) Crossing Below Power Wires or Cables: (See Part 4)

| STORM LOADING AREA | TABLE |
|--------------------|-------|
| Light | C |
| Medium | D |
| Heavy | E |

(c) Above Power Service Drops or Lines: (See Part 4)

| STORM LOADING AREA | TABLE |
|--------------------|-------|
| Light | C |
| Medium | F |
| Heavy | G |

(d) *Below Foreigns Guys or Communication Cables and Neon Signs:*

| STORM LOADING AREA | TABLE |
|--------------------|-------|
| Light | C |
| Medium | F |
| Heavy | G |

(e) *Alongside Neon Signs*

| STORM LOADING AREA | TABLE |
|--------------------|-------|
| Light | C |
| Medium | F |
| Heavy | G |

3.03 Determining Clearances—Using Graph Tables C Through M: The clearance required for various job conditions for span lengths not included in Table A or B, can be determined in the following manner:

- Identify the reference letter (A, B, C, etc) associated with the job condition.
- Locate the vertical line associated with the span length encountered.
- The horizontal line, at which the two above lines intersect, will identify the clearance (feet-inches) required.

4. POWER SUPPLY VOLTAGES

4.01 Employees placing a drop wire that may contact a power supply wire or cable shall wear insulating gloves and other protective equipment when performing such a work operation. In joint construction, any one of the following supply voltages could be encountered:

Phase-to-Phase Voltage

- Secondary distribution—600 volts or less
- Primary distribution—2200 to 34,500 volts
- Subtransmission—26,000 to 69,000 volts.

Phase-to-Ground Voltage

- Primary distribution—1270 to 20,000 volts
- Subtransmission—15,000 to 40,000 volts.

4.02 It is imperative that employees be able to identify supply voltages and take additional precautions when exposed to such voltages.

4.03 Power conductors immediately above telephone facilities, if attached to spool type insulators on a crossarm, can safely be assumed to be secondary service, with voltages less than 600 volts.

4.04 It is quite common to have a primary distribution supply, above the secondary distribution with a voltage range of 2200 to 34,500 volts.

4.05 Employees can estimate the voltage of power by observing the size and type of insulator, voltage markings on transformer, position of supply conductors on a pole, etc. (See Fig. 8, 9, and 10.)

4.06 Employees should make it a point to acquaint themselves with the power company facilities in localities where they work, so they may be able to accurately estimate power facilities.

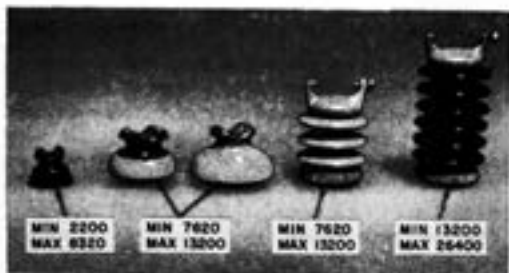


Fig. 8—Typical Power Supply Insulators



Fig. 9—Voltage Marking on Transformer

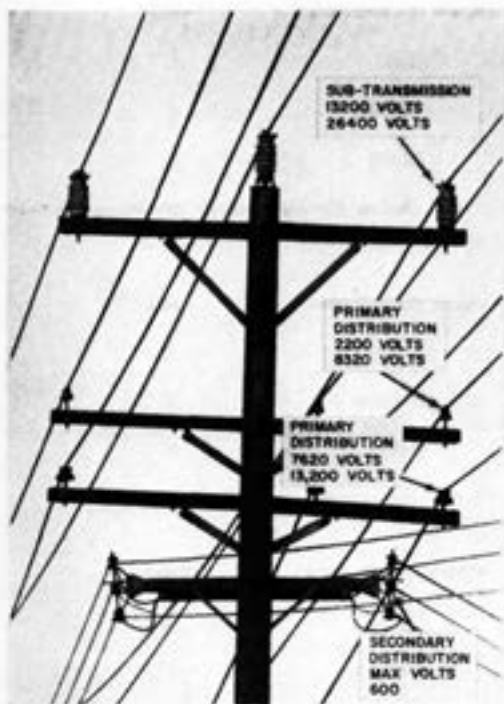


Fig. 10—Position of Supply Conductors

TABLE A
CLEARANCES
PLACING DROP WIRE (AT 80° F)
ABOVE GROUND OR RAILS

| STORM LOADING AREA | | LIGHT | | | MEDIUM | | HEAVY | | |
|---|------------------|-------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| SPAN LENGTH (FT) | | 300 OR LESS | 350 OR LESS | 170 OR LESS | OVER 170 | 75 OR LESS | OVER 75 | 75 OR LESS | OVER 75 |
| DROP WIRE SAG | | NORMAL OR MINIMUM | NORMAL | MINIMUM | MINIMUM | NORMAL | NORMAL | MINIMUM | MINIMUM |
| Crossing Above: | REF | FT IN | FT IN | FT IN | TABLE | FT IN | TABLE | FT IN | TABLE |
| Railroad Tracks Generally Special Case | Fig. 2 | † 27-0 25-0 | ‡ 27-0 25-0 | ‡ 27-0 25-0 | See Table H | § 27-0 25-0 | See Table I | § 27-3 25-3 | See Table J |
| Public Roads Generally * Pole at Road's Edge* | Fig. 4 | 18-0 -- | 18-0 -- | 18-0 18-0 | | 18-0 18-0 | | 18-3 18-3 | |
| Public Alleys Generally Pole at Road's Edge | Fig. 4 | 15-0 -- | 15-0 -- | 15-0 15-0 | | 15-0 15-0 | | 15-3 15-3 | |
| Residential Driveways Generally Pole at Road's Edge | Fig. 4 | 10-0 -- | 10-0 -- | 10-0 10-0 | | 10-0 10-0 | | 10-3 10-3 | |
| Flat Roof Edges | | 8-0 | 8-0 | 8-0 | | 8-0 | | 8-3 | |
| Peak Roof Edges or Billboards | | 2-0 | 2-0 | 2-0 | | 2-0 | | 2-2 | |
| Neon Signs | | 4-0 | 4-0 | 4-0 | | 4-0 | | 4-3 | |
| Waterways | | Must Be Shown On Detail Plans | | | | | | | |
| Running Along: | | | | | | | | | |
| Public Roads With: Major Overhang | Fig. 5 | 18-0 | 18-0 | 18-0 | See Table H | 18-0 | See Table I | 18-3 | See Table J |
| Minor Overhang Urban Rural (Lt Traffic) | Fig. 5 | 18-0 14-0 | 18-0 14-0 | 18-0 14-0 | | 18-0 14-0 | | 18-3 14-3 | |
| No Overhang Back of Obstr Not Back of Obstr | Fig. 6 Fig. 7 | 8-0 13-0 | 8-0 13-0 | 8-0 13-0 | | 8-0 13-0 | | 8-3 13-3 | |
| Public Alleys | | 15-0 | 15-0 | 15-0 | | 15-0 | | 15-3 | |

* Clearance height over residential street may be reduced 2 feet at the edge of the road, if the required clearance at the center of the road is obtained (Fig. 3).

† Must be supported on 6M strand for spans over 150 ft.

‡ Must be supported on 6M strand for spans over 125 ft.

§ Must be supported on 6M strand for spans over 100 ft.

TABLE B
DROP WIRE
MAINTENANCE CLEARANCES (AT 60° F)
ABOVE GROUND OR RAILS

| STORM LOADING AREA | | LIGHT | | | MEDIUM | | HEAVY | | |
|-------------------------------|--------|-------------------------------|-------------|-------------|-------------|------------|-------------|------------|-------------|
| SPAN LENGTH (FT) | | 300 OR LESS | 250 OR LESS | 175 OR LESS | OVER 175 | 75 OR LESS | OVER 75 | 75 OR LESS | OVER 75 |
| DROP WIRE SAG | | NORMAL OR MINIMUM | NORMAL | MINIMUM | MINIMUM | NORMAL | NORMAL | MINIMUM | MINIMUM |
| Crossing Above: | REF | FT IN | FT IN | FT IN | TABLE | FT IN | TABLE | FT IN | TABLE |
| Railroad Tracks | | † | ‡ | ‡ | See Table K | § | See Table I | § | See Table M |
| Generally | | 27-0 | 27-0 | 27-0 | | 27-0 | | 27-0 | |
| Special Case | Fig. 2 | 25-0 | 25-0 | 25-0 | | 25-0 | | 25-0 | |
| Public Roads | | | | | | | | | |
| Generally * | | 18-0 | 18-0 | 18-0 | | 18-0 | | 18-0 | |
| Pole at Road's Edge* | Fig. 4 | -- | -- | 18-0 | | 18-0 | | 18-0 | |
| Public Alleys | | | | | | | | | |
| Generally | | 15-0 | 15-0 | 15-0 | | 15-0 | | 15-0 | |
| Pole at Road's Edge | Fig. 4 | -- | -- | 15-0 | | 15-0 | | 15-0 | |
| Residential Driveways | | | | | | | | | |
| Generally | | 10-0 | 10-0 | 10-0 | 10-0 | 10-0 | | | |
| Pole at Road's Edge | Fig. 4 | -- | -- | 10-0 | 10-0 | 10-0 | | | |
| Flat Roof Bldgs | | 8-0 | 8-0 | 8-0 | 8-0 | 8-0 | | | |
| Peak Roof Bldgs or Billboards | | 2-0 | 2-0 | 2-0 | 2-0 | 2-0 | | | |
| Neon Signs | | 4-0 | 4-0 | 4-0 | 4-0 | 4-0 | | | |
| Waterways | | Must Be Shown On Detail Plans | | | | | | | |
| Running Along: | | | | | | | | | |
| Public Roads With: | | | | | See Table K | | See Table L | | See Table M |
| Major Overhang | Fig. 5 | 18-0 | 18-0 | 18-0 | | 18-0 | | 18-0 | |
| Minor Overhang | Fig. 5 | | | | | | | | |
| Urban | | 18-0 | 18-0 | 18-0 | | 18-0 | | 18-0 | |
| Rural (Lt Traffic) | | 14-0 | 14-0 | 14-0 | 14-0 | 14-0 | | | |
| No Overhang | | | | | | | | | |
| Back of Obstr | Fig. 6 | 8-0 | 8-0 | 8-0 | 8-0 | 8-0 | | | |
| Not Back of Obstr | Fig. 7 | 13-0 | 13-0 | 13-0 | 13-0 | 13-0 | | | |
| Public Alleys | | 15-0 | 15-0 | 15-0 | 15-0 | 15-0 | | | |

* Clearance height over residential street may be reduced 2 feet at the edge of the road, if the required clearance at the center of the road is obtained (Fig. 3).

† Must be supported on 6M strand for spans over 150 ft.

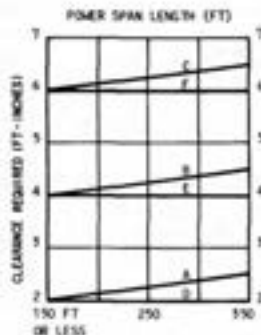
‡ Must be supported on 6M strand for spans over 125 ft.

§ Must be supported on 6M strand for spans over 100 ft.

TABLE C
LIGHT LOADING AREA

CLEARANCES
PLACING DROP WIRE
(WITH NORMAL OR MINIMUM SAG)
CROSSING BELOW POWER WIRES OR CABLES

| KIND OF FACILITY | REF |
|--|-------------|
| 500 VOLTS (NOTE 1) OR LESS SERVICE WIRES OR CABLES LINE WIRES—GENERALLY IF WITHIN 6 FT OF TELEPHONE POLE (NOTE 2) | A A B |
| 501-750 VOLTS (NOTE 1) PHASE WIRES | B |
| 751-8700 VOLTS (NOTE 1) PHASE WIRES—GENERALLY IF WITHIN 6 FT OF TELEPHONE POLE (NOTE 2) | B C |
| 8701-30,000 VOLTS (NOTE 1) PHASE WIRES—GENERALLY IF NEAR TELEPHONE POLE (NOTE 2) | C |
| GROUNDED NEUTRALS—SYSTEMS OF: UP TO 22,000 VOLTS TO GROUND | A |
| OVER 22,000 VOLTS TO GROUND (NOTE 3) | |
| OTHER NEUTRALS (NOTE 3) | |
| GROUNDING METAL SHEATH CABLES OR ANY CABLE LASHED TO GROUNDING STRAND—ANY VOLTAGE | D |
| SPACER CABLES (NOTE 4) 500 VOLTS (NOTE 1) OR LESS GENERALLY IF WITHIN 6 FT OF TELEPHONE POLE (NOTE 2) | D E |
| 501-750 VOLTS (NOTE 1) | E |
| 751-8700 VOLTS (NOTE 1) GENERALLY IF WITHIN 6 FT OF TELEPHONE POLE (NOTE 2) | E F |
| 8701-30,000 VOLTS (NOTE 1) IF NEAR TELEPHONE POLE (NOTE 2) | F |



NOTE:
MAINTENANCE CLEARANCES FOR SPAN LENGTHS UP TO
150 FEET TO BE THE SAME AS THAT SPECIFIED
IN PLACING THE DROP WIRE FOR SPAN LENGTHS OF 150
FEET OR LESS.

- NOTES:
- VOLTAGE TO GROUND, IF POWER CIRCUIT IS EFFECTIVELY GROUNDING; VOLTAGE BETWEEN WIRES IF NOT GROUNDING.
 - EVERY EFFORT SHALL BE MADE TO AVOID THESE SITUATIONS AND ESTABLISH A COMMON POLE CROSSING INSTEAD.
 - SAME AS ASSOCIATED PHASE WIRES.
 - ILLUSTRATED IN SECTION 420-216-015.
 - PLACE WIRE GUARD AT POINT OF CROSSING.

| DROP WIRE ABOVE | DROP WIRE | |
|--|------------------------|-------------------------|
| | CLEARANCE * FT - IN | MAX SPAN LENGTH † FT |
| POWER SERVICE DROPS OR POWER LINE WIRES 500 VOLTS OR LESS | 2 0 | 300 |
| TROLLEY CONTACT WIRES 750 VOLTS OR LESS (NOTE 5) | 4 0 | 250 |
| DROP WIRE BELOW | | |
| FOREIGN GUYS, COMMUNICATION CABLES | 2 0 | 500 |
| NEON SIGN | 4 0 | 500 |
| DROP WIRE ALONGSIDE | | |
| NEON SIGN | 2 0 | 500 |

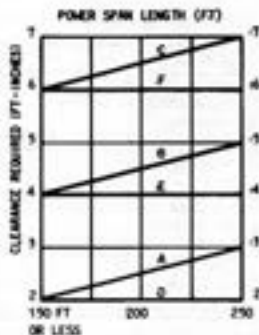
* PLACING OR MAINTENANCE CLEARANCE

† NORMAL OR MINIMUM DROP WIRE SAG

TABLE D
MEDIUM LOADING AREA

CLEARANCES
PLACING DROP WIRE
(WITH NORMAL OR MINIMUM SAG)
CROSSING BELOW POWER WIRES OR CABLES

| KIND OF FACILITY | REF |
|--|-----|
| 100 VOLTS (NOTE 1) OR LESS SERVICE WIRES OR CABLES | A |
| LINE WIRES—GENERALLY | A |
| IF WITHIN 6 FT OF TELEPHONE POLE (NOTE 2) | B |
| 101-750 VOLTS (NOTE 1) PHASE WIRES | B |
| 751-8700 VOLTS (NOTE 1) PHASE WIRES—GENERALLY | B |
| IF WITHIN 6 FT OF TELEPHONE POLE (NOTE 2) | C |
| 8701-50,000 VOLTS (NOTE 1) PHASE WIRES—GENERALLY | C |
| IF NEAR TELEPHONE POLE (NOTE 2) | |
| GROUNDING NEUTRALS—SYSTEMS OF: UP TO 22,000 VOLTS TO GROUND | A |
| OVER 22,000 VOLTS TO GROUND (NOTE 3) | |
| OTHER NEUTRALS (NOTE 3) | |
| GROUNDING METAL SHEATH CABLES OR ANY CABLE LASHED TO GROUNDING STRAND—ANY VOLTAGE | D |
| SPACER CABLES (NOTE 4) 300 VOLTS (NOTE 1) OR LESS GENERALLY | D |
| IF WITHIN 6 FT OF TELEPHONE POLE (NOTE 2) | E |
| 101-750 VOLTS (NOTE 1) | E |
| 751-8700 VOLTS (NOTE 1) GENERALLY | E |
| IF WITHIN 6 FT OF TELEPHONE POLE (NOTE 2) | F |
| 8701-50,000 VOLTS (NOTE 1) IF NEAR TELEPHONE POLE (NOTE 2) | F |



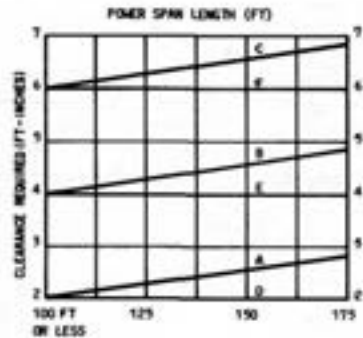
NOTE:
MAINTENANCE CLEARANCES FOR SPAN LENGTHS UP TO
250 FEET TO BE THE SAME AS THAT SPECIFIED
IN PLACING THE DROP WIRE FOR SPAN LENGTHS OF 150
FEET OR LESS.

NOTES:
1. VOLTAGE TO GROUND, IF POWER CIRCUIT IS
EFFECTIVELY GROUNDING; VOLTAGE BETWEEN
WIRES IF NOT GROUNDING.
2. EVERY EFFORT SHALL BE MADE TO AVOID
THESE SITUATIONS AND ESTABLISH A
COMMON POLE CROSSING INSTEAD.
3. SAME AS ASSOCIATED PHASE WIRES.
4. ILLUSTRATED IN SECTION 620-216-015.

TABLE E
HEAVY LOADING AREA

CLEARANCES
PLACING DROP WIRE
(WITH NORMAL OR MINIMUM SAG)
CROSSING BELOW POWER WIRES OR CABLES

| KIND OF FACILITY | REF |
|---|-------------|
| 500 VOLTS (NOTE 1) OR LESS SERVICE WIRES OR CABLES LINE WIRES--GENERALLY IF WITHIN 6 FT OF TELEPHONE POLE (NOTE 2) | A A B |
| 501-750 VOLTS (NOTE 1) PHASE WIRES | B |
| 751-8700 VOLTS (NOTE 1) PHASE WIRES--GENERALLY IF WITHIN 6 FT OF TELEPHONE POLE (NOTE 2) | B C |
| 8701-50,000 VOLTS (NOTE 1) PHASE WIRES--GENERALLY IF NEAR TELEPHONE POLE (NOTE 2) | C |
| GROUNDING NEUTRALS--SYSTEMS OF: UP TO 22,000 VOLTS TO GROUND | A |
| OVER 22,000 VOLTS TO GROUND (NOTE 3) | |
| OTHER NEUTRALS (NOTE 3) | |
| GROUNDING METAL SHEATH CABLES OR ANY CABLE LASHED TO GROUNDING STRAND--ANY VOLTAGE | D |
| SPACER CABLES (NOTE 4) 500 VOLTS (NOTE 1) OR LESS GENERALLY IF WITHIN 6 FT OF TELEPHONE POLE (NOTE 2) | D E |
| 501-750 VOLTS (NOTE 1) | E |
| 751-8700 VOLTS (NOTE 1) GENERALLY IF WITHIN 6 FT OF TELEPHONE POLE (NOTE 2) | E F |
| 8701-50,000 VOLTS (NOTE 1) IF NEAR TELEPHONE POLE (NOTE 2) | F |



NOTE:

MAINTENANCE CLEARANCES FOR SPAN LENGTHS OF 104 TO 175 FEET TO BE THE SAME AS THAT SPECIFIED IN PLACING THE DROP WIRE FOR SPAN LENGTHS OF 100 FEET OR LESS.

NOTES:

1. VOLTAGE TO GROUND, IF POWER CIRCUIT IS EFFECTIVELY GROUNDING; VOLTAGE BETWEEN WIRES IF NOT GROUNDING.
2. EVERY EFFORT SHALL BE MADE TO AVOID THESE SITUATIONS AND ESTABLISH A COMMON POLE CROSSING INSTEAD.
3. SAME AS ASSOCIATED PHASE WIRES.
4. ILLUSTRATED IN SECTION 620-214-015.

TABLE F
MEDIUM LOADING AREA

| DROP WIRE ABOVE | PLACING WIRE | | MAINTAINING WIRE | |
|--|--------------|-------------|------------------|-------------|
| | NORMAL SAG | MINIMUM SAG | NORMAL SAG | MINIMUM SAG |
| POWER SERVICE DROPS OR POWER LINE WIRES 700 VOLTS OR LESS | A | B | A | A |
| TROLLEY CONTACT WIRES 750 VOLTS OR LESS (NOTE 1) | C | D | C | C |
| DROP WIRE BELOW | | | | |
| FOREIGN GUYS, COMMUNICATION CABLES (NOTE 2) | A | A | A | A |
| NEON SIGN | C | C | C | C |
| DROP WIRE ALONGSIDE | | | | |
| NEON SIGN | A | A | A | A |

NOTES:

1. PLACE WIRE GUARD AT POINT OF CROSSING.
2. SPAN LENGTH OF FOREIGN CABLE NOT OVER 250 FEET.

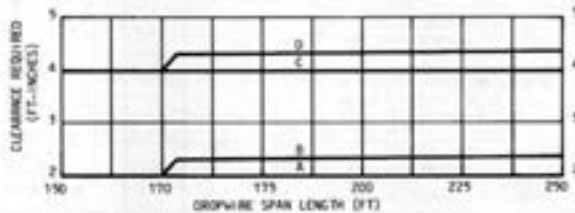


TABLE G
HEAVY LOADING AREA

| DROP WIRE ABOVE | PLACING WIRE | | MAINTAINING WIRE | |
|--|--------------|-------------|------------------|-------------|
| | NORMAL SAG | MINIMUM SAG | NORMAL SAG | MINIMUM SAG |
| POWER SERVICE DROPS OR POWER LINE WIRES 700 VOLTS OR LESS | A | B | C | C |
| TROLLEY CONTACT WIRES 750 VOLTS OR LESS (NOTE 1) | D | E | F | F |
| DROP WIRE BELOW | | | | |
| FOREIGN GUYS, COMMUNICATION CABLES (NOTE 2) | C | C | C | C |
| NEON SIGN | F | F | F | F |
| DROP WIRE ALONGSIDE | | | | |
| NEON SIGN | C | C | C | C |

NOTES:

1. PLACE WIRE GUARD AT POINT OF CROSSING.
2. SPAN LENGTH OF FOREIGN CABLE NOT OVER 175 FEET.

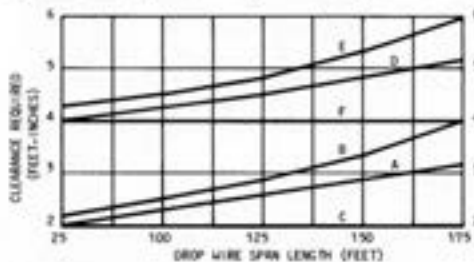


TABLE H
PLACING DROP WIRE IN MEDIUM LOADING AREA
WITH MINIMUM SAG

DETERMINING CLEARANCE REQUIRED

- IDENTIFY THE REFERENCE LETTER (A, B, C, ETC) ASSOCIATED WITH THE JOB CONDITION. IF THE DROP WIRE CROSSES ABOVE A PUBLIC ROAD (POLE NOT WITHIN 50 FT) THE REFERENCE LETTER WOULD BE C.
- LOCATE THE VERTICAL LINE OF THE DROP WIRE SPAN LENGTH. IF THE DROP WIRE SPAN OVER THE PUBLIC ROAD IS 200 FT, IDENTIFY THE VERTICAL LINE OF THE 200 FT SPAN LENGTH.
- THE REQUIRED CLEARANCE HEIGHT IS THE POINT WHERE LINE C AND LINE 200 INTERSECT. REFER HORIZONTALLY TO THE CLEARANCE (FEET-INCHES) HEIGHT REQUIRED.

| DROP WIRE CROSSING ABOVE | REF |
|--|-----|
| RAILROAD TRACKS GENERALLY | A |
| SPECIAL CASE (FIG. 2) | B |
| PUBLIC ROADS GENERALLY * | C |
| POLE AT ROADS EDGE (WITHIN 50 FT OF FAR EDGE (FIG. 4)) * | D |
| PUBLIC ALLEYS GENERALLY | E |
| POLE AT ROADS EDGE (WITHIN 50 FT OF FAR EDGE (FIG. 4)) | F |
| RESIDENTIAL DRIVEWAYS GENERALLY | G |
| POLE AT ROADS EDGE (WITHIN 50 FT OF FAR EDGE (FIG. 4)) | H |
| FLAT ROOF BUILDING | I |
| PEAK ROOF BUILDING OR BILLBOARD | J |
| NEON SIGN | K |

| DROP WIRE RUNNING ALONG | |
|---|---|
| PUBLIC ROAD MAJOR OVERHANG (FIG. 5) | L |
| MINOR OVERHANG (FIG. 5) | M |
| URBAN RURAL (LIGHT TRAFFIC) | N |
| NO OVERHANG BACK OF OBSTRUCTION (FIG. 6) | O |
| NOT BACK OF OBSTRUCTION (FIG. 7) | P |
| PUBLIC ALLEY | Q |

- * THE CLEARANCE OVER RESIDENTIAL STREETS MAY BE REDUCED 2 FEET AT THE EDGE OF THE ROAD IF REQUIRED CLEARANCE IS OBTAINED AT THE CENTER OF THE ROAD. SEE FIG. 3.

NOTE:

- MUST BE SUPPORTED ON 6M STRAND FOR SPANS OVER 125 FT.
- NOT RECOMMENDED FOR SPAN LENGTHS OVER 250 FT.

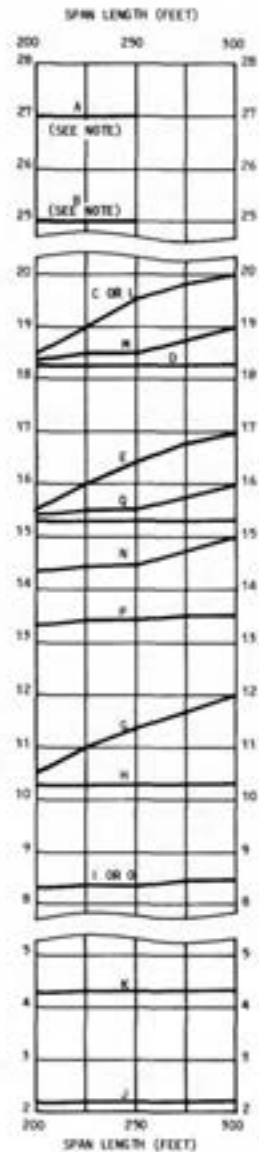


TABLE I
PLACING DROP WIRE IN HEAVY LOADING AREA
WITH NORMAL SAG

DETERMINING CLEARANCE REQUIRED

- IDENTIFY THE REFERENCE LETTER (A, B, C, ETC) ASSOCIATED WITH THE JOB CONDITION. IF THE DROP WIRE CROSSES ABOVE A PUBLIC ROAD (POLE NOT WITHIN 50 FT) THE REFERENCE LETTER WOULD BE C.
- LOCATE THE VERTICAL LINE OF THE DROP WIRE SPAN LENGTH. IF THE DROP WIRE SPAN OVER THE PUBLIC ROAD IS 200 FT, IDENTIFY THE VERTICAL LINE OF THE 200 FT SPAN LENGTH.
- THE REQUIRED CLEARANCE HEIGHT IS THE POINT WHERE LINE C AND LINE 200 INTERSECT. REFER HORIZONTALLY TO THE CLEARANCE (FEET-INCHES) HEIGHT REQUIRED.

| DROP WIRE CROSSING ABOVE | REF |
|--|-----|
| RAILROAD TRACKS GENERALLY | A |
| SPECIAL CASE (FIG. 2) | B |
| PUBLIC ROADS GENERALLY * | C |
| POLE AT ROAD EDGE (WITHIN 50 FT OF FAR EDGE (FIG. 4) * | D |
| PUBLIC ALLEYS GENERALLY | E |
| POLE AT ROAD EDGE (WITHIN 50 FT OF FAR EDGE (FIG. 4) * | F |
| RESIDENTIAL DRIVEWAYS GENERALLY | G |
| POLE AT ROAD EDGE (WITHIN 50 FT OF FAR EDGE (FIG. 4) * | H |
| FLAT ROOF BUILDING | I |
| PEAK ROOF BUILDING OR BILLBOARD | J |
| NEON SIGN | K |

DROP WIRE RUNNING ALONG

| | |
|---|---|
| PUBLIC ROAD MAJOR OVERHANG (FIG. 5) | L |
| MINOR OVERHANG (FIG. 5) | M |
| URBAN RURAL (LIGHT TRAFFIC) | N |
| NO OVERHANG BACK OF OBSTRUCTION (FIG. 4) | O |
| NOT BACK OF OBSTRUCTION (FIG. 3) | P |
| PUBLIC ALLEY | Q |

- * THE CLEARANCE OVER RESIDENTIAL STREETS MAY BE REDUCED 2 FEET AT THE EDGE OF THE ROAD IF REQUIRED CLEARANCE IS OBTAINED AT THE CENTER OF THE ROAD. SEE FIG. 3.

NOTE:

MUST BE SUPPORTED ON AN STRAND FOR SPANS OVER 100 FT.
NOT RECOMMENDED FOR SPAN LENGTHS OVER 175 FT.

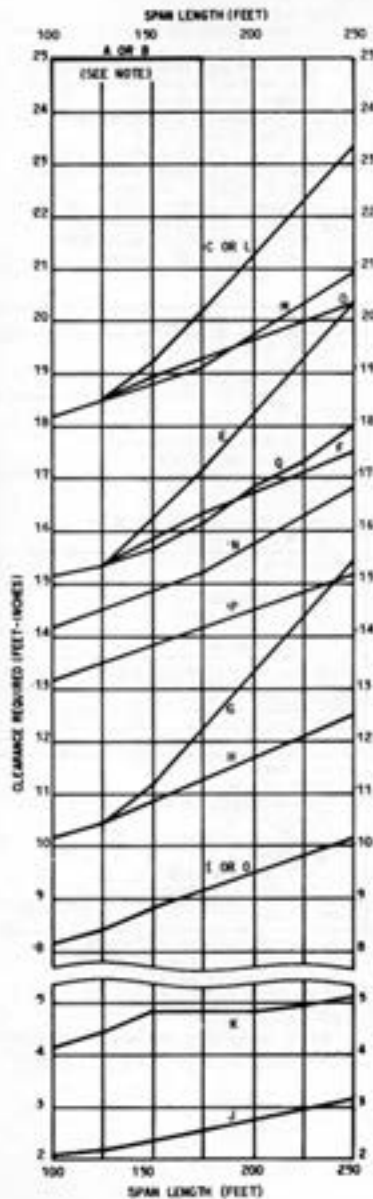


TABLE J
PLACING DROP WIRE IN HEAVY LOADING AREA
WITH MINIMUM SAG

DETERMINING CLEARANCE REQUIRED

- IDENTIFY THE REFERENCE LETTER (A, B, C, ETC) ASSOCIATED WITH THE JOB CONDITION.
 IF THE DROP WIRE CROSSES ABOVE A PUBLIC ROAD (POLE NOT WITHIN 50 FT) THE REFERENCE LETTER WOULD BE C.
- LOCATE THE VERTICAL LINE OF THE DROP WIRE SPAN LENGTH.
 IF THE DROP WIRE SPAN OVER THE PUBLIC ROAD IS 200 FT, IDENTIFY THE VERTICAL LINE OF THE 200 FT SPAN LENGTH.
- THE REQUIRED CLEARANCE HEIGHT IS THE POINT WHERE LINE C AND LINE 200 INTERSECT. REFER HORIZONTALLY TO THE CLEARANCE (FEET-INCHES) HEIGHT REQUIRED.

| DROP WIRE CROSSING ABOVE | REF |
|---|-----|
| RAILROAD TRACKS | |
| GENERALLY | A |
| SPECIAL CASE (FIG. 2) | B |
| PUBLIC ROADS | |
| GENERALLY* | C |
| POLE AT ROADS EDGE (WITHIN 50 FT OF FAR EDGE (FIG. 4))* | D |
| PUBLIC ALLEYS | |
| GENERALLY | E |
| POLE AT ROADS EDGE (WITHIN 50 FT OF FAR EDGE (FIG. 4)) | F |
| RESIDENTIAL DRIVEWAYS | |
| GENERALLY | G |
| POLE AT ROADS EDGE (WITHIN 50 FT OF FAR EDGE (FIG. 4)) | H |
| FLAT ROOF BUILDING | I |
| PEAK ROOF BUILDING OR BILLBOARD | J |
| NEON SIGN | K |

| DROP WIRE RUNNING ALONG | REF |
|----------------------------------|-----|
| PUBLIC ROAD | |
| MAJOR OVERHANG (FIG. 5) | L |
| MINOR OVERHANG (FIG. 5) | |
| URBAN | M |
| RURAL (LIGHT TRAFFIC) | N |
| NO OVERHANG | |
| BACK OF OBSTRUCTION (FIG. 6) | O |
| NOT BACK OF OBSTRUCTION (FIG. 7) | P |
| PUBLIC ALLEY | Q |

- * THE CLEARANCE OVER RESIDENTIAL STREETS MAY BE REDUCED 2 FEET AT THE EDGE OF THE ROAD IF REQUIRED CLEARANCE IS OBTAINED AT THE CENTER OF THE ROAD, SEE FIG. 3.

NOTE:

MUST BE SUPPORTED ON GR STRAND FOR SPANS OVER 100 FT, NOT RECOMMENDED FOR SPAN LENGTHS OVER 150 FT.

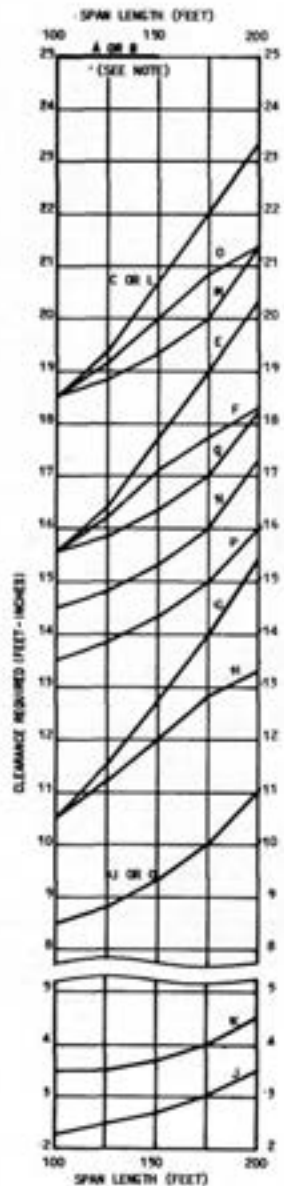


TABLE K
DROP WIRE MAINTENANCE CLEARANCES FOR
MEDIUM LOADING AREAS -
WIRES WITH MINIMUM SAG

DETERMINING CLEARANCE REQUIRED

- IDENTIFY THE REFERENCE LETTER (A, B, C, ETC) ASSOCIATED WITH THE JOB CONDITION.
IF THE DROP WIRE CROSSES ABOVE A PUBLIC ROAD (POLE NOT WITHIN 50 FT) THE REFERENCE LETTER WOULD BE C.
- LOCATE THE VERTICAL LINE OF THE DROP WIRE SPAN LENGTH.
IF THE DROP WIRE SPAN OVER THE PUBLIC ROAD IS 200 FT, IDENTIFY THE VERTICAL LINE OF THE 200 FT SPAN LENGTH.
- THE REQUIRED CLEARANCE HEIGHT IS THE POINT WHERE LINE C AND LINE 200 INTERSECT. REFER HORIZONTALLY TO THE CLEARANCE (FEET-INCHES) HEIGHT REQUIRED.

| DROP WIRE CROSSING ABOVE | REF |
|---|-----|
| RAILROAD TRACKS GENERALLY | A |
| SPECIAL CASE (FIG. 7) | B |
| PUBLIC ROADS GENERALLY * | C |
| POLE AT ROAD EDGE (WITHIN 50 FT OF FAR EDGE (FIG. 4)) * | D |
| PUBLIC ALLEYS GENERALLY | E |
| POLE AT ROAD EDGE (WITHIN 50 FT OF FAR EDGE (FIG. 4)) | F |
| RESIDENTIAL DRIVEWAYS GENERALLY | G |
| POLE AT ROAD EDGE (WITHIN 50 FT OF FAR EDGE (FIG. 4)) | H |
| FLAT ROOF BUILDING | I |
| PEAK ROOF BUILDING OR BILLBOARD | J |
| NEON SIGN | K |

| DROP WIRE RUNNING ALONG | REF |
|---|-----|
| PUBLIC ROAD MAJOR OVERHANG (FIG. 5) | L |
| MINOR OVERHANG (FIG. 5) | M |
| URBAN RURAL (LIGHT TRAFFIC) | N |
| NO OVERHANG BACK OF OBSTRUCTION (FIG. 6) NOT BACK OF OBSTRUCTION (FIG. 7) | O |
| PUBLIC ALLEY | Q |

- THE CLEARANCE OVER RESIDENTIAL STREETS MAY BE REDUCED 2 FEET AT THE EDGE OF THE ROAD IF REQUIRED CLEARANCE IS OBTAINED AT THE CENTER OF THE ROAD, SEE FIG. 3.

NOTE:

- MUST BE SUPPORTED ON 6M STRAND FOR SPANS OVER 125 FT.
NOT RECOMMENDED FOR SPAN LENGTHS OVER 250 FT.

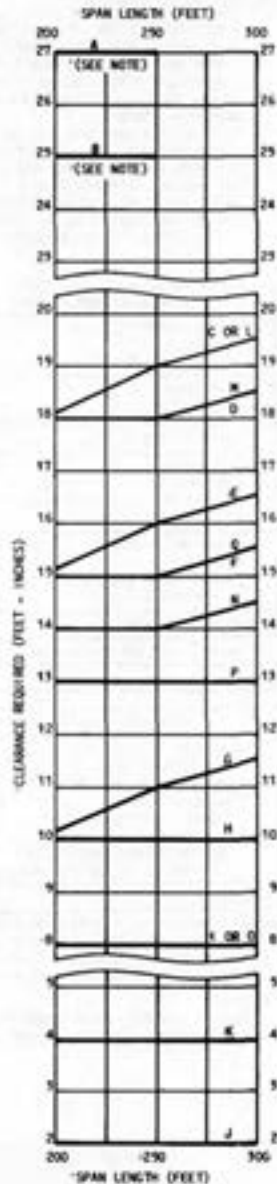


TABLE L
DROP WIRE MAINTENANCE CLEARANCES FOR
HEAVY LOADING AREA -
WIRES WITH NORMAL SAG

DETERMINING CLEARANCE REQUIRED

- IDENTIFY THE REFERENCE LETTER (A, B, C, ETC) ASSOCIATED WITH THE JOB CONDITION.
 IF THE DROP WIRE CROSSES ABOVE A PUBLIC ROAD (POLE NOT WITHIN 50 FT) THE REFERENCE LETTER WOULD BE C.
- LOCATE THE VERTICAL LINE OF THE DROP WIRE SPAN LENGTH.
 IF THE DROP WIRE SPAN OVER THE PUBLIC ROAD IS 200 FT, IDENTIFY THE VERTICAL LINE OF THE 200 FT SPAN LENGTH.
- THE REQUIRED CLEARANCE HEIGHT IS THE POINT WHERE LINE C AND LINE 200 INTERSECT, REFER HORIZONTALLY TO THE CLEARANCE (FEET-INCHES) HEIGHT REQUIRED.

| DROP WIRE CROSSING ABOVE | REF |
|--|-----|
| RAILROAD TRACKS GENERALLY | A |
| SPECIAL CASE (FIG. 2) | B |
| PUBLIC ROADS GENERALLY * | C |
| POLE AT ROAD EDGE (WITHIN 50 FT OF FAR EDGE (FIG. 4) * | D |
| PUBLIC ALLEYS GENERALLY | E |
| POLE AT ROAD EDGE (WITHIN 50 FT OF FAR EDGE (FIG. 4) * | F |
| RESIDENTIAL DRIVEWAYS GENERALLY | G |
| POLE AT ROAD EDGE (WITHIN 50 FT OF FAR EDGE (FIG. 4) * | H |
| FLAT ROOF BUILDING | I |
| PEAK ROOF BUILDING OR BILLBOARD | J |
| NEON SIGN | K |

| DROP WIRE RUNNING ALONG | REF |
|---|-----|
| PUBLIC ROAD MAJOR OVERHANG (FIG. 5) | L |
| MINOR OVERHANG (FIG. 5) | M |
| URBAN RURAL (LIGHT TRAFFIC) | N |
| NO OVERHANG BACK OF OBSTRUCTION (FIG. 4) | O |
| NOT BACK OF OBSTRUCTION (FIG. 7) | P |
| PUBLIC ALLEY | Q |

- * THE CLEARANCE OVER RESIDENTIAL STREETS MAY BE REDUCED 2 FEET AT THE EDGE OF THE ROAD IF REQUIRED CLEARANCE IS OBTAINED AT THE CENTER OF THE ROAD, SEE FIG. 3.

NOTE:

- MUST BE SUPPORTED ON 6M STRAND FOR SPANS OVER 100 FT.
- NOT RECOMMENDED FOR SPAN LENGTHS OVER 175 FT.

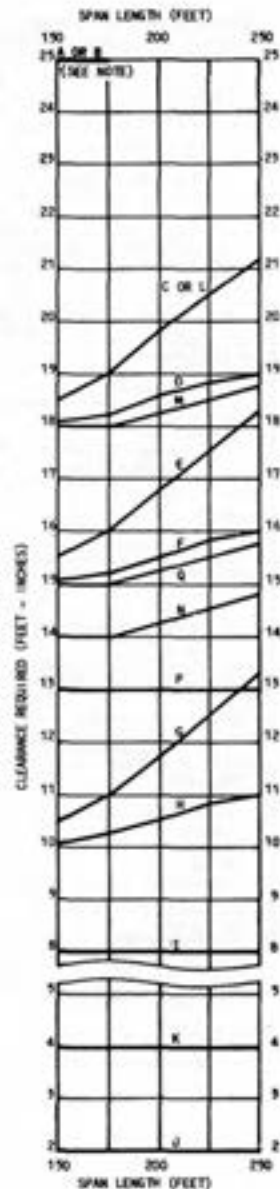


TABLE M
DROP WIRE MAINTENANCE CLEARANCES FOR
HEAVY LOADING AREA -
WIRES WITH MINIMUM SAG

DETERMINING CLEARANCE REQUIRED

- IDENTIFY THE REFERENCE LETTER (A, B, C, ETC) ASSOCIATED WITH THE JOB CONDITION.
IF THE DROP WIRE CROSSES ABOVE A PUBLIC ROAD (POLE NOT WITHIN 50 FT) THE REFERENCE LETTER WOULD BE C.
- LOCATE THE VERTICAL LINE OF THE DROP WIRE SPAN LENGTH.
IF THE DROP WIRE SPAN OVER THE PUBLIC ROAD IS 200 FT, IDENTIFY THE VERTICAL LINE OF THE 200 FT SPAN LENGTH.
- THE REQUIRED CLEARANCE HEIGHT IS THE POINT WHERE LINE C AND LINE 200 INTERSECT. REFER HORIZONTALLY TO THE CLEARANCE (FEET-INCHES) HEIGHT REQUIRED.

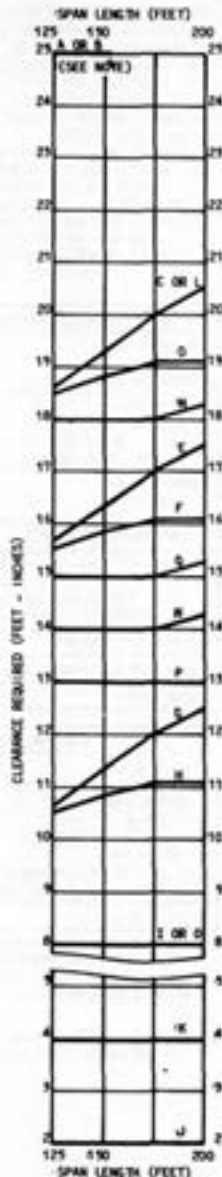
| DROP WIRE CROSSING ABOVE | REF |
|--|--------|
| RAILROAD TRACKS GENERALLY SPECIAL CASE (FIG. 2) | A B |
| PUBLIC ROADS GENERALLY * POLE AT ROADS EDGE (WITHIN 50 FT OF FAR EDGE [FIG. 4]) * | C D |
| PUBLIC ALLEYS GENERALLY POLE AT ROADS EDGE (WITHIN 50 FT OF FAR EDGE [FIG. 4]) | E F |
| RESIDENTIAL DRIVEWAYS GENERALLY POLE AT ROADS EDGE (WITHIN 50 FT OF FAR EDGE [FIG. 4]) | G H |
| FLAT ROOF BUILDING | I |
| PEAK ROOF BUILDING OR BILLBOARD | J |
| NEON SIGN | K |

| DROP WIRE RUNNING ALONG | REF |
|--|-------------|
| PUBLIC ROAD MAJOR OVERHANG (FIG. 5) MINOR OVERHANG (FIG. 5) URBAN RURAL (LIGHT TRAFFIC) NO OVERHANG | L M N |
| BACK OF OBSTRUCTION (FIG. 6) NOT BACK OF OBSTRUCTION (FIG. 7) | O P |
| PUBLIC ALLEY | Q |

- * THE CLEARANCE OVER RESIDENTIAL STREETS MAY BE REDUCED 2 FEET AT THE EDGE OF THE ROAD IF REQUIRED CLEARANCE IS OBTAINED AT THE CENTER OF THE ROAD. SEE FIG. 3.

NOTE:

MUST BE SUPPORTED ON 4M STRAND FOR SPANS OVER 100 FT.
NOT RECOMMENDED FOR SPAN LENGTHS OVER 150 FT.



SPlicing DROP AND BLOCK WIRING

| | CONTENTS | PAGE |
|----|--|------|
| 1. | GENERAL | 1 |
| 2. | DESCRIPTION OF SINGLE TUBE BRASS SLEEVES | 1 |
| 3. | SPlicing DROP WIRE TO DROP WIRE | 2 |
| 4. | SPlicing BLOCK WIRE TO BLOCK WIRE | 4 |
| 5. | SPlicing BLOCK WIRE TO DROP WIRE | 5 |

- When a splice is to be placed in a wire span, exercise care in splicing so as to equalize the tension in the conductors as near as possible.
- Thoroughly tape all splices.

1.04 For convenience in describing splicing procedures covered in these instructions, the wires to be spliced shall be referred to as pair No. 1 and pair No. 2.

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1. GENERAL

1.01 This section covers methods for splicing drop and block wires, using single tube brass sleeves pressed on with a sleeve presser.

1.02 This section is reissued to include information on F drop wire and to include splicing information using AMP® drop wire splice.

1.03 Observe the following general rules when splicing insulated drop and block wires.

- Exercise care to avoid nicking the conductors when removing the insulation.
- Thoroughly clean the skinned conductor ends before inserting into the brass sleeves.
- Splice tracer conductor to tracer conductor and plain conductor to plain conductor.

2. DESCRIPTION OF SINGLE TUBE BRASS SLEEVES

2.01 *S brass sleeves:* These sleeves are single brass tubes having bore diameters the same size throughout their length. The centers of the sleeves are indented to ensure insertions of the proper lengths of conductor ends. A color band marking 1/8 inch in width is applied around the sleeve to identify the size.

2.02 *Combination S brass sleeves:* These sleeves are similarly constructed from single brass tubes. There are two different bore diameters in these sleeves, each extending through half the sleeve length. Two color band markings 1/8 inch in width are used to distinguish these sleeves.

2.03 The available sleeve sizes, associated color band markings, and type of wire for which they are intended in drop and block wiring are indicated in Table A.

TABLE A
TYPES OF S BRASS SLEEVES

| TYPE OF SLEEVE | SIZE | COLOR BAND | LENGTH (INCHES) | TYPE OF WIRE |
|---------------------|-----------------|------------|-----------------|--------------------------------|
| S Brass | 032 - 025 | None | 1 | Block |
| | 045 - 040 | Black | 1-7/8 | Drop |
| Combination S Brass | 045 - 040 x 032 | Black-Gray | 1 | Drop to Block |
| | 045 - 040 x 064 | Blue-Black | 1-7/8 | Drop to Bridle or C Rural Wire |

3. **SPlicing DROP WIRE TO DROP WIRE**

3.01 Splice F drop wire using S brass sleeves as follows:

Note: C drop wire may be spliced in a similar manner.

- (1) Slide drop wire pair No. 1 halfway into jaws of diagonal pliers and cut insulation web as shown in Fig. 1.

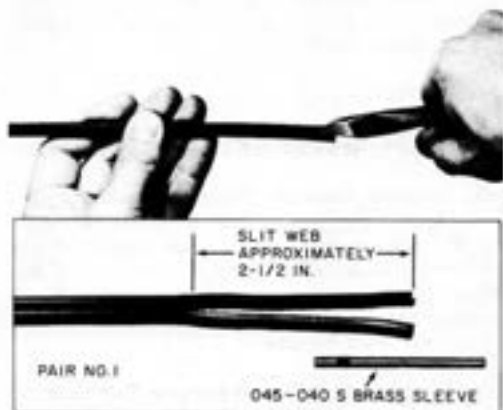


Fig. 1—Slitting Insulating Web

- (2) Nick insulation circumferentially 15/16-inch from end (Fig. 2). *Do not nick conductors.*



Fig. 2—Nicking Insulation

- (3) Crush the 15/16-inch length of insulation between the handles of diagonal pliers (Fig. 3).



Fig. 3—Crushing Insulation

- (4) Remove insulation, clean conductors with diagonal pliers, and install brass sleeves (Fig. 4).

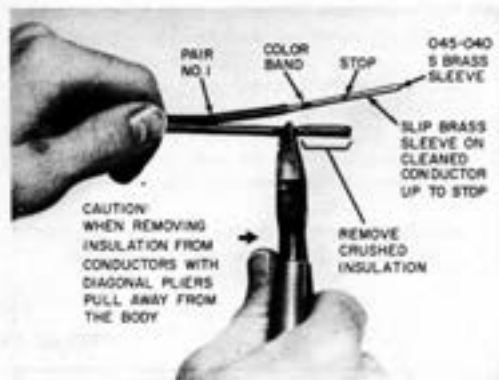


Fig. 4—Removing Insulation and Installing Brass Sleeve (Drop Wire)

- (5) Treat conductors of pair No. 2 as described for pair No. 1 in Steps (1) through (3).
- (6) Remove insulation from pair No. 2 and matching tracer conductors, insert conductors

of pair No. 2 into sleeves of pair No. 1. Crimp lightly with sleeve presser to hold in place (Fig. 5).

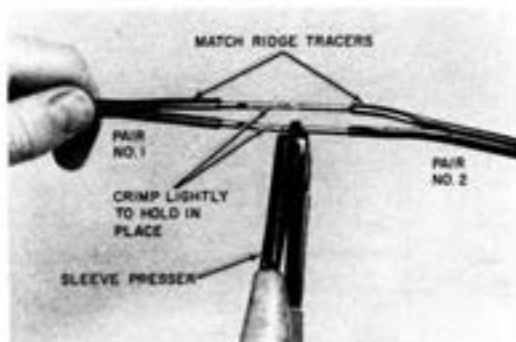


Fig. 5—Installing Pair No. 2

- (7) Crimp each sleeve six times (approximately 1/16 inch intervals) and apply DR tape as shown in Fig. 6.

Note: Where drop wire splice will fall in a drop wire span, the spliced conductors should be of equal length to equalize tension between the conductors. Pull and straighten the spliced conductors. If one conductor is shorter than the other, lengthen the shorter one by pressing one or more of the unpressed portions of the sleeve until equalization is obtained.

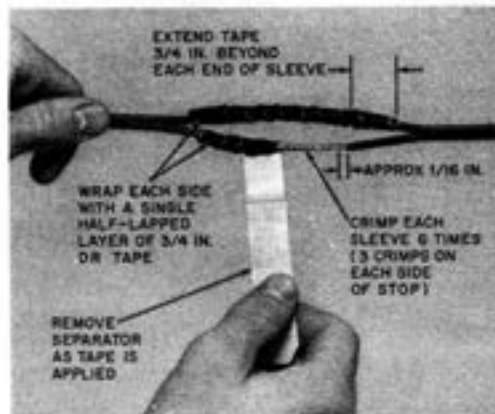


Fig. 6—Applying DR Tape After Crimping Sleeves

- (8) Wrap entire splice with vinyl tape starting at the center of the splice, wrapping to one end (Fig. 7). Reverse direction, wrap to the other end; reverse direction again and end wrapping at the center.♦

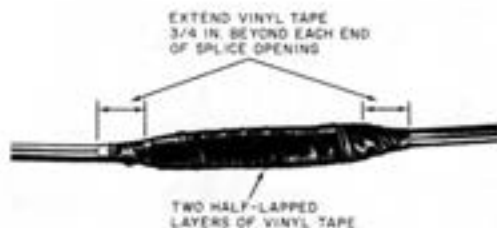


Fig. 7—Completed Splice (Drop to Drop)

3.02 Splice F drop wire using AMP® drop wire splice as shown in Fig. 8.



NOTES:

1. SAGE MARKS, 1-INCH APART, ARE FOUND ON SIDE OF SPLICE HOUSING MARKED "RIB"
2. REMOVE APPROX 3/4 IN OF OUTER JACKET ON C DROP WIRE.

(1) DROP WIRE PREPARATION



(2) DROP WIRE INSERTION



(3) COMPLETED SPLICE

Fig. 8—Splicing Drop Wire with Amp Drop Wire Splice

4. SPLICING BLOCK WIRE TO BLOCK WIRE

4.01 Splice block wire to block wire as follows:

- (1) Cut ends of block wire making sure conductors are even. Nick insulation 1/2 inch from end exercising care not to nick conductors. Remove insulation, clean conductors with diagonal pliers and install brass sleeves (Fig. 9).

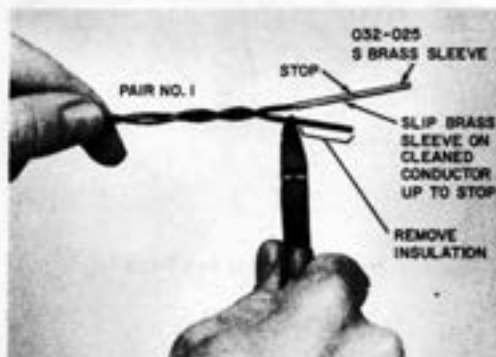
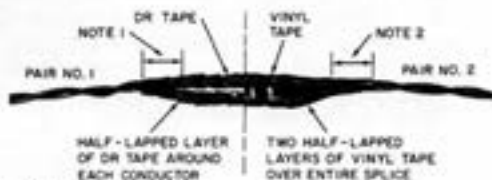


Fig. 9—Removing Insulation and Installing Brass Sleeve (Block Wire)

- (2) Crimp sleeves as in 3.01 (7) and apply DR tape and vinyl tape as described in 3.01 (8) and Fig. 10.



NOTES:

1. EXTEND DR TAPE 3/4-INCH BEYOND EACH END OF SLEEVE
2. EXTEND VINYL TAPE 3/4-INCH BEYOND ENDS OF DR TAPE

Fig. 10—DR Tape and Vinyl Tape Applied

5. SPlicing BLOCK WIRE TO DROP WIRE

Caution: Splice block wire only to unexposed drop wire or to drop wire on the station side of a fuseless protector.

5.01 Splice block wire to drop wire as follows:

- (1) Prepare the ends of drop wire (pair No. 1) and the ends of block wire (pair No. 2) as described in Parts 3 and 4.
- (2) Match tracer conductors and insert skinned ends of pairs 1 and 2 into the proper bores of 045-040 × 032 combination S brass sleeves. Crimp the sleeves slightly with diagonal pliers to restrain the conductors from slipping out.
- (3) Starting 1/16 inch from one end of a sleeve, press each sleeve four times with the sleeve presser. See Fig. 11.

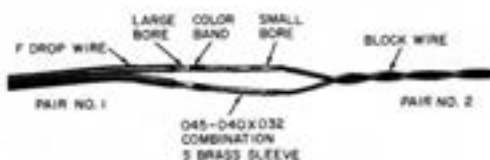


Fig. 11—Sleeves Installed (Drop to Block)

- (4) Wrap each joint with a single half-lapped layer of 3/4-inch DR tape.
- (5) Wrap the entire splice with two half-lapped layers of D or F vinyl tape. Start at the center of the splice, wrap to 3/4 inch beyond the end of the DR tape, then reverse the direction of wrap to 3/4 inch beyond the end of the opening, reverse direction again and end the wrapping at the center of the splice. See Fig. 12.

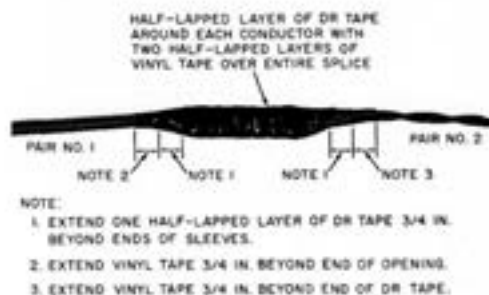


Fig. 12—Completed Splice (Drop to Block)

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DROP AND BLOCK WIRING

STRINGING SAGS FOR DROP WIRE

1. GENERAL

1.01 This section covers the normal and minimum sags for C and F drop wire.

1.02 This section is reissued to include reference to F drop wire which replaces C drop wire.

1.03 Table A gives normal stringing sags to which C or F drop wire should be strung. Workman on poles can obtain these sags with normal hand pulling. However, if normal stringing sags will not provide adequate ground clearances, use minimum stringing sags.

1.04 Table B indicates the minimum stringing sag to which C or F drop wire can be strung where ground clearances under the spans are controlling. These smaller sags result in higher stringing tensions in the wire and hence pulling tools are required to enable workmen to pull the wire up to tension.

1.05 Both Tables A and B indicate the approximate final unloaded sags which C or F drop wire will develop after being subjected to wind and ice storms. To avoid the necessity of resagging drop wire after storms to comply with ground clearance requirements, allowance shall be made in selecting heights of attachments on poles and houses to care for sag increases from stringing to final conditions. Such sag increases between stringing sags and final sags are shown in Tables A and B.

1.06 Sag increases shown in Tables A and B are the maximum amounts which develop at midspan only. These amounts decrease as you approach the supporting attachments of the drop wire span. Table C indicates the percentage of total sag at 5 percent intervals along the span.

1.07 In span-clamp-to-house spans, string drop wire with a tension which will not pull the aerial cable out of line. If this is not practical then distribute the drop from a pole.

TABLE A

NORMAL STRINGING SAGS FOR C OR F DROP WIRE
IN POLE-TO-POLE AND POLE-TO-HOUSE SPANS

| SPAN LENGTH | STRINGING | | APPROX TENSION | APPROX FINAL UNLOADED SAG FOLLOWING STORM LOADING | | SAG INCREASE FROM STRINGING TO FINAL CONDITION | |
|---------------------------------------|-----------|----|----------------|---|----|--|----|
| | SAG | | | FT | IN | FT | IN |
| FT | FT | IN | LB | FT | IN | FT | IN |
| HEAVY LOADING AREA | | | | | | | |
| 50 (or less) | 0 | 6 | 30 ↓ | 0 | 6 | | |
| 75 | 1 | 0 | | 1 | 0 | | |
| 100 | 1 | 9 | | 2 | 0 | 0 | 3 |
| 125 | 2 | 10 | | 3 | 4 | 0 | 6 |
| 150 | 4 | 0 | | 4 | 10 | 0 | 10 |
| 175 | 5 | 6 | | 6 | 7 | 1 | 1 |
| 200 | 7 | 0 | | 8 | 6 | 1 | 6 |
| 225 | 9 | 0 | | 10 | 10 | 1 | 10 |
| 250 | 11 | 2 | ↓ | 13 | 4 | 2 | 2 |
| MEDIUM AND LIGHT LOADING AREAS | | | | | | | |
| 50 (or less) | 0 | 6 | 30 ↓ | Same as Stringing Sags | | No Increases | |
| 75 | 1 | 0 | | | | | |
| 100 | 1 | 9 | | | | | |
| 125 | 2 | 10 | | | | | |
| 150 | 4 | 0 | | | | | |
| 175 | 5 | 6 | | | | | |
| 200 | 7 | 0 | | | | | |
| 225 | 9 | 0 | | | | | |
| 250 | 11 | 2 | ↓ | | | | |

Note: On spans over 250 feet — Use minimum stringing sags shown in Table B.

2. NORMAL STRINGING SAGS FOR C OR F DROP WIRE

2.01 String C or F drop wire to the sags indicated in Table A in all pole-to-pole and pole-to-house spans except in those cases where adequate ground

TABLE B

MINIMUM STRINGING SAGS FOR C OR F DROP WIRE
IN POLE-TO-POLE AND POLE-TO-HOUSE SPANS

| SPAN LENGTH | STRINGING | | APPROX FINAL UNLOADED SAG FOLLOWING STORM LOADING | SAG INCREASE FROM STRINGING TO FINAL CONDITION | | | |
|---------------------------------------|-----------|-------------------|---|---|----|----------------------|---|
| | SAG | APPROX TENSION | | FT | IN | | |
| FT | FT | IN | LB | FT | IN | | |
| HEAVY LOADING AREA | | | | | | | |
| 50 (or less) | 0 | 3 | 50 ↓ | 0 | 5 | 0 | 2 |
| 75 | 0 | 7 | | 0 | 10 | 0 | 3 |
| 100 | 1 | 0 | | 1 | 5 | 0 | 5 |
| 125 | 1 | 7 | | 2 | 3 | 0 | 8 |
| 150 | 2 | 3 | | 3 | 7 | 1 | 4 |
| 175 | 3 | 0 | | 5 | 0 | 2 | 0 |
| 200 | 4 | 0 | | 7 | 0 | 3 | 0 |
| Over 200 ft— Same as Table A | | | | | | | |
| MEDIUM LOADING AREA | | | | | | | |
| 50 (or less) | 0 | 3 | 50 ↓ | 0 | 3 | | |
| 75 | 0 | 7 | | 0 | 7 | | |
| 100 | 1 | 0 | | 1 | 0 | | |
| 125 | 1 | 7 | | 1 | 7 | | |
| 150 | 2 | 3 | | 2 | 4 | 0 | 1 |
| 175 | 3 | 0 | | 3 | 2 | 0 | 2 |
| 200 | 4 | 0 | | 4 | 4 | 0 | 4 |
| 225 | 5 | 0 | | 5 | 5 | 0 | 5 |
| 250 | 6 | 0 | | 6 | 5 | 0 | 5 |
| 275 | 7 | 6 | | 8 | 0 | 0 | 6 |
| 300 | 9 | 0 | 9 | 6 | 0 | 6 | |
| LIGHT LOADING AREA | | | | | | | |
| 50 (or less) | 0 | 3 | 50 ↓ | Same as String- ing Sags | | No In- creases | |
| 75 | 0 | 7 | | | | | |
| 100 | 1 | 0 | | | | | |
| 125 | 1 | 7 | | | | | |
| 150 | 2 | 3 | | | | | |
| 175 | 3 | 0 | | | | | |
| 200 | 4 | 0 | | | | | |
| 225 | 5 | 0 | | | | | |
| 250 | 6 | 0 | | | | | |
| 275 | 7 | 6 | | | | | |
| 300 | 9 | 0 | | | | | |

TABLE C

AMOUNT OF SAG AT 5 PERCENT INTERVALS
ALONG SPAN

| POINTS ALONG TOTAL LENGTH OF SPAN (%) | % OF MAX. SAG |
|--|---------------|
| 5 — 95 | 19.5 |
| 10 — 90 | 36.5 |
| 15 — 85 | 51.0 |
| 20 — 80 | 64.0 |
| 25 — 75 | 75.0 |
| 30 — 70 | 84.4 |
| 35 — 65 | 91.3 |
| 40 — 60 | 96.0 |
| 45 — 55 | 98.9 |
| 50 — 50 | 100.0 |

clearances can only be provided with the use of the minimum stringing sags shown in Table B. Your supervisor will advise the storm loading to be assumed for the area concerned.

2.02 Wire expands to become longer in hot weather and contracts to shorten in cold weather. The effect becomes more noticeable as span lengths increase. In order to compensate for this effect, when drop wire spans exceed 100 feet and the temperature is below 32°F, reduce the sags shown in Table A by 4 inches.

3. SAGGING DROP WIRE TO NORMAL STRINGING SAGS

3.01 The sag of drop wire in pole-to-house or pole-to-pole span is indicated in Fig. 1 and 2.

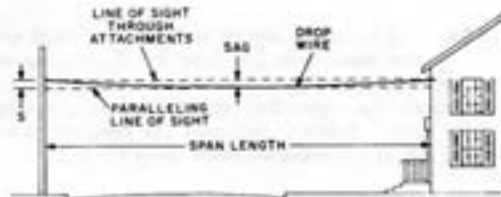


Fig. 1—Drop Wire Attachments on Same Level

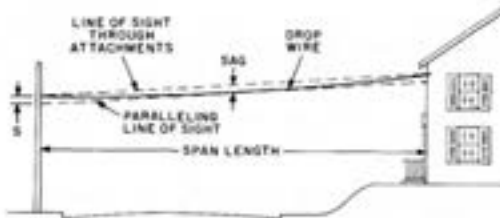


Fig. 2—Drop Wire Attachments on Different Levels

3.02 Since the normal stringing sags given in Table A are used only in locations where ground clearance is readily obtained, it is satisfactory to estimate the amount of sag given to drop wire.

4. MINIMUM STRINGING SAGS FOR C OR F DROP WIRE

4.01 The minimum stringing sags to which C or F drop wire should be strung are indicated in Table B. These sags should be used where they provide the only means of obtaining required ground clearances under drop wire in spans.

4.02 In order to compensate for the effects of temperature (mentioned in 2.02), the sags shown in Table B shall be reduced by 5 inches when drop wire spans exceed 100 feet and the temperature is below 32°F.

4.03 The minimum sags shown in Table B require a stringing tension of 50 pounds which is more than workmen on poles can readily pull with the normal means of placing drop wire. Therefore, when minimum sags are used the wire is tensioned with the aid of a drop wire puller.

5. TENSIONING DROP WIRE TO MINIMUM STRINGING SAGS

5.01 Tensioning of drop wire by means of the drop wire puller is accomplished as follows:

- (1) Suspend the drop wire puller on the drive hook by means of its hook. Pull up on the drop wire handtight and hold it over the drive hook with one hand. With the free hand reach out and place the wire grip on the drop wire at arm's length. This setup for tensioning drop wire is shown in Fig. 3.

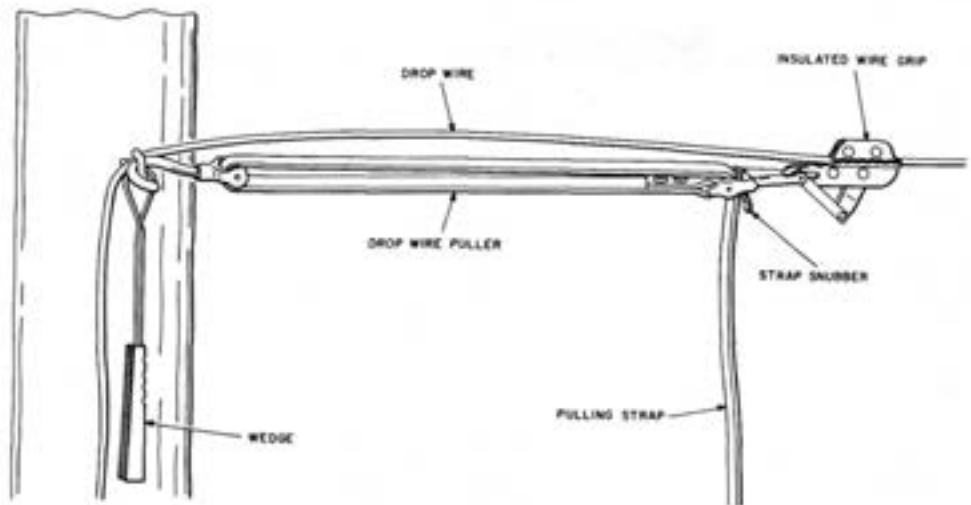


Fig. 3—Tensioning Drop Wire

(2) Pull on the drop wire with the drop wire puller until the sag corresponds to the stringing sag shown in Table B [reduced by 5 inches where required (see 4.02)]. Snub the pulling strap with the strap snubber and note the ground clearance. For clearances, see Sections 462-070-015, 462-070-016, 462-070-017. If the desired clearance with minimum sag is not accomplished, make adjustments by raising attachments at either or both ends of the drop wire span.

(3) Place the drop wire clamp loosely on the slack drop wire section between the grip

and the pole. Take up the slack in the wire and hold while tightening the drop wire clamp on the drop wire with the tail wire locating about 1/2 inch short of the drive hook.

(4) Pull on the drop wire and attach the drop wire clamp to the drive hook.

(5) Remove the wire puller by detaching the wire grip thereby transferring drop wire tension to the drop wire clamp. The drop wire puller may then be removed from the drive hook.

DROP WIRE PLACING, REPLACING, AND LOWERING

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| 2. PRECAUTIONS | 2 | LOWERING DROP WIRE SPAN | 12 |
| 3. PLACING DROP WIRE OVER ROADWAY | 3 | Crossing Over Secondary Power Wires | 12 |
| No Interference | 3 | Crossing Over Trolley Power Wires | 12 |
| Tree Interference | 4 | | |
| 4. PLACING DROP WIRE OTHER THAN OVER ROADWAY | 6 | 1. GENERAL | |
| Between Building and Pole or Strand | 6 | 1.01 This section is revised to incorporate into one practice the placement, replacement, or removal of a drop wire, under various conditions. This section contains information formerly found in Sections 460-300-125, 462-400-205, 462-800-311, and 462-800-312. | |
| Between Two Buildings | 8 | 1.02 In placing a drop wire, the following basic principals are to be followed: | |
| 5. PLACING DROP WIRE OVER SECONDARY POWER SUPPLY | 8 | (a) Locate the drop wire reel and lay the wire without causing a hazard to pedestrians or motorists. | |
| 6. PLACING DROP WIRE OVER TROLLEY WIRES (750 VOLTS OR LESS) | 8 | (b) Raise the drop wire with a handline while standing at the ground level whenever the drop wire is to cross a roadway or other hazards. | |
| 7. REPLACING DROP WIRE | 9 | (c) Wear insulating gloves and other protective equipment whenever there is a possibility that the drop wire or handline may come in contact with power wires. | |
| Over Roadway, Secondary Wires, or Other Hazards (Not Trolley Wires) | 9 | 1.03 Avoid placing a drop wire over trolley wires (750 volts or less) or secondary power conductors if other means of installing the wire is practical. Under no conditions shall a drop wire be placed over primary supply conductors. | |
| Taut Span | 10 | | |
| Over Trolley Wires (750 Volts or Less) | 10 | | |
| 8. LOWERING DROP WIRE | 10 | | |
| HANDLINE METHOD | 10 | | |
| Lowering Wire Span From a Pole or Strand | 10 | | |

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1.04 All poles must be visually examined (some require testing, see Section 620-132-010) before climbing or placing a ladder against a pole or strand, as described in Section 620-131-010. Whenever it is necessary to place an extension ladder against a suspension strand, test the strand as described in Section 460-300-110.

1.05 Drop wires shall be placed so that clearances specified in Section 462-070-015 are met.

1.06 In placing or replacing a drop wire, except when crossing over a trolley wire, the basic concept of having the individual employee control the entire work operation has proved to be the safest manner to perform this task.

1.07 On busy or high speed roadways where it is impossible to safely place a drop wire, obtain the assistance of another employee. In some cases, it may be necessary to seek the assistance of the local law enforcement agency to control the traffic.

1.08 Whenever it is necessary to alert or divert oncoming traffic, or guard any part of the work area, place appropriate warning devices as described in Section 620-135-010.

2. PRECAUTIONS

2.01 Never place a drop wire over primary power conductors.

2.02 Insulating gloves and other protective equipment shall be worn by employees when performing operations in which the handline or drop wire may come in contact with the power wires.

2.03 The handline used for raising a drop wire shall be free from metallic strands and preferably shall be dry.

2.04 When necessary to carry the handline up a pole or ladder, secure one end of the handline to the B handline carrier (Fig. 1) attached to the body belt. The steel loop of the B handline carrier is designed to release the handline if it is placed under tension, while climbing a pole or ladder. If a B handline carrier is not available, double the end of the handline back on itself and place the loop under the side or back of the body belt, so it will be readily released if placed under tension.

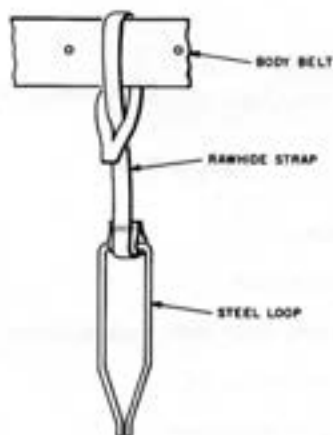


Fig. 1—B Handline Carrier

2.05 Never release the drop wire attachment from a span while working inside the angle formed by the wire.

2.06 Avoid working from a ladder placed against a building with the side rails crossing a wire run or in any other position where movement of the wire, due to loosening of the attachments, would cause an accident.

2.07 When a drop wire is to be attached to a span clamp, place the base of the extension ladder on the field side of the suspension strand, not in the roadway. If there is no street or highway adjacent to the span clamp, place the ladder against the strand, opposite from the drop wire run to the building.

2.08 In placing or replacing a drop wire, precautions must be taken to ensure that the drop wire or handline will not slide along or become disengaged from its support. Whenever there is such a possibility, place a temporary guide to enclose the drop wire by any one of the following methods:

- At strand—attach an E span clamp.
- At pole—attach a C bridal ring.

- At building attachment—use a short piece of ground wire to form a guide loop as shown in Fig. 2.

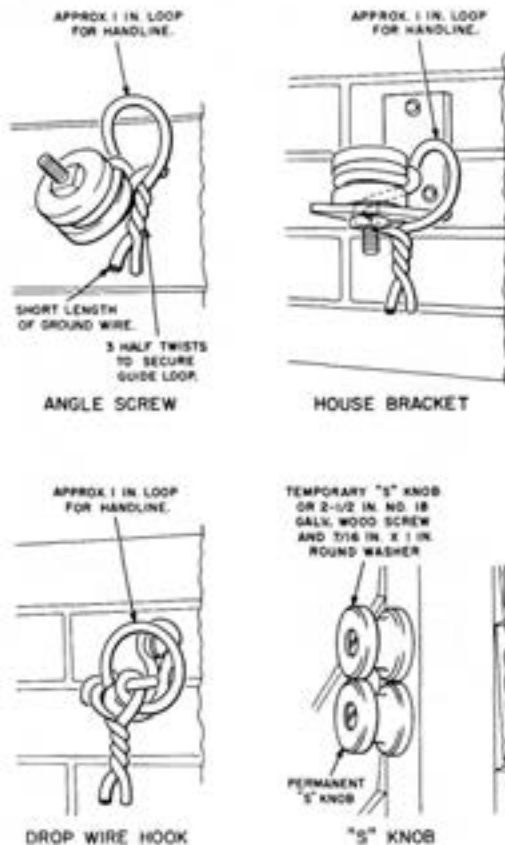


Fig. 2—Temporary Guide Loop

3. PLACING DROP WIRE OVER ROADWAY

No Interference

- 3.01 When a drop wire is to be placed over a roadway free of any interference, place the wire in the following manner:

Caution: Before proceeding with the following operation, fasten the inner end

of the coil of drop wire securely to one of the rigid spokes of the drop wire reel.

- Install the building attachment and secure the drop wire to this support. Complete building run in a standard manner. Keep drop wire reel near the building to avoid accidents or damage to wire (Fig. 3).
- From the ground level, throw or place a handline over the strand, guard arm, drive hook, or cross arm so that both ends reach the ground, with no excess length in the portion of the handline towards the building. After the handline is in place, tie it to the base of the pole or lower rungs of the ladder to avoid interference with pedestrians or vehicles. If it is necessary to climb the pole or ladder to place the handline, install any drop wire support needed.
- Roll the drop wire reel from the building to the edge of the roadway, paying out sufficient slack to ensure the wire rests flat on the ground.
- When no traffic is approaching, roll the drop wire reel across the roadway to the previously placed handline, paying out the wire so it rests flat on the ground.

Note: If a metal or hard rubber-tired vehicle passes over the wire, return the drop wire reel back to the building side of the roadway and pull the wire from the roadway. Inspect the wire for possible damage and replace or repair if necessary.

- Release the handline from the base of the pole or ladder. Tie a bowline knot at the end of the handline toward the building and around the drop wire at the reel as shown in Fig. 4. Be careful not to raise the wire on the roadway when securing the rope. Take up any excess wire on the reel.
- Set the brake of the drop wire reel so that when the wire is raised by the handline, there will be sufficient tension on the wire to enable it to be pulled up to the approximate required height in the span over the roadway.
- After checking to make sure the drop wire reel is in a stable position and its brake is properly set, grasp the free end of the handline.

When no vehicles or pedestrians are approaching, raise the drop wire as shown in Fig. 5. If it is necessary to remove excess slack from the span as the wire is being raised, pull the wire at the reel end to obtain desired slack. Wind excess length of wire on reel.

(h) After the drop wire has been raised to the approximate required height, secure the handline to the base of the pole (Fig. 6) or to the lower rungs of the ladder.

(i) Climb the pole or ladder and attach drop wire to the pole or strand in a standard manner, without removing handline from the drop wire. When attaching drop wire to a span clamp, the ladder will force the strand out of line. Make necessary adjustments to ensure proper sag and clearance after the ladder is removed.

(j) Remove handline from drop wire. Cut drop wire of sufficient length to reach terminating point. Complete connection in a standard manner.

Tree Interference

3.02 Placing drop wire through trees shall be avoided when practical. However, if trees cannot be avoided, proceed in the following manner:

Caution: Before proceeding with the following operation, fasten the inner end of the drop wire securely to a rigid spoke of the drop wire reel.

(a) When the tree is located on the same side of the roadway as the building:

(1) Place the drop wire reel on the side toward the pole line. If the tree overhangs the road, the reel shall not be placed in the road unless it is properly guarded by means of a company truck or equivalent.

(2) Place the handline in the desired location among branches of the tree. Attach the drop wire and pull into position among the branches. A wire raising tool may be used to facilitate this operation.

Warning: The handline and drop wire shall not overhang the road unless properly guarded. If practical, park the company

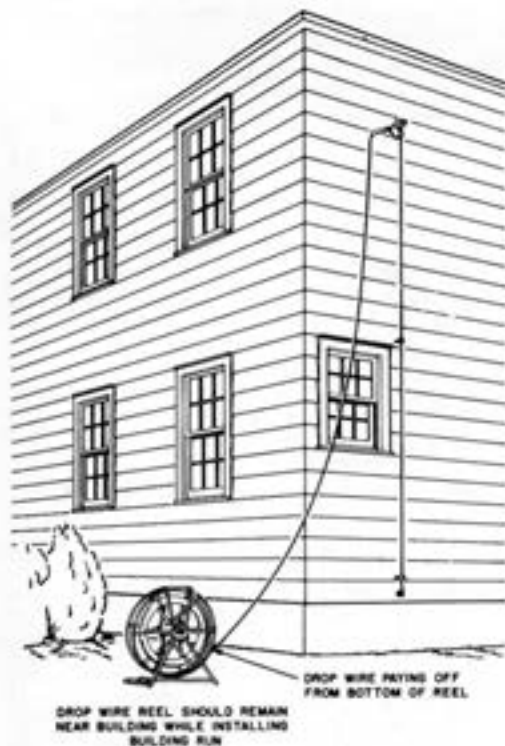


Fig. 3—Drop Wire Attached to Building

truck so it will shield the handline and drop wire.

(3) Attach drop wire to building, as covered in 3.01 (a), making sure the wire rests flat on the ground between tree and building.

(4) Complete wire run across roadway to pole or span clamp as covered in 3.01 (b) through (j).

(b) Procedure where tree is located in the immediate vicinity of pole or span clamp:

(1) Place handline over strand, guard arm, drive hook, or cross arm and among the tree branches as illustrated in Fig. 7, so that the drop wire may be raised into position. A

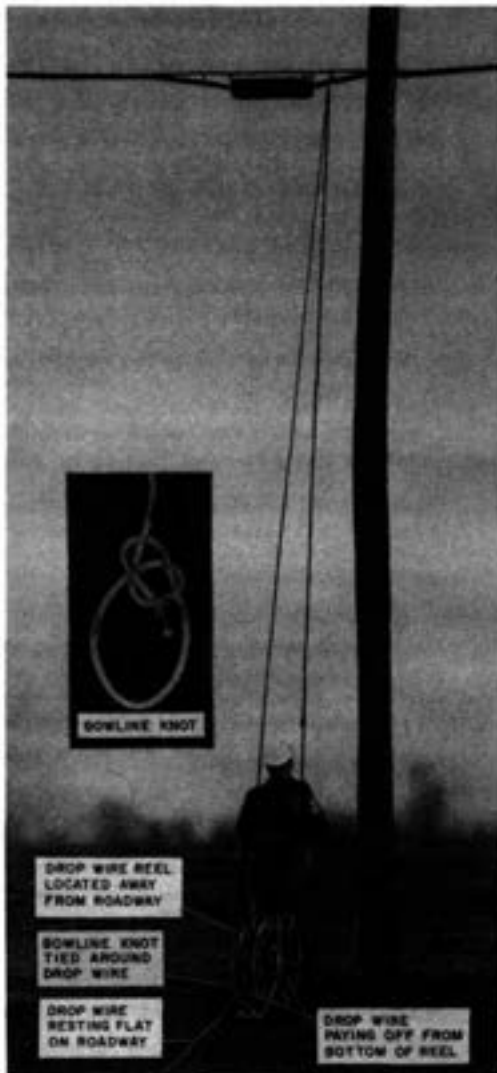


Fig. 4—Bowline Knot Placed Around Drop Wire

wire raising tool may be used to facilitate this operation. After the handline is placed, tie it off to the pole or lower rungs of the ladder to avoid interference with pedestrians or vehicles.



Fig. 5—Raising Drop Wire

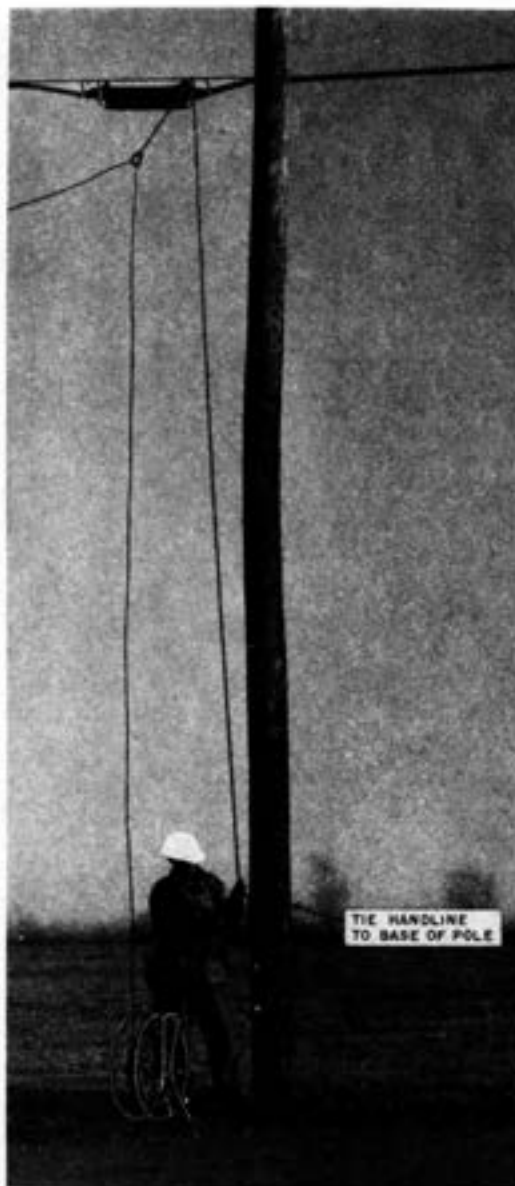


Fig. 6—Drop Wire Raised to Approximate Height

Warning: *The handline shall not overhang the street unless guarded. If practical, position the company truck so it will shield the handline.*

(2) Place the drop wire as covered in 3.01 (a), (c), and (d) and raise the wire at the pole or strand end of the span as follows:

- (a) With the drop wire crossing the roadway and resting flat on the ground, remove sufficient wire from drop wire reel to reach the terminating point.
- (b) Tie the drop wire to the handline as shown in Fig. 7. The handline must be long enough so that both ends are accessible from the ground during the entire raising operation.

Note: If the handline is to be placed over a support or attachment on which a square knot would snag, fasten the wire to the handline as shown in Fig. 8.

- (c) When no vehicles or pedestrians are approaching, raise the drop wire by pulling the end of the handline placed over the strand or pole attachment. If necessary, the handline can be pulled in either direction to work the drop wire into position as shown in Fig. 9.

- (d) After the wire has been raised to the approximate height, tie the handline to the base of the pole or to the lower rungs of the ladder and complete the operation as outlined in 3.01 (i) and (j).

4. PLACING DROP WIRE OTHER THAN OVER ROADWAY

Between Building and Pole or Strand

4.01 When placing a drop wire which does not cross a roadway, follow the methods outlined in 3.01 or 3.02 if these procedures are necessary to raise the wire safely. However, if no conflict or hazard is encountered, the procedure to raise the wire can be modified as described in 4.02.



Fig. 7—Drop Wire Tied to Handline

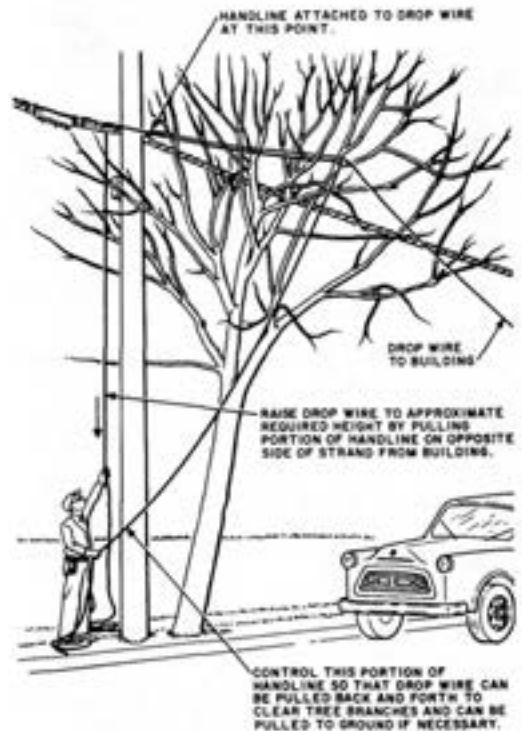


Fig. 9—Raising Drop Wire

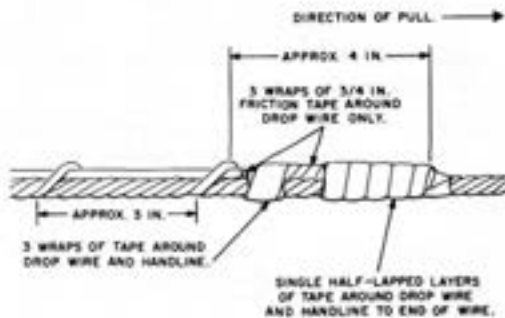


Fig. 8—Alternate Tie to Prevent Snagging

4.02 After the drop wire has been attached to the building and payed out with the drop wire reel to the pole or strand:

- Tie a bowline knot around the drop wire at the reel with a handline.
- Set the drop wire reel brake so there will be sufficient tension to pull the wire to the approximate required height in the span.
- Loop the other end of the handline to the B handline carrier or under the body belt as described in 2.04. Climb the pole or ladder.
- Place the handline over the strand, guard arm, drive hook, or cross arm and raise the drop wire to the approximate required height and secure the handline to the pole or strand.

- (e) Attach the drop wire to the pole or strand in a standard manner, without removing the handline until the drop wire is secured.

Between Two Buildings

4.03 Place a drop wire between two buildings in the same manner as a building to pole run, providing as much sag as practical and still maintaining proper clearance. However, after attaching the drop wire to the first building:

- (a) Place a handline in the drop wire attachment at the second building.
- (b) Pay out the drop wire from the first building attachment so it rests flat on the ground.
- (c) Tie a bowline knot around the wire at the reel with a handline.
- (d) Set the drop wire reel brake.
- (e) From ground level, raise the drop to the desired height.
- (f) Tie the handline to a substantial and secure support near the base of the building.
- (g) Ascend the ladder to attach the drop wire clamp and complete the drop wire run.

5. PLACING DROP WIRE OVER SECONDARY POWER SUPPLY

5.01 When there is no alternative and a drop wire must be placed over secondary power wires, follow the same procedures outlined in other parts of this practice and:

- (a) Wear insulating gloves and other protective equipment.
- (b) Handle drop wire or handline, crossing over secondary conductors, with insulating gloves. Do not allow wire to contact other body parts.
- (c) Minimize the amount of time a drop wire or handline is exposed to a secondary power source by placing and raising the wire without delay.
- (d) Throw or place a dry handline over the secondary conductors, tie to drop wire and

raise from the ground level at pole, strand, or the second building attachment.

6. PLACING DROP WIRE OVER TROLLEY WIRES (750 VOLTS OR LESS)

6.01 When placing a drop wire over trolley wires, the following additional precautions are to be taken:

- Two employees shall be used for this operation.
- Both employees shall wear insulating gloves and other protective equipment.
- A dry handline shall be placed in the span over the trolley power supply to pull the drop wire.
- One employee shall control the reel end of the wire, while the other employee exerts a strain on the handline to pull the drop wire.
- The drop wire should not be permitted to contact a trolley wire.
- When necessary, obtain assistance of the local law enforcement agency on busy or high speed roadways.

6.02 Proceed as follows:

- (a) If the span over the trolley wire is to extend from a building to a pole, install the building attachment. In a pole to pole span, fasten the attachment at the pole.
- (b) If there is any possibility that the drop wire or handline could become disengaged during a pulling operation, place a temporary guide as described in 2.08.
- (c) Ensure that the drop wire reel is in a stable position at the initial attachment: at the building, pole, or strand.

Caution: *Fasten the inner end of the drop wire coil to a rigid spoke of the drop wire reel.*

- (d) Set the brake of the drop wire reel so that when the wire is pulled, there will be

sufficient tension to prevent it from sagging into the trolley contact.

(e) Using a dry handline of sufficient length to extend across the span and to the ground level on both sides of the roadway, secure one end of the handline to the base of the pole or ladder and pass the other end over the pole attachment or strand on the side toward the roadway.

(f) When no vehicles or pedestrians are approaching, one employee is to throw the free end of the handline over the trolley wire, while the other employee, using a warning flag, is alert for any oncoming traffic.

(g) If the drop wire is to extend to a pole or strand, throw or place the handline over the attachment and pull up the slack in the handline.

(h) If the drop wire extends to a building attachment, place the handline over the drive hook or other support and pull up the slack in the handline.

(i) With the handline in place, one employee maintains a strain on the handline while the other employee secures the drop wire to the handline as shown in Fig. 8. Any slack in the handline and drop wire is to be reeled onto a drop wire reel.

(j) The drop wire can be safely pulled over the trolley wire, with one employee controlling the action of the drop wire reel and the other employee pulling the drop wire across the span with the handline.

(k) The handline is to be lashed to the base of the pole or ladder after a sufficient length is obtained for terminating purposes.

(l) The drop wire is to be secured to its attachment at the reel end of the drop wire and then at the terminating end, always maintaining sufficient tension on the wire to keep it clear of the trolley wire.

(m) Verify that the drop wire clearance conforms to the requirements in Section 462-070-015.

(n) Place a wire guard at the point where the drop wire crosses the trolley wire.

7. REPLACING DROP WIRE

Over Roadway, Secondary Wires, or Other Hazards (Not Trolley Wires)

7.01 When it is necessary to replace a defective drop wire, the same basic principals outlined in this practice on the placing of the wire must be followed. The existing drop wire can be used as a means to pull in the new drop wire. Proceed as follows when the existing drop wire has a normal sag:

Note: See 7.02 if a taut span is encountered.

(a) Locate the drop wire reel at the building, pole, or strand.

(b) Firmly tape the new drop wire at the building attachment to the existing wire beyond the drop wire clamp.

(c) Set the drop wire brake so that there will be sufficient tension to hold the span when the old drop wire is cut.

(d) Ascend the pole or ladder and remove the old drop wire and clamp from its attachment and place the new wire in the drop wire hook or similar attachment. Verify that the brake on the drop wire reel exerts sufficient tension to prevent excess sagging. If the brake is not set properly, reattach the drop wire clamp and readjust the brake on the reel. After the drop wire reel is properly adjusted, cut the old drop wire at the point where the drop wire clamp is attached.

Warning: *Never release the drop wire attachment from a span while working inside the angle formed by the wire.*

(e) At the terminating end of the drop wire, secure a handline to the base of the pole or ladder. Ascend the pole or ladder and firmly secure the rope to the existing drop wire with tape at a point in the span beyond the drop wire clamp.

(f) Release the drop wire clamp from its attachment and remove it from the existing

drop wire. Cut the old drop wire end near the rope.

(g) Descend the pole or ladder and pull in the replacement wire from the ground level. After allowing the required amount of wire for terminating, tie off the handline at the base of the pole or ladder.

(h) Place and secure the necessary attachments at the reel end of the drop wire and then at the terminating end.

Taut Span

7.02 Special precautions shall be taken when a taut drop wire span is encountered. Employees are always expected to visually examine poles before climbing or working from a strand or pole supported equipment as covered in Section 620-131-010, but it is more important when confronted with a taut span. A damaged or defected pole may be the cause of the taut wire.

7.03. Before replacing or lowering a taut span, release the tension in the span in the following manner:

(a) Lash a handline to the base of the pole or to the lower rungs of the extension ladder.

(b) Disconnect the drop wire from the terminal and remove the free end from the rings on the pole.

(c) Place a temporary drop wire clamp on the wire, about one foot out in the span. Seat the clamp firmly on the wire.

(d) Pass a loop of the handline through the tail of the temporary drop wire clamp. Apply enough strain to relieve the tension on the original drop wire clamp and secure the handline.

(e) Remove and relocate the original drop wire clamp to allow near normal sag on the drop wire.

(f) Slowly release the strain on the handline and secure the drop wire clamp to its original attachment.

(g) Remove the temporary drop wire clamp and proceed to replace or remove the drop wire as covered in other parts of this practice.

Over Trolley Wires (750 Volts or Less)

7.04 When replacing a drop wire span over a trolley power supply, follow the procedures described in 7.01 and take additional precautions specified in Part 6, which includes:

- Two employees shall be used for this operation.
- Insulating gloves and protective equipment must be worn.
- One employee shall control the reel end of the span and the other employee at the pulling end.
- The drop wire is to be pulled in without contacting a trolley wire.

8. LOWERING DROP WIRE

Warning: The lowering of a taut drop wire span requires that special precautions be taken to ensure that the wire is lowered safely. The excessive strain on a taut span must be released, as covered in 7.02, before the drop wire is lowered.

8.01 A wire span may be dropped from a pole providing conditions are such that:

- (a) The drop wire does not cross over a roadway, a trolley wire, or a secondary power wire.
- (b) The drop wire will not interfere with pedestrians or cause property damage.
- (c) The drop wire will not be struck by passing vehicles.

If any of these conditions are present, the span shall be lowered by the handline method described in 8.02 and 8.03.

HANDLINE METHOD

Lowering Wire Span From a Pole or Strand

8.02 Lower the drop wire from its attachment on a pole or strand in the following manner:

- (a) Lash a handline securely to the base of the pole or ladder rungs, allowing a sufficient length on the ground so that both ends will be accessible from the ground level until the wire has been lowered.
- (b) Throw or place the other end of the handline over the strand, guard arm, drive hook, or cross arm so that the end reaches the ground. If the drop wire passes through a tree in the immediate vicinity, place the handline so that it follows the route of the wire through the tree. A wire raising tool may be used to facilitate this operation. After the handline has been placed, tie it to the base of the pole or ladder to avoid interference from pedestrians or vehicles.

Warning: *The handline shall not overhang the street unless it is properly guarded. If practical, park the company vehicle so it will shield the handline.*

- (c) Disconnect the drop wire from the terminal and release the free end up to the drop wire clamp.
- (d) Place a temporary drop wire clamp on the wire to be lowered, about one foot out in the span. Seat the clamp firmly on the wire.
- (e) Tie a loop of the handline to the tail of the temporary drop wire clamp so that the lashed end of the handline is sufficiently taut to remove tension from the original drop wire clamp.
- (f) Remove the original drop wire clamp from the drop wire, thus leaving the wire suspended by the temporary drop wire clamp and the lashed end line.
- (g) Return to the ground level. Untie the handline from the base of the poles or ladder rungs, and, when no vehicles or pedestrians are approaching, lower the drop wire to the ground. The employee shall have control of both ends of the handline (Fig. 10) so that a pull can be exerted in either direction to work the drop wire among tree branches or to raise the wire quickly if necessary.

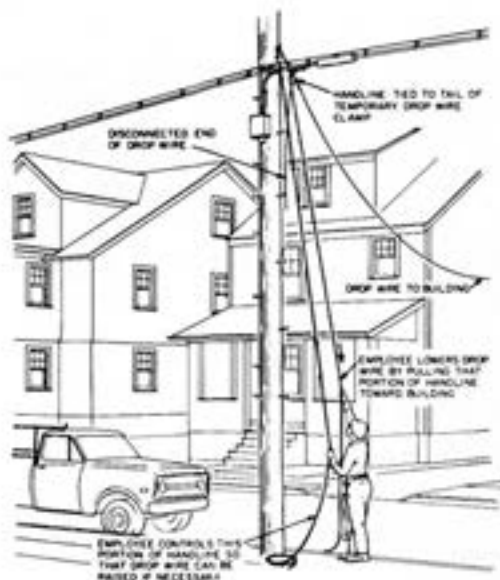


Fig. 10—Lowering Drop Wire

Lowering Wire Span Between Buildings

8.03 The following method shall be used when it is necessary to lower a drop wire between buildings with a handline:

- (a) Select the end of the drop wire span at which the operation can be best performed.
- (b) Remove the drop wire from hardware attachments on the building up to the first attachment. Do not remove the drop wire clamp which supports the wire span.
- (c) Place the handline over the drive hook or similar attachment, so the end of the handline toward the span reaches the ground level. If there is a possibility that the handline could become accidentally disengaged during the lowering process, place a temporary guide to enclose the attachment as described in 2.08.
- (d) Place a temporary drop wire clamp on the wire to be lowered, about one foot out in the span. Seat the clamp firmly on the wire.

- (e) Tie a loop to the handline securely to the tail of the temporary drop wire clamp.
- (f) Return to the ground. Pull the long end of the handline sufficiently taut to remove tension from the original drop wire clamp. Lash the handline firmly and secure support at the base of the building, thereby supporting the wire span by means of the temporary drop wire clamp and lashed handline.
- (g) Remove the original drop wire clamp from the building attachment.
- (h) Return to the ground level and lower the drop wire with the handline.

LOWERING DROP WIRE SPAN

Crossing Over Secondary Power Wires

8.04 Whenever it is necessary to lower a drop wire span which crosses a secondary power supply, follow the procedures outlined in 8.02 or 8.03 and:

- (a) Wear insulating gloves and other protective equipment.
- (b) If the drop wire span to be lowered includes the end which was connected to the terminal, cut off the exposed conductor ends.
- (c) After lowering the drop wire to the ground level and removing the temporary drop wire clamp, free the drop wire from the power contact without delay.
- (d) In the lowering process, the employee shall not contact the drop wire with any part of the body other than with the insulating gloves.
- (e) If there is a possibility that the drop wire or handline could become disengaged during the operation, place a temporary guide as described in 2.08.

Crossing Over Trolley Power Wires

8.05 When it is necessary to remove or lower a drop wire span crossing over a trolley wire, the following additional protection shall be taken:

- Two employees shall be used for this operation.

- The span over the trolley power supply must be lowered independently of any additional spans.
- Both employees shall wear insulating gloves and other protective equipment.
- A dry handline, of sufficient length to reach across the trolley span, is to be used for this operation. The end to which the long handline is attached depends upon job conditions, such as:

| SPAN OVER TROLLEY | LOCATE LONG HANDLINE |
|---------------------------------|----------------------|
| Terminal Pole to Pole or Strand | Terminal End |
| Building to Terminal Pole | Terminal End |
| Building to Building | Building End |

- The drop wire end to which the long handline is attached should be securely taped, instead of being secured to a temporary drop wire clamp. This will allow it to pass over or through any attachments.
- The drop wire should not be permitted to contact the trolley wire.
- Excessive strain on a taut drop wire span must first be released, as covered in 7.03, before any other operations are begun.
- If there is a possibility that the drop wire or handline could become disengaged during the operation, place a temporary guide as described in 2.08.

8.06 Proceed in the following manner to remove the drop wire from the trolley span:

- (a) Place the long handline over the strand, pole attachment, or building attachment.
- (b) Tape the free end of the handline to the drop wire at the drop wire clamp toward the span.

(c) Secure the handline by tying it to the base of the pole or lower ladder rung. (In a building-to-building span, secure the handline to a stable support at ground level.)

(d) Disconnect the drop wire from the terminal and its attachments (in a building-to-building span, cut the drop wire) and remove the drop wire clamp. The drop wire is now secured to the long handline.

(e) At the other end of the span, secure another handline to the drop wire so the pulling operation can be performed from the ground level by:

- (1) Secure the handline to the base of the pole or lower rung of the extension ladder.
- (2) Place the handline over the strand or pole attachment.

(3) Tape the handline to the drop wire at the clamp end toward the span.

(4) Remove the drop wire clamp (the entire span is now secured by both handlines).

Note: If the trolley span is attached to a building, the additional handline would not be used for the pulling operation.

(f) With both employees at the ground level, the drop wire and handline can be pulled across the span. An even steady strain should be applied to keep the drop wire free of the trolley contact.

(g) The long handline, pulled across the span, is to be secured and can be used to pull in the same or new drop wire.

DROP AND BLOCK WIRING WIRE GUARD

1. GENERAL

1.01 This section covers the description of wire guards and their use as protection for drop wire against abrasion.

1.02 This section is reissued to delete the S wire guard which is rated Manufacture Discontinued.

1.03 The best protection against abrasion is obtained by stringing drop wire clear of obstructions. This should be done where practicable even though it means longer wire runs.

2. PROTECTING DROP WIRE AGAINST ABRASION

2.01 Protect drop wire with wire guards where it is impracticable to avoid contact with:

- (a) Tree limbs or branches larger than 1/2 inch in diameter.
- (b) Obstructions in the span such as garages, guys, signs, street lighting standards, etc.
- (c) Suspension strand of ring-supported cable at span clamps in drop wire run between pole and span clamp.
- (d) Small branches (less than 1/2 inch in diameter), twigs, and foliage if it is impracticable to obtain clearance for two or three years. Refer to 620-310-200 covering tree pruning methods for a list of fast and slow growing trees.

3. DESCRIPTION OF WIRE GUARD

3.01 **P Wire Guard**—This is a slotted guard of black plastic which can be spiraled on the drop wire or the drop wire pulled through it. P guards are furnished in 3-foot lengths.

4. INSTALLING WIRE GUARDS

General

4.01 Center wire guard on a drop with respect to the point of contact with tree limbs or other obstructions.

4.02 Extend the wire protection at least 3 feet beyond each side of the tree exposure in order to provide for subsequent tree growth.

4.03 Use a B clip crimper for sliding guards to the proper position on the drop wire and for placing wire clips to hold guards in place.

4.04 Hold wire guards in position by placing wire clips on the drop against the ends of the protection. Where more than three guard lengths are used, placed intermediate wire clips not more than three guard lengths apart.

4.05 **P Wire** guards can be placed on drop wire by means of a hook tool fashioned from the tail wire of a drop wire clamp, or by using a screwdriver as a guide. (See Fig. 1, Fig. 2, and Fig. 3.)



Fig. 1—Hook Fashioned From Drop Wire Clamp

4.06 Place P wire guard on drop wire as follows:

- (1) Spiral one end of the wire guard on the drop wire for a length of about 4 inches.
- (2) When using the hook: Insert the hook in the slit of the guard and hold it close to the drop wire. Grip the part of the guard

already on the wire and pull guard away from the hook as shown in Fig. 2.

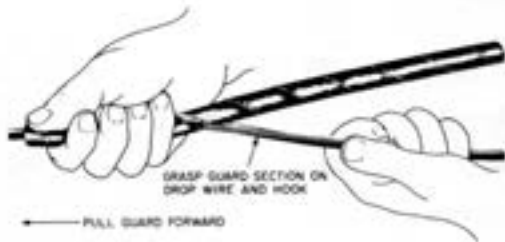


Fig. 2—Placing P Wire Guard Hook Method

(3) When using screwdriver: After inserting the screwdriver blade into the part of the guard not on the wire and holding it in position shown in Fig. 3, grip the part of the guard already on the wire and pull guard away from the screwdriver.



Fig. 3—Placing P Wire Guard Screwdriver Method

Typical Installation of P Wire Guard

4.07 Methods of protecting drop wire against abrasion are illustrated in Fig. 4 through 8.

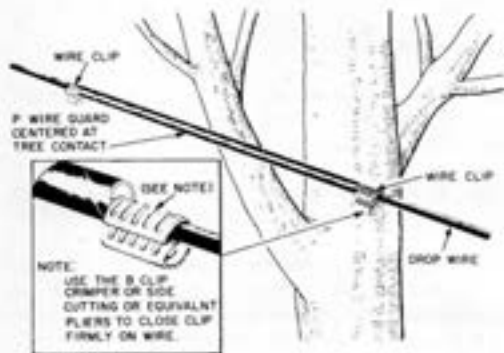


Fig. 4—Protection For Wire At Tree Contact Larger Than 1 1/2 Inch Diameter

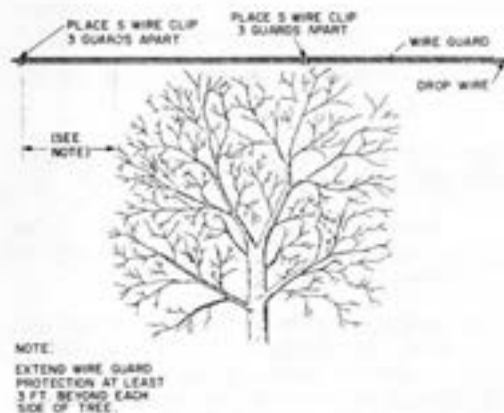


Fig. 5—Protection For Wire Over Tree

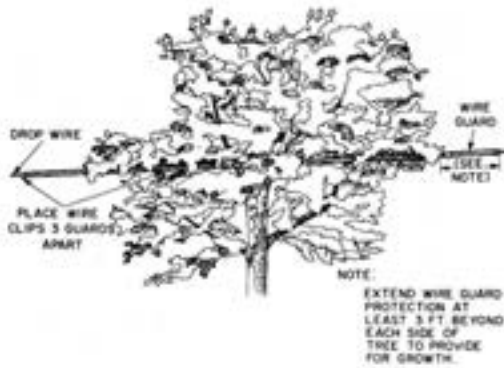


Fig. 6—Protection For Wire Through Tree

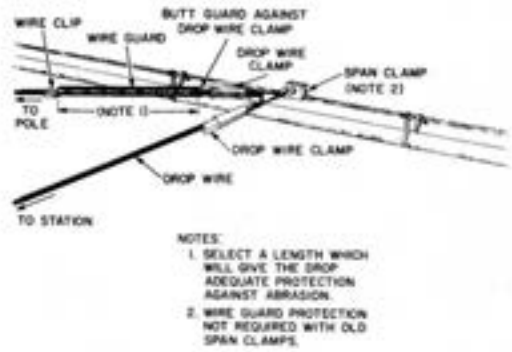


Fig. 8—Protecting Wire From Abrasion At Span Clamp on Strand For Ring Supported Cable

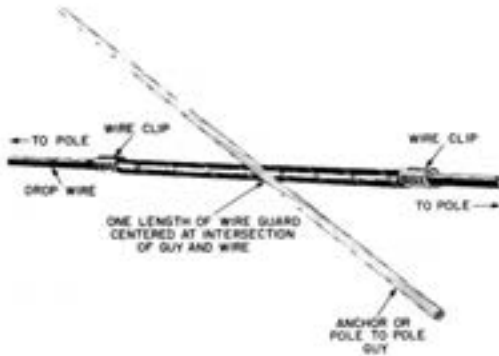


Fig. 7—Protection For Wire At Guy in Span

DROP AND BLOCK WIRING

MULTIPLE DROP WIRE—PLACING AND STRINGING SAGS

1. GENERAL

1.001 This addendum supplements Section 462-500-011, Issue 4. Place this pink sheet ahead of Page 1 of the section.

1.002 This addendum is issued to:

- (a) Show change in code of F multiple drop wire
- (b) Include 5-pair F multiple drop wire.

2. CHANGES TO SECTION

2.001 On Page 1, change paragraph 1.03 to read as follows:

1.03 ASW-5/22-F and ASW-6/22-F (F multiple drop wire) may be used in runs up to 700 feet and may be used with fuseless protectors and 24-AWG stub cable.

2.002 On Page 6, change heading of Part 4 from PLACING F MULTIPLE DROP WIRE to PLACING MULTIPLE DROP WIRE.

2.003 On Page 12, change title of Table C from NORMAL STRINGING SAGS FOR F MULTIPLE DROP WIRE to NORMAL STRINGING SAGS FOR ASW-5/22-F AND ASW-6/22-F MULTIPLE DROP WIRE.

2.004 On Page 12, Table C, change second sentence of footnote to read as follows: Sags are the same as ASW-5/22-F and ASW-6/22-F multiple drop wire.

2.005 On Page 13, change title of Table D from MINIMUM STRINGING SAGS FOR F MULTIPLE DROP WIRE to MINIMUM STRINGING SAGS FOR ASW-5/22-F AND ASW-6/22-F MULTIPLE DROP WIRE.

2.006 On Page 13, Table D, change second sentence of footnote to read as follows: Sags are the same as ASW-5/22-F and ASW-6/22-F multiple drop wire.

2.007 On Page 14, change paragraph 6.01 to read as follows:

6.01 Prepare ASW-5/22-F and ASW-6/22-F multiple drop wire for termination in accordance with Fig. 13 through 16.

2.008 On Page 15, change heading of Part 7 from SPLICING F MULTIPLE DROP WIRE to SPLICING MULTIPLE DROP WIRE.

2.009 On Page 15, change paragraph 7.01 to read as follows:

7.01 ASW-5/22-F and ASW-6/22-F multiple drop wire may be spliced before placing, using the material listed in Table B and shown in Fig. 17.

2.010 On Page 16, change paragraph 7.02 to read as follows:

7.02 Splice ASW-5/22-F and ASW-6/22-F multiple drop wire as illustrated in Fig. 18 through 25.

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DROP AND BLOCK WIRING

MULTIPLE DROP WIRE—PLACING AND STRINGING SAGS

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1. GENERAL

1.01 Multiple drop wire is used for making multiple drop connections where fuseless-type protection or no station protection is required.

1.02 This section is reissued to:

- include information on splicing F multiple drop wire,
- include information on Buffalo lineman's tool,
- include information on No. 5056B wirevise.

Since this is a general revision, arrows normally used to indicate changes have been omitted.

1.03 F multiple drop wire may be used in runs up to 700 feet and may be used with fuseless protectors and 24 AWG stub cable.

1.04 Multiple drop wire should be distributed preferably from a pole, but it may be distributed from a span clamp provided the cable suspension strand is not pulled noticeably out of line.

1.05 Splicing of C or E (MD) multiple drop wire is **not** recommended. The method of splicing F multiple drop wire is outlined in Part 7 of this section.

1.06 Refer to the following sections of the Bell System Practices for additional information.

| SECTION | TITLE |
|-------------|--|
| 462-350-213 | Fastening and Equipping First Attachments of Drop Wire Runs to Buildings |
| 462-500-015 | Clearances for Multiple Drop Wire in Light Loading Areas |
| 462-500-016 | Clearances for Multiple Drop Wire in Medium Loading Areas |
| 462-500-017 | Clearances for Multiple Drop Wire in Heavy Loading Areas |

1.07 Descriptive information on multiple drop wire may be found in the 626 Division of the Bell System Practices.

2. PRECAUTIONS

2.01 Never place multiple drop wire over primary power conductors.

2.02 Obtain assistance before placing multiple drop wire over streets, highways, or elsewhere, if traffic, trees, or other conditions are such that one person cannot do the work safely.

2.03 Insulating gloves in addition to other protective equipment shall be worn by all employees when performing all operations in which the handline or drop wire may come in contact with power wires or power cable.

2.04 The handline used to raise the multiple drop wire shall be free from metallic strands and shall be dry.

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2.05 When necessary to carry a handline up a pole or ladder, secure one end of the handline to a B handline carrier (Fig. 1) attached to a body belt. If the B handline carrier is not available, double the end of the handline back on itself for a distance of approximately 1 foot and place this loop under the side or back of the body belt so it will be readily released under tension.

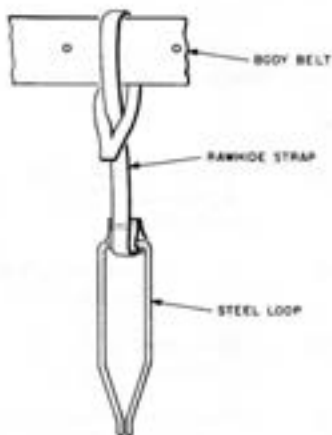


Fig. 1—B Handline Carrier

2.06 Never release the drop wire support from a wire span while working inside the angle formed by the wire.

2.07 When multiple drop wire is to be attached to a span clamp, place the extension ladder on the field side of the suspension strand not in the street or highway. If there is no street or highway adjacent to the span clamp, place the ladder preferably against the opposite side of the strand from the drop wire run to the building.

2.08 Do *not* support an extension ladder on F multiple drop wire.

2.09 Locate first attachment where drop wire will be clear of any obstructions.

2.10 Locate ring runs with consideration to permanency and accessibility. Avoid runs requiring the use of long ladders.

2.11 At pole to building runs, tension multiple drop wire at the pole end of the run.

3. ASSOCIATED MATERIAL AND APPARATUS

3.01 Materials and apparatus required in connection with the installation of multiple drop wire and their uses are described in Tables A and B.

TABLE A
BUILDING ATTACHMENTS AND FASTENERS

| ATTACHMENT ² | ATTACHMENT HARDWARE | FASTENER(S) ² REQUIRED FOR USE ON | | | REMARKS |
|-------------------------|---------------------|--|---|--|--|
| | | MASONRY | WOOD | STUCCO ON WOOD METAL ON WOOD OR RIGID COMPOSITION | |
| First | Drop Wire Hook | 5/16 × 1-3/4 in. Hammer Drive Anchor | No. 18 RH Galvanized Wood Screw 2-1/2 in. or longer (screw should penetrate studding 1-1/4 in. min) | | Only one multiple drop wire shall be supported on a drop wire hook |
| Second or Last | No. 9 Cable Clamp | 1/4 × 1 in. Hammer Drive Anchor | 1-1/2 in. No. 14 Galvanized RH Wood Screws | 2 In. No. 14 RH Wood Screws | Place clamp 6 in. from drop wire hook or entrance to term., protector, or building |
| Intermediate | 5/8 in. Drive Rings | 1/4 × 1 in. D Drive Anchor | No additional fasteners required | | Space rings approx. 3 ft. apart horiz., 6 ft. apart vert. |

Note 1: When the original wall surface has been covered by either aluminum or vinyl covering, add one inch to the length of the recommended fastener. Any holes made in aluminum or vinyl siding must be sealed with a caulking compound.

Note 2: See Section 462-350-213 for information on insulated attachments.

TABLE B

ASSOCIATED MATERIAL AND APPARATUS

| MATERIAL OR APPRATUS | APPLICATION | FOR USE WITH MULTIPLE DROP WIRE | | |
|---|--|---------------------------------|-----|-----|
| | | F | C | E |
| Reliable Electric Co. Wirevise (No. 5056B) (Fig. 2) | To connect support wire to drive hooks, drop wire hooks, or span clamps | Yes | No | No |
| Preformed Deadend (DE-2506) (Fig. 3) | | | | |
| Bridging Connector, 6C (Fig. 4) | For joining support wire in order to maintain mechanical and electrical continuity | Yes | No | No |
| AT-8851 Tangent Support (Fig. 5) | For intermediate pole attachment | Yes | No | No |
| Buffalo Lineman's Tool, Catalog No. 1 (Fig. 8) | For pulling wire to proper tension and snubbing | Yes | No | No |
| Multiple Drop Wire Puller, AT-7480 | | No | Yes | Yes |
| 116A or 116C Protector and No. 10 Ground Wire | 6-pair fuseless station protector for inside or outside mounting | Yes | Yes | Yes |
| 104-Type Wire Terminal | 6-pair wire terminal similar to 116A or 116C protector without protector | Yes | Yes | Yes |
| D Drop Wire Clamp | For supporting wire at span attachments | No | Yes | Yes |
| B Drive Hook | First and last pole attachments | Yes | Yes | Yes |
| Reliable Electric Co. Wirelink (5057N) (Fig. 17) | For joining support wire in splicing operation | Yes | No | No |
| 701 Connectors (Fig. 17) | For splicing 22 Gauge conductors of F Multiple drop wire | Yes | No | No |
| 13A Splice Case (Fig. 17) | For enclosing splice | Yes | No | No |
| B Sealing Tape (Fig. 17) | For forming sealing collars around drop wire in 13A splice case | Yes | No | No |
| B Sealing Cord (Fig. 17) | For sealing 13A splice case | Yes | No | No |

TABLE B (Contd)

ASSOCIATED MATERIAL AND APPARATUS

| MATERIAL OR APPARATUS | APPLICATION | FOR USE WITH MULTIPLE DROP WIRE | | |
|-------------------------------|---|---------------------------------|----|----|
| | | F | C | E |
| F-6 Sealing Washers (Fig. 17) | For containing B sealing tape in 13A splice case | Yes | No | No |
| B Polyethylene Tape (Fig. 17) | Provides dielectric barrier between wirelink, conductors, and splice case | Yes | No | No |
| C Vinyl Tape (Fig. 17) | For marking and to secure B Polyethylene tape | Yes | No | No |



Fig. 2—No. 30568 Wirevise

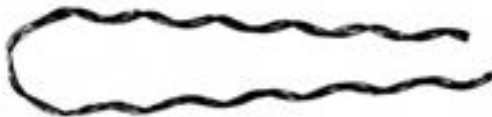


Fig. 3—DE-2506 Dead End



BRIDGING CONNECTOR

Fig. 4—Bridging Connector for 0.083 Support Wire

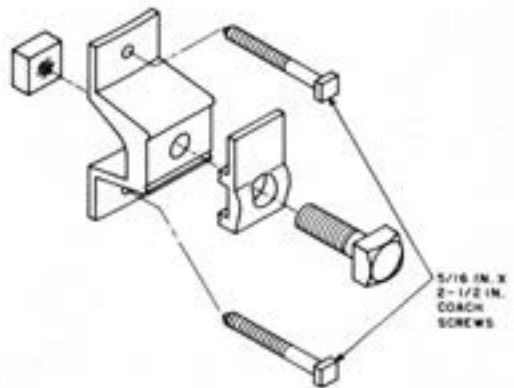


Fig. 5—AT-8851 Tangent Support

3.02 Additional information on building attachments may be found in Sections 462-350-211, 462-350-212, 462-350-213, and 462-350-214.

4. PLACING F MULTIPLE DROP WIRE

IMPORTANT:

- Do not connect the building end of the support wire to the customers ground.
- Place the wire to avoid contact between the support wire and metal siding or other conductive material on customers building. Use insulated attachments at these locations. (See Section 462-350-213.)

Note: Building attachments which do not require removal of insulation from support wire are considered insulated.

Building Runs

4.01 Place multiple drop wire along building runs as follows:

- (1) Place multiple drop wire along proposed building run from wire terminal or protector to first attachment (see Fig. 6).

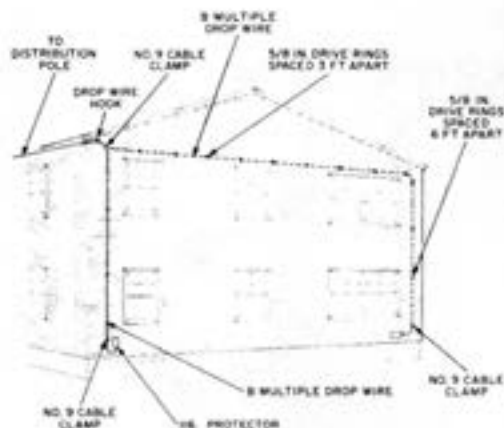


Fig. 6—Typical Wire Run on Building

- (2) Cut support wire at first attachment and slit the web approximately 1 inch in the direction toward the terminal or protector.

- (3) Separate the support wire and jacketed pairs for approximately 2 or 3 feet and remove that portion of support wire. Exercise caution not to damage the PVC jacket particularly at temperatures near or below 0°F.

Note: At installations where there is more than one building attachment, such as building-to-building spans, the support wire must be continuous (both electrically and mechanically) up to the last attachment. Where it is necessary to cut the support wire, it must be rejoined with a GC bridging connector (Fig. 4). At a junction with buried plant, bond the support wire to the terminal housing.

- (4) Cut the web approximately 1 inch at the point of first attachment in the direction toward the pole. Separate the support wire from the jacketed pairs for approximately 10 inches. Crush the PVC jacket of the support wire between the handles of the diagonal pliers and remove the insulation.

- (5) Place a plastic cable tie around the jacketed pairs and support wire at the point of separation to prevent further splitting of the web.

- (6) Install a No. 5056B wirevise (Fig. 2) or a DE-2506 dead end (Fig. 3) on the bare support wire and over drop wire hook (Fig. 7).

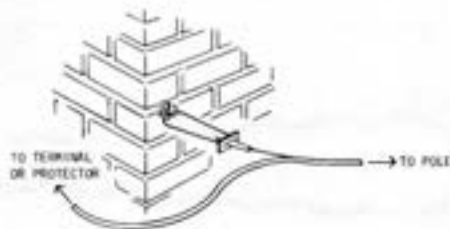


Fig. 7—Multiple Drop Wire Installed at First Building Attachment

- (7) Complete wire run on building using hardware described in Tables A and B.

Pole Runs and Attachments

4.02 Place multiple drop wire at pole runs as follows:

- (1) Pay out multiple drop wire at building-to-pole spans as described for drop wire in Section 462-400-205.
- (2) Using a Buffalo lineman's tool, catalog No. 1 (Fig. 8), tension the wire to the required sag (Fig. 9). See Part 5 for stringing sags.

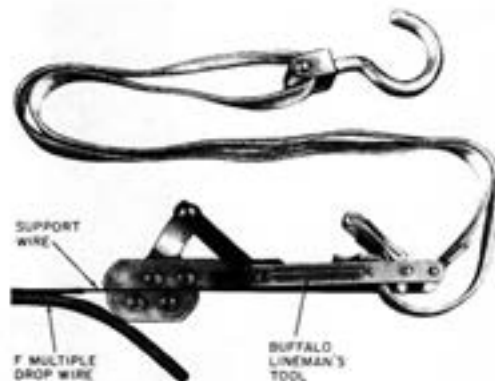


Fig. 8—Buffalo Lineman's Tool, Catalog No. 1



Fig. 9—Tensioning Wire With a Buffalo Lineman's Tool

Note: When tensioning F multiple drop wire, the jaws of the Buffalo lineman's tool, catalog No. 1 shall engage only the support wire. Initial sagging does not require removal of insulation from support wire. However, when applying full stringing tension, removal of the insulation is recommended to prevent possible slippage within the jaws.

- (3) Cut the wire to the required length making an allowance for a 6-inch drip loop.
- (4) Cut the web and separate the support wire from the jacketed pairs to approximately 8 inches from the pole attachment.

- (5) Place a plastic cable tie around the jacketed pairs and support wire at the point of separation to prevent further splitting of the web.
- (6) Cut the support wire at the required length allowing sufficient length for bonding to the cable strand.
- (7) Crush and strip the PVC jacket around the support wire back to the cable tie(s).
- (8) Install a DE-2506 dead end or a No. 5056B wirevise on the bare support wire and attach to pole attachment. Release and remove drop wire puller.
- (9) Complete the pole attachment as shown in Fig. 10.

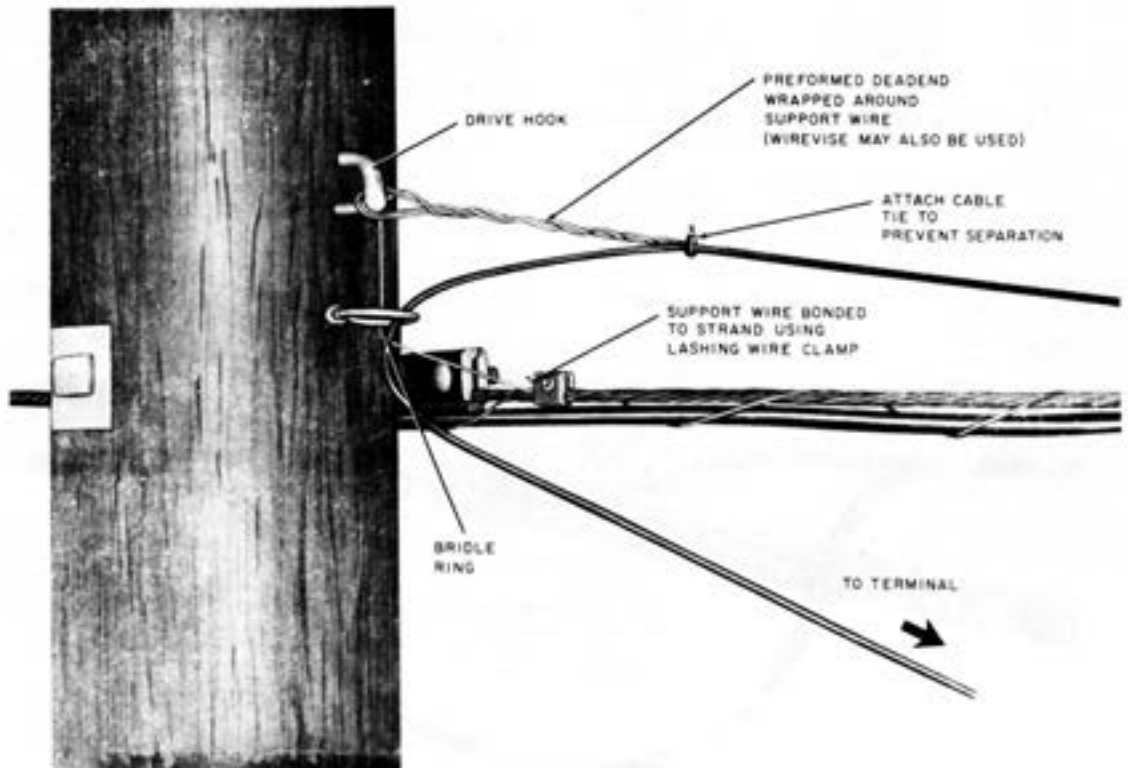


Fig. 10—Completed Pole Attachment

Pole-to-Pole Spans

4.03 At installations where pole-to-pole spans are required, attach the support wire at end pole of the run in the same manner as described in paragraph 4.02. If splicing is required, follow the instructions in Part 7. The support wire must be both electrically and mechanically continuous. To maintain continuity at areas where support wire is not under tension, use a bridging connector (see Fig. 11).

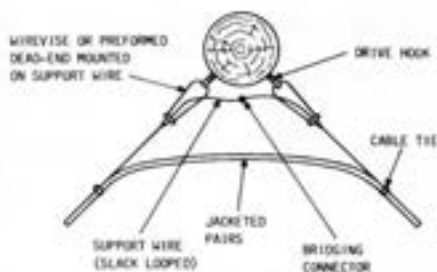


Fig. 11—Turn In Multiple Drop Wire Run at Intermediate Pole

4.04 When necessary to attach the support wire to intermediate poles along a run, an AT-8851

tangent support (Fig. 5) may be installed as follows:

- (1) Center the tangent support 8 inches above the strand if the drop wire crosses a street, and 8 inches below the strand if the drop wire remains on the same side.
- (2) Tension the wire to the required sag and remove approximately 2 inches of insulation from the support wire at the tangent support attachment.
- (3) Insert the bare wire in the semicircular groove of the tangent support and tighten.
- (4) Place a cable tie approximately 4 inches from the tangent support on each side to prevent further separation.

Turns at Intermediate Poles and Midspan

4.05 When it is necessary to make a turn in the multiple drop wire run at an intermediate pole location, attach the drop wire as shown in Fig. 11.

4.06 When it is necessary to make a turn in the multiple drop wire run at midspan, attach the drop wire as shown in Fig. 12.

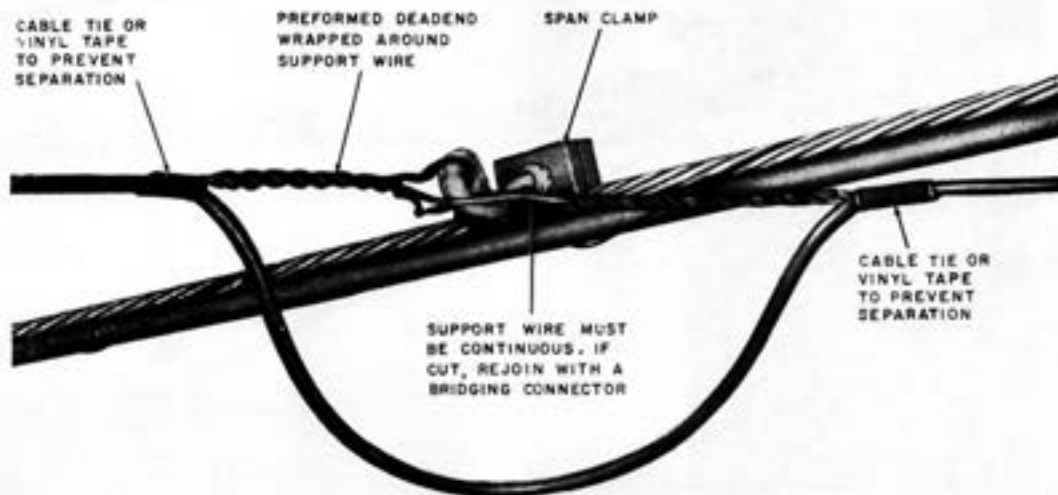


Fig. 12—Turn In Multiple Drop Wire Run at Midspan

5. STRINGING SAGS

5.01 String multiple drop wire to the sags in Table C on pole-to-pole and pole-to-house spans except in those cases where adequate ground clearances can only be obtained with the minimum sags of Table D. Your supervisor will advise the storm loading to be assumed for the area concerned.

5.02 Use the minimum sags of Table D in cases where these reduced sags provide the only means of obtaining ground clearances under the wire in spans.

5.03 The sag given to multiple drop wire may be estimated by sighting between wire supports.

TABLE C
NORMAL STRINGING SAGS FOR F
MULTIPLE DROP WIRE

| SPAN LENGTH | STRINGING | | | FINAL UNLOADED SAG FOLLOWING STORM LOADING | | SAG INCREASE FROM STRINGING TO FINAL CONDITION |
|--|--------------|-----|----|--|-----|--|
| | SAG TENSION* | | | FT | IN. | |
| FT | FT | IN. | LB | FT | IN. | IN. |
| HEAVY LOADING AREA | | | | | | |
| 100 | 1 | 9 | 65 | 2 | 0 | 3 |
| 125 | 2 | 10 | 65 | 3 | 4 | 6 |
| 150 | 4 | 0 | 65 | 4 | 6 | 6 |
| 175 | 5 | 6 | 65 | 6 | 1 | 7 |
| 200 | 7 | 0 | 65 | 7 | 7 | 7 |
| 225 | 9 | 0 | 65 | 9 | 8 | 8 |
| 250 | 11 | 2 | 65 | 11 | 11 | 9 |
| MEDIUM LOADING AREA | | | | | | |
| 100 | 1 | 9 | 65 | 1 | 9 | — |
| 125 | 2 | 10 | 65 | 3 | 0 | 2 |
| 150 | 4 | 0 | 65 | 4 | 2 | 2 |
| 175 | 5 | 6 | 65 | 5 | 9 | 3 |
| 200 | 7 | 0 | 65 | 7 | 3 | 3 |
| 225 | 9 | 0 | 65 | 9 | 4 | 4 |
| 250 | 11 | 2 | 65 | 11 | 6 | 4 |
| LIGHT LOADING AREA | | | | | | |
| 100 | 1 | 9 | 65 | Same as stringing sags | | No increases |
| 125 | 2 | 10 | 65 | | | |
| 150 | 4 | 0 | 65 | | | |
| 175 | 5 | 6 | 65 | | | |
| 200 | 7 | 0 | 65 | | | |
| 225 | 9 | 0 | 65 | | | |
| 250 | 11 | 2 | 65 | | | |
| Over 250 Ft—Use minimum sags shown in Table D. | | | | | | |

* Stringing tension for C and E multiple drop wire is 110 lbs for all loading areas. Sags are same as F multiple drop wire.

TABLE D
 MINIMUM STRINGING SAGS FOR F
 MULTIPLE DROP WIRE

| SPAN LENGTH | STRINGING | | | FINAL UNLOADED SAG FOLLOWING STORM LOADING | | SAG INCREASE FROM STRINGING TO FINAL CONDITION | |
|----------------------------|--------------|-----|----|--|-----|---|-----|
| | SAG TENSION* | | | FT | IN. | FT | IN. |
| FT | FT | IN. | LB | FT | IN. | FT | IN. |
| HEAVY LOADING AREA | | | | | | | |
| 100 | 1 | 4 | 85 | 1 | 11 | | 7 |
| 125 | 2 | 1 | 85 | 2 | 9 | | 8 |
| 150 | 3 | 0 | 85 | 3 | 8 | | 8 |
| 175 | 4 | 1 | 85 | 4 | 10 | | 9 |
| 200 | 5 | 4 | 85 | 6 | 2 | | 10 |
| 225 | 6 | 9 | 85 | 7 | 8 | | 11 |
| 250 | 8 | 4 | 85 | 9 | 5 | 1 | 1 |
| 275 | 10 | 0 | 85 | 11 | 3 | 1 | 3 |
| 300 | 12 | 0 | 85 | 13 | 3 | 1 | 3 |
| MEDIUM LOADING AREA | | | | | | | |
| 100 | 1 | 4 | 85 | 1 | 8 | | 4 |
| 125 | 2 | 1 | 85 | 2 | 5 | | 4 |
| 150 | 3 | 0 | 85 | 3 | 4 | | 4 |
| 175 | 4 | 1 | 85 | 4 | 6 | | 5 |
| 200 | 5 | 4 | 85 | 5 | 9 | | 5 |
| 225 | 6 | 9 | 85 | 7 | 2 | | 5 |
| 250 | 8 | 4 | 85 | 8 | 10 | | 6 |
| 275 | 10 | 0 | 85 | 10 | 6 | | 6 |
| 300 | 12 | 0 | 85 | 12 | 6 | | 6 |
| LIGHT LOADING AREA | | | | | | | |
| 100 | 1 | 4 | 85 | Same as stringing sags | | No increases | |
| 125 | 2 | 1 | 85 | | | | |
| 150 | 3 | 0 | 85 | | | | |
| 175 | 4 | 1 | 85 | | | | |
| 200 | 5 | 4 | 85 | | | | |
| 225 | 6 | 9 | 85 | | | | |
| 250 | 8 | 4 | 85 | | | | |
| 275 | 10 | 0 | 85 | | | | |
| 300 | 12 | 0 | 85 | | | | |

* Stringing tension for C and E multiple drop wire is 150 lbs for all loading areas. Sags are the same as F multiple drop wire.

6. PREPARATION OF CONDUCTORS FOR TERMINATION

6.01 Prepare F multiple drop wire for termination in accordance with Fig. 13 through 16.

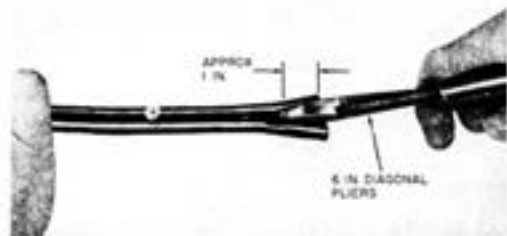


Fig. 13—Cutting Web With Diagonal Pliers

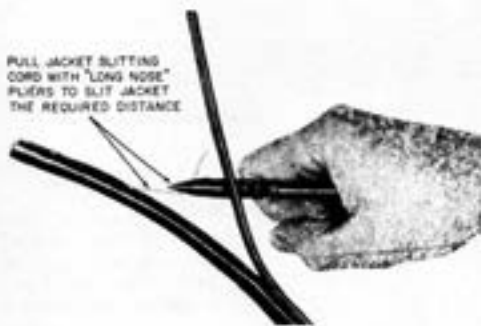


Fig. 15—Slitting Jacket



Fig. 14—Cutting Jacket With Diagonal Pliers

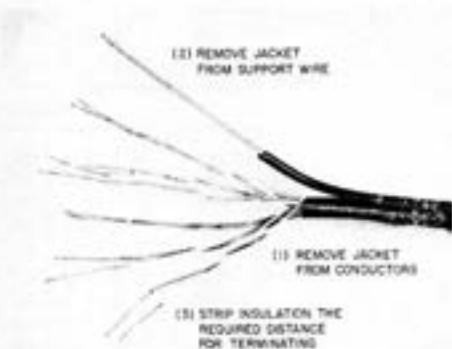


Fig. 16—Conductors Prepared for Termination

7. SPlicing F MULTIPLE DROP WIRE

7.01 F multiple drop wire may be spliced before placing using the material listed in Table B and shown in Fig. 17.

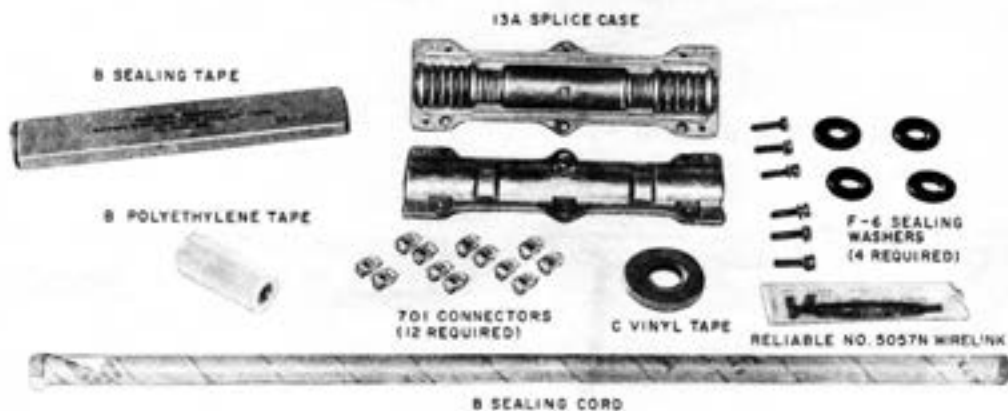


Fig. 17—Material Required for Splicing F Multiple Drop Wire

7.02 Splice F multiple drop wire as illustrated in Fig. 18 through 25.

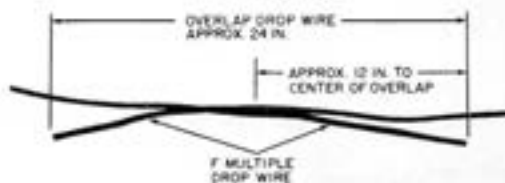


Fig. 18—Overlap Drop Wires

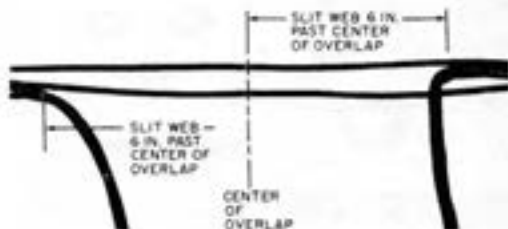


Fig. 19—Slit Web

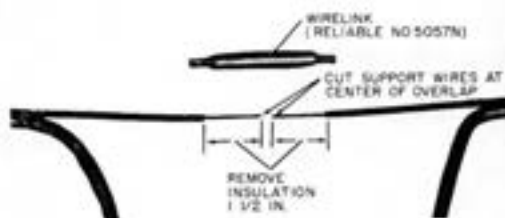


Fig. 20—Preparing Support Wire for Installation of Wirelink

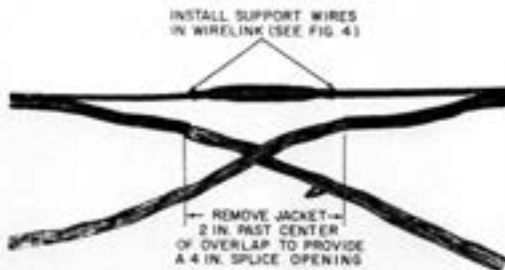


Fig. 21—Support Wire Installed in Wirelink



Fig. 22—Splicing Completed



Fig. 23—Splice Wrapped With B Polyethylene Tape



1. WRAP SPLICE AND WIRELINK WITH B POLYETHYLENE TAPE—SECURE WITH C VINYL TAPE
2. SCUFF JACKET AND FORM SEALING COLLAR WITH B SEALING TAPE (PLACE A SHORT LENGTH OF SEALING TAPE BETWEEN SUPPORT WIRE AND CONDUCTOR INSULATION BEFORE WRAPPING WITH B SEALING TAPE). PLACE F-6 SEALING WASHERS ON BOTH SIDES OF EACH SEALING COLLAR.
3. PLACE PREPARED SPLICE IN 13A CABLE CLOSURE. COMPLETE INSULATION PER SECTION 633-470-100. DO NOT INSTALL INNER SHEATH CLAMPS.

Fig. 24—Splice Placed in 13A Splice Case



Fig. 25—Completed Splice

CLEARANCES FOR MULTIPLE DROP WIRE IN THE LIGHT LOADING AREA

1. GENERAL

1.001 This addendum supplements Section 462-500-015, Issue 1.

1.002 This addendum is issued to add a paragraph to Part I regarding the placing of aerial drop wire over swimming pools.

1.003 Add the following paragraph:

1.05 Clearances over public and private swimming pools are not covered by the National Electrical Safety Code. However, for reasons of safety, sanitation, and appearance, aerial multiple drop wire crossings over swimming pools should be avoided.

CLEARANCES FOR MULTIPLE DROP WIRE IN THE LIGHT LOADING AREA

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| 3. CLEARANCES CROSSING BELOW POWER WIRES AND CABLES | 5 |
| 4. MISCELLANEOUS CLEARANCES | 6 |

1. GENERAL

1.01 This section contains the recommended clearances for multiple drop wire installed in the light loading area. The values specified meet the requirements of the National Electrical Safety Code (Sixth Edition). They apply under conditions of 60°F with no wind or ice.

1.02 Multiple drop wire installed in the light loading area will not experience any permanent increase in sag unless the storm loading is quite severe. Hence there is no difference between "construction" and "maintenance" values of clearances above ground or rails. However, clearances crossing below foreign wires may be reduced as these wires do undergo permanent stretching in some cases. Construction clearances in these situations are, therefore, somewhat greater than maintenance clearances.

1.03 Multiple drop wire must be installed with relatively large sags. Because of this, it is generally advantageous to locate poles and wire runs so that the middle of the span will **not** be above the traveled part of public roads, alleys and driveways. This will generally be the case at crossings when the far edge of the road, alley, etc,

is not more than 50 feet from the pole (measured along the wire route). Where this condition exists, it will generally be possible to base the height of pole attachment on something less than 100 per cent of the midspan sag. The following table shows the percentage of midspan sag to be used in determining the height of pole attachment when the 50-foot criterion applies. This procedure should be ignored for span lengths less than 145 feet.

| <u>SPAN LENGTH (feet)</u> | <u>PER CENT OF MIDSPAN SAG</u> |
|---------------------------|--------------------------------|
| 145-160 | 90 |
| 161-180 | 85 |
| 181-200 | 80 |
| 201-225 | 75 |
| 226-250 | 70 |
| 251-275 | 65 |
| 276-300 | 60 |

Example: A 275 foot span crosses a road. The midspan sag is 10 feet, the far edge of the road is within 50 feet of the pole and is 2 feet lower than the ground where the pole is located. The sag 50 feet from the pole will be 65 per cent of midspan or 6-1/2 feet. The minimum height of pole attachment is then 18 feet minus 2 feet plus 6-1/2 feet or 22-1/2 feet.

1.04 Clearances shown in this section should be used unless the detail plans show other values. This may occur when engineering forces recognize certain factors not allowed for in this section or to meet local regulations, ordinances, etc. Clearances for span lengths and voltages not shown in this section are an engineering responsibility and will be shown on the detail plans.

2. CLEARANCES ABOVE GROUND OR RAILS

(Normal or Minimum Sags)

SPAN LENGTHS 300 FEET OR LESS

| SITUATION | REF | Ft In. | |
|------------------------------|--------|--------|---|
| Crossing Above: | | | |
| Railroad Tracks | | | |
| Generally | — | 27-0 | } Span lengths over 150 feet require a 10M supporting strand. |
| Special Case | Fig. 1 | 25-0 | |
| Public Roads | — | 18-0 | |
| Public Alleys | — | 15-0 | |
| Resid Driveways | — | 10-0 | |
| Flat Roof Bldgs | — | 8-0 | |
| Peak Roof Bldgs & Billboards | — | 2-0 | |
| Neon Signs | — | 4-0 | |
| Waterways | — | | Must be shown on detail plans. |
| Running Along: | | | |
| Public Roads | | | |
| Major Overhang | Fig. 2 | 18-0 | |
| Minor Overhang | Fig. 2 | | |
| Urban | — | 18-0 | |
| Rural (Lt Traffic) | — | 14-0 | |
| No Overhang | | | |
| Back of Obst | Fig. 3 | 8-0 | |
| Not Back of Obst | Fig. 4 | 13-0 | |
| Public Alleys | — | 15-0 | |

WIRE CROSSING RAILROAD TRACKS - SPECIAL CASE

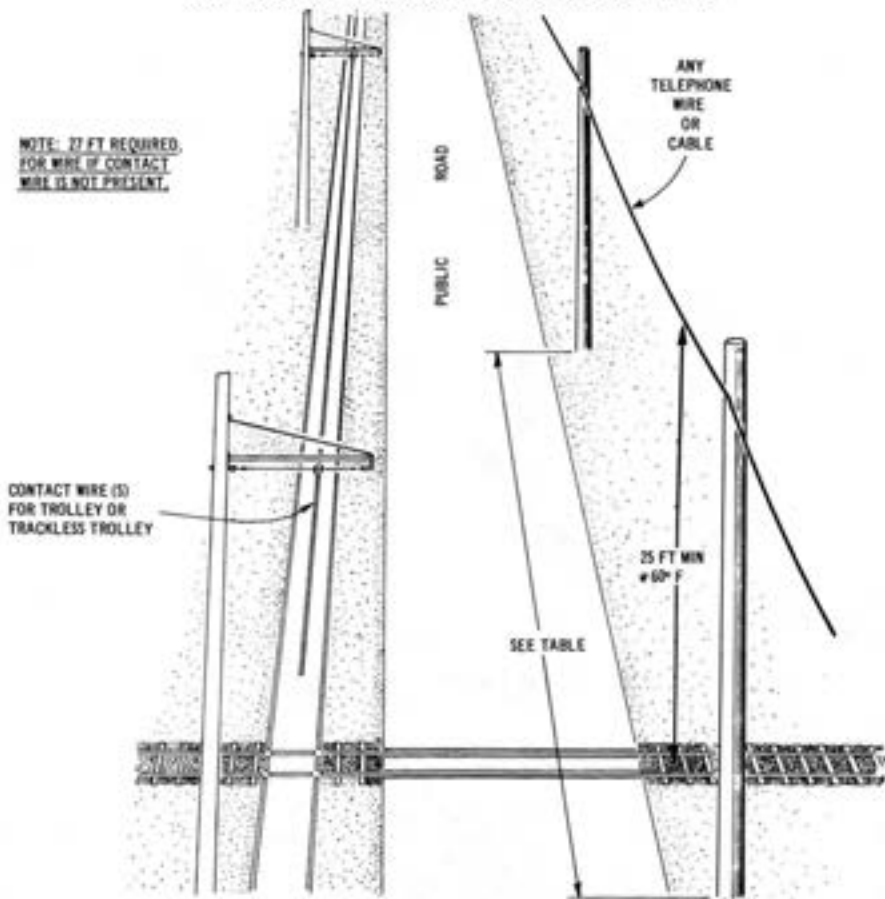


Fig. 1

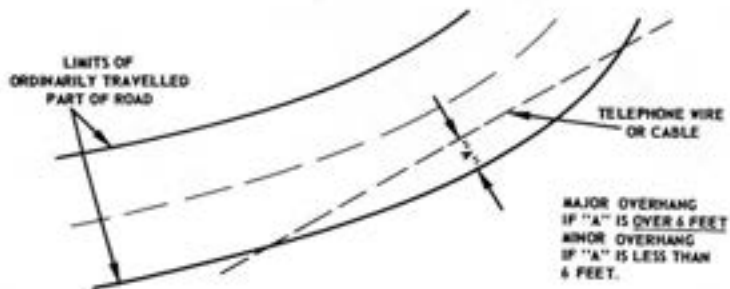


Fig. 2

RUNNING ALONG PUBLIC ROADS - BACK OF DITCHES ETC.
(NO OVERHANG)

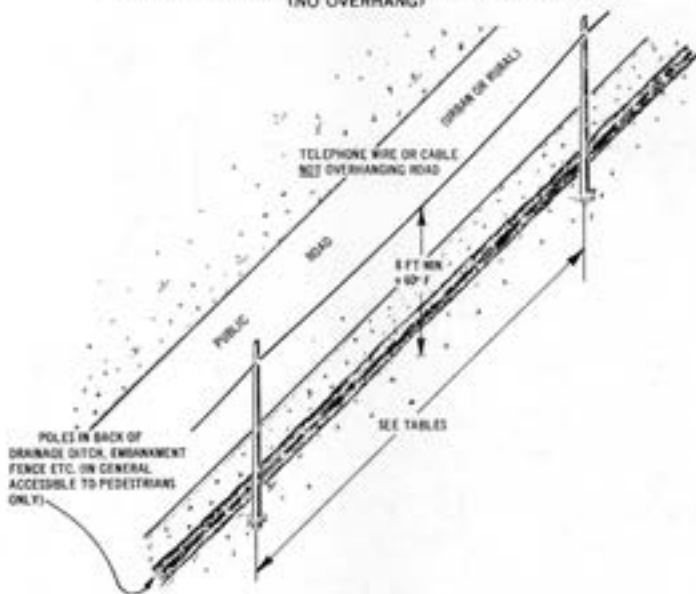


FIG. 3

RUNNING ALONG, BUT NOT OVERHANGING PUBLIC ROADS
(NOT BACK OF OBSTRUCTION)

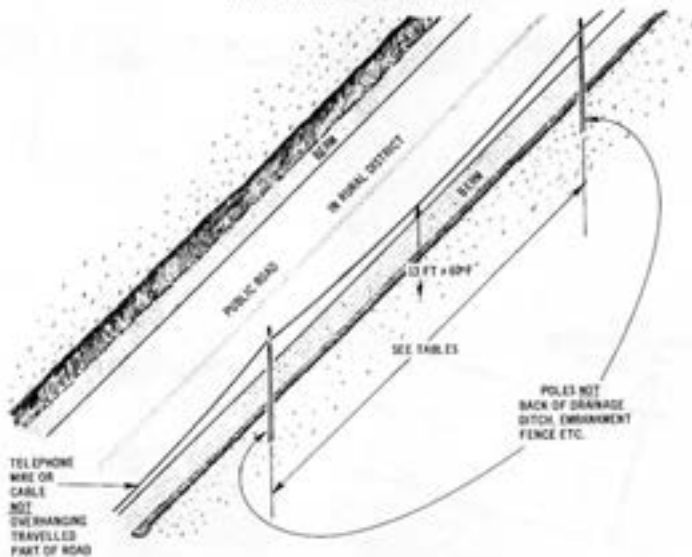


FIG. 4

3. CLEARANCES CROSSING BELOW POWER WIRES AND CABLES

CONSTRUCTION¹ CLEARANCES FOR
POWER SPAN LENGTHS OF

| KIND OF POWER FACILITY | 150-1855 | 181-250 | 251-350 |
|---|---------------------------------|---------|---------|
| | ft. in. | ft. in. | ft. in. |
| 300 volts ¹ or less | | | |
| Service wires or cables | 2-0 | 2-3 | 2-6 |
| Line wires | 2-0 | 2-3 | 2-6 |
| If within 6 feet of telephone pole ⁴ (See Section 620-210-012) | 4-0 | 4-3 | 4-6 |
| 301-750 volts ¹ — phase wires | 4-0 | 4-3 | 4-6 |
| 751-8700 volts ¹ — phase wires | 4-0 | 4-3 | 4-6 |
| If within 6 feet of telephone pole ⁴ (See Section 620-210-012) | 6-0 | 6-3 | 6-6 |
| 8701-50,000 volts ¹ — phase wires | 6-0 | 6-3 | 6-6 |
| Grounded neutrals — systems of: | | | |
| Up to 22,000 volts to ground | 2-0 | 2-3 | 2-6 |
| Over 22,000 volts to ground | Same as associated phase wires. | | |
| Other neutrals | Same as associated phase wires. | | |
| Grounded metal sheath cables or any cable lashed to grounded strand, any voltage | 2-0 | 2-0 | 2-0 |
| Spacer cable ² | | | |
| 300 volts ¹ or less | 2-0 | 2-0 | 2-0 |
| If within 6 feet of telephone pole ⁴ | 4-0 | 4-0 | 4-0 |
| 301-750 volts ¹ | 4-0 | 4-0 | 4-0 |
| 751-8700 volts ¹ | 4-0 | 4-0 | 4-0 |
| If within 6 feet of telephone pole ⁴ | 6-0 | 6-0 | 6-0 |
| 8701-50,000 volts ¹ | 6-0 | 6-0 | 6-0 |

1. Voltage to ground if power circuit is grounded; voltage between wires if not.
2. Illustrated in Section 620-216-013.
3. Maintenance clearances for all span lengths up to 350 feet are the same as construction clearances for span lengths of 150 feet or less.
4. Every effort should be made to avoid these situations and establish a common pole crossing instead.

4. MISCELLANEOUS CLEARANCES

| Multiple Drop Wire Above: | |
|--|--|
| Power service drops or wires of 300 volts or less, foreign guys, foreign communications cable, trolley span wires. | |
| <u>SPAN LENGTH OF MULTIPLE DROP WIRE (NORMAL OR MINIMUM SAGS)</u> | <u>CLEARANCE IN FEET, INCHES CONSTRUCTION OR MAINTENANCE</u> |
| 300-less | 2-0 |
| Trolley contact wires 750 volts-less | |
| 300-less* | 4-0 |
| Multiple Drop Wire Below: | |
| Foreign guys or communication cables ☉ | |
| Any span length | 2-0 |
| Neon signs | |
| Any span length | 4-0 |
| Multiple Drop Wire Alongside: | |
| Neon signs | |
| Any span length | 2-0 |

* Place wire guard at point of crossing.

☉ Span length of foreign cable not over 350 feet.

CLEARANCES FOR MULTIPLE DROP WIRE IN THE MEDIUM LOADING AREA

1. GENERAL

1.001 This addendum supplements Section 462-500-016, Issue 1.

1.002 This addendum is issued to add a paragraph to Part 1 regarding the placing of aerial drop wire over swimming pools.

1.003 Add the following paragraph:

1.06 Clearances over public and private swimming pools are not covered by the National Electrical Safety Code. However, for reasons of safety, sanitation, and appearance, aerial multiple drop wire crossings over swimming pools should be avoided.

CLEARANCES FOR MULTIPLE DROP WIRE IN THE MEDIUM LOADING AREA

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1. GENERAL

1.01 This section covers the recommended clearances for multiple drop wire in the medium loading area. The values specified meet the requirements of the National Electrical Safety Code (Sixth Edition). They apply under conditions of 60°F with no wind or ice.

1.02 "Construction" clearances generally contain some allowance for extra sag which will be introduced as a result of permanent stretching caused by storm loading. It will not be necessary to resag multiple drop wire unless the storm loading experienced is quite severe.

1.03 "Maintenance" clearances should exist after the wire has been through storm loading and the temperature returns to 60°F. Wire should be resagged, however, if clearances at 60°F fall below maintenance values.

1.04 Multiple drop wire must be installed with relatively large sags. Hence it will generally be advantageous to locate poles and wire runs so that the middle of the span will *not* be

above the traveled part of roads, alleys, and driveways. This will often be the case at crossings when the far edge of the road, alley, etc, is 50 feet or less from the pole (measured along the wire route). Where this condition exists, it will generally be possible to have the height of pole attachment on something less than 100 per cent of the midspan sag. The following table shows the percentage of midspan sag to be used in determining the height of pole attachment when the 50-foot criterion applies. This procedure should be ignored for spans less than 145 feet.

| SPAN LENGTH (feet) | PER CENT OF MIDSPAN SAG |
|--------------------|-------------------------|
| 145-160 | 90 |
| 161-180 | 85 |
| 181-200 | 80 |
| 201-225 | 75 |
| 226-250 | 70 |
| 251-275 | 65 |
| 276-300 | 60 |

Example: A 275 foot span crosses a road; the midspan sag is 10 feet. The pole nearest the road is within 50 feet of the far edge and is on ground which is 2 feet higher than the road. The sag at 50 feet will be 65 per cent of midspan or 6-1/2 feet. The required clearance is 18 feet 4 inches. Minimum height of pole attachment is 18 feet 4 inches minus 2 feet, plus 6 feet 6 inches, or 22 feet 10 inches.

1.05 Clearances shown in this section should be used unless the detail plans show other values. Clearances shown on the detail plans may call for different values where engineering forces have recognized factors not allowed for in this section. Clearances for span lengths, voltages and conditions not shown in this section are an engineering responsibility and will be shown on the detail plans.

2. CLEARANCES ABOVE GROUND OR RAILS

(a) Using Normal Sags

SPAN LENGTHS IN FEET

| SITUATION | REF. | 100-LESS | | 101-150 | | 151-200 | | 201-250 | |
|------------------------------------|--------|--------------------------------|-------------------|------------------|-------------------|--|-------------------|------------------|-------------------|
| | | CONST Ft. In. | (MTC)E Ft. In. | CONST Ft. In. | (MTC)E Ft. In. | CONST Ft. In. | (MTC)E Ft. In. | CONST Ft. In. | (MTC)E Ft. In. |
| Crossing Above: | | | | | | | | | |
| Railroad Tracks | | | | | | | | | |
| Generally | — | 27-0 | (27-0) | 27-2 | (27-0) | } Must be supported on 6M strand for spans 126-150 feet; 10M required for spans over 150 ft. | | | |
| Special Case | Fig. 1 | 25-0 | (25-0) | 25-2 | (25-2) | | | | |
| Public Roads ☉ | — | 18-0 | (18-0) | 18-2 | (18-0) | 18-3 | (18-0) | 18-4 | (18-0) |
| Public Alleys ☉ | — | 15-0 | (15-0) | 15-2 | (15-0) | 15-3 | (15-0) | 15-0 | (15-0) |
| Resid. Driveways ☉ | — | 10-0 | (10-0) | 10-2 | (10-0) | 10-3 | (10-0) | 10-4 | (10-0) |
| Flat Roof Buildings | — | 8-0 | (8-0) | 8-2 | (8-0) | 8-3 | (8-0) | 8-4 | (8-0) |
| Peak Roof Buildings, Billboards | — | 2-0 | (2-0) | 2-2 | (2-0) | 2-3 | (2-0) | 2-4 | (2-0) |
| Neon Signs | — | 4-0 | (4-0) | 4-2 | (4-0) | 4-3 | (4-0) | 4-4 | (4-0) |
| Waterways | — | Must be shown on detail plans. | | | | | | | |
| Running Along: | | | | | | | | | |
| Public Roads | | | | | | | | | |
| Major Overhang | Fig. 2 | 18-0 | (18-0) | 18-2 | (18-0) | 18-3 | (18-0) | 18-4 | (18-0) |
| Minor Overhang | Fig. 2 | | | | | | | | |
| Urban | — | 18-0 | (18-0) | 18-2 | (18-0) | 18-3 | (18-0) | 18-4 | (18-0) |
| Rural (Lt. Traffic) | — | 14-0 | (14-0) | 14-2 | (14-0) | 14-3 | (14-0) | 14-4 | (14-0) |
| No Overhang | | | | | | | | | |
| Back of Obst. | Fig. 3 | 8-0 | (8-0) | 8-2 | (8-0) | 8-3 | (8-0) | 8-4 | (8-0) |
| Not Back of Obst. | Fig. 4 | 13-0 | (13-0) | 13-2 | (13-0) | 13-3 | (13-0) | 13-4 | (13-0) |
| Public Alleys | — | 15-0 | (15-0) | 15-2 | (15-0) | 15-3 | (15-0) | 15-4 | (15-0) |

☉ For these span lengths, clearances are not significantly affected by locating poles within 50 feet of the far edge of the road, alley or driveway. Some saving in pole height may be obtained however. See par 1.04.

2. CLEARANCES ABOVE GROUND OR RAILS

(b) Using Minimum Sags

SPAN LENGTHS IN FEET

| SITUATION | REF. | 75-LESS | | 76-130 | | 131-230 | | 231-275 | | 276-300 | |
|------------------------------------|--------|--------------------------------|---------|---------|---------|---|---------|---------|---------|---------|---------|
| | | CONST | (MTC) | CONST | (MTC) | CONST | (MTC) | CONST | (MTC) | CONST | (MTC) |
| | | Ft. In. | Ft. In. | Ft. In. | Ft. In. | Ft. In. | Ft. In. | Ft. In. | Ft. In. | Ft. In. | Ft. In. |
| Crossing Above: | | | | | | | | | | | |
| Railroad Tracks | | | | | | | | | | | |
| Generally | — | 27-2 | (27-0) | 27-4 | (27-0) | Span lengths over 125 feet require 6M supporting strand; 10M required for span lengths over 150 feet. | | | | | |
| Special Case | Fig. 1 | 25-2 | (25-0) | 25-4 | (25-0) | | | | | | |
| Public Roads | | | | | | | | | | | |
| Generally | — | 18-2 | (18-0) | 18-4 | (18-0) | 18-6 | (18-0) | 18-9 | (18-3) | 19-0 | (18-6) |
| Pole not over 50 ft. from far edge | — | 18-2 | (18-0) | 18-4 | (18-0) | 18-4 | (18-0) | 18-4 | (18-0) | 18-4 | (18-0) |
| Public Alleys | | | | | | | | | | | |
| Generally | — | 15-2 | (15-0) | 15-4 | (15-0) | 15-6 | (15-0) | 15-9 | (15-3) | 16-0 | (15-6) |
| Pole not over 50 ft. from far edge | — | 15-2 | (15-0) | 15-4 | (15-0) | 15-4 | (15-0) | 15-4 | (15-0) | 15-4 | (15-0) |
| Resid. Driveways | | | | | | | | | | | |
| Generally | — | 10-2 | (10-0) | 10-4 | (10-0) | 10-6 | (10-0) | 10-9 | (10-3) | 11-0 | (10-6) |
| Pole not over 50 ft. from far edge | — | 10-2 | (10-0) | 10-4 | (10-0) | 10-4 | (10-0) | 10-4 | (10-0) | 10-4 | (10-0) |
| Flat Roof Buildings | — | 8-2 | (8-0) | 8-4 | (8-0) | 8-6 | (8-0) | 8-6 | (8-0) | 8-6 | (8-0) |
| Peak Roof Buildings, Billboards | — | 2-2 | (2-0) | 2-4 | (2-0) | 2-6 | (2-0) | 2-6 | (2-0) | 2-6 | (2-0) |
| Neon Signs | — | 4-2 | (4-0) | 4-4 | (4-0) | 4-6 | (4-0) | 4-6 | (4-0) | 4-6 | (4-0) |
| Waterways | | Must be shown on detail plans. | | | | | | | | | |
| Running Along: | | | | | | | | | | | |
| Public Roads | | | | | | | | | | | |
| Major Overhang | Fig. 2 | 18-2 | (18-0) | 18-4 | (18-0) | 18-6 | (18-0) | 18-9 | (18-3) | 19-0 | (18-6) |
| Minor Overhang | Fig. 2 | | | | | | | | | | |
| Urban | — | 18-2 | (18-0) | 18-4 | (18-0) | 18-6 | (18-0) | 18-9 | (18-3) | 18-6 | (18-6) |
| Rural (Lt. Traffic) | — | 14-2 | (14-0) | 14-4 | (14-0) | 14-6 | (14-0) | 14-9 | (14-3) | 15-0 | (14-6) |
| No Overhang | | | | | | | | | | | |
| Back of Obst. | Fig. 3 | 8-2 | (8-0) | 8-4 | (8-0) | 8-6 | (8-0) | 8-6 | (8-0) | 8-6 | (8-0) |
| Not Back of Obst. | Fig. 4 | 13-2 | (13-0) | 13-4 | (13-0) | 13-6 | (13-0) | 13-6 | (13-0) | 13-6 | (13-0) |
| Public Alleys | — | 15-2 | (15-0) | 15-4 | (15-0) | 15-6 | (15-0) | 15-9 | (15-3) | 16-0 | (15-6) |

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WIRE CROSSING RAILROAD TRACKS - SPECIAL CASE

NOTE: 27 FT REQUIRED FOR WIRE IF CONTACT WIRE IS NOT PRESENT.

CONTACT WIRE (S) FOR TROLLEY OR TRACKLESS TROLLEY

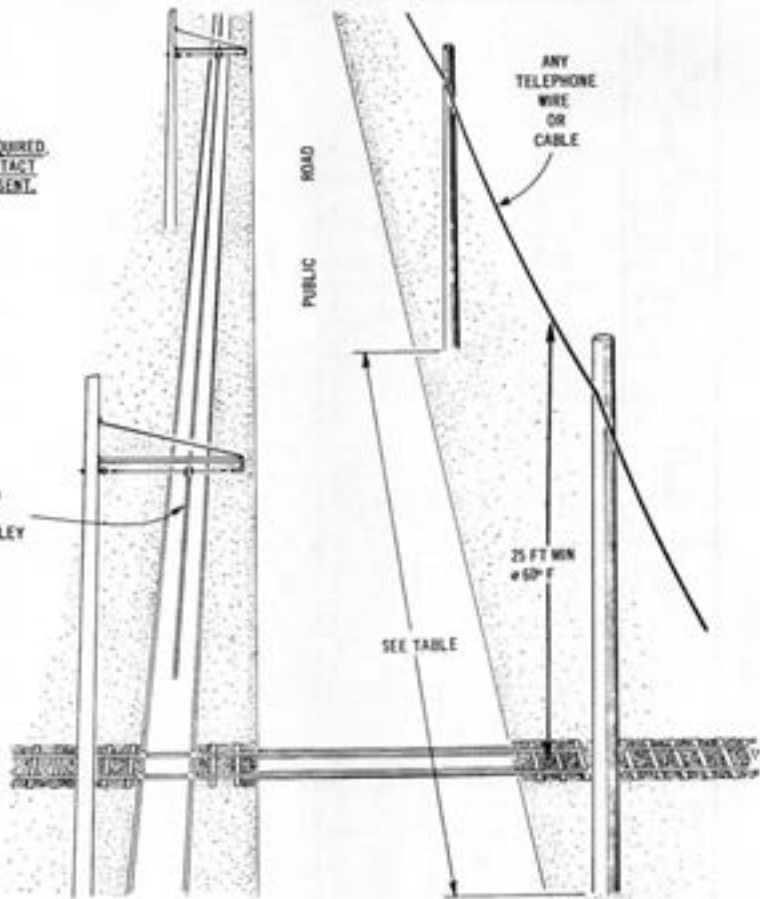


FIG. 1

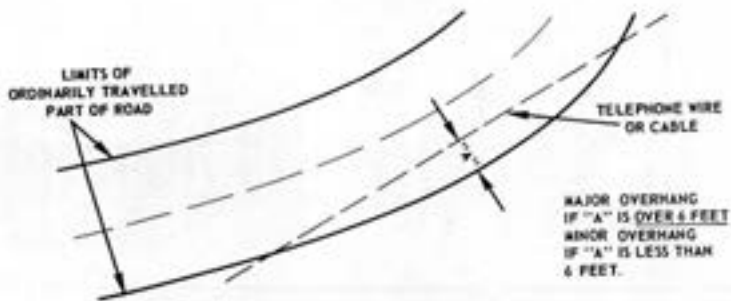


FIG. 2

RUNNING ALONG PUBLIC ROADS - BACK OF DITCHES ETC.
(NO OVERHANG)

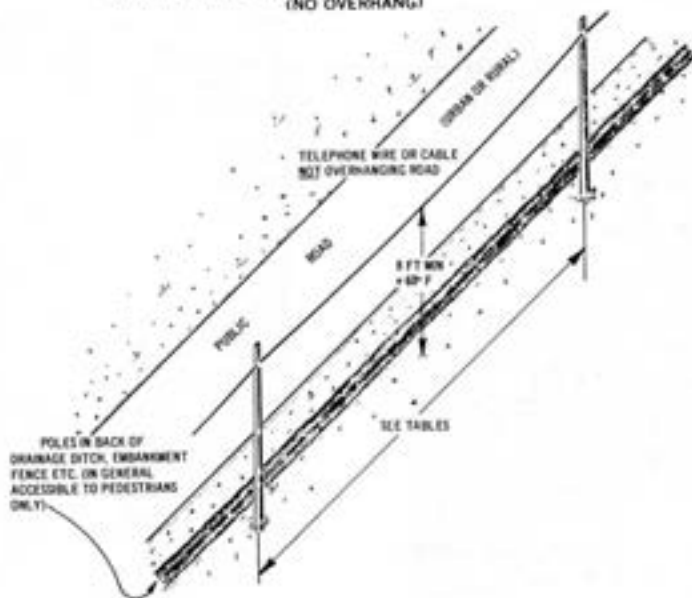


FIG. 3

RUNNING ALONG, BUT NOT OVERHANGING PUBLIC ROADS
(NOT BACK OF OBSTRUCTION)

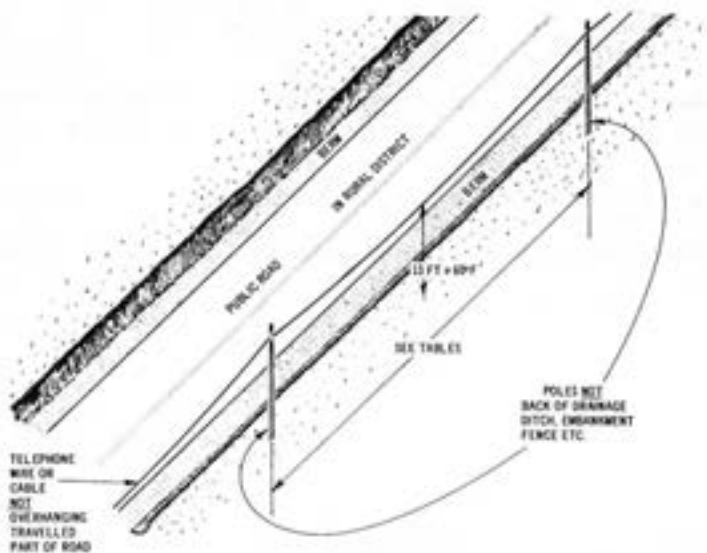


FIG. 4

3. CLEARANCES CROSSING BELOW POWER WIRES AND CABLES

CONSTRUCTION² CLEARANCES
FOR POWER SPAN LENGTHS OF

| KIND OF POWER FACILITY | 150-LESS ft. in. | 151-200 ft. in. | 201-250 ft. in. |
|---|---------------------------------|--------------------|--------------------|
| 300 volts ¹ or less | | | |
| Service wires or cables | 2-0 | 2-6 | 3-0 |
| Line wires — generally | 2-0 | 2-6 | 3-0 |
| If within 6 feet of telephone pole ⁴ (See Section 620-210-012) | 4-0 | 4-6 | 5-0 |
| 301-750 volts ¹ — phase wires | 4-0 | 4-6 | 5-0 |
| 751-8700 volts ¹ — phase wires | 4-0 | 4-6 | 5-0 |
| If within 6 feet of telephone pole ⁴ (See Section 620-210-012) | 6-0 | 6-6 | 7-0 |
| 8701-50,000 volts ¹ — phase wires | 6-0 | 6-6 | 7-0 |
| If near telephone pole, see Section 620-210-012 | | | |
| Grounded neutrals — systems of: | | | |
| Up to 22,000 volts to ground | 2-0 | 2-6 | 3-0 |
| Over 22,000 volts to ground | Same as associated phase wires. | | |
| Other neutrals | Same as associated phase wires. | | |
| Grounded metal sheath cables or any cable lashed to grounded strand, any voltage | 2-0 | 2-0 | 2-0 |
| Spacer cables ² | | | |
| 300 volts ¹ or less | 2-0 | 2-0 | 2-0 |
| If within 6 feet of telephone pole ⁴ | 4-0 | 4-0 | 4-0 |
| 301-750 volts ¹ | 4-0 | 4-0 | 4-0 |
| 751-8700 volts ¹ — generally | 4-0 | 4-0 | 4-0 |
| If within 6 feet of telephone pole ⁴ | 6-0 | 6-0 | 6-0 |
| 8701-50,000 volts ¹ | 6-0 | 6-0 | 6-0 |

1. Voltage to ground if power circuit is grounded; voltage between wires if not.
2. Illustrated in Section 620-216-013.
3. Maintenance clearances for span lengths up to 250 feet are the same as construction clearances for span lengths of 150 feet or less.
4. Every effort should be made to avoid these situations and establish a common pole crossing instead.

4. MISCELLANEOUS CLEARANCES

| SPAN LENGTH OF MULTIPLE DROP WIRE (feet) | | CLEARANCE IN FEET, INCHES | |
|---|--|---------------------------|-------------|
| | | CONSTRUCTION | MAINTENANCE |
| 100-less | | 2-0 | 2-0 |
| 101-150 | | 2-2 | 2-0 |
| 151-200 | | 2-3 | 2-0 |
| 201-250 | | 2-4 | 2-0 |
| USING MINIMUM SAGS | | | |
| 75-less | | 2-2 | 2-0 |
| 76-150 | | 2-4 | 2-0 |
| 151-225 | | 2-5 | 2-0 |
| 226-250 | | 2-6 | 2-0 |
| Trolley contact wires 750 volts — less (Normal or Minimum Sags) 250-less* | | 4-6 | 4-0 |
| Multiple Drop Wire Below: | | | |
| Foreign guys or communication cables ∅ Any span length | | 2-0 | 2-0 |
| Neon Signs | | | |
| Any span length | | 4-0 | 4-0 |
| Multiple Drop Wire Alongside: | | | |
| Neon Signs Any span length | | 2-0 | 2-0 |

* Place wire guard at point of crossing.

∅ Span length of foreign cable not over 250 feet.



CLEARANCES FOR MULTIPLE DROP WIRE IN THE HEAVY LOADING AREA

1. GENERAL

1.001 This addendum supplements Section 462-500-017, Issue 2.

1.002 This addendum is issued to add a paragraph to Part 1 regarding the placing of aerial drop wire over swimming pools.

1.003 Add the following paragraph:

1.07 Clearances over public and private swimming pools are not covered by the National Electrical Safety Code. However, for reasons of safety, sanitation, and appearance, aerial multiple drop wire crossings over swimming pools should be avoided.

CLEARANCES FOR MULTIPLE DROP WIRE IN THE HEAVY LOADING AREA

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| (b) USING MINIMUM SAGS | 7 |
| 3. CLEARANCES CROSSING BELOW POWER WIRES AND CABLES | 9 |
| 4. MISCELLANEOUS CLEARANCES | 10 |

1. GENERAL

1.01 This section contains the recommended clearances for multiple drop wire installed in the heavy loading area. It has been reissued to correct printing errors on pages 4 and 5. The values specified meet the requirements of the National Electrical Safety Code (Sixth Edition). They apply under conditions of 60°F with no wind or ice.

1.02 "Construction" clearances generally contain an allowance for extra sag which will be introduced as a result of permanent stretching of the wire under storm loaded conditions. It will not be necessary to resag multiple drop wire unless the storm loading experienced is quite severe.

1.03 "Maintenance" clearances should exist after the wire has been through storm loading and the temperature returns to 60°F. It will be necessary to pull slack, however, if clearances at 60°F fall below maintenance values.

1.04 Note that clearance requirements shown for wire overhanging the traveled part of public roads are considerably larger than the clearances required where no such overhang exists. Note also that clearances for wire crossing alleys, roads and driveways show one set of values for general use and a second somewhat lower set of values for use when one pole is located within 50 feet of the far edge as shown in Fig. 1.

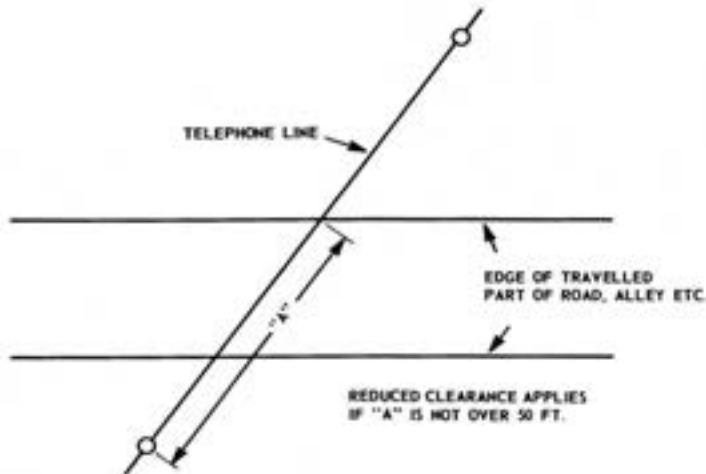


Fig. 1

1.05 Multiple drop wire must be installed with relatively large sags. Hence it will generally be advantageous to locate poles and wire runs so that the middle of the span will **not** be above the traveled part of the road, alley or driveway. This will often be the case at crossings when the far edge of the road, alleys, etc. is 50 feet or less from the pole. (See Fig. 1) When this condition exists, it may be possible to base the height of pole attachment on something less than 100 per cent of the midspan. The following table shows the percentage of midspan sag to be used in determining the height of pole attachment when the 50-foot criterion applies. This procedure should be ignored for spans less than 145 feet.

| <u>SPAN LENGTH (Feet)</u> | <u>PER CENT OF MIDSPAN SAG</u> |
|---------------------------|--------------------------------|
| 145-160 | 90 |
| 161-180 | 85 |
| 181-200 | 80 |
| 201-225 | 75 |
| 226-250 | 70 |
| 251-275 | 65 |
| 276-300 | 60 |

Example: A 275 foot span crosses a road; the midspan sag is 10 feet. The pole is within 50 feet of the far edge of the road and is on ground 2 feet higher than the road. Sag at 50 feet will be 65 per cent of midspan or 6-1/2 feet. From part 2 (b) of this section, the required clearance is 18 feet 9 inches. Minimum height of pole attachment is 18 feet 9 inches minus 2 feet plus 6 feet 6 inches or 23 feet 3 inches.

1.06 Clearances for span lengths, voltages and conditions now shown in this section are an engineering responsibility and will be shown on the detail plans. Clearances shown in this section are to be used unless the detail plans indicate otherwise. Detail plans may indicate different values where local rules differ from the Code or where engineering forces have allowed for certain factors.

2. CLEARANCES ABOVE GROUND OR RAILS

(a) Using Normal Sags

SPANS OF 175 FEET OR LESS

| SITUATION | REF. | 75-100 | | 76-100 | | 101-130 | | 131-175 | |
|---------------------------------------|--------|--------------------------------|-------------------|------------------|-------------------|---|-------------------|------------------|-------------------|
| | | CONST ft. in. | (MTCR) ft. in. | CONST ft. in. | (MTCR) ft. in. | CONST ft. in. | (MTCR) ft. in. | CONST ft. in. | (MTCR) ft. in. |
| Crossing Above: | | | | | | | | | |
| Railroad Tracks Generally | — | 27-0 | (27-0) | 27-3 | (27-0) | Must be supported on 6M strand for spans over 100 feet; 10M required for spans over 150 ft. | | | |
| Special Case | Fig. 2 | 25-0 | (25-0) | 25-3 | (25-0) | | | | |
| Public Roads Generally | — | 18-0 | (18-0) | 18-3 | (18-0) | 18-6 | (18-0) | 18-7 | (18-0) |
| Pole not over 50 ft. from far edge | Fig. 1 | 18-0 | (18-0) | 18-3 | (18-0) | 18-5 | (18-0) | 18-6 | (18-0) |
| Public Alleys Generally | — | 15-0 | (15-0) | 15-3 | (15-0) | 15-6 | (15-0) | 15-7 | (15-0) |
| Pole not over 50 ft. from far edge | Fig. 1 | 15-0 | (15-0) | 15-3 | (15-0) | 15-5 | (15-0) | 15-6 | (15-0) |
| Resid. Driveways Generally | — | 10-0 | (10-0) | 10-3 | (10-0) | 10-6 | (10-0) | 10-7 | (10-0) |
| Pole not over 50 ft. from far edge | Fig. 1 | 10-0 | (10-0) | 10-3 | (10-0) | 10-5 | (10-0) | 10-6 | (10-0) |
| Flat Roof Buildings | — | 8-0 | (8-0) | 8-3 | (8-0) | 8-6 | (8-0) | 8-7 | (8-0) |
| Peak Roof Buildings, Billboards | — | 2-0 | (2-0) | 2-3 | (2-0) | 2-3 | (2-0) | 2-4 | (2-0) |
| Neon Signs | — | 4-0 | (4-0) | 4-3 | (4-0) | 4-6 | (4-0) | 4-7 | (4-0) |
| Waterways | — | Must be shown on detail plans. | | | | | | | |
| Running Along: | | | | | | | | | |
| Public Roads Major Overhang | Fig. 3 | 18-0 | (18-0) | 18-3 | (18-0) | 18-6 | (18-0) | 18-7 | (18-0) |
| Minor Overhang | Fig. 3 | | | | | | | | |
| Urban | — | 18-0 | (18-0) | 18-3 | (18-0) | 18-6 | (18-0) | 18-7 | (18-0) |
| Rural (Lt. Traffic) | — | 14-0 | (14-0) | 14-3 | (14-0) | 14-6 | (14-0) | 14-7 | (14-0) |
| No Overhang | | | | | | | | | |
| Back of Obst. | Fig. 4 | 8-0 | (8-0) | 8-3 | (8-0) | 8-6 | (8-0) | 8-7 | (8-0) |
| Not Back of Obst. | Fig. 5 | 13-0 | (13-0) | 13-3 | (13-0) | 13-6 | (13-0) | 13-7 | (13-0) |
| Public Alleys | | 15-0 | (15-0) | 15-3 | (15-0) | 15-6 | (15-0) | 15-7 | (15-0) |

WIRE CROSSING RAILROAD TRACKS - SPECIAL CASE

NOTE: 27 FT REQUIRED FOR WIRE IF CONTACT WIRE IS NOT PRESENT.

CONTACT WIRE (S) FOR TROLLEY OR TRACKLESS TROLLEY

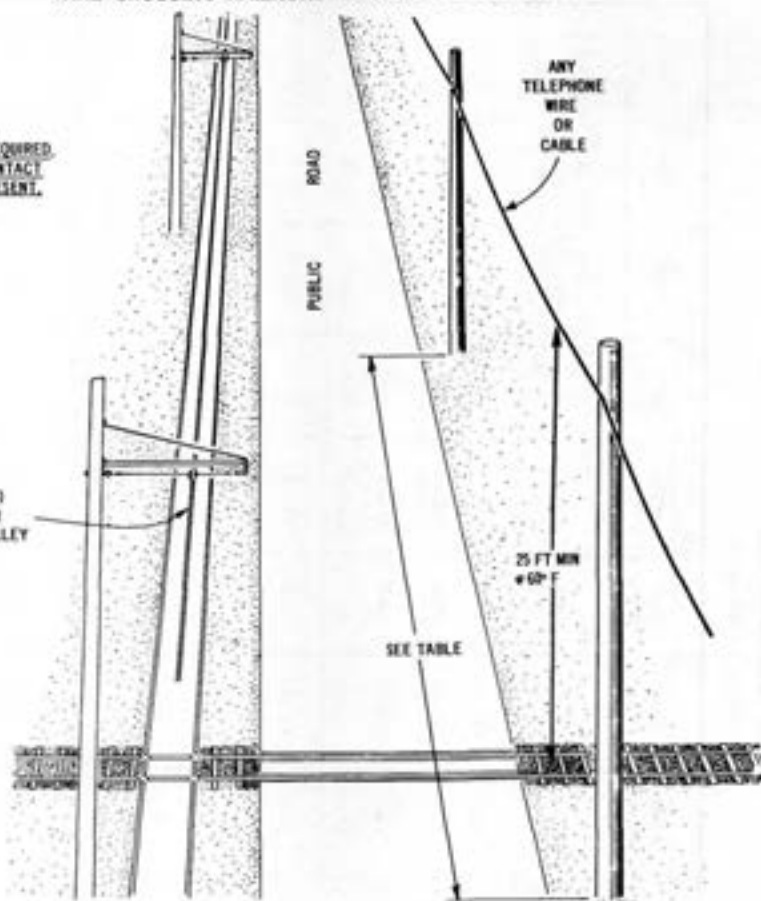


Fig. 2

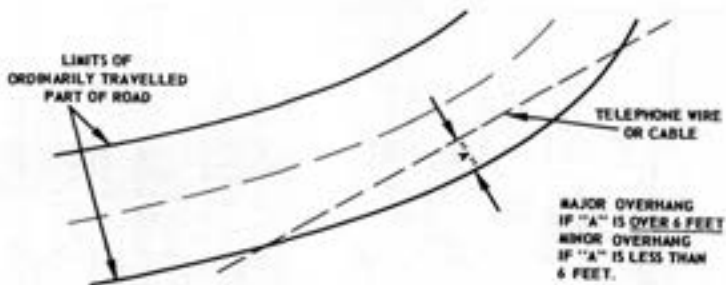


Fig. 3

RUNNING ALONG PUBLIC ROADS - BACK OF DITCHES ETC.
(NO OVERHANG)

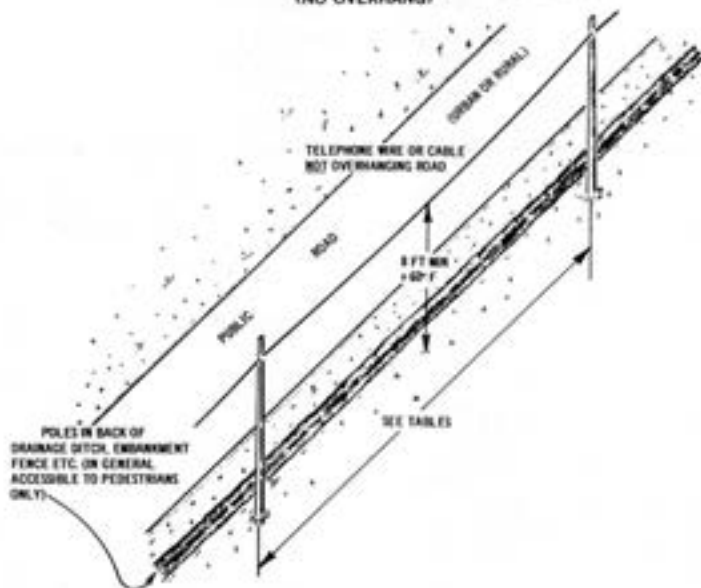


Fig. 4

RUNNING ALONG, BUT NOT OVERHANGING PUBLIC ROADS
(NOT BACK OF OBSTRUCTION)

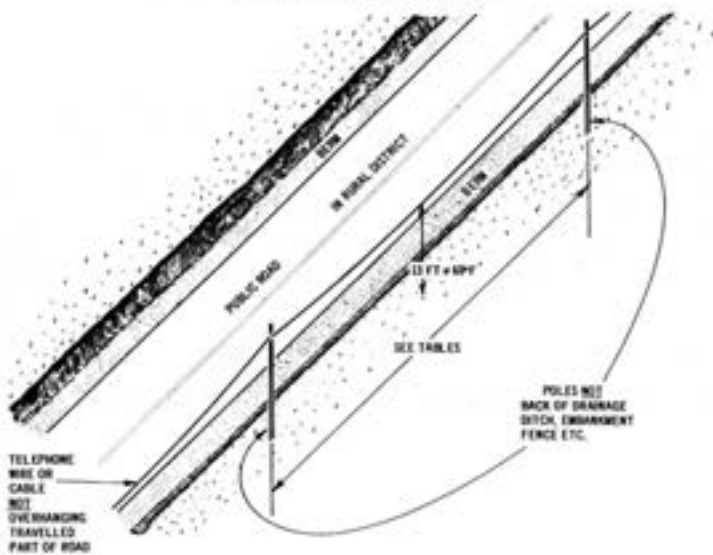


Fig. 5

2. CLEARANCES ABOVE GROUND OR RAILS

(a) Using Normal Sags (Cont.)

SPANS OF 176-250 FEET

| SITUATION | REF. | 176-200 | | 201-225 | | 226-250 | |
|--|-------------|---|------------------|------------------|------------------|------------------|------------------|
| | | CONST ft. in. | (MTC) ft. in. | CONST ft. in. | (MTC) ft. in. | CONST ft. in. | (MTC) ft. in. |
| Crossing Above: | | | | | | | |
| Railroad Tracks Generally Special Case | Fig. 2 | Must be supported on 10M strand for these span lengths. | | | | | |
| Public Roads Generally Pole not over 50 ft. from far edge | — Fig. 1 | 18-10 18-6 | (18-3) (18-0) | 19-2 18-7 | (18-6) (18-0) | 19-6 18-7 | (18-9) (18-0) |
| Public Alleys Generally Pole not over 50 ft. from far edge | — Fig. 1 | 15-10 15-6 | (15-3) (15-0) | 16-2 15-7 | (15-6) (15-0) | 16-6 15-7 | (15-9) (15-0) |
| Resid. Driveways Generally Pole not over 50 ft. from far edge | — Fig. 1 | 10-10 10-6 | (10-3) (10-0) | 11-2 10-7 | (10-6) (10-0) | 11-6 10-8 | (10-9) (10-1) |
| Flat Roof Buildings | — | 8-7 | (8-0) | 8-8 | (8-0) | 8-9 | (8-0) |
| Peak Roof Buildings, Billboards | — | 2-4 | (2-0) | 2-4 | (2-0) | 2-5 | (2-0) |
| Neon Signs | — | 4-7 | (4-0) | 4-8 | (4-0) | 4-9 | (4-0) |
| Waterways | — | Must be shown on detail plans. | | | | | |
| Running Along: | | | | | | | |
| Public Roads Major Overhang | Fig. 3 | 18-10 | (18-3) | 19-2 | (18-6) | 19-6 | (18-9) |
| Minor Overhang Urban | Fig. 3 — | 18-10 | (18-3) | 19-2 | (18-6) | 19-6 | (18-9) |
| Rural (Lt. Traffic) | — | 14-10 | (14-3) | 15-2 | (14-6) | 15-6 | (14-9) |
| No Overhang Back of Obst. | Fig. 4 | 8-7 | (8-0) | 8-8 | (8-0) | 8-9 | (8-0) |
| Not Back of Obst. | Fig. 5 | 13-7 | (13-0) | 13-8 | (13-0) | 13-9 | (13-0) |
| Public Alleys | — | 15-10 | (15-3) | 16-2 | (15-6) | 16-6 | (15-9) |

2. CLEARANCES ABOVE GROUND OR RAILS

(b) Using Minimum Sags

SPAN LENGTHS OF 175 FEET OR LESS

| SITUATION | REF. | 75-LESS | | 76-100 | | 101-150 | | 151-175 | |
|--|------------------|--------------------------------|-------------------|------------------|-------------------|---|-------------------|------------------|-------------------|
| | | CONST ft. in. | (MTCR) ft. in. | CONST ft. in. | (MTCR) ft. in. | CONST ft. in. | (MTCR) ft. in. | CONST ft. in. | (MTCR) ft. in. |
| Crossing Above: | | | | | | | | | |
| Railroad Tracks Generally Special Case | — Fig. 2 | 27-3 25-3 | (27-0) (25-0) | 27-7 25-7 | (27-0) (25-0) | { Must be supported on 6M strand for spans of 101-150 feet; 10M required over 150 feet. | | | |
| Public Roads Generally Pole not over 50 ft. from far edge | — Fig. 1 | 18-3 18-3 | (18-0) (18-0) | 18-7 18-7 | (18-0) (18-0) | | | | |
| Public Alleys Generally Pole not over 50 ft. from far edge | — Fig. 1 | 15-3 15-3 | (15-0) (15-0) | 15-7 15-7 | (15-0) (15-0) | 15-8 15-7 | (15-0) (15-0) | 15-9 15-7 | (15-0) (15-0) |
| Resid. Driveways Generally Pole not over 50 ft. from far edge | — Fig. 1 | 10-3 10-3 | (10-0) (10-0) | 10-7 10-7 | (10-0) (10-0) | 10-8 10-7 | (10-0) (10-0) | 10-9 10-7 | (10-0) (10-0) |
| Flat Roof Buildings | — | 8-3 | (8-0) | 8-7 | (8-0) | 8-8 | (8-0) | 8-7 | (8-0) |
| Peak Roof Buildings, Billboards | — | 2-3 | (2-0) | 2-7 | (2-0) | 2-8 | (2-0) | 2-8 | (2-0) |
| Neon Signs | — | 4-3 | (4-0) | 4-7 | (4-0) | 4-8 | (4-0) | 4-9 | (4-0) |
| Waterways | — | Must be shown on detail plans. | | | | | | | |
| Running Along: | | | | | | | | | |
| Public Roads Major Overhang | Fig. 3 | 18-3 | (18-0) | 18-7 | (18-0) | 18-8 | (18-0) | 18-9 | (18-0) |
| Minor Overhang Urban Rural (Lt. Traffic) | Fig. 3 — | 18-3 14-3 | (18-0) (14-0) | 18-7 14-7 | (18-0) (18-0) | 18-8 14-8 | (18-0) (14-0) | 18-9 14-9 | (18-0) (14-0) |
| No Overhang Back of Obst. Not Back of Obst. | Fig. 4 Fig. 5 | 8-3 13-3 | (8-0) (13-0) | 8-7 13-7 | (8-0) (13-0) | 8-8 13-8 | (8-0) (13-0) | 8-9 13-9 | (8-0) (13-0) |
| Public Alleys | — | 15-3 | (15-0) | 15-7 | (15-0) | 15-8 | (15-0) | 15-9 | (15-0) |

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2. CLEARANCES ABOVE GROUND OR RAILS

(b) Using Minimum Sags

SPAN LENGTHS OF 174-300 FEET

| SITUATION | REF. | 174-200 | | 201-225 | | 226-250 | | 251-275 | | 276-300 | |
|--|-------------|----------------------------------|------------------|------------------|------------------|------------------|------------------|-----------------------|------------------|------------------|------------------|
| | | CONST ft. in. | (MTC) ft. in. | CONST ft. in. | (MTC) ft. in. | CONST ft. in. | (MTC) ft. in. | CONST ft. in. | (MTC) ft. in. | CONST ft. in. | (MTC) ft. in. |
| Crossing Above: | | | | | | | | | | | |
| Railroad Tracks Generally Special Case | — Fig. 2 | Must be supported on 10M strand. | | | | | | | | | |
| Public Roads Generally Pole not over 50 ft. from far edge | — Fig. 1 | 19-1 18-8 | (18-3) (18-0) | 19-5 18-8 | (18-6) (18-0) | 19-10 18-8 | (18-9) (18-0) | To be shown on plans. | | | |
| | | | | | | | | 18-9 | (18-0) | 18-9 | (18-0) |
| Public Alleys Generally Pole not over 50 ft. from far edge | — Fig. 1 | 16-1 15-8 | (15-3) (15-0) | 16-5 15-8 | (15-6) (15-0) | 16-10 15-8 | (15-9) (15-0) | 17-3 15-9 | (16-0) (15-0) | 17-6 15-9 | (16-3) (15-0) |
| Resid. Driveways Generally Pole not over 50 ft. from far edge | — Fig. 1 | 11-1 10-7 | (10-3) (10-0) | 11-5 10-8 | (10-6) (10-0) | 11-10 10-9 | (10-9) (10-1) | 12-3 11-0 | (11-0) (10-3) | 12-6 11-1 | (11-3) (10-4) |
| Flat Roof Buildings | — | 8-10 | (8-0) | 8-11 | (9-0) | 9-1 | (8-0) | 9-3 | (8-0) | 9-3 | (8-0) |
| Peak Roof Buildings, Billboards | — | 2-8 | (2-0) | 2-8 | (2-0) | 2-8 | (2-0) | 2-8 | (2-0) | 2-8 | (2-0) |
| Neon Signs | — | 4-10 | (4-0) | 4-11 | (4-0) | 5-1 | (4-0) | 5-2 | (4-0) | 5-3 | (4-0) |
| Waterways | — | Must be shown on detail plans. | | | | | | | | | |
| Running Along: | | | | | | | | | | | |
| Public Roads Major Overhang | Fig. 3 | 19-1 | (18-3) | 19-5 | (18-6) | 19-10 | (18-9) | 20-3 | (19-0) | 20-6 | (19-3) |
| Minor Overhang | Fig. 3 | | | | | | | | | | |
| Urban | — | 19-1 | (18-3) | 19-5 | (18-6) | 19-10 | (18-9) | 20-3 | (19-0) | 20-6 | (19-6) |
| Rural (Lt. Traffic) | — | 15-1 | (14-3) | 15-5 | (14-6) | 15-10 | (14-9) | 16-3 | (15-0) | 16-6 | (15-3) |
| No Overhang | | | | | | | | | | | |
| Back of Obst. | Fig. 4 | 8-10 | (8-0) | 8-11 | (8-0) | 9-1 | (8-0) | 9-3 | (8-0) | 9-3 | (8-0) |
| Not Back of Obst. | Fig. 5 | 13-10 | (13-0) | 13-11 | (13-0) | 14-1 | (13-0) | 14-3 | (13-0) | 14-3 | (13-0) |
| Public Alleys | — | 16-1 | (15-3) | 16-5 | (15-6) | 16-10 | (15-9) | 17-3 | (16-0) | 17-6 | (16-3) |

3. CLEARANCES CROSSING BELOW POWER WIRES AND CABLES**CONSTRUCTION¹ CLEARANCES
FOR POWER SPAN LENGTHS OF**

| KIND OF POWER FACILITY | 100-LESS ft. in. | 101-150 ft. in. | 151-175 ft. in. |
|---|---------------------------------|--------------------|--------------------|
| 300 volts ¹ or less | | | |
| Service wires or cables | 2-0 | 2-6 | 2-9 |
| Line wires | 2-0 | 2-6 | 2-9 |
| If within 6 feet of telephone pole ⁴ (See Section 620-210-012) | 4-0 | 4-6 | 4-9 |
| 301-750 volts ¹ — phase wires | 4-0 | 4-6 | 4-9 |
| 751-8700 volts ¹ — phase wires | 4-0 | 4-6 | 4-9 |
| If within 6 feet of telephone pole ⁴ (See Section 620-210-012) | 6-0 | 6-6 | 6-9 |
| 8701-50,000 volts ¹ — phase wires | 6-0 | 6-6 | 6-9 |
| If near telephone pole, see Section 620-210-012 | | | |
| Grounded neutrals — systems of: | | | |
| Up to 22,000 volts to ground | 2-0 | 2-6 | 2-9 |
| Over 22,000 volts to ground | Same as associated phase wires. | | |
| Other neutrals | Same as associated phase wires. | | |
| Grounded metal sheath cables or any cable lashed to grounded strand, any voltage | 2-0 | 2-0 | 2-0 |
| Spacer cables ² | | | |
| 300 volts ¹ or less | 2-0 | 2-0 | 2-0 |
| If within 6 feet of telephone pole ⁴ | 4-0 | 4-0 | 4-0 |
| 301-750 volts ¹ | 4-0 | 4-0 | 4-0 |
| 751-8700 volts ¹ | 4-0 | 4-0 | 4-0 |
| If within 6 feet of telephone pole ⁴ | 6-0 | 6-0 | 6-0 |
| 8701-50,000 volts ¹ | 6-0 | 6-0 | 6-0 |

1. Voltage to ground if power circuit is grounded; voltage between wires if not.
2. Illustrated in Section 620-216-013.
3. Maintenance clearances for span lengths up to 175 feet are the same as construction clearances for span lengths of 100 feet or less.
4. Every effort should be made to avoid these situations and establish a common pole crossing instead.

4. MISCELLANEOUS CLEARANCES

Multiple Drop Wire Above:

Power service drops or power line wires of 300 volts or less, foreign guys, foreign communication cables, trolley span wires.

| SPAN LENGTH OF MULTIPLE DROP WIRE (Feet) | CLEARANCE IN FEET, INCHES | |
|---|---------------------------|-------------|
| | CONSTRUCTION | MAINTENANCE |
| USING NORMAL SAGS | | |
| 100-less | 2-3 | 2-0 |
| 101-150 | 2-6 | 2-0 |
| 151-175 | 2-7 | 2-0 |
| 176-191 | 3-1 | 2-6 |
| 192-208 | 3-7 | 3-0 |
| 209-225 | 4-2 | 3-6 |
| 226-241 | 4-9 | 4-0 |
| USING MINIMUM SAGS | | |
| 100-less | 2-7 | 2-0 |
| 101-150 | 2-8 | 2-0 |
| 151-175 | 2-9 | 2-0 |
| 176-191 | 3-4 | 2-6 |
| 192-208 | 3-10 | 3-0 |
| 209-225 | 4-5 | 3-6 |
| 226-241 | 5-0 | 4-0 |
| 242-258 | 5-7 | 4-6 |
| 259-275 | 6-3 | 5-0 |

Trolley contact wires 750 volts — less
(Normal or Minimum Sags)

| | | |
|----------|-----|-----|
| 75-less* | 4-3 | 4-0 |
| 76-175* | 4-9 | 4-0 |

Multiple Drop Wire Below:

Foreign guys or communication cables ⊗

| | | |
|-----------------|-----|-----|
| Any span length | 2-0 | 2-0 |
|-----------------|-----|-----|

Neon Signs

| | | |
|-----------------|-----|-----|
| Any span length | 4-0 | 4-0 |
|-----------------|-----|-----|

Multiple Drop Wire Alongside:

Neon Signs

| | | |
|-----------------|-----|-----|
| Any span length | 2-0 | 2-0 |
|-----------------|-----|-----|

* Place wire guard at point of crossing.

⊗ Span length of foreign cable not over 175 feet.

