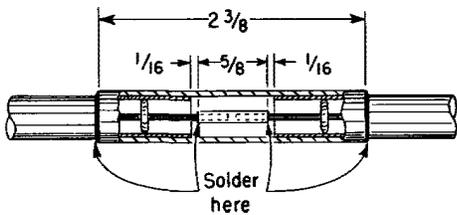


TRANSMISSION LINES
COAXIAL TRANSMISSION LINES AND CONNECTORS
INSTALLATION

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		<u>1. GENERAL</u>	
		1.01 This section contains general information relating to installation of coaxial transmission lines and connectors associated with various types of lines used for radio services.	
		<u>2. AIR DIELECTRIC LINES</u>	
		2.01 The size of air dielectric line specifications depends upon power and attenuation requirements.	
		2.02 Both 7/8-inch and 3/8-inch semirigid coaxial lines are furnished with low loss steatite or teflon insulating beads. It should be noted that although these lines may be described as soft drawn, they are considerably stiffer than common soft-drawn copper tubing. The added stiffness makes the line more difficult to handle but reduces the tendency of the outer conductor to kink and ripple at turns.	
		2.03 If it appears feasible to install an entire run of coaxial line in one piece, the length of line required should be specified in ordering. The suppliers can provide a reasonable length of semirigid copper line in one continuous prefabricated section. Shipments of 7/8-inch semirigid line can be made in continuous lengths up to 1000 feet while 3/8-inch can be obtained in continuous lengths up to 4000 feet.	
		2.04 It is sometimes necessary to install the semirigid copper line in sections and splice the sections together with soldered coupling sets shown in Figs. 1 and 2. The inner conductors of the two sections of transmission	

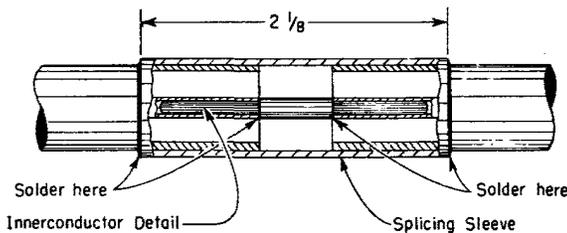
SECTION 402-100-200

line are joined with a small soldered detail. The outer conductors are made continuous by means of a sleeve which is soldered in place over the joint.



COMMUNICATION PRODUCTS CO.
COUPLING SET PART 2-503
FOR 3/8 COPPER TRANSMISSION LINE

Fig. 1



COMMUNICATION PRODUCTS CO.
COUPLING SET PART 4-502
FOR 7/8 COPPER TRANSMISSION LINE

Fig. 2

2.05 Listed below are the catalogue numbers of Communication Products Company antenna couplings, end seals, and splicing sleeves referred to in this section which are commonly used in Bell System radio systems.

Item	Size	Part No.
Antenna Coupling	7/8-inch	12-502
Antenna Coupling	3/8-inch	11-503
Splicing Set	7/8-inch	4-502
Splicing Set	3/8-inch	2-503
End Seal Coupling	7/8-inch	2-502
End Seal Coupling	3/8-inch	4-503

2.06 To assure proper installation of fillings used on 3/8-inch and 7/8-inch semirigid coaxial transmission lines, the following tools and material are required:

Garnet Cloth	- No. 4/0
Presto-O-Lite Torch	- No. 04-P-90
Presto-O-Lite Tank	- No. MC
Solder	- KS-512-L45
Solder	- KS-512-L50 or KS-512-L60
Flux	- Kester No. 315

(A) Installation of 12-502 Antenna Coupling Set

2.07 Procedure:

(a) Equip hack saw frame with fine tooth blade. Saw transmission line at right angle to length. Place saw cut so that last ceramic bead is approximately 1/2 inch from new end of line. Remove burrs, if any, carefully with a small triangular file. See Fig. 3.

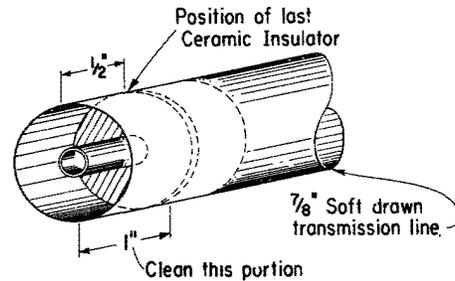


Fig. 3

(b) Using a piece of garnet cloth cut approximately 1/2 inch by 2 inches and rolled as shown in Fig. 4, gently clean any oxidation from interior of inner conductor of transmission line.

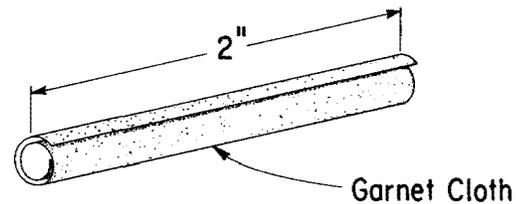


Fig. 4

Caution: Remove all copper dust and chips from interior of line.

(c) Insert inner conductor connector into inner conductor of transmission line. Apply heat by holding tip of 200-watt soldering iron in contact with and under junction of connector and inner conductor. Flow solder (KS-512 L45) into joint through slot in connector. Do not allow any solder to accumulate on exterior of inner conductor or connector. See Fig. 5.

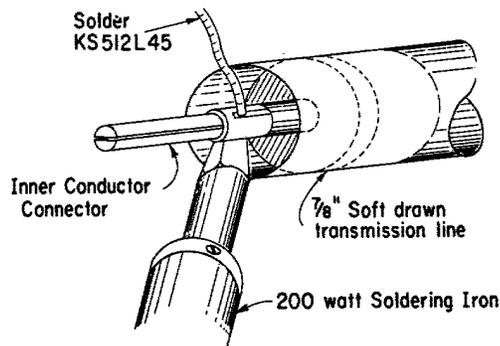


Fig. 5

(d) Using a piece of garnet cloth, clean only one inch of outer surface of outer conductor of transmission line. See Fig. 3.

Caution: Remove rubber gland before proceeding with Step (e).

(e) Slip the 12-502 coupling housing over cleaned end of transmission line as far as it will go. Apply heat to point shown in Fig. 6 by means of a Prest-O-Lite torch. Flow solder (KS-512 L45) into crevice between transmission line and coupling housing. Do not allow solder to accumulate on exterior of transmission line or coupling housing. Be sure entire crevice is filled with solder. This must be an airtight joint. No solder should collect inside of transmission line or housing.

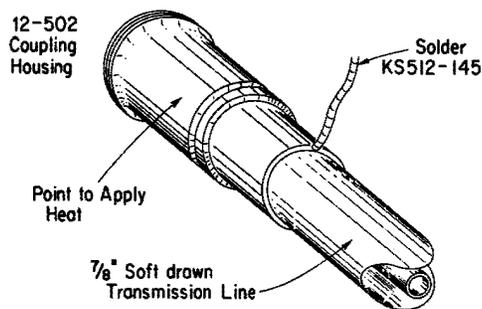


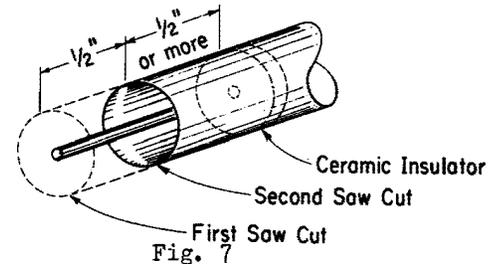
Fig. 6

(B) Installation of 11-503 Antenna Coupling Set

2.08 Procedure:

(a) With hack saw equipped with fine tooth blade, saw transmission line at right angle to length, cutting through inner conductor.

(b) Approximately 1/2 inch from first cut, make second saw cut through outer conductor only. First ceramic insulator must be 1/2 inch or more from end of outer conductor. With side cutters, cut inner conductor exactly 1/2 inch from outer conductor. See Fig. 7.



(c) Carefully remove burrs, if any, with small triangular file. Using a piece of garnet cloth, gently clean inner conductor and outer conductor as shown in Fig. 8. Remove all copper dust and chips from interior and exterior of transmission line.

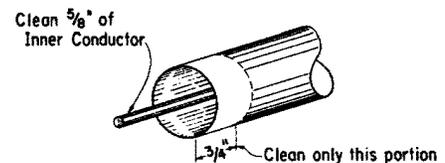


Fig. 8

(d) Assemble reducing coupling on prepared transmission line as follows. See Fig. 9.

- (1) Slip reducing sleeve well back on transmission line.
- (2) Place poly F reducing insulator so that outer conductor fits into groove on end of insulator.
- (3) Fit split reducing pin over inner conductor of transmission line as shown. Be sure inner conductor extends all the way into split reducing pin (1/2 inch).

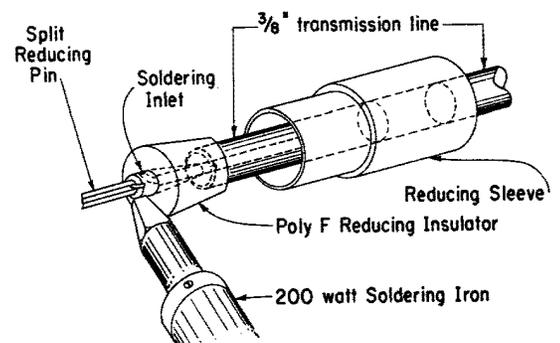


Fig. 9

(e) Apply heat to split reducing pin using 200-watt soldering iron as shown in Fig. 9. Flow solder (KS-512 L45) into solder inlet. Use judgment on amount of solder used. Solder should not flow into interior of transmission line. Remove soldering iron and allow to cool.

(f) Move reducing sleeve forward on transmission line until poly F reducing insulator snugly fits into recess on sleeve. Line up split reducing pin if necessary to place pin on center axis of transmission line and coupling assembly. See Fig. 10.

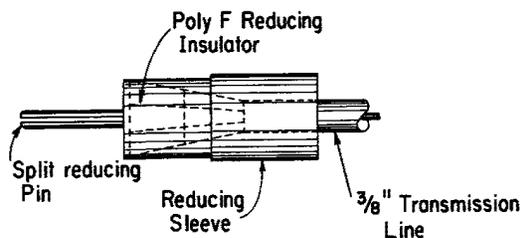


Fig. 10

Caution: Remove rubber gland in coupling housing before continuing with operation (g).

(g) Slip coupling housing over assembly as shown in Fig. 11. Apply heat to point indicated by means of Prest-O-Lite torch. Flow solder (KS-512 L45) into crevice between 3/8-inch transmission line and reducing sleeve and between reducing sleeve and coupling housing. Do not allow excess solder to accumulate on exterior of transmission line, reducing sleeve or coupling housing. Be sure entire crevice is filled in each case. These joints must be airtight. No solder should collect inside transmission line or coupling housing. Judgment must be used in applying solder since inside can not be inspected after soldering is complete.

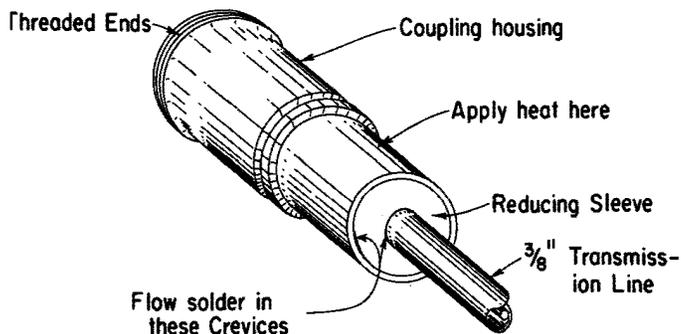


Fig. 11

2.09 Before the 11-503 or 12-502 coupling can be connected to the antenna, the hard-drawn 7/8-inch copper transmission line of antenna must be prepared as follows:

(a) If antenna stub transmission line is shipped equipped with protective cap, heat cap by means of 200-watt soldering iron and remove. Wipe off all solder from transmission line using standard wiping cloth. Care should be taken to produce smooth regular surface on the exterior of transmission line. All solder, dirt, waste, etc, should be removed from interior of line. Check that inner conductor is flush with outer conductor. If not, cut line as described in Step (b).

(b) Using hack saw, cut antenna transmission line stub at right angle to length. Last ceramic insulator should not be closer than 1/4 inch to end of inner conductor. See Fig. 12. Carefully remove burrs, if any, with small triangular file.

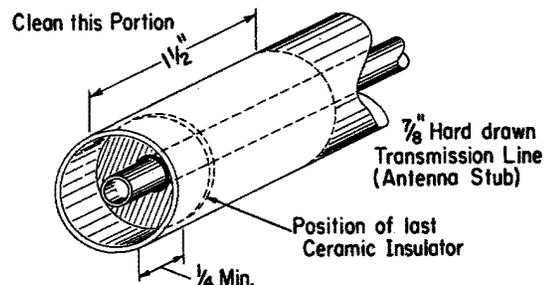


Fig. 12

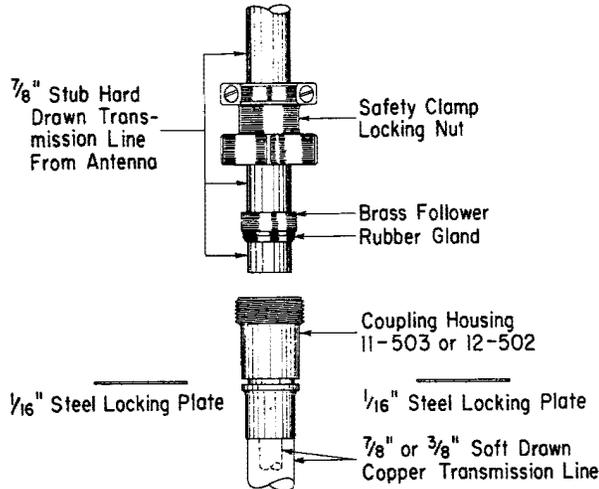
(c) Using a piece of garnet cloth prepared as shown in Fig. 4, gently clean any oxidation from interior of inner conductor.

(d) Using a second piece of garnet cloth, clean exterior of outer conductor for a distance of approximately 1-1/2 inches from end. Remove all chips, copper dust, etc, from interior of transmission line. See Fig. 12.

2.10 After coupling housing and assembly 11-503 or 12-502 are installed on 3/8-inch or 7/8-inch transmission line as previously described, the transmission line may be raised into place on antenna supporting structure. This may be facilitated by placing safety clamp locking nut of coupler on threaded end of coupler housing and fastening hoisting rope or wire to the safety clamp locking nut.

2.11 With transmission line in position the steel support locking plates (Fig. 13), when used, may be slipped into slot on coupler

housing from opposite directions and bolts passed through holes in the locking plates. The plates are then used to support the coupler housing. The safety clamp locking nut should then be removed from the coupler housing.



ASSEMBLY OF ANTENNA COUPLER ON
HARD DRAWN COPPER ANTENNA STUB

Fig. 13

2.12 Safety clamp locking nut should now be slipped on antenna transmission line stub followed by the rubber gland follower and the rubber gland as shown in Fig. 13.

2.13 The antenna may now be loosely secured in place on antenna supporting structure to allow for a vertical motion. Antenna transmission line stub should now be slipped carefully into coupler housing with caution being taken to see that inner conductor connector slips into inner conductor of antenna transmission line.

2.14 The rubber gland and follower are then slipped home into recess in coupler housing. Care should be exercised to see that rubber gland is properly seated in the coupling housing.

2.15 The safety clamp locking nut is now brought into position over the threaded end of coupler housing and loosely screwed into place.

2.16 Apply for 10 minutes dry air or nitrogen at low pressure, up to 15 pounds, at the equipment end to purge the line of moist air. The air will pass out of the line at the loose coupling at the antenna.

2.17 Measure the insulation resistance with a standard 400-volt megger and note the reading. The reading should be greater than 1000 megohms. If less is noted, apply more dry air. If insulation resistance does not increase, there is probably some fault in the line or antenna and this condition should be removed before proceeding.

2.18 Screw down the safety clamp locking nut as tightly as possible by hand. Apply a Stillson wrench to body of coupler housing to hold it in place. Apply a second wrench to the safety clamp locking nut and tighten nut one-quarter turn minimum, tighten more if necessary to retain the gas pressure.

2.19 The screws of the safety clamp may now be fastened by means of an 8-inch regular screw driver.

2.20 The antenna supporting pipe is then fastened securely in place.

(C) Installation of Splicing Sets

2.21 Communication Products Company splicing sets 2-503 for 3/8-inch transmission line and 4-502 for 7/8-inch transmission line are basically alike in design. They vary in size with the transmission line with which they are used. Since the 7/8-inch line has a 1/4-inch tube for a center conductor, the coupling used is a pin, whereas with the 3/8-inch line, the center conductor coupling is a sleeve that fits over the No. 12 wire. For both sizes of line, the outer conductor or sheath is coupled by use of a sleeve.

2.22 The procedure as to initial cutting and cleaning of the transmission line is similar to those instructions described in (A) and (B), and the methods described there should be followed. It is well again to exercise great care to remove burrs, chips, and saw filings before assembly. Figs. 1 and 2 show these couplings as they should be connected and give dimensions to use in preparing ends of transmission line.

2.23 The proper amount of solder must be applied to make an airtight coupling and yet prevent it from running inside the line.

2.24 The use of Kester No. 315 flux will prevent oxidation after cleaning and will aid in making a solid airtight coupling.

(D) Installation of 2-502 End Seal

2.25 Determine exact length of transmission line required to extend to the point where the end seal is to be installed.

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2.26 Procedure:

- (a) Cut transmission line as outlined in (A), Step (a).
- (b) Prepare end seal by thoroughly cleaning inside sleeve to shoulder, which is located at opposite end from insulator cap, with piece of garnet cloth placed on a screw driver. Rotate garnet cloth on inside surface of sleeve until every trace of foreign matter has been removed and a bright finish obtained. See Fig. 4.

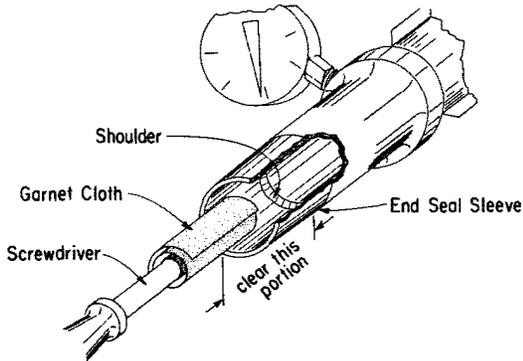


Fig. 4

- (c) Cut strip of garnet cloth and roll as shown in Fig. 2 into an "abrasive stick." Slide it into the opening at the insulator cap of the end seal. Work the stick in and out with a rotary motion until inside of insulator cap tube is clean and bright.
- (d) With garnet cloth, brighten the end seal inner connector rod.
- (e) While holding end seal in vertical position with insulator cap terminal upward, tap gently to remove all metallic filings or chips.
- (f) Lightly coat the inside of the sleeve to shoulder of end seal and both ends of inner conductor rod with flux (Kester No. 315).
- (g) Prepare the transmission line for soldering by brightening the outer surface of the outer conductor with garnet cloth for a distance of one inch.
- (h) Clean and brighten the inside of inner conductor, using piece of garnet cloth prepared as shown in Fig. 4. Work the cloth in and out of tube with a rotary motion until brightness is obtained.
- (i) Remove all metallic filings and chips from inside and outside of transmission line.
- (j) Lightly coat inside of inner conductor and outside of outer conductor with flux (Kester No. 315).
- (k) Insert the end seal inner connector rod into the transmission line inner conductor for a distance of about one inch. Solder this junction using KS-512 145 solder. Use care not to allow solder to accumulate on the outer surface of transmission line inner conductor or the end seal inner conductor.
- (l) Slide the end seal over the transmission line, entering the connector rod into the cap on the top of the insulator.
- (m) Locate the end seal in a vertical position and solder with the insulator cap terminal up. Apply a soft flame to the transmission line just below the end of the sleeve but do not attempt to heat too quickly. Touch the solder to the joint and be certain that a reasonable amount of solder is drawn upward into the joint as soon as the temperature of the parts reaches the flow point of the solder. Quench with dampened cloth applied just below the joint, then further cool to room temperature with another application of moistened cloth.
- (n) When transmission line and end seal are cool, form a radius or fillet of solder around the joint and fill all pin holes. Do this by applying a very small soft flame directly to the joint, heating just enough to cause solder to flow at this joint only, not allowing it to raise the temperature of the whole assembly. This "breeding over" operation is a desirable one as it insures a good joint being made, one which presents a finished and workmanlike appearance. Do not overheat the joint. Most torches have a flame temperature of 2000° F. Solder flows below 500° F. In soldering, overheating of a joint can do as much harm as underheating.
- (o) The joint on the top of the end seal is the last one to make and should be done after the line has been installed and after all stresses resulting from the uncoiling of the line have been relieved by the free movement of the inner conductor. Solder this joint with a small soldering iron using only resin core solder. Cut the connector rod flush with the end of the insulator cap tube with a hack saw and form a solder head at

this point, being careful not to overheat which would cause the cap to become loose thus damaging the end seal.

(E) Installation of 4-503 End Seal

2.27 Procedure:

- (a) After point on line where end seal is to be installed is determined, cut transmission line as described in (A), Step (a). Cut back outer conductor of transmission line 5 inches. See Fig. 15.

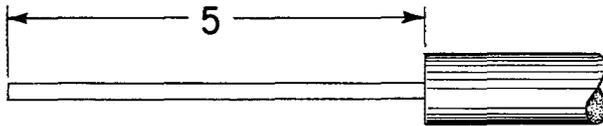


Fig. 15

- (b) Remove beads on exposed section of inner conductor and file bead crimps by use of a triangular file.
- (c) Using a piece of garnet cloth, gently clean inner conductor and outer surface of outer conductor back a distance of approximately one inch.
- (d) Remove all copper dust and chips from interior and exterior of transmission line.
- (e) Lightly coat the cleaned portion of the outer conductor with flux.
- (f) Carefully clean inner surface of end seal sleeve as described in (D), Steps (b) and (c).
- (g) Lightly coat inner surface of end seal sleeve with flux.
- (h) Slide the end seal over the line, entering the inner conductor into the cap on top of the insulator.
- (i) Position end seal and solder as described in (D), Steps (m), (n), and (o).

(F) Pressurizing of Air Dielectric Lines

2.28 To gain maximum efficiency from the use of air dielectric lines, it is important that moisture within the line be maintained at an absolute minimum. Even though air dielectric

lines are hermetically sealed, moisture will be present due to condensation. The degree of condensation will vary with climatic conditions in the various localities where air dielectric lines are used.

2.29 Several means of combating moisture are available. One such means is by the use of a dehydrator which delivers dry air to the line at a given pressure. Dehydrators of this type vary in design, but their operation is basically alike. When pressure is built up to a given value, usually 15 pounds per square inch, the dehydrator shuts itself off. When the pressure decreases to a given value, usually 10 pounds per square inch, the dehydrator automatically restores the pressure to the given maximum value. The dehydrator collects moisture from the air within the line through a chamber containing heated desiccant and drives moisture off in form of steam. The use of dehydrators enables an air dielectric line to be maintained under constant pressure of dry air even when moderate leaks are present within the line.

2.30 Another means of keeping air dielectric lines under pressure is by means of nitrogen gas supplied through the use of high pressure cylinders. This means is most commonly used with Bell System services. The use of this method makes it imperative that air dielectric lines be installed and maintained free of leaks. Pressurized lines using nitrogen are maintained at 15 pounds per square inch. This method makes it necessary that pressure be checked regularly. A loss of pressure will affect the transmission qualities, perhaps even causing permanent damage which might result in the necessity to completely replace the line.

3. "SEMISOLID" DIELECTRIC LINES

3.01 Described in the following paragraphs are several types of connectors used with HELIAX type HX-0 and STYROFLEX cables along with techniques used in the termination of such connectors.

(A) Installation of Connectors for STYROFLEX Coaxial Cables

3.02 Shown on Fig. 65, Page 23, are connectors used with STYROFLEX cables having outside diameter dimensions from 1/2-inch to 3-1/8-inch.

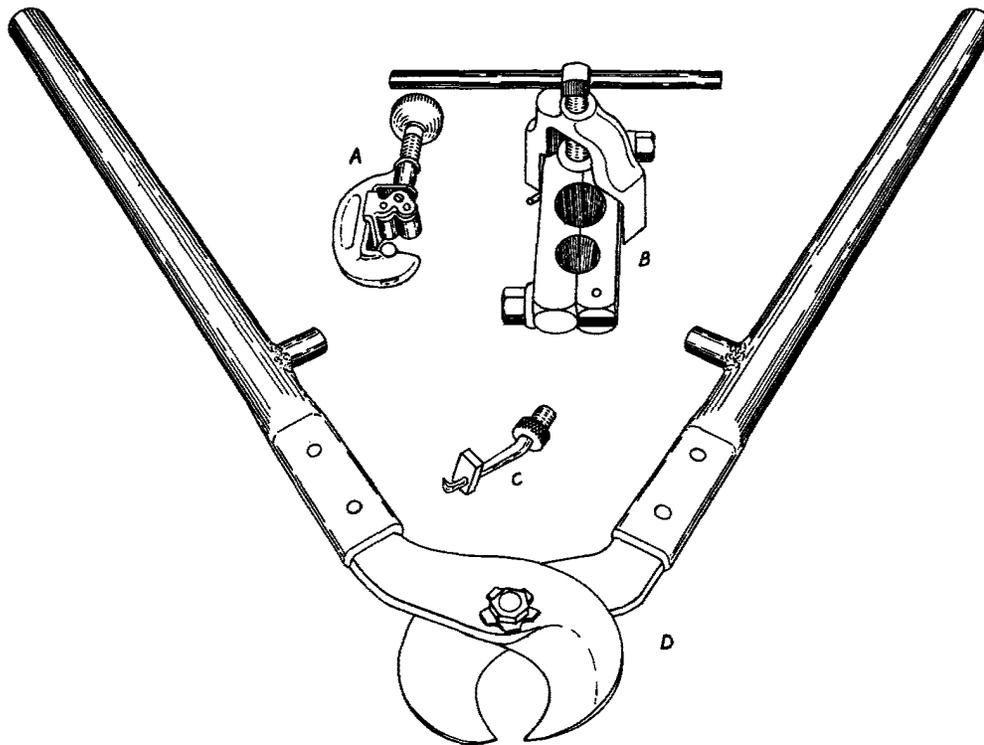


Fig. 16

3.03 The operations to follow are to be used in preparing STYROFLEX cable to receive flare type fittings described and illustrated in Fig. 65 and are applicable to 1/2-inch to 1-1/8-inch diameter cable.

3.04 Special Tools: The tools shown on Fig. 16 are required to properly terminate flare type fittings on STYROFLEX cables having an outside diameter of 1/2-inch to 1-1/8-inch. The following lists the catalogue numbers of the tools shown on Fig. 16 which are supplied by the Communication Products Co.

- (A) Catalogue Number 131-507 - Rotary cutter fitted with special wheel and rollers for use in cutting cable up to and including 7/8-inch diameter.
- (A) Catalogue Number 150-507 - Rotary cutter for 1-1/8-inch diameter cables.

(B) Catalogue Number 132-507 - Flaring tool which flares sheath to correct angle for fittings to be used on cables up to and including 1-1/8-inch diameter cable.

(C) Catalogue Number 134-507 - Electrically heated hot knife which may be used on all sizes of cables. The knife will screw into a standard Western Electric soldering iron.

(D) Catalogue Number 130-507 - Cable cutting shears for use in cutting cables up to and including 1-1/8-inch diameter.

3.05 Procedure:

- (a) Cut cable at desired point, as shown in Fig. 17, using recommended cable shears. The shears make use of specially shaped cutting blade to insure minimum damage to the STYROFLEX cable.

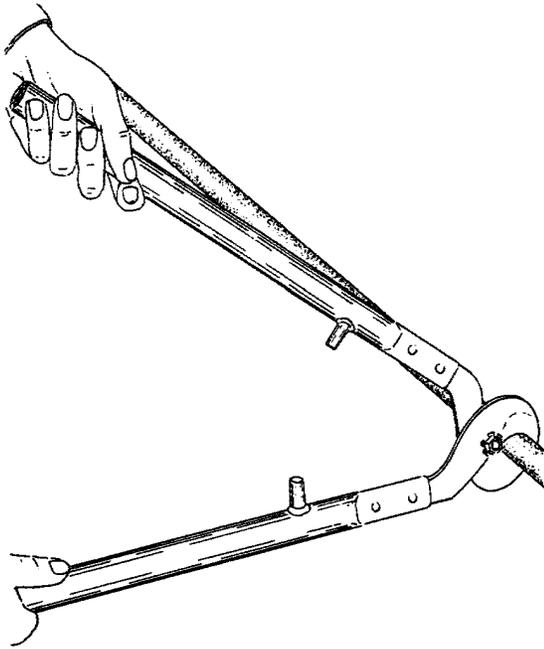


Fig. 17

(b) Using rotary cutter, with cutting wheel placed 1-1/2 inches from sheared end, cut through aluminum sheath. In cutting the sheath, advance the cutting roller rapidly so as to produce a heavy burr inward in order to securely lock the inner helix in place. See Fig. 18.

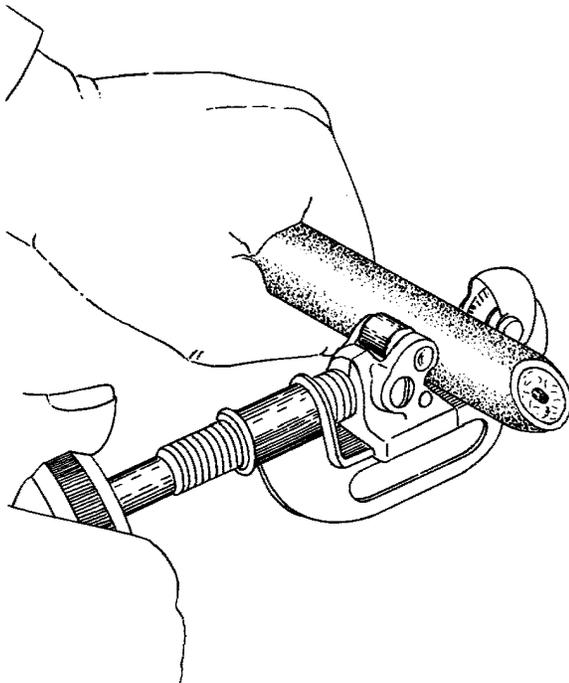


Fig. 18

(c) Using combination pliers as shown in Fig. 19, remove the piece of sheath which has been parted from the end of the cable in the previous step. Insert shows the appearance of the cable after this short length of aluminum sheath has been removed, exposing the polystyrene insulating skin and insulating helix.

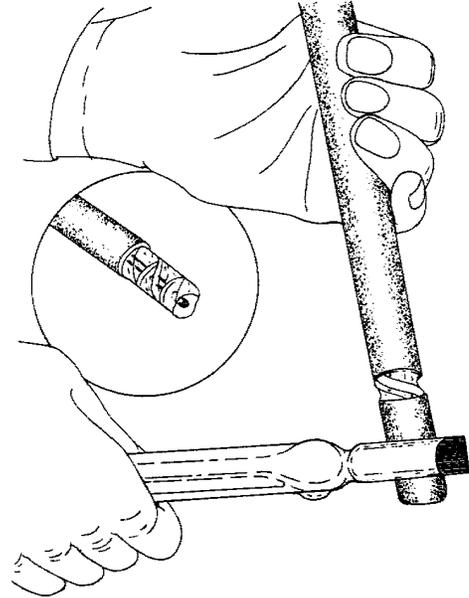


Fig. 19

(d) With hot knife tip screwed in standard Western Electric soldering iron, carefully melt the polystyrene sheath and helix, as shown in Fig. 20, exposing the inner conductor as shown in the insert. The inner skin and helix which remain inside the cable are now fused into one solid piece.

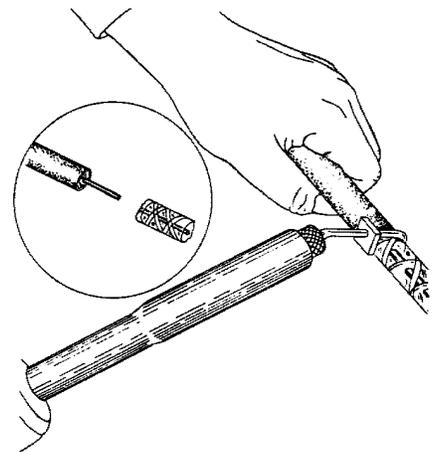


Fig. 20

(e) Set the stop on cutting knife tip as shown in insert on Fig. 21. Then insert blade of heated knife into aluminum sheath to stop on tip, keeping tip parallel with the inner conductor. Melt through the polystyrene helix. In this operation it is necessary that each layer of the helix be cut.

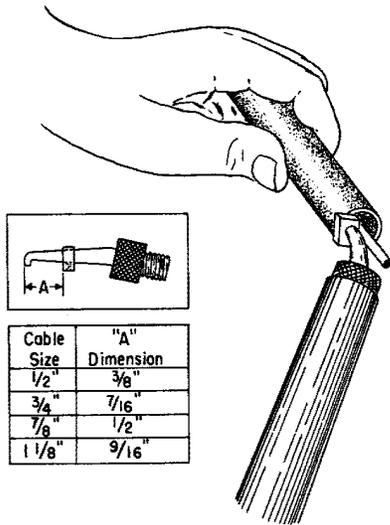


Fig. 21

(f) Using a small screwdriver, remove the partially melted chip of insulation. See Fig. 22.

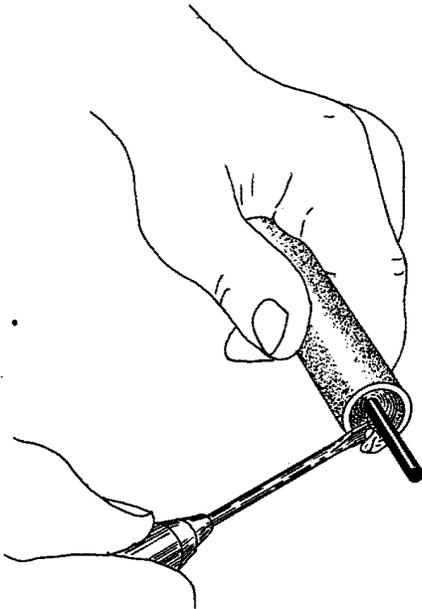


Fig. 22

(g) Using the small blade of a pocketknife and holding the end of the cable downward to prevent the entry of chips, carefully cut the metal burr from the inside edge of the sheath as shown in Fig. 23.

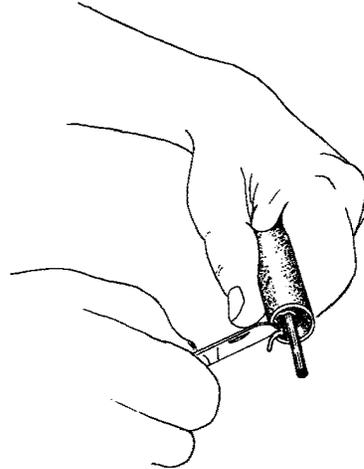


Fig. 23

(h) Remove the polystyrene skin lying against inside wall of aluminum sheath using hooked edge of heated knife as shown in Fig. 21. Rotate iron through 360 degrees while holding hot tip against skin. Withdraw melted portion of skin with long-nose pliers.

(i) Slide nut and ferrule of fitting on cable which was prepared in the previous steps. Flare the end of the aluminum sheath using flaring tool as shown in Fig. 24. Make sure that the end of the aluminum sheath is square and flush with the face of the flaring tool blocks.

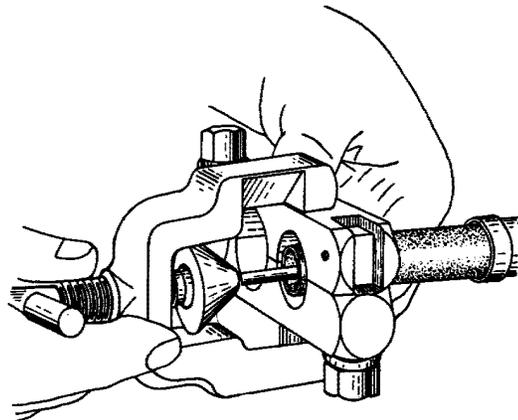


Fig. 24

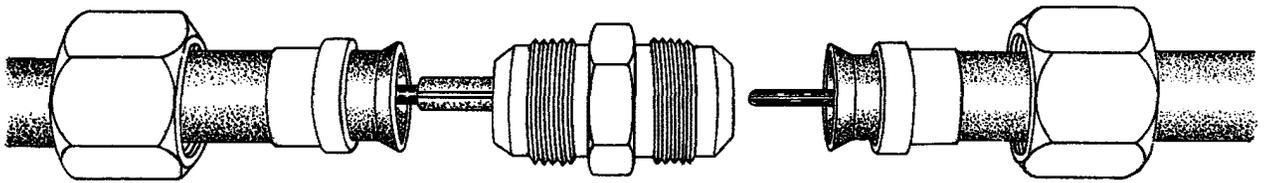


Fig. 25

(j) Cut the inner conductor $5/8$ -inch from end of the flare. File the end of the inner conductor to form a smooth full radius while holding end of cable downward to prevent entrance of filings.

(k) The cable and fittings may now be assembled as shown in Fig. 25. Insert inner conductors of cable into inner conductor of fittings. The nuts should then be drawn up tightly using 12-inch wrenches, one applied to the fitting body and one to the nut.

3.06 The following steps describe the procedures to follow in preparing STYROFLEX cable to receive flare type fittings described and illustrated in Fig. 65 when used with cables having an outside diameter of $1-5/8$ -inch to $3-1/8$ -inch.

3.07 Special Tools: Shown in Fig. 26 are special tools required to properly terminate flare type fittings on STYROFLEX cables having an outside diameter of $1-5/8$ -inch to $3-1/8$ -inch. The following lists the catalogue

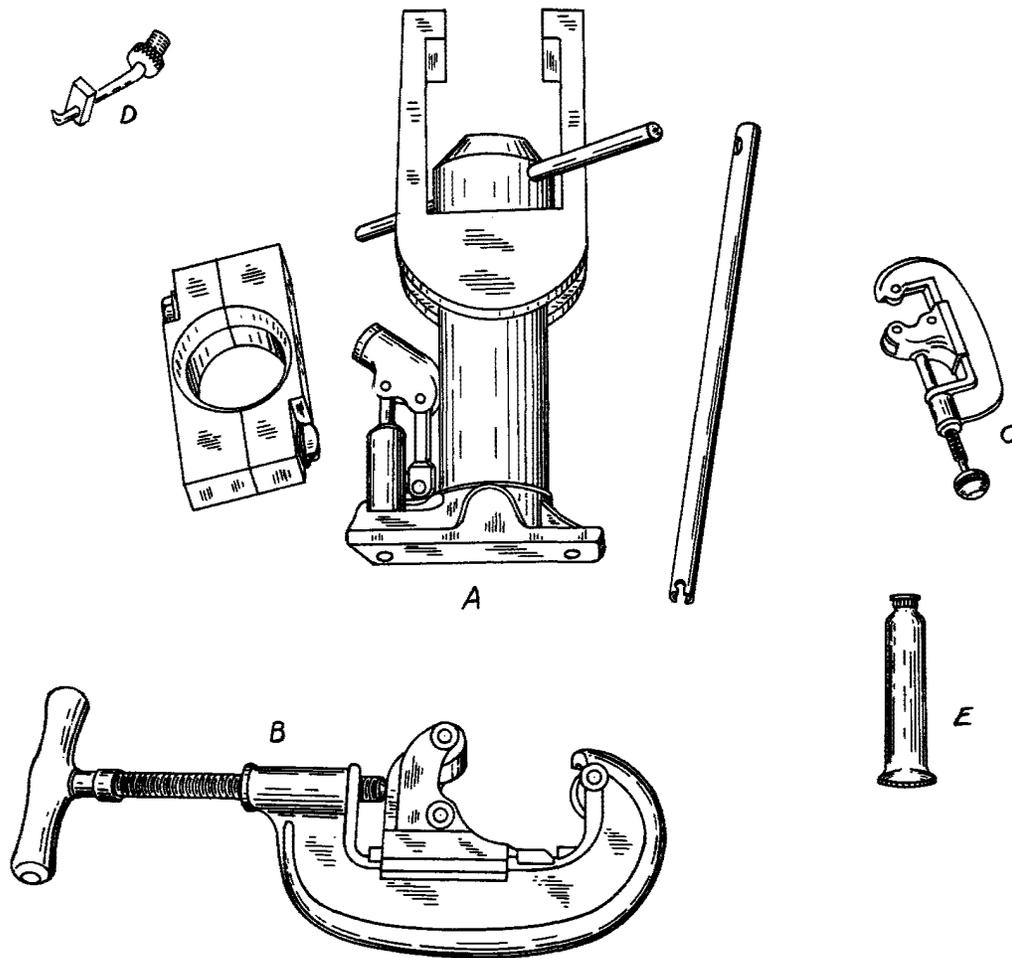


Fig. 26

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numbers of tools shown in Fig. 26 which are supplied by the Communication Products Co.

- (A) Catalogue Number 148-507 - Flaring tool which flares sheath to correct angle for fittings to be used on 3-1/8-inch cable.
- (A) Catalogue Number 155-507 - Flaring tool which flares sheath to correct angle for fittings to be used on 1-5/8-inch cable.
- (B) Catalogue Number 149-507 - Rotary cutter fitted with special wheel and rollers for use in cutting 3-1/8-inch cable sheath.
- (C) Catalogue Number 150-507 - Rotary cutter fitted with special wheel and rollers for use in cutting cable tubing 5/8-inch to 1-5/8-inch outside diameter.
- (C) Catalogue Number 131-507 - Rotary cutter fitted with special wheel and rollers for use in cutting cable tubing 1/2-inch to one-inch outside diameter.
- (D) Catalogue Number 134-507 - Electrically heated hot knife which may be used in all sizes of cables. The knife will screw into a standard Western Electric soldering iron.
- (E) Catalogue Number 137-507 - Silicone compound to be used on "O" ring seals.

3.08 Procedure:

- (a) Apply the large rotary cutter to cable as shown in Fig. 27 and cut through the cutter roller rapidly in order to produce a heavy burr on the inside surface of the sheath. Make a similar cut in a 2-inch section of sheath which is supported only by the polystyrene helix and the insulating skin. The burrs formed hold the helix in place and prevent the thin laminations from unravelling.

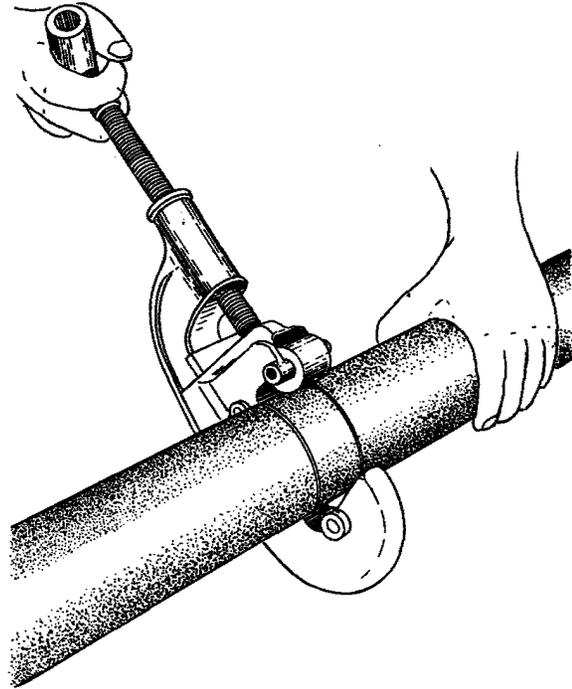


Fig. 27

- (b) Using a fine tooth hacksaw, carefully saw through the section of sheath which has been parted from the cable in the previous operation, cutting at a 45 degree angle to the center line of the cable as shown in Fig. 28. Make certain that the saw does not cut through the insulating skin as this would permit chips of aluminum to enter the cable interior.

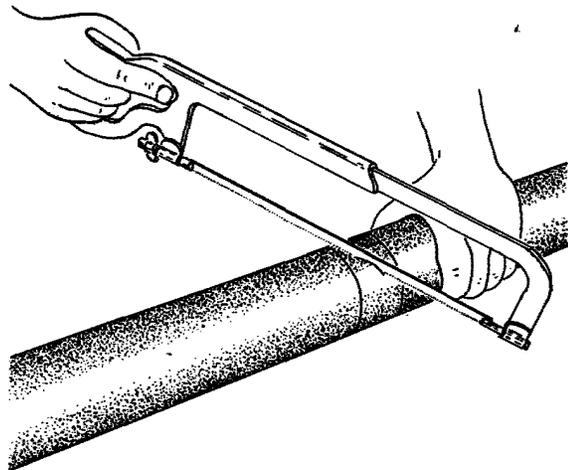


Fig. 28

(c) Place a small screwdriver under a corner edge of the ring of sheath at the saw cut, pry upward and elevate further with pliers. Fold this corner piece back, taking new holds with the pliers until the section of sheath is removed thus exposing the insulating skin. See Fig. 29.

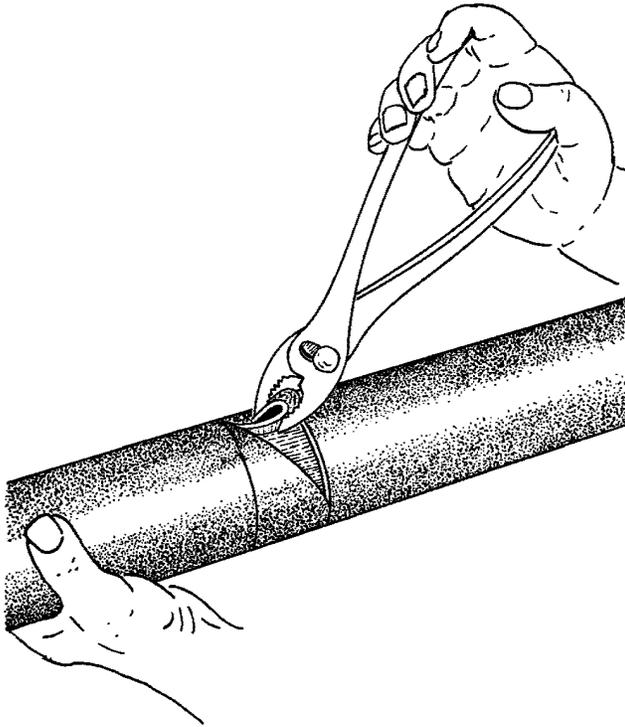


Fig. 29

(d) Since particles of aluminum might enter the interior of the cable during the following operation, brush the entire surface of the polystyrene skin, particularly the edge of the cable where it meets the skin, making certain that no chips are lodged in this area.

(e) With the cutting knife tip screwed into a standard Western Electric soldering iron, cut through insulating skin and helix close to the ends of the cable as shown in Fig. 30. This operation will heat seal the laminations of the helix thus far retained in place by the burr formed in (a).

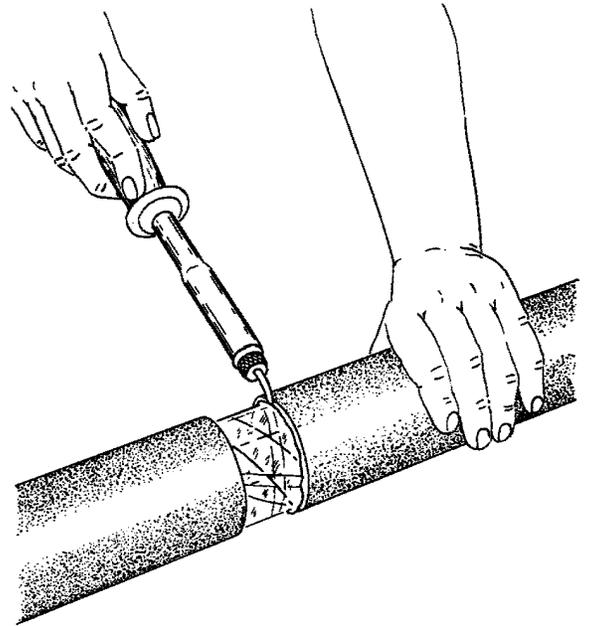


Fig. 30

(f) Using the small rotary cutter, as shown in Fig. 31, cut the inner conductor midway between the sheath ends. This will produce two cable ends with the inner conductors projecting one inch beyond the outer conductors.

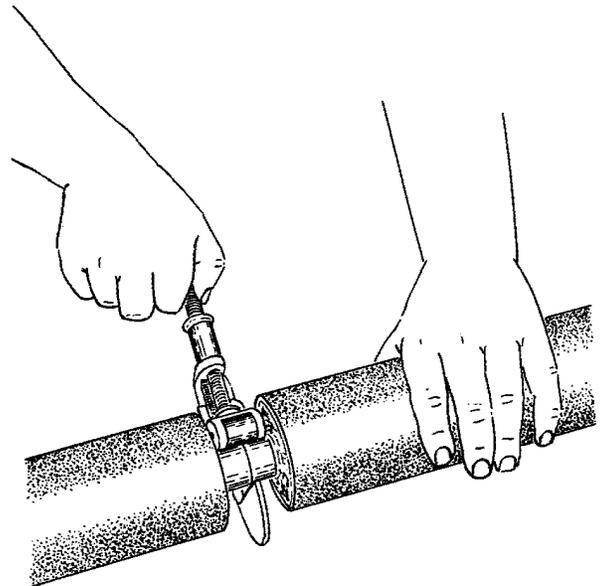


Fig. 31

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(g) Insert heated cutting knife tip into aluminum sheath and melt through the polystyrene helix for a distance respective of dimensions shown in insert of Fig. 32. In this operation it is necessary that each layer of the laminated helix insulation be cut and heat sealed to prevent the laminations from unravelling.

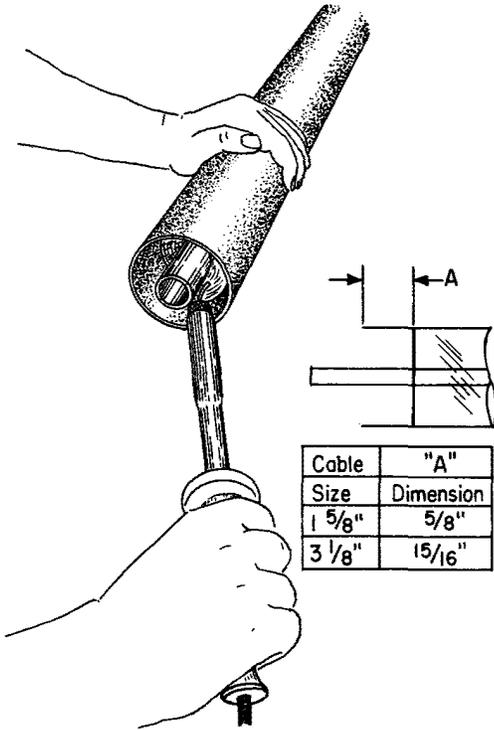


Fig. 32

(h) Having sealed the helix, remove the melted down chip of insulation with a pair of long-nose pliers as shown in Fig. 33.

(i) Using the hooked end of the heated cutting knife as shown in Fig. 32, remove the polystyrene skin lying against the inside wall of the aluminum sheath. Rotate the knife through 360 degrees while pressing the hot tip against the skin. The skin should be cut flush with the end of the helix and the piece cut away should be removed.



Fig. 33

(j) Using the large blade of a pocket knife, as shown in Fig. 34, and with the end of the cable in a downward position to prevent chips of aluminum from entering the interior of the cable, cut the metal burr from the inside edge of the sheath.

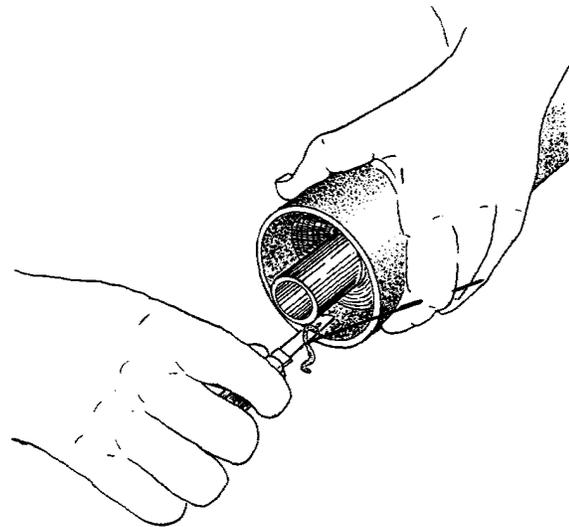


Fig. 34

(k) With the cable held downward, as shown in Fig. 35, remove burr from outside of inner conductor using fine milled file.

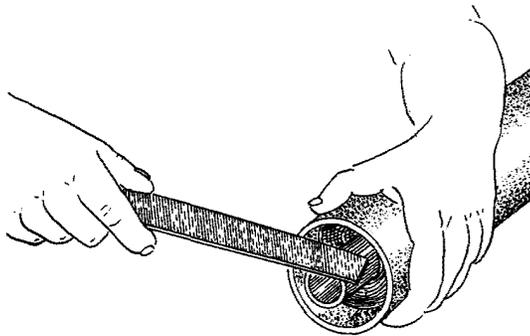


Fig. 35

(l) Slide flare follower flange of connector in place on cable. Enter end of cable into clamping vise of flaring tool shown in Fig. 26A, and with end of cable flush with jaws of vise, tighten clamp securely. Insert vise into jack yoke, square up and center cable over flaring tool nose. A few strokes of the jack handle will produce a smooth, burnished flare on the cable sheath. Before inserting vise into jack yoke, inspect flaring taper to make certain it is clean and free of aluminum particles. See Fig. 36.

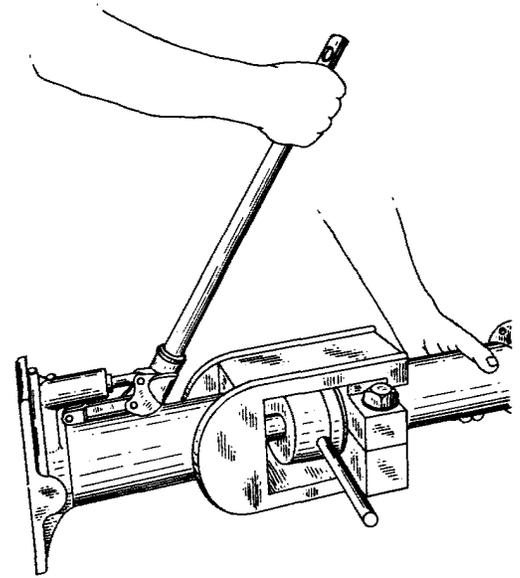


Fig. 36

(m) Carefully examine the work thus far done, checking for the fit of the flange over the flare, probing for metal chips or foreign materials inside the cable, examining the sheath for burrs and inspecting for general fitness of the cable before further assembly is undertaken.

(n) Place inner conductor connector in place as shown in Fig. 37. Apply silicone compound very sparingly to "O" rings and apply a

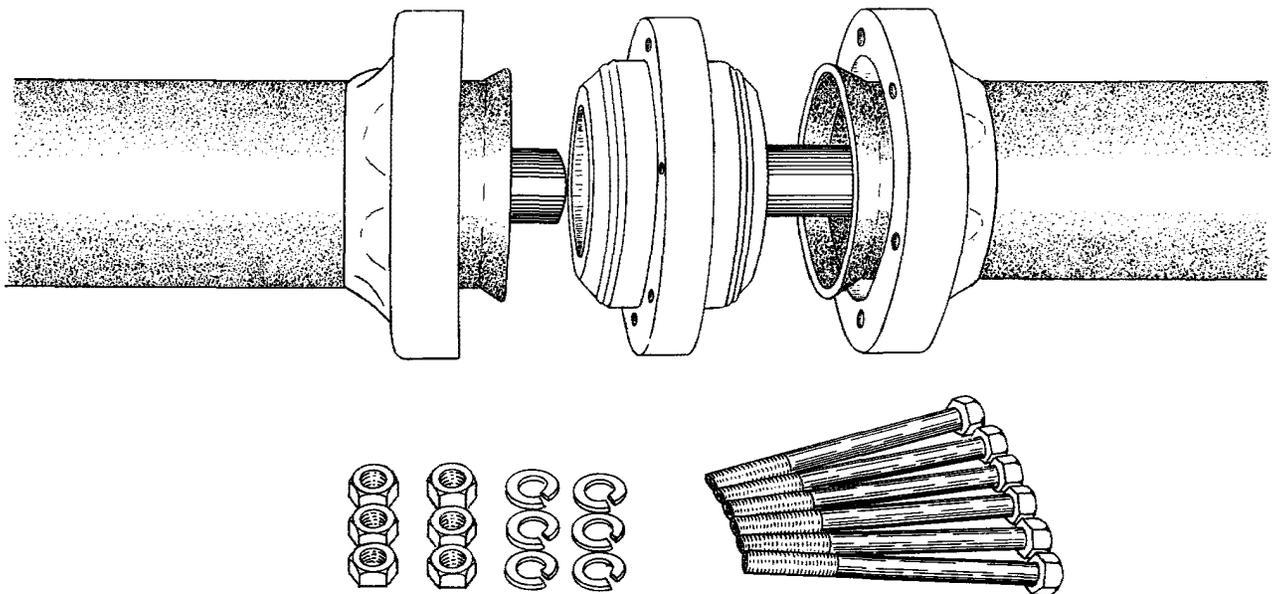


Fig. 37

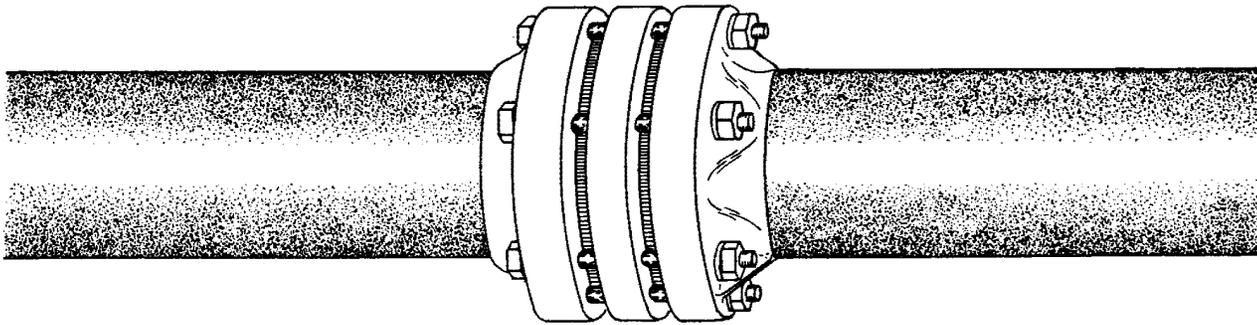


Fig. 38

light coating of compound to flange surfaces with the finger in order to lubricate the surfaces and facilitate the draw-up. Tighten bolts with wrench. Final assembly should appear as shown in Fig. 38.

(B) Termination of ANDREW Type 3050 Flanged Connector

3.09 The type 3050 connector is a universal fitting designed for use on the ANDREW HELIAX cable. The following fittings manufactured by the Andrew Corporation are intended for use with the 3050 connector:

- Type L-12291-A Adapter to RG-8/U Cable
- Type L-12692-A Adapter to RG-17/U Cable
- Type L-13940 Gas Barrier
- Type 1350 Gas Inlet Coupling

3.10 Procedure for terminating type 3050 connector to type HX-0 cable:

(a) Cut end of cable even. As shown in Fig. 39, remove 2-1/4 inches of vinyl jacket. Clean outer surface of outer conductor with KS-7860 petroleum spirits.

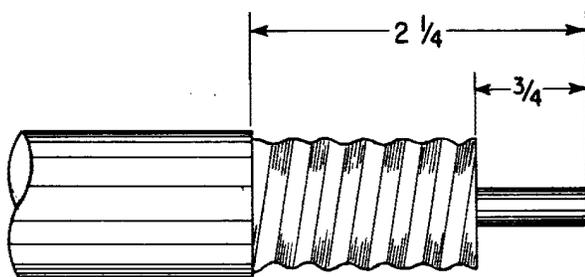


Fig. 40

(b) Expose 3/4 inch of inner conductor by cutting outer conductor and spiral insulation. After cutting operations, remove all metal filings and foreign materials from insulation and inside of outer conductor.

(c) Clean inner surface of inner conductor of HELIAX cable and outer surface of that portion of the inner adapter which plugs into the cable inner conductor. Tin both cleaned surfaces. With both surfaces heated to soldering temperature, push inner adapter into cable inner conductor while adding additional solder. With dampened cloth, cool to prevent melting of spiral insulation. See Fig. 40 for identification of connector parts.

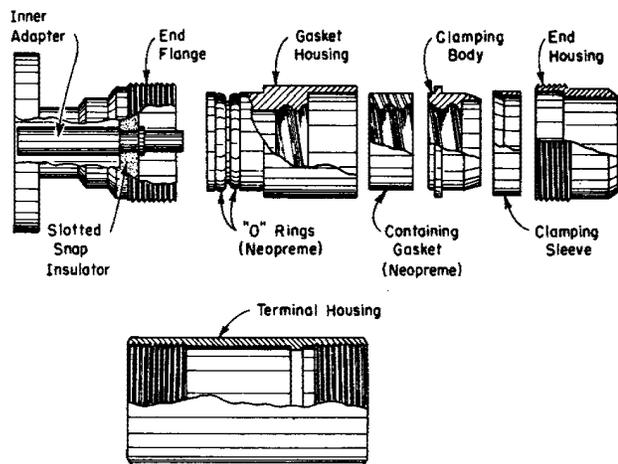
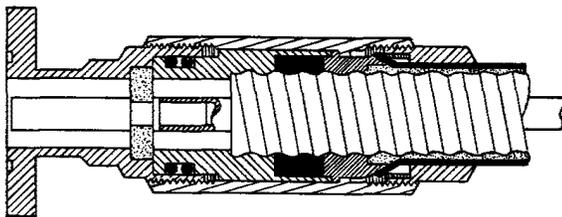


Fig. 40

(d) Clean solder joint with garnet cloth. Soldering and sanding should be done with the cable tilted slightly downward to keep out foreign matter.

- (e) Slide end housing, clamping sleeve, and terminal housing, in that order, back over cable approximately 6 to 8 inches from end.
- (f) Screw clamping body on to outer conductor so that beveled end fits under vinyl jacket.
- (g) Apply silicone compound to containing gasket and insert into gasket housing. Screw gasket housing and containing gasket on to outer conductor of cable. Adjust clamping body to form tight fit with gasket housing.
- (h) Apply silicone compound to "O" rings and slip into place on gasket housing as shown in Fig. 41.
- (i) Place slotted snap insulator on inner adapter. Insulator and gasket housing should fit flush as shown in Fig. 42. Insulator should be kept clean to prevent arcing.



CROSS VIEW OF 3050 CONNECTOR
TERMINATED ON HELIAX CABLE

Fig. 41

- (j) Press end flange over "O" rings on gasket housing. Pull terminal housing forward and screw on end flange until tight.
- (k) Slide vinyl jacket forward and pull clamping sleeve and end housing forward. Screw end housing into terminal housing until tight.

4. SOLID DIELECTRIC LINES

4.01 Several types of connectors most commonly used in Bell System service are described in detail as to cutting and soldering requirements within this section. Basic information given here can also be used in termination of many other types of connectors. Where special methods are required that are not covered in this section, it is suggested that reference be made to the manufacturer's instructions for the particular connector involved.

4.02 Most types of connectors intended for use on solid dielectric coaxial cables are not of moistureproof construction; therefore, when such connectors are used in locations subject to moisture, a silicone compound must be applied to designated points on the connector and associated cable to render the connection free from becoming damaged when exposed to dampness. Silicone compound is a smooth colorless grease having the consistency of petroleum jelly. Its consistency does not thin with heat; it does not harden or crack at -40°F and is effective at $+400^{\circ}\text{F}$.

(A) Termination of 259A Plug

4.03 Procedure:

- (a) Cut end of cable even. Remove vinyl jacket $1\text{-}3/16$ inches as shown in Fig. 42.

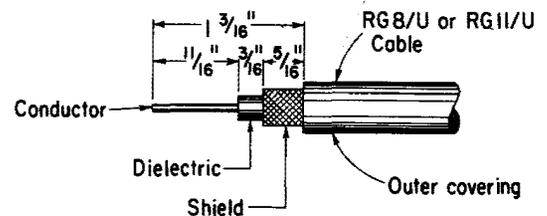


Fig. 42

- (b) Bare $11/16$ inch of center conductor. Trim braided shield as shown in Fig. 42.
- (c) Slide shell and locking nut over cable with large opening toward prepared end. See Fig. 43.

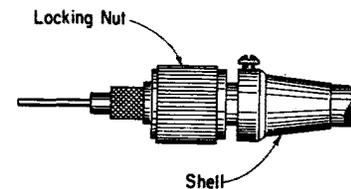


Fig. 43

- (d) Thread cable into plug body until shield is in line with holes. See Fig. 44.

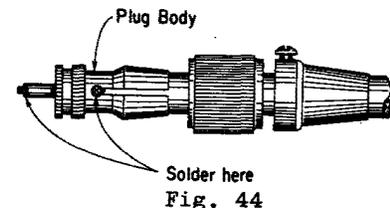


Fig. 44

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- (e) Solder shielding to plug body through holes using KS-512 L50 (50% tin and 50% lead) or KS-512 L60 (60% tin and 40% lead) solder. Remove excess solder.
- (f) Solder cable conductor to plug pin using solder described in step above and smooth off end.
- (g) Slip locking nut and shell over plug body and tighten shell locking screw.

Caution: Heat application for soldering shall be kept to a minimum to prevent breakdown of dielectric.

(B) Termination of 259A Plug with UG-175/U Adapter or UG-176/U Adapter

4.04 Procedure:

- (a) Cut end of cable even. Remove vinyl jacket 3/4 inch. Slide shell, locking nut and adapter on cable as shown in Fig. 45.

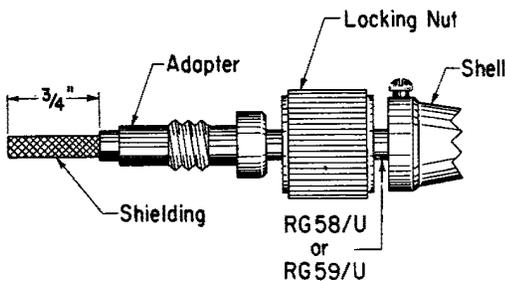


Fig. 45

- (b) Fan shielding slightly and fold back over cable, then slide adapter forward and under the folded back shielding. Press the shielding down over the body of adapter and trim off excess length of stranded shielding. See Fig. 46.

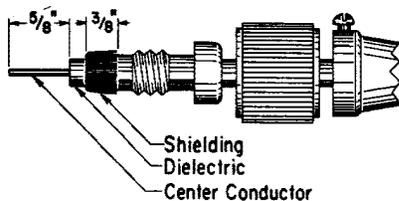
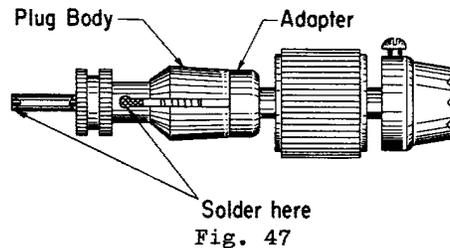


Fig. 46

- (c) Position adapter to dimensions shown and bare 5/8 inch of center conductor. Take care not to nick conductor. Tin exposed center conductor. See Fig. 46.

- (d) Screw the plug assembly on the adapter and solder the shielding to shell through holes. Remove excess solder. See Fig. 47.



- (e) Solder inner conductor to plug pin and smooth off end. See Fig. 47.
- (f) Slip locking nut and shell over plug body and tighten shell locking screw.

(C) Termination of UG-88/U Plug

4.05 Procedure:

- (a) Trim jacket as shown in Fig. 48 for desired cable being used.

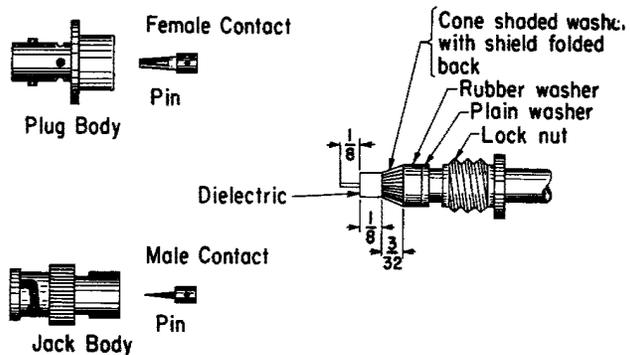


Fig. 48

- (b) Slide lock nut over cable, plain washer, rubber washer, and cone shaped washer. Position cone shaped washer so it is flush with end of outer jacket. See Fig. 48.
- (c) With cone shaped washer in place, comb out braid, fold back smooth as shown in Fig. 48 and trim to 3/32 inch in length.
- (d) Slip contact pin in place, butt against dielectric and solder. Remove excess solder from outside of contact. Be sure cable dielectric is not heated excessively and swollen so as to prevent dielectric from entering into plug body or jack body.

(e) Push assembly into body as far as it will go. Slide nut into plug body and screw in place with wrench until tight. For this operation, hold cable and shell rigid and rotate nut.

(D) Termination of UHF Receptacles Using Shielding Hoods

4.06 Procedure:

(a) Cut end of cable even. Remove vinyl jacket to appropriate dimensions as shown in Fig. 49.

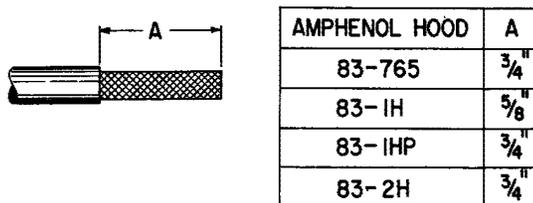


Fig. 49

(b) Remove braid and dielectric to expose center conductor as shown in Fig. 50.

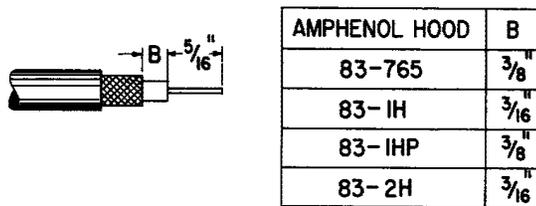


Fig. 50

(c) Remove braid to expose dielectric to appropriate dimensions. Tin center conductor. See dimension B shown in Fig. 50.

(d) If amphenol hood 83-765 is used proceed as follows: Slide hood over braid. Solder inner conductor to contact. Slide hood flush against receptacle and tack solder hood flange to receptacle flange. Solder hood to braid. Tape this junction or use vinyl tubing. See Fig. 51.

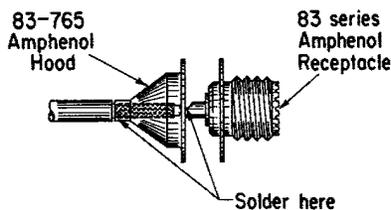


Fig. 51

(e) If amphenol hood 83-IHP is used proceed as follows: Slide hood over braid. Bring receptacle flush against hood. Tack solder inner conductor to contact and hood to braid. Tape this junction or use vinyl tubing. See Fig. 52.

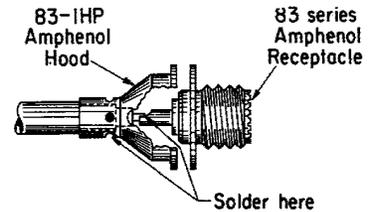


Fig. 52

(f) If amphenol hood 83-IH or 83-2H is used proceed as follows: Slide hood over braid and force under vinyl jacket. Place inner conductor in contact sleeve and solder. Push hood flush against receptacle. Tack solder hood to braid through solder holes. Tape this junction or use vinyl tubing.

(E) Termination of UG-333/U or UG-334/U Jack

4.07 Procedure:

(a) Cut end of cable even. Cut off vinyl jacket 1-1/2 inches from end of cable. Fan copper braid out. Cut off dielectric 7/8 inch from end. Cut off center conductor 11/16 inch from end as shown in Fig. 53.

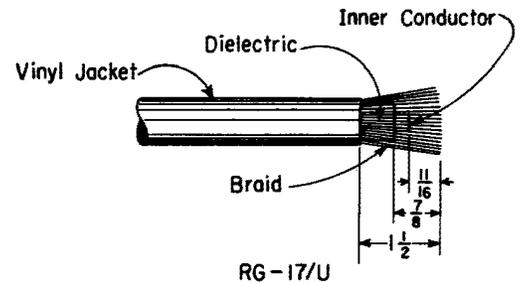


Fig. 53

(b) Slide nut and outer sleeve over vinyl jacket as shown in Fig. 54. Slide inner sleeve over braid and under vinyl jacket until jacket touches large rim of inner sleeve.

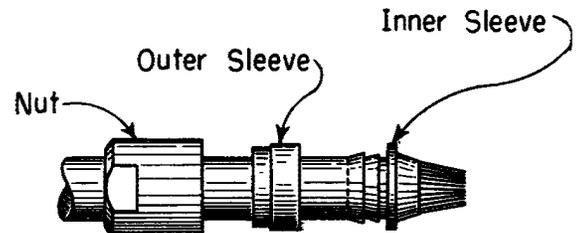


Fig. 54

(c) With inner sleeve in place, trim copper braid leaving $\frac{3}{16}$ inch exposed. See Fig. 55.

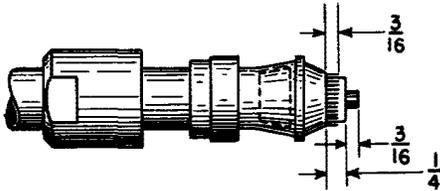


Fig. 55

(d) Fold copper braid back over inner sleeve and smooth. Tin center conductor using minimum heat. Holding contact with pliers, solder contact to center conductor. Wipe contact and dielectric free of excess solder. Slip gasket over inner sleeve as shown in Fig. 56. Slide outer sleeve as close as possible to inner sleeve and nut over outer sleeve.

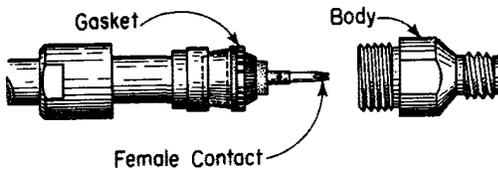


Fig. 56

(e) Slide body of jack in place carefully so that center conductor contact enters hole in insulator. Tighten body and nut with wrench.

(F) Termination of Amphenol 82-151 Splicing Sleeve

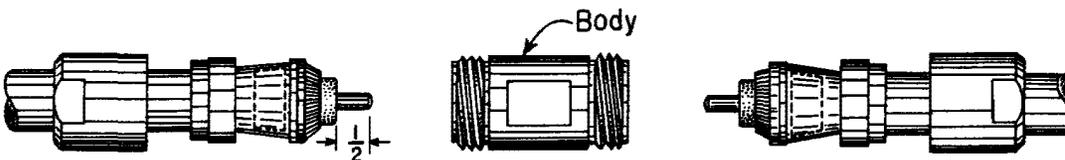
4.08 Procedure:

(a) The amphenol 82-151 splicing sleeve is terminated on RG-17/U coaxial cable as described in (E) with the following exceptions.

(b) Cut off vinyl jacket $1\text{-}\frac{3}{16}$ inches from end of cable, fan copper braid out. Cut off dielectric $\frac{1}{2}$ inch from end.

(c) With a file, bevel end of inner conductor as shown in Fig. 57. Carefully clean exposed inner conductor with piece of garnet cloth. Remove all particles of copper dust from terminating surfaces.

(d) Slide body into place carefully so that center conductor enters hole in insulator. Tighten nuts to body with wrench.



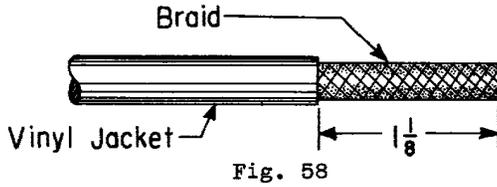
AMPHENOL 82-151 SPLICING SLEEVE
FOR RG-17/U CABLE

Fig. 57

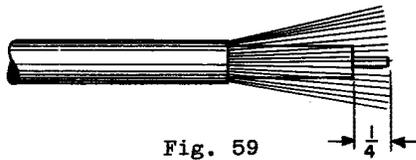
(G) Termination of UG-59A/U or UG-59B/U Plug

4.09 Procedure:

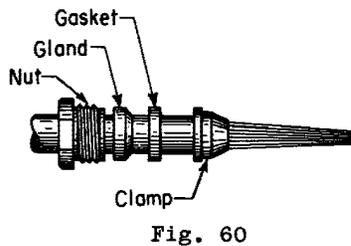
- (a) Cut end of cable even. Strip off vinyl jacket 1-1/8 inches as shown in Fig. 58.



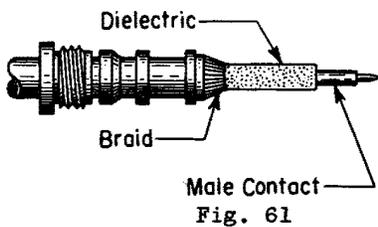
- (b) Fray copper braid as shown in Fig. 59. Cut off dielectric 1/4 inch from end and tin center conductor.



- (c) Taper braid and slide nut and gland onto jacket making certain knife edge of gland is toward end of cable. Slide gasket onto jacket with "V" groove toward gland. The clamp is now pushed over braid so that internal shoulder butts flush against vinyl jacket. See Fig. 60.



- (d) Fold braid back over clamp and trim proper length to cover tapered portion of clamp. Solder contact to center conductor. Contact must butt against cable dielectric. Avoid use of excess heat as it will swell dielectric. See that contact and end of dielectric are free of solder, resin, and foreign material. See Fig. 61.



- (e) Slide body carefully into place so that contact enters hole in insulator. Face of dielectric must fit flush against insulator. Slide gasket, gland, and nut into plug body by pushing nut. Be sure knife edge of gland remains in groove of gasket. Tighten nut with wrench. Gasket should be cut in half during tightening operation. See Fig. 62.

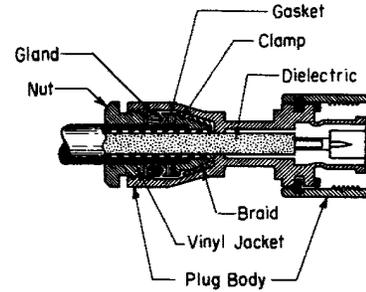


Fig. 62

(H) Construction of UHF Adapter

- 4.10 The construction of the UHF adapter involves the following steps using parts from these standard type connectors:

- 1 - UG-18B/U Type N Connector
- 1 - PL-258 Type UHF Junction
- 1 - M-358 Type UHF "T" Connector

4.11 Procedure:

- (a) Unscrew the center pin from the "T" connector. The remaining parts of the "T" connector are not used in the construction of the adapter.

- (b) Place the center pin in a lathe or drill press and turn down the threaded portion to a diameter of 0.058 inch, maintaining the threaded length which is approximately 0.18 inch as shown in Fig. 63.

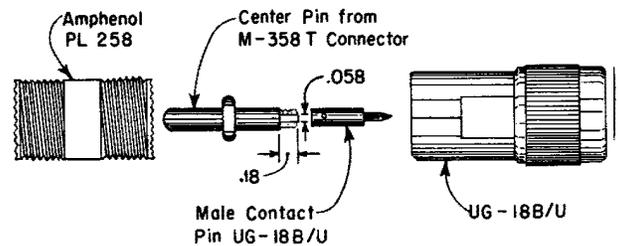


Fig. 63

- (c) Place the turned down portion of the "T" connector center pin into the end hole of the male contact pin of the UG-18B/U connector.

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Solder the two pins together at the small opening in the side of the male contact pin. Remove the excess solder by filing flush with the opening.

(d) From the UG-18B/U connector, remove the braid-clamping and weather-sealing components. These components are not employed in the adapter.

(e) Seat the male contact pin, which is soldered to the "T" connector pin, into the UG-18B/U connector.

(f) Screw the PL-258 type UHF junction into the UG-18B/U connector. The "T" connector center pin will automatically seat into the type UHF junction in this operation. Fig. 64 shows a cross-section view of the adapter when assembly operations are completed.

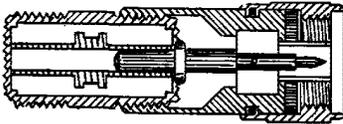


Fig. 64

4.12 By screwing the UG-18B/U connector end of the adapter to a type N receptacle, a conversion to a type UHF receptacle is provided. This adapter, while not necessarily providing a 51.5-ohm impedance match, may be used in applications where other UHF fittings are also utilized.

(I) Installation of Solid Dielectric Lines

4.13 The use of solid dielectric lines in base station installations are restricted generally to short lengths such as between end

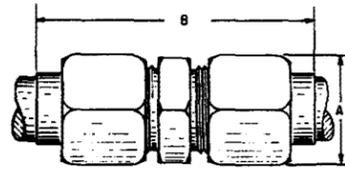
seal adapter and the equipment chassis. On some installations it may be desirable to use solid dielectric line in preference to air dielectric line. In such cases extreme care must be taken to avoid long horizontal and vertical runs. The line must be rigidly supported if exposed to low temperature or wind. When exposed to high temperature, the dielectric material used in solid dielectric lines has a tendency to flow, thus causing the conductors to become decentered.

4.14 It is of great importance when selecting solid dielectric coaxial cable for use, that cable having a noncontaminating type jacket be used.

4.15 Early manufacture of coaxial cables with noncontaminating jackets made use of an outer coating of clear or natural polyethylene. It has been found in several cases where this type cable was placed that it was deteriorated by ultraviolet rays in a relatively short time. This deterioration was noticed when hairline cracks appeared in the jacket material. This cracking does not adversely affect transmission unless the cracks become excessive or the copper braid becomes discolored.

4.16 On installations where this condition is present, it is recommended the cable be replaced by one having a jacket material of black polyvinylchloride which is expected to have better resistance to deterioration by sunlight and other conditions of weathering. Cables which are supplied with Army-Navy numbers such as RG-11A/U or RG-8A/U contain a noncontaminating type jacket of black polyvinylchloride material. The RG-11A/U and RG-8A/U cables may be obtained through the Western Electric Company from the Federal Telephone and Radio Corporation, American Phenolic Corporation, the Okonite Company, and other commercial manufacturers of coaxial cable.

COUPLINGS



COMM. PROD. CO. CATALOG NO.	STYROFLEX CABLE SIZE O.D. IN INCHES	IMPEDANCE OHMS	DIMENSIONS (INCHES)	
			A	B
4-514	1/2	50	7/8	2 1/2
5-514	1/2	70	7/8	2 1/2
4-515	3/4	50	1 1/4	3 1/2
5-515	3/4	70	1 1/4	3 1/2
4-516	7/8	50	1 3/8	3 5/8
5-516	7/8	70	1 3/8	3 5/8
4-518	1 1/8	50	1 5/8	4 3/8

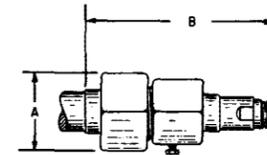
ADAPTERS

MALE ADAPTER CONNECTS TO:

- UG-23/U - 50 ohm
- UG-95/U - 70 ohm

FEMALE ADAPTER CONNECTS TO:

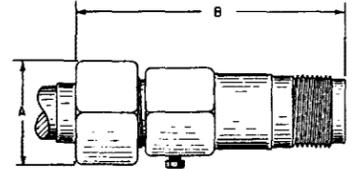
- UG-21/U - 50 ohm
- UG-94/U - 70 ohm



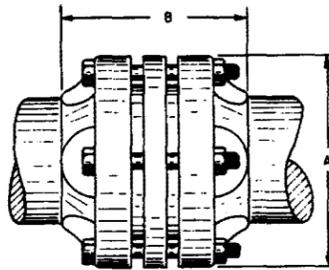
COMM. PROD. CO. CATALOG NO.	STYROFLEX CABLE SIZE O.D. IN INCHES	IMPEDANCE OHMS	DIMENSIONS (INCHES)	
			A	B
22-514	1/2	50	7/8	3 1/4
21-514	1/2	70	7/8	3 1/4
22-515	3/4	50	1 1/4	4
21-515	3/4	70	1 1/4	4
22-516	7/8	50	1 3/8	4 7/16
21-516	7/8	70	1 3/8	4 7/16
22-518	1 1/8	50	1 5/8	4 15/16
21-518	1 1/8	70	1 5/8	4 15/16

ADAPTERS

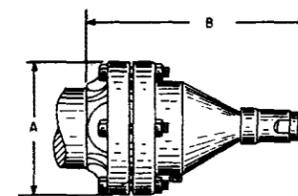
MALE ADAPTER CONNECTS TO - UG-352/U
FEMALE ADAPTER CONNECTS TO - UG-154/U



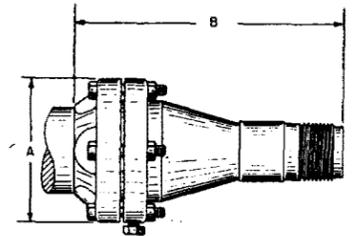
COMM. PROD. CO. CATALOG NO.	STYROFLEX CABLE SIZE O.D. IN INCHES	IMPEDANCE OHMS	DIMENSIONS (INCHES)	
			A	B
50-514	1/2	50	1 1/2	4 5/8
50-515	3/4	50	1 1/2	5 1/2
50-516	7/8	50	1 1/2	5 7/8
50-518	1 1/8	50	1 5/8	6 1/2



COMM. PROD. CO. CATALOG NO.	STYROFLEX CABLE SIZE O.D. IN INCHES	IMPEDANCE OHMS	DIMENSIONS (INCHES)	
			A	B
4-520	1 5/8	50	3 1/2	3 3/4
6-520	1 5/8	70	3 1/2	3 3/4
4-521	3 1/8	50	5 3/16	5 1/2
5-521	3 1/8	70	5 3/16	5 1/2



COMM. PROD. CO. CATALOG NO.	STYROFLEX CABLE SIZE O.D. IN INCHES	IMPEDANCE OHMS	DIMENSIONS (INCHES)	
			A	B
22-520	1 5/8	50	3 1/2	5 3/8
21-520	1 5/8	70	3 1/2	5 3/8
22-521	3 1/8	50	5 3/16	8 1/8
21-521	3 1/8	70	5 3/16	8 1/8



COMM. PROD. CO. CATALOG NO.	STYROFLEX CABLE SIZE O.D. IN INCHES	IMPEDANCE OHMS	DIMENSIONS (INCHES)	
			A	B
50-520	1 5/8	50	3 1/2	6 3/4
50-521	3 1/8	50	5 3/16	9 1/2

Fig. 65 - Connectors for Styroflex Cable