

PLASTIC INSULATED CONDUCTOR (PIC) CABLE

CABLE SPLICING

GENERAL

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- 1. GENERAL**
- 1.01** This section contains general splicing information and describes splicing operations applicable to PIC (air core and/or waterproof) copper and aluminum conductor cables.
- 1.02** This section is reissued to:
- Add information on KS-21446 solvent
 - Add information on checking for dryness of cable
 - Add information on using waterproof cable for building entrances
 - Delete reference to T2 LOCAP[†] cable.
- Revision arrows have been used to denote significant changes.
- 1.03** The PICs referred to in this section are:
- Dual expanded polyethylene insulated conductors (DEPIC)
 - Solid polyethylene, solid polypropylene insulated conductors
 - Polyethylene-polyvinyl chloride (PE-PVC) insulated conductors.
 - Expanded polyethylene-polyvinyl (XPE-PVC) riser cables, AR series.♦

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SECTION 632-410-200

♦1.04 The modular splicing system should be first choice for joining cable conductors. Once joined, certain mating parts of the connector system can be added, rearranged, or removed without resplicing the conductors.

1.05 When using 710 connectors, the in-line splicing method should be the first choice for joining the conductors in the main cable of straight or load splice.♦

1.06 Unless otherwise specified, the cables referred to in this section are of the even-count type.

2. PRECAUTIONS

2.01 Plastic Melting Point: The plastic insulation in these cables begins to soften at temperatures of approximately 175°F, and melts at approximately 230°F. Therefore, it is important to avoid overheating.

2.02 Wiping Joints: When wiping an auxiliary sleeve joint, the solder pouring time should be as short as practicable to avoid overheating the insulation. Continuous heating of the auxiliary sleeve during joint wiping should be limited to no more than 5 minutes.

2.03 Use of Test Pick: The use of a test pick should be avoided if possible. However, if one must be used to make electrical contact with the conductor, the puncture should be repaired with vinyl tape. The 700-, 701-, 702-, and 710-type connectors have provision for testing which does not require puncturing the insulation; but on 700-, 701-, and 702-type connectors, the test point must be repaired with B sealant to restore watertightness. ♦ The W2HM test cord can be used if no bridge module is in place.♦

2.04 Split Pairs: Because of the springiness of plastic insulation and the length of twist used on some pairs, the pairs in air-core PIC cables have more tendency to split than pulp-insulated pairs. In waterproof cable, this condition is not likely to exist due to the filling compound which will hold the pair together. Care should be taken to avoid split pairs.

2.05 Encapsulant: The encapsulant contains chemicals to which some individuals are sensitive. Contact of the chemicals with the skin can cause irritation. Every effort should be made to avoid direct contact of the encapsulant. The B disposable gloves (Section 081-856-101) are available and must

be used when handling encapsulant. Technicians must become familiar with hygienic methods of handling and using encapsulant.

♦2.06 **KS-21446 Solvent: DANGER: Special eye protection (goggles) must be worn when working with KS-21446 solvents to clean waterproof cables.** This solvent can be used to remove filling compound from splicing machines and other tools; however, the following precautions should be observed:

- Avoid prolonged skin contact with KS-21446 solvent or similar solvent which can cause defatting of tissue resulting in dry, irritated skin.
- Do not use KS-21446 solvent or similar solvent to clean hands or other parts of the body. Bell System waterless hand cleaner (Comcode 400-522-967) may be used for this purpose.
- KS-21446 or other solvents should not be pressurized or sprayed as this will create a heavy airborne vapor and mist concentration in the work area.♦

3. MATERIAL AND TOOLS

3.01 The following material and tools are used to splice PIC cables:

(a) **Material and Use**

(1) **700-, 701-, and 702-Type Connectors:**

The 700-, 701-, and 702-type connectors are used for joining or bridging small (pair size) cables having any combination of aluminum, copper, or copper-steel conductors. These connectors contain a moisture-resistant compound. They are recommended for use in terminals and in all buried splices. They do not require further encapsulation in below-ground pressurized cables (Section 632-205-215). There are also flame-retardant connectors which do not contain moisture-resistant compound. They are recommended for use in buildings.

(2) **710-Type Connector:** This is used for

joining, half tapping, or bridging 25-pair and larger groups of copper conductors. These connectors are available with a moisture-resistant compound for PIC cable requiring

moisture protection. They do not require further encapsulation in pressurized splices. There are also flame-retardant 710-type connectors which do not contain the moisture-resistant compound (Section 632-205-220). The 710 connector system also includes a 5-pair connector. With the exception of length, the 5-pair 710 connector has the same features and characteristics as the 25-pair 710 connector.

♦**Note:** The 5-pair 710 connector is not compatible with the 25-pair 710 connector.♦

(3) **CONECs System:** The CONECs System of joining cable ends is available for PIC air core and waterproof cables as outlined in Sections 626-500-101 and 632-020-250.

(b) **Tools and Use**

(1) **E Connector Presser:** This is a hand tool for pressing 700-, 701-, and 702-type connectors.

(2) **H Connector Presser:** This is a hand-operated magazine-fed tool for pressing 700-, 701-, and 702-type connectors.

Note: The E- and H-type connector presser is described and their use is illustrated in Section 632-205-215.

(3) **D, E, or F Cutter Presser:** The D, E, or F cutter presser is a pneumatically powered tool for pressing 710-type connectors and cutting conductors (Section 632-205-220).

(4) **835A1 Tool:** The 835A1 tool (Mfr Disc.) is a manually-operated cutter-presser which

uses a lever system instead of hydraulic system for power to assemble 710 connectors.

(5) **890A Tool:** The 890A tool is a manually (lever) operated tool which uses a cam/hydraulic system for power to assemble 25-pair 710 connectors.

(6) **945A Tool:** The 945A tool is a manually operated tool which is used to assemble the 5-pair 710 connector module. It can also be used to splice 25-pair 710-type connectors by pressing and cutting 5 pairs at a time throughout the length of the 710 25-pair module. The 945A tool is equipped with a mounting rod for aerial mounting or it can be used with any of the other tool mounts

Note: The 835A, 890A, and 945A tools are described and their use is illustrated in Section 632-205-220.

(7) **L Connector Presser:** This connector presser is used for joining preterminated 710 connector modules (Section 632-205-220).

(8) **D Insertion Tool:** This is used for splicing and rearranging individual pairs in a 710 connector (Section 632-205-220).

(9) **G Long-Nose Pliers:** These pliers are a hand tool used for pressing 700-, 701-, 702-type connectors (Section 081-020-133).

4. **SHEATH PREPARATION**

4.01 Information regarding sheath preparation prior to splicing is dependent upon the type of closure that will be used (Table A) and the type of sheath contained on the cable being spliced.

TABLE A

REFERENCES (DIVISION AND LAYER OF BELL SYSTEM PRACTICES) FOR SHEATH PREPARATION AND SPLICE CLOSURES

TYPE PLANT	CLOSURES	SPLICE CASES	AUXILIARY SLEEVES	TEMPORARY OPENINGS
Aerial	633-500-	633-400-	633-300-	633-040-
Buried	631-600-	633-460-	633-300-	633-040-
Underground	—	633-400-	633-300-	633-040-

5. **CORE PREPARATION (AIR CORE)**

5.01 The air-core PIC cable pairs are fully color coded as described in the 626-101, 632-033, and 632-034 Divisions of the Bell System Practices with pairs arranged in 25-pair binder groups consisting of a single 25-pair unit; two units of 12 and 13 pairs, or three units of 8, 8, and 9 pairs. ♦The three units of 8, 8, and 9 pairs construction are rated Mfr Disc.♦ Upon opening the end of air-core PIC cable or before working on one or more units, the binder groups should be marked to keep the pairs permanently associated. Use short lengths of paired plastic conductors of the same color combination as the binders or any of the commercially available ties. The method of placing binder group markers is illustrated in Fig. 1.

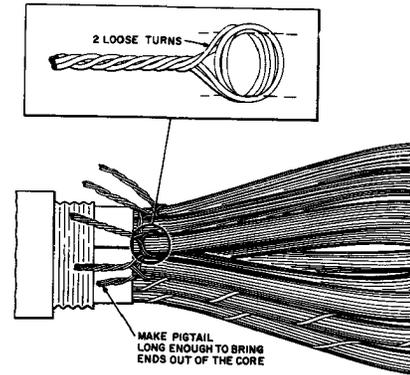


Fig. 1—Marking Binder Groups

5.02 In fully color-coded 900-pair cable with a pair count of 1 to 900, pairs 601 to 900 can be identified by the red binder around each 50-pair multiunit. **Mark these binder groups using a single red wire and paired wires having the color combination of the binders, ie, white-blue and red, white-orange and red, etc.**

♦5.03 **Mirror-Image PIC Extra Pairs:** The PIC cable larger than 900 pairs contain spare pairs to ensure a complete pair count available to the field. These pairs are positioned in the outer layer interstices, and the number of quad spare pairs will equal or exceed the number of defective pairs. The number of spare pairs is dependent on the cable size. There is one for every 300 cable pairs plus one.♦

5.04 When a binder group consists of two or three units, remove the binders from each of the units and combine the pairs; then mark the binder groups as outlined in paragraphs 5.01 and 5.02.

5.05 The DUCTPIC cable core for pair sizes 3600 and less is composed of 100-pair multiunits. The 4200-pair DUCTPIC cable uses 300-pair multiunits. Multiunit identification in DUCTPIC cable is "PIC mirror image". DUCTPIC cable multiunits have two colored, plastic binders wrapped around each multiunit; one to define a multiunit position within a layer, and a second to define its layer within the cable. The green multiunit binder is the marker unit that establishes the starting point for counting within the layer. The green multiunit is flanked by red multiunits, then blue multiunits, then red, etc. A multiunit second binder color is yellow if it is in the outer layer of a cable core, black if it is the next layer in, then yellow alternating with black for each progressive layer. (See Fig. 2 and 3.)

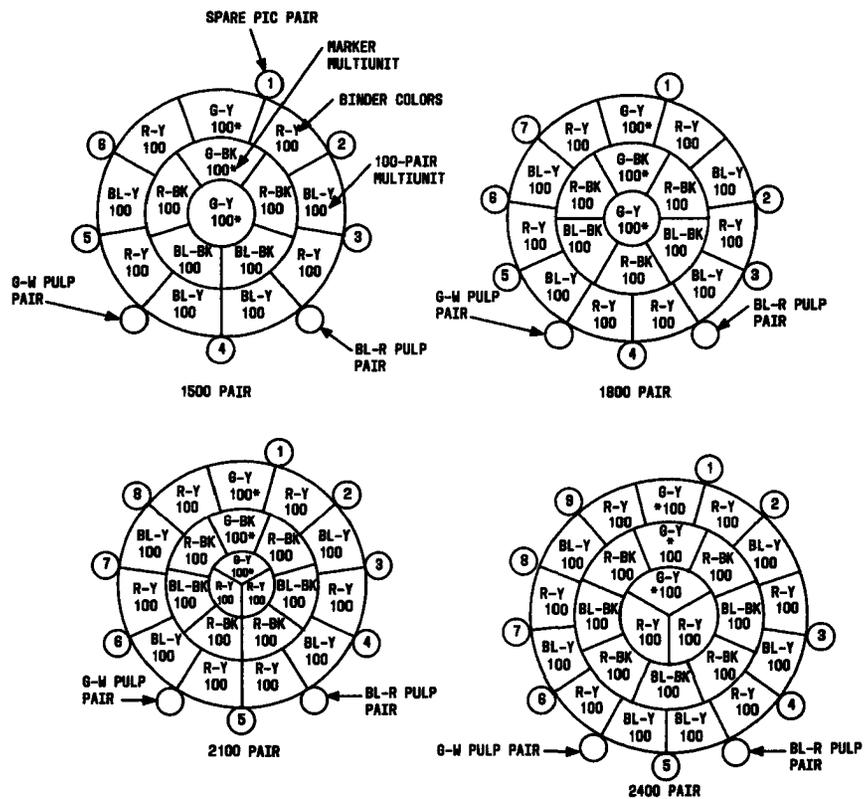


Fig. 2—1500-Through 2400-Pair 24-Gauge DUCTPIC Cable Core

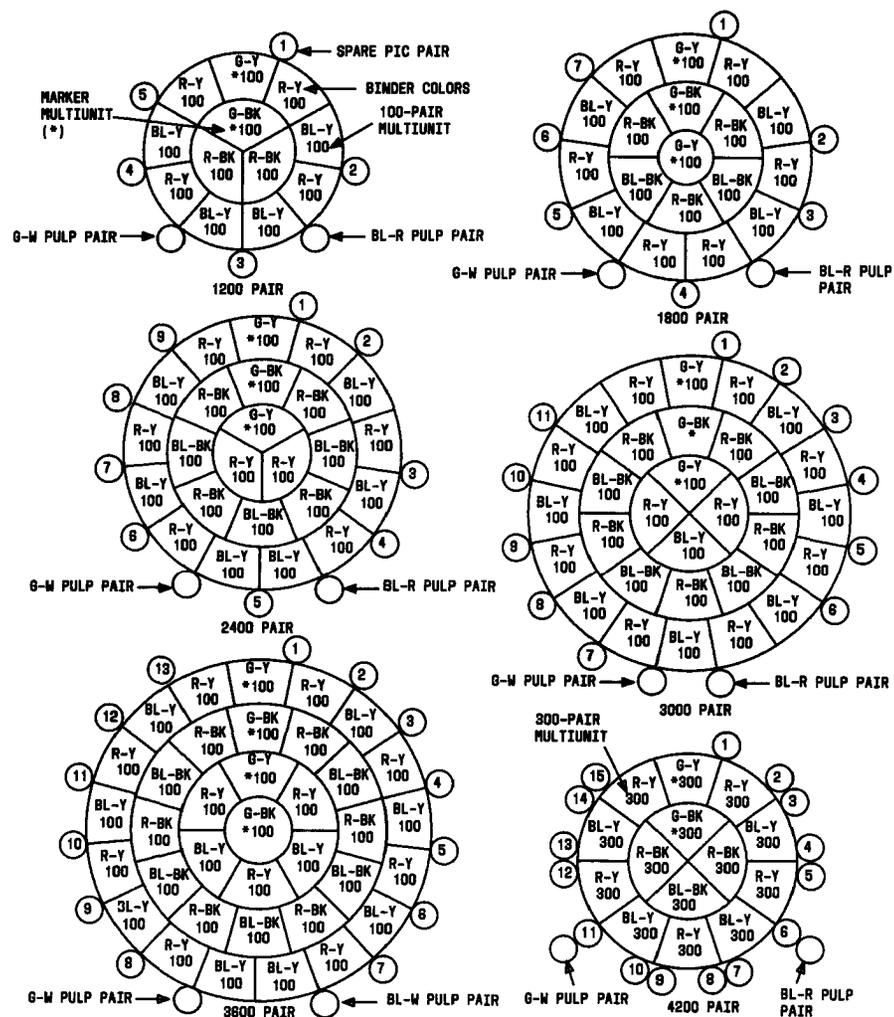


Fig. 3—1200-Through 4200-Pair 26-Gauge DUCTPIC Cable Core Layouts

5.06 PIC steampeth cable (over 900 pairs) identifies multiunits by the "PIC mirror-image" concept as described in Section 632-032-112. The low-count steampeth PIC cable multiunits are identified by the standard PIC color code as shown in Table B.

TABLE B
PIC STEAMPETH CABLES —
CORE CONSTRUCTION

PAIR SIZE	GAUGE		
	22	24	26
600 and Less	Standard PIC Color Code		
900	Mirror Image PIC		
1200			
1500			
1800			
2100			
2400			
2700			

5.07 At straight splices, mark all binder groups at each end of the cable.

5.08 At access points, bridging points, or similar locations, remove binders and mark only the binder groups involved in the scheduled work.

6. CORE PREPARATION (WATERPROOF)

6.01 The waterproof PIC cable pairs are fully color coded as described in Section 632-032-201. Waterproof cables have the same PIC pair color code, core makeup, and lengths of pair twist as used in air-core cables.

6.02 Unit constructed cables of 6 through 25 pairs consist of a single unit. The basic subdivision in other sizes is the *binder group* which has 25 distinctly colored pairs.

Note: Waterproof PIC cables containing more than 900 pairs will use the *PIC mirror-image* concept for multiunit identification.

6.03 **900-Pair Cables and Smaller:** In order for the even-count PIC color code to be used to the best advantage in the field, no shorts, crosses, grounds, or opens are permitted in waterproof cables as shipped from the factory. Wire armored cables are an exception and are covered in Section 626-759-250.

6.04 **1200-Pair Cables and Larger:** These cables contain spare pairs to ensure a complete count available to the field. These pairs are positioned in the outer layer interstices, and the number of spare pairs will equal or exceed the number of defective pairs. †The number of spare pairs is dependent on the cable size. There is one for every 300 cable pairs plus one.‡

6.05 **Locating Factory-Found Defective Pairs:** This information is contained in Section 632-020-200.

6.06 **Filling compound** throughout the core distinguishes waterproof cable. The filling compound flows into all empty space in the cable core during manufacturing. The compound wets the conductor insulation well enough to prevent interfacial penetration of water. The compound contains an antioxidant which ensures retention of the desirable characteristics for many years. A waterproof compound is also applied over the core wrap and between all components of the sheath to eliminate any possible water path between sheath layers.

6.07 †Aerial ready-access distribution closures or terminals must not be used with waterproof cable but can be used in the T-zone. Filled cable coming up the riser pole must be spliced to air-core cable in the T-zone and can be closed with ready-access type closures or terminals. FLEXGEL* filling compound can be spliced to air-core cable in the T-zone area and ready access closures used. Petroleum filled "L" or "J" will bleed from warm temperatures and drip on the ground or cars below, and result in customer complaints. **Filled cable must not be placed in aerial plant.‡**

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6.08 Cables coded with the *second letter "L" or "J"* are filled with a petroleum compound. Compounds of this type have been used since waterproof cable was introduced. Cables coded with the *second letter "F"* are *DEPIC* insulated conductors and are filled with an extended thermoplastic rubber FLEXGEL filling compound. Cables coded with the *second letter "G"* will denote solid PIC insulated cable with FLEXGEL filling compound. Both the petroleum and FLEXGEL filling compounds are flexible at normal temperatures, but the FLEXGEL filling compound is more flexible at low temperatures than the petroleum compound.

6.09 Waterproof cables with FLEXGEL filling compound meet all performance requirements for buried systems and offer the following advantages over cables filled with petroleum:

- When D-encapsulant is used to encapsulate a cable splice, the FLEXGEL filling compound need not be removed to ensure a waterproof encapsulation of the splice area.
- Cable with FLEXGEL filling compound is more flexible. The units and pairs in the cable are more easily separated in cold weather.
- Cable with FLEXGEL filling compound can be handled with less soiling and staining of clothing and tools.

6.10 †**DANGER: Special eye protection (goggles) must be worn when working with KS-21446 solvents to clean waterproof cables. Do not use an open flame to heat the solvent.‡** It is not necessary to remove the filling compound from the cable as far as the performance of the cable and any connecting devices are concerned; however, when D encapsulant is used to encapsulate splices, it is necessary to completely remove the filling compound from the *cables coded with the second letter "L" or "J"*. The following technique can be used to clean the cable:

- (1) †Waterproof cable filled with FLEXGEL filling compound (indicated by the letter "F" or "G" in the cable code) does not require cleaning. In those cases where petroleum jelly (PJ) filled cable (indicated by the letter "L" or "J" in the cable code) is used on new construction and in reentry

and rehabilitation, solvent cleaning must be used, since petroleum jelly (PJ) filling compound must be removed thoroughly. This is required to assure a watertight seal between D encapsulant and the conductor insulation.‡

(2) At 60°F or lower, the KS-21446 solvent may be heated using a roto-egg washer or B solvent warmer AT-8766. The roto-egg washer is a galvanized tub equipped with a thermostatically controlled 110 Vac heating element which warms the solvent to 100-120°F. The B solvent warmer is a thermostatically controlled immersion type heater that clamps over the edge of a container. The container must be obtained separately.

6.11 Use the B solvent warmer as follows:

- (1) Obtain a container large enough to immerse the cable core.
- (2) Place an AT-8766 B solvent warmer in the container; then pour KS-21446 compound solvent into the container until the solvent level is above the heating element of the warmer. **Do not use any solvent but the KS-21446 solvent. When in doubt, do not use.**
- (3) Connect the B solvent warmer to a 110 Vac power source equipped with ground fault interrupters. The B solvent warmer is equipped with a thermostatically controlled heating element which heats the solvent to about 120°F. An illuminated green lamp on the solvent warmer indicates the heating element is heating the solvent. The lamp will flicker as the solvent approaches 120°F. Stirring or agitating the solvent occasionally will minimize the flickering. When the solvent reaches approximately 120°F, the green lamp will go out.

Note: The red lamp indicates a faulty control thermostat. Should this lamp illuminate, disconnect the B solvent warmer from power source and return solvent warmer for repair in accordance with local instructions.

(4) When the solvent reaches the proper temperature as indicated by the extinguished green lamps, disconnect the power source and carry the heated solvent to the splice or terminating location.

Roto-Egg Washer

6.12 Use the roto-egg washer as follows:

- (1) Pour the KS-21446 solvent in the container until the solvent level is above the heating element in the container (about 1/3 to 1/2 full).
- (2) Connect the roto-egg washer to a 110 Vac power source equipped with ground fault interrupters. When the solvent reaches approximately 120°F, disconnect the power source and carry the heat solvent to the splice or terminating location.

6.13 Procedures for removing filling compound are as follows:

- (1) Place the container as close as possible to the cable to facilitate immersing the cable core into the heated solvent.
- (2) Immerse the core into the heated solvent. This will allow the core wrap to be immediately removed in one piece after immersion for about a minute.
- (3) **Warning: Do not overspread the binder units. This can result in split pairs.** Cut the core binders and immerse the core in the heated solvent. Twist the pairs at the end of each binder group to retain identity. Press the core against the bottom of the container to spread the units apart to allow the heated solution to penetrate in and around the units.
- (4) Dry the cable core with paper towels or rags. Then, apply binder group identification ties around the groups to be terminated using scrap wire having the same color insulation as the binder group tape or commercially available ties. Remove or half hitch the binder group tape.

Note: Half hitching the binder group tape is sufficient for binder groups identification when splices are made in below ground closures and reentry is not anticipated.

- (5) Rags or paper towels used to remove compound must be placed in a covered metal container and disposed of in accordance with local routine.

(6) After the cleaning operation, the solvent should be stored in a suitable container per local instructions for reuse or disposal conforming to local procedure covering flammable liquid.

6.14 Cover the ground in the splicing pit or trench to prevent contact between the cable core and soil and to provide a dirt-free area for the tools and materials normally used for splicing. A junk bag should be provided for wire clippings and debris.

7. COLOR CODE SPLICING

7.01 **Subscriber and Trunk:** In general, these cable pairs are spliced color to color throughout their length. Unless otherwise specified in the detail plan, splices should be made as follows:

- (a) **Cables of the Same Size (Straight Splices):** Splice like-color binder groups only. Join pairs color to color.
- (b) **Reduction in Cable Size and Bridge Points:** Splice complete binder groups except when Engineering Specifications indicate a division of binder groups. In joining binder groups of unlike color, the normal sequence of binder colors should be maintained. Join the pairs color to color.
- (c) When splicing 6-, 11-, or 16-pair cables to a binder group, the pairs should be spliced as specified on the detail plans.

7.02 **Splicing Even-Count PIC to Odd-Count PIC, Pulp, or Strip Paper:**

- (a) The binder group color and pair count sequence of the even-count PIC cable is controlling and must be maintained.
- (b) The pair count sequence in even-count PIC cable must agree with the pair number sequence in superseded (manufacture discontinued) type PIC, pulp, or paper cables.

8. SUPERSEDED ODD-COUNT PIC CABLES

8.01 **AHB, AHA, AKM, and AKT Type:** These cables are fully color coded and have extra pairs (contain 51, 76, 101, and 102 pairs, etc).

8.02 **Subscriber and Trunk:** In general, the pairs in these cables can be spliced color to color throughout their length. Unless otherwise specified in the detail plans, splices in these cables should be made as covered in paragraphs 8.03 through 8.06.

8.03 **Splicing PIC to PIC:**

- (a) **Cables of the Same Size (Straight Splices):** Splice like-colored units only. Join pairs color to color.
- (b) **Reduction in Cable Size and Bridge Points:** The unit binder color sequence and pair number sequence must be followed in each cable.

8.04 **PIC to Pulp or Strip Paper:** The color code pair count sequence in the PIC cable must agree with the pair number sequence of pulp- or paper-insulated cables.

8.05 **CA-1813 and CA-1814 Type:** The 6-, 11-, 16-, and 26-pair size cables and the units of 12, 16, 17, 25, and 26 pairs in cables made with units have an individual pair color code. Layer cables and cables with 50- and 51-pair units do not have an individual pair color code.

8.06 The method of splicing is generally the same as that covered in paragraphs 8.03 and 8.04 except as follows:

- (1) If random splicing is specified in these superseded cables, one of the color-coded pairs in the outer layer of layer-type cables or in one of the units should be made continuous throughout the length of the cable for convenience in testing and maintenance.
- (2) The remaining pairs should be spliced at random as directed, in accordance with the color random or bunch random splicing methods described in Section 632-400-205.

9. "DUCTPIC" CABLE (AIR-CORE DEPIC)

9.01 The makeup of DUCTPIC cable is covered in Section 632-032-201. This cable is designed to provide more pairs of the same electrical characteristics in a given sheath diameter than the presently used pulp cables.

9.02 DUCTPIC cables have a pulp pair (BI-R) in the interstices. The pulp pair should be used to check for dryness of single-reel lengths of cable at

the time of receipt from Western Electric, after placing, before splicing, or after restoration (drying). A second pulp pair (W-Gr) may be added as a spare to the first.

9.03 Immediately after opening the cable, the pulp pair should be located and the tip-to-ring resistance measured. The KS-8455, KS-16979, or 145A test set should be used to measure the insulation resistance. **The pairs must not be under test longer than 10 seconds as the current may dry out a short wet length and give an erroneous dry indication.** Other test sets (ohmmeters) with 3 to 100 volts at the test leads during test can be used, but test sets with less than 3 volts should be avoided.

9.04 The resistance between tip and ring of the pulp pair is the indicator of dryness as shown below:

CABLE CONDITION	T-R RESISTANCE
Dry	50,000 ohms (or above)
Wet or Very Damp	500-50,000 ohms
No Test (Note)	0-500 ohms

Note: If the resistance is less than 500 ohms, use the spare pulp pair (if present) and retest.

9.05 A wet cable should be dried per Section 644-200-030, and the integrity of the jacket should be determined before splicing. A very damp cable should be purged with dry gas until the tip-to-ring resistance exceeds 50,000 ohms. Recheck the tip-to-ring resistance before final splice wrap-up.

9.06 The DUCTPIC cable core for pair sizes 3600 and less is composed of 100-pair multiunits. The 4200-pair DUCTPIC cable uses 300-pair multiunits. Multiunit identification in this cable is "PIC mirror image."

9.07 DUCTPIC cables should be spliced like any other PIC cables; thus, conductors should be spliced "color to color" and "multiunit to multiunit." The 710 encapsulated series connectors should be used for splicing DUCTPIC cable.



The B series 710 connectors are for PULP cable only and should not be used on DUCTPIC cable.

9.08 To increase the pair density, less insulation is applied to the conductors of DUCTPIC cables. Because of this, it is recommended that a tight wrapdown be prevented. A large closure must be used for the splice. Example: For a 3000-pair DUCTPIC cable, it is recommended that a 9-1/2 inch diameter closure such as the 2D2 type as shown in Section 633-506-201 be used when a center bank splice is made.

9.09 DUCTPIC cables are coded DCTC, DCMZ, or DCTZ.

10. LOW CAPACITANCE DEPIC CABLES

10.01 MAT* cable and ICOT† cable are low-capacitance *DEPIC* cables designed especially for T-carrier use. Each is screened and has T carrier service pair complements.

10.02 Splicing techniques and core description are covered in Sections 626-105-007 and 640-010-005.

11. CONDUCTOR JOINTS

11.01 High quality joints are required in all cables—exchange and trunk. All new PIC joining operations should be performed by one of the following methods:

- (a) 700-, 701-, and 702-Type Connector—see Section 632-205-215
- (b) 710-Type Connector—see Section 632-205-220.

700-Type Connectors

11.02 The *700 Connector* is used for:

- (a) Joining any combination of aluminum, copper, or copper-steel conductors.
- (b) Joining 17- through 26-gauge conductors in any combination.
- (c) Splicing three wires, or bridging up to two wires to one through wire. Any two wire ports may be used when joining only two wires.

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†Trademark of Western Electric.

701-Type Connector

11.03 The *701 Connector* is used for:

- (a) Joining any combination of aluminum, copper, or copper-steel conductors
- (b) Joining 19- through 26-gauge conductors in any combination
- (c) Splicing two wires only.

702-Type Connector

11.04 The *702 Connector* is used for:

- (a) Bridging one wire to one through wire
- (b) Joining 19 through 26 gauge in any combination
- (c) Joining any combination of aluminum, copper, or copper-steel conductor.

710-Type Connector

11.05 The wire joining procedures and specifications for the various 710-type are contained in Section 632-205-220.

12. LOADING AND INDUCTOR SPLICES

12.01 For loading pairs in aerial cables, the multicoil in-splice coil case may be used. Section 631-215-300 describes the installation of the 6-type splice closures. The multicoil case is placed within the closure and the pairs are joined with 710-type connectors.

12.02 The method of splicing inductors is described in Section 643-700-205.

12.03 Splicing of stub cables in apparatus cases is covered by special instructions in the 639 and 640 Divisions of Bell System Practices.

12.04 The method of in-splice or enclosure loading with the 710 load coil is described in Section 643-640-202.

13. WRAPPING AND/OR ENCAPSULATING COMPLETED SPLICE

13.01 When it is necessary to wrap or encapsulate a completed splice, the procedures described in Section 632-490-200 must be used.

14. CLOSING THE SPLICE

14.01 Splices between plastic-insulated cables are usually closed with either a metal splice case, lead sleeve, or plastic closure.

14.02 *Splice Case:* When a splice case is used, the case must be installed as described in Section 633-400-200.

14.03 *Closure:* When a closure is used, the closure is installed as outlined in Section 633-500-102 (18-type cable closure), Section 633-506-201 (2-type closure), and Section 633-506-205 (50- and 51-type closures).

14.04 *Lead Sleeve:* When lead sleeves are used, the cable ends should be prepared with auxiliary sleeves as covered in Section 633-300-206. If PAP or PASP sheath is involved, the auxiliary sleeves must be installed in such a way as to provide a water seal between the inner and outer polyethylene jackets. Otherwise, water may enter the splice if the outer jacket should become damaged. Lead sleeves are installed as covered in Section 633-200-201.

14.05 Appropriate sized lead end plates (Section 633-200-201) should be made and soldered to the auxiliary sleeves before placing the sleeves on the cable. This avoids overheating the plastic insulation on the conductors during the wiping operation.

14.06 *Protection:* Lead sleeve and metallic splice cases on buried cables should be protected against corrosion as covered in Section 633-020-205.

15. PRESSURE PLUGS (AIR-CORE PIC)

15.01 A pressure plug must be made in PIC cables near where they join strip paper- or pulp-insulated cables. The plug should be made as described in Section 637-241-011, or by using a 10- or 12-type stub as outlined in Section 631-020-101.

15.02 The purpose of the gas plug is to prevent low-insulation resistance in the paper or pulp cable due to movement of moist air from the PIC cable or the actual flow of water as the result of a sheath break in the PIC cable sheath.

15.03 *Plug PIC cable* in accordance with the following:

- (a) Where PIC cable is used for a building entrance (either aerial or underground) or as a lateral and is fed from a paper- or pulp-insulated conductor cable, a gas plug should be made in the PIC cable close to the junction splice.
- (b) Where pressurized paper- or pulp-insulated conductor cable is to be extended with PIC cable that is *not* to be pressurized, the PIC cable must be plugged close to the junction splice.
- (c) When specified in preparation for continuous pressure testing.
- (d) When specified in detail plans.

15.04 *No plug is required* under the following conditions, unless it is needed for pressure testing purposes:

- (a) When PIC pairs are enclosed in sheaths which are hermetically sealed, such as lead or lepeph, stalpeth or PASP, and tolpeph J or K.
- (b) When waterproof PIC cable cannot be plugged, use of a 10- or 12-type stub should be considered as an air block if needed (Section 631-020-101).

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¶16. ENTRANCE TO BUILDINGS¶

¶16.01 Waterproof cable can be used for building entrances provided the following requirements are followed.

(a) Cable shield is bonded to building ground within 50 feet of the entrance as outlined in Section 631-460-200.

(b) A transition to air-core cable is made and the splice is enclosed by a metallic or fire-resistant splice case.

(c) Waterproof cable conductors are not terminated directly on connector or protector blocks.

(d) All waterproof cable sheath openings are enclosed by a metallic or fire-resistant splice case.¶