SPLICING T CARRIER CABLES

GENERAL

CONTENTS PAGE

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1. GENERAL

1.01 This section contains general information on splicing air core and waterproof cables for carrier transmission. It covers ***straight field splices*** and ***office end splices*** to connector (tip) cables. Splices at interconnecting points, ie, repeater stations, are covered in other sections of the 640 Division of Bell System Practices.

1.02 This section is reissued to:

- Revise cable descriptions and illustrations
- Add requirement for wrapping either high or low level pairs with aluminum in all splice cases in a repeater station or within 1000 feet of repeater station
- Add reference to new 16-type closures
- Reorganize material in the section.

Since this constitutes a general revision, arrows ordinarily used to denote changes have been omitted.

1.03 ***Wire Joining:***

- Except for LOCAP cable, the preferred method for splicing carrier cables is with 710-, 700- or 701-type connectors (Sections 632-205-220 and 632-205-215, respectively).
- For LOCAP cable use 700-3B connectors.

Split Pairs: Split pairs will cause unacceptable levels of near-end crosstalk in adjacent pairs and units. Split pairs may be avoided, eg, by using the 152A test set (Section 634-400-530) with the cutter-presser and the 710 connectors.

1.04 ***Splicing Method:*** For straight splices use either in-line or foldback splicing methods.

1.05 ***Splicing Systems—***

(a) ***Recommended Buried Splicing System for Waterproof Cables is:***

(1) 700/710-type connectors

(2) 16-type or 2-type closure (Sections 633-500-104 and 633-506-201, respectively)

Note: Aboveground splices in buried installations can be made in any approved pedestal (631 Division of Bell System Practices).

(3) D encapsulant [same section reference as in (2)].

All of these were developed for full compatibility. Use of different connectors, encapsulants or closures could result in splice failure.

(b) ***Recommended Aerial Splicing System for Air Core Cables is:***

(1) Connector selection (see paragraph 1.03)

(2) 18-type closure (see Section 633-500-102).

Note: LOCAP cables should be enclosed using double seal cast iron cases (2-type cases may be used).

(c) ***Recommended Underground Splicing System for Air Core Cables is:***

(1) Connector selection (see paragraph 1.03)

(2) 2-type plastic splice closure (Section 633-506-201).

Note: Waterproof Cables—For splices in manholes, use recommendations given in (a).

1.06 ***T Carrier Operating Modes:***

- T carrier systems can be configured for either a ***one-cable*** or ***two-cable*** operation. In the ***one-cable*** operation both directions of transmission (east-west and west-east) are carried within the same cable. In the ***two-cable*** operation only one direction of transmission (east-west or west-east) is carried in each cable sheath. T2 carrier systems are configured for two-cable LOCAP operation only.

1.07 ***Pressure Plugs:***

- ***Air Core Cables:*** Plug as outlined in the 637 Division of Bell System Practices.
- ***Waterproof Cables:*** A pressure plug is normally not necessary when joining nonpressurized air core cables to waterproof cables. If a pressure plug is required, use a 10-type or 12-type stub as outlined in Section 631-020-101. Do not attempt to build a pressure plug in waterproof cable.

1.08 ***Wrapping Splices:*** Air core PIC cable splices are wrapped with B polyethylene tape. Pulp insulated conductor cable splices are wrapped with muslin. Waterproof PIC cable splices are wrapped with serving tape and encapsulated.

1.09 The work print will designate the pairs assigned for T carrier transmission in the one- or two-cable operating modes. ***Always refer to the work print for pair assignments before splicing the cable.***

1.10 ***Missing or Defective Pairs:*** The pair identification of these pairs is given on the tag attached at each end of the shipped cable.

1.11 ***Replacing Pairs:*** For screened cables, always use the interstitial pair nearest the group containing the defective pairs. Never use an interstitial pair on the opposite side of the screen. Do not use service pairs to replace digital pairs.

2. PRECAUTIONS

2.01 ***Use of Test Pick:*** The test pick should not be used to identify plastic-insulated conductors. Such conductors generally should be identified using a probe and amplifier.

Split pairs can induce crosstalk 60 dB greater than normal. These degradations are unacceptable for voice or digital transmisson even in screened cables. Care should be taken to avoid split pairs (see READ in paragraph 1.03).

2.02 ***Shielding Splices:*** For all T1C and those T1-unidirectional installations specified on work prints, shielding is to be provided in all splice cases both within a repeater station and within 1000 feet of a repeater station.

2.03 Always maintain the integrity of the unit throughout the length of the cable. Never cross-over units in splicing the cable sections.

3. T CARRIER CABLE CODES

3.01 The cable codes and physical characteristics are given in Table A. All of these cables (except BHAA and CDA) have a bisecting insulated screen across the cable core which provides sufficient near-end crosstalk (NEXT) isolation to allow all pairs in the cable to be used for T1 or T1C carrier.

3.02 ***Standard T2 Carrier Cables:*** Low capacitance (LOCAP, ie, 39nF/mile for air core; 46nF/mile for waterproof) cable codes and physical characteristics are given in Table B.

TABLE A

STANDARD T CARRIER CABLES

CABLE CODE	PAIR SIZES	CONDUCTOR GAUGE AND MATERIAL	CORE AND INSULATION	SHEATH
SCREENED				
MCR (MAT)*	412, 616, 1024 1228, 1432, 1840	25 ga Copper	Air Core DEPIC	PASP, Stalpeth
MCM (ICOT)	54, 106, 158, 210, 314, 418, 616, 922	24 ga Copper	Air Core DEPIC	PASP, Stalpeth
KHA	28, 54, 106, 158, 210 314, 418, 616	22 ga Copper	Air Core PIC	PAP PASP
MLM (ICOT)	54, 106, 158, 210, 314 418, 616, 922	24 ga Copper	Waterproof DEPIC	ASP
KJA	28, 54, 106, 158, 210 314, 418, 616	22 ga Copper	Waterproof PIC	ASP
KLA	106, 158, 210, 314 418, 616	22 ga Copper	Waterproof DEPIC	ASP
NONSCREENED				
BHAA	100, 150, 200, 300 400, 600	22 ga Copper	Air Core PIC	ASP
CDA	600, 900, 1200	22 ga Copper	Air Core Pulp	Stalpeth PASP

* MAT = Metropolitan Area Trunk Cable System

TABLE B

STANDARD T2 CARRIER CABLES (LOCAP)

CABLE CODE	PAIR SIZES	CONDUCTOR GAUGE AND MATERIAL	CORE AND INSULATION	SHEATH
LCAT	27, 52, 104, 154, 204	22 (Copper)	Air core DEPIC	ARPAP
LLAW	27, 52, 104, 154, 204	22 (Copper)	Waterproof DEPIC	ASP

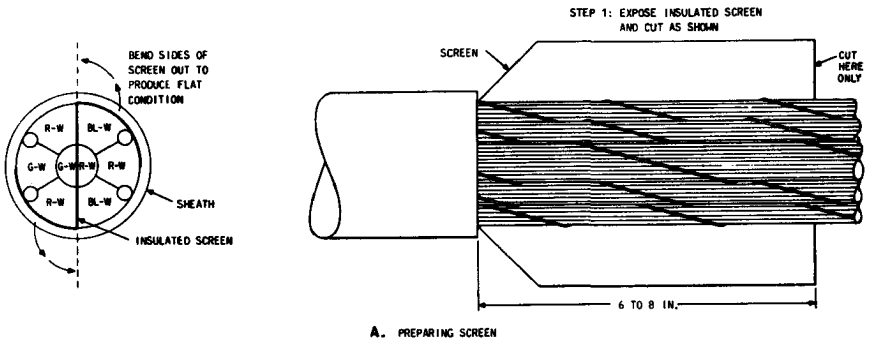
4. SPLICING CABLES FOR T CARRIER—SUBURBAN, INTERCITY, AND CLUSTATE TRUNK PLANT

A. Treatment of Screen at Splices

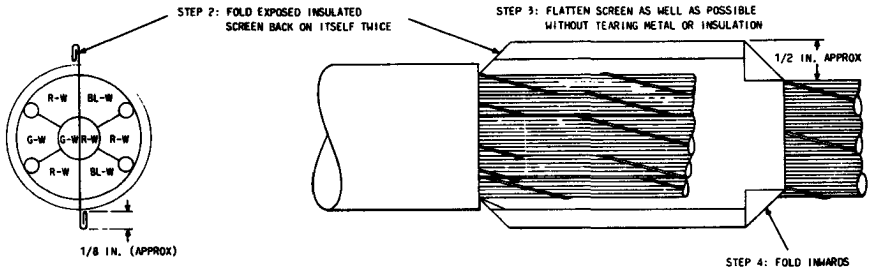
Air Core PIC

4.01 At a splice the screen should not be electrically continuous nor should it be grounded. If the screen is grounded, foreign potentials may be introduced into the cable core.

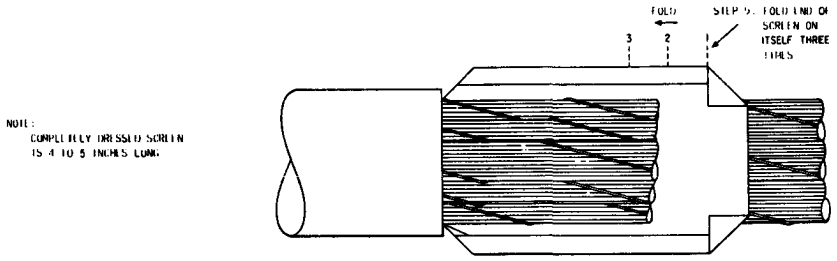
4.02 After removing the sheath and preparing the butts for the type of closure to be used, proceed as shown in Fig. 1.



A. PREPARING SCREEN



B. FLATTENING AND FOLDING SCREEN



C. COMPLETING FOLDING OF SCREEN

Fig. 1—Treatment of Screen at Splices

4.03 Complete the splicing for whichever half of the core that is least accessible. Arrange the cable ends so the screen is approximately vertical and the groups in the other one-half of the cable are all on the same side of the screen.

4.04 Wrap the completed one-half of the splice with a layer of polyethylene tape or muslin, whichever is applicable. Complete the other one-half of the splice and wrap it with polyethylene or muslin.

4.05 Wrap one side (either one) with one layer of overlapped aluminum tape AT-7165 or heavy duty aluminum foil (Fig. 2). Do not include the screen in the tape or foil wrapping.

Note: This restores the integrity of the screen in the splice. Electrical continuity of the screen is not required. The screen must not be grounded in the splice.

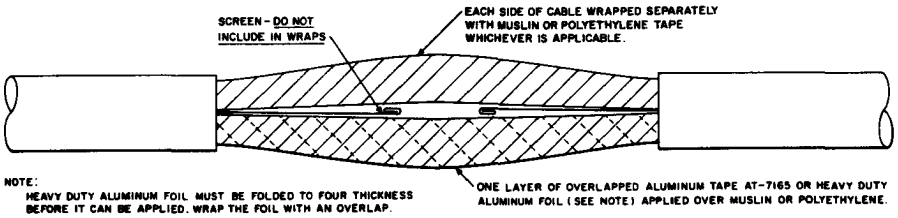


Fig. 2—Wrapping Splice (Air Core Cable)

4.06 Wrap both sides of the splice together with polyethylene tape or muslin, whichever is applicable.

Waterproof PIC—2D2 Closure

4.07 After removing the sheath and preparing the butts, prepare the screen in the same manner as for air core screened cables.

4.08 Arrange the cable ends so the screen is approximately vertical. Make certain the groups to be spliced together are on the same side of the screen.

4.09 Treat binder groups on each side of the screen as separate cables. Tie off and splice the cable ends in accordance with the PIC binder group color code and pair sequence. Figure 3 illustrates a typical screened cable with 710-type connectors prior to restoration of the screen and encapsulation.

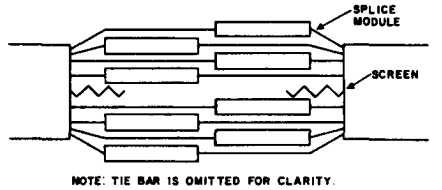


Fig. 3—Typical Screened Cable Prior to Restoration of Screen and Encapsulation

4.10 Prepare a 16- by 19-inch size screen using B aluminum tape or heavy duty aluminum foil. For B aluminum tape, join four 16-inch long tape pieces with proper overlap (Fig. 4) to obtain screen size.

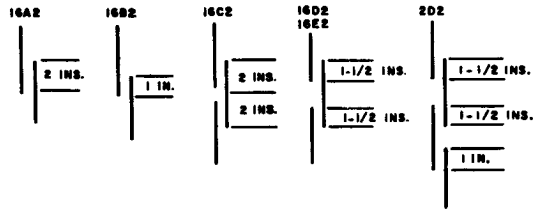
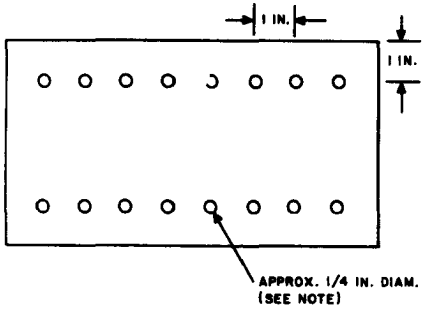


Fig. 4—Overlapping B Aluminum Tape

4.11 Wrap the screen with one layer of E vinyl tape.

4.12 Punch holes in screen (Fig. 5) about 1 inch apart, and 1 inch in from the edge of the long side.



NOTE:
HOLES MAY BE MADE BY PUSHING A LEAD PENCIL THROUGH ALUMINUM TAPE.

Fig. 5—Holes Punched in B Aluminum Tape

4.13 Place the screen between the two halves of the splice in any of the ways shown in Fig. 6. Do not place the screen in any of the ways shown in Fig. 7.

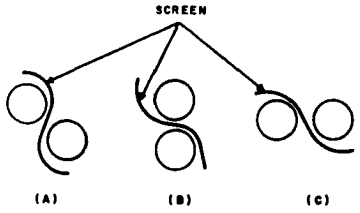


Fig. 6—Proper Methods of Placing Screen

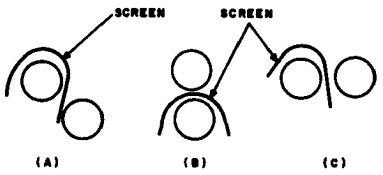


Fig. 7—Improper Method of Placing Screen

4.14 Form and wrap the splice to fit into the closure using the serving tape supplied with the closure.

4.15 Install closure in accordance with Section 633-506-201 and fill with D encapsulant.

Waterproof PIC—16-Type Closure

4.16 ***Restoring Screen at Splice Enclosed with 16E2 Closure:*** When splicing waterproof cable for this closure, the splice is supported by the splicing tray as it is being built. After cutting and folding back the screen (Fig. 1), use the instructions supplied with the closure to set up the cables to be spliced and proceed as follows:

(1) Use the foldback method to splice that half of cable which will lie on the back or bottom of the splicing tray.

(2) Form a screen of appropriate size (see following list) from heavy duty aluminum foil or B aluminum tape. Punch several 1/4-inch holes (Bell System lead pencil may be used) in the middle of the screen (ie, in the middle of the long dimension).

CLOSURE	ALUMINUM TAPE	SCREEN SIZE
16A2	2 pcs 7 in. long	7 X 6 in.
16B2	2 pcs 10 in. long	10 X 7 in.
16C2	3 pcs 13 in. long	13 X 8 in.
16D2	3 pcs 16 in. long	16 X 9 in.
16E2	3 pcs 18 in. long	18 X 9 in.

(3) Dress the completed half of the splice against the tray and place the screen as shown in Fig. 8.

(4) Fold the screen over the edge (Fig. 9) and secure with cotton tape in several places.

(5) Complete the remainder of the splice and dress into the tray.

(6) Remove the cotton tape and dress screen edges around the last half of the splice. Secure the splice with cable ties (Fig. 10).

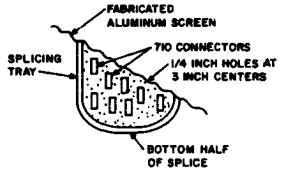


Fig. 8—Placing Screen Across Splice (16-Type Closure)

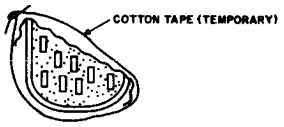


Fig. 9—Securing Screen With Cotton Tape

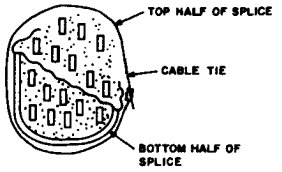


Fig. 10—Dressing Edges of Screen

B. Screened MAT Cables (MCR)

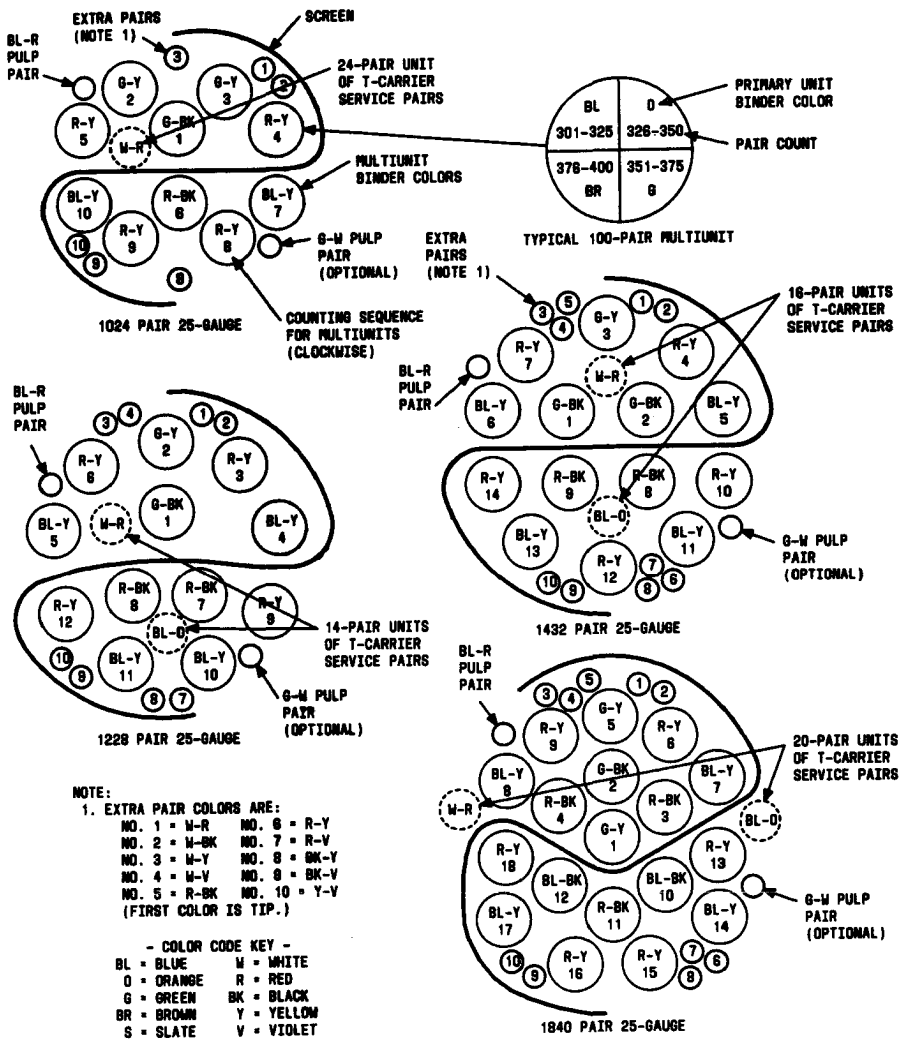
4.17 Core lay-ups of MCR cables are shown in Fig. 11 and 12. All feature:

(a) A bisecting, insulated, aluminum screen with edges extending around the core.

(b) On the ***low pair count side of the screen,*** extra pair 1 is always present and more extra pairs are added in the sequence 2, then 3, 4, and lastly, 5. On the ***high pair count side of the screen,*** the order is 10, then 9, 8, 7, and lastly 6. These pairs are used to substitute for missing or defective pairs on the same side of the screen.

(c) All MAT cables have an extra unit or units of service pairs. The number of service pairs is one fault locate pair for each 50 cable pairs plus four pairs per cable. Where there are 25 or less service pairs, they are assembled in one unit with a W-R binder and located on the low pair count side of the screen. Where there are more than 25 service pairs, they are divided into two units of equal size. One unit has a W-R binder and is located on the low pair count side. The other has a BL-0 binder and is located on the high pair count side.

Note: The service pairs are included in the cable pair count.



NOTE:
1. EXTRA PAIR COLORS ARE:

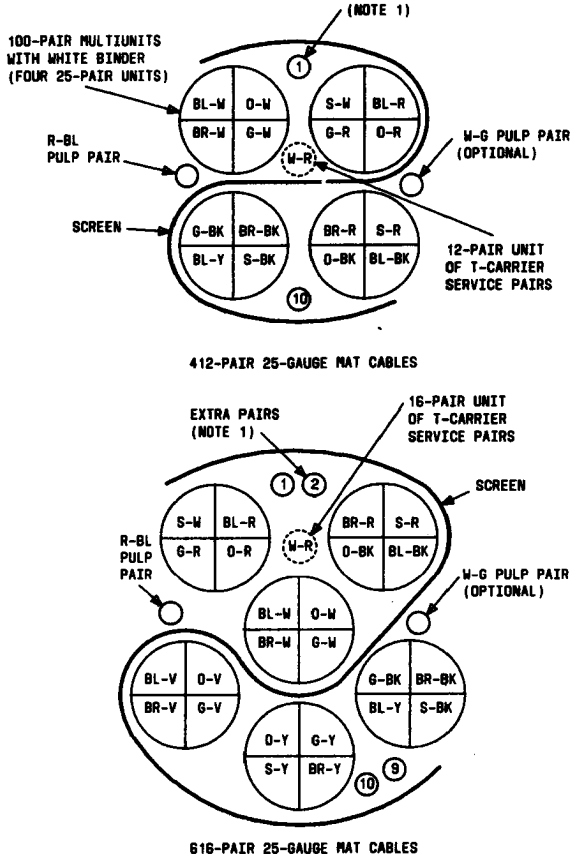
NO. 1 = W-R	NO. 6 = R-Y
NO. 2 = W-BK	NO. 7 = R-V
NO. 3 = W-Y	NO. 8 = BK-Y
NO. 4 = W-V	NO. 9 = BK-V
NO. 5 = R-BK	NO. 10 = Y-V

(FIRST COLOR IS TIP.)

- COLOR CODE KEY -

BL = BLUE	W = WHITE
O = ORANGE	R = RED
G = GREEN	BK = BLACK
BR = BROWN	Y = YELLOW
S = SLATE	V = VIOLET

Fig. 11—1024- and 1840-Pair MAT Cable Lay-Ups (MCR)



NOTE:
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NO. 1 = W-R	NO. 6 = R-Y
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NO. 3 = W-Y	NO. 8 = BK-Y
NO. 4 = W-V	NO. 9 = BK-V
NO. 5 = R-BK	NO. 10 = Y-V

(FIRST COLOR IS TIP)

- COLOR CODE KEY -

BL = BLUE	W = WHITE
O = ORANGE	R = RED
G = GREEN	BK = BLACK
BR = BROWN	Y = YELLOW
S = SLATE	V = VIOLET

Fig. 12—412- Through 616-Pair MAT Cable Lay-Ups (MCR)

4.18 ***Core Lay-Ups of 1024- Through 1840-Pair Cables***—All feature:

(a) 100-pair multiunits consisting of four 25-pair primary units

(b) Pairs within each 25-pair primary unit having standard PIC color code

(c) Each 25-pair unit having a different color binder in standard sequence of blue, orange, green, and brown

(d) Sequence of multiunit count called "mirror image PIC" (see Section 632-032-112).

Note: To maintain the mirror-image symmetry in the 1024- and 1432-pair MAT cables, it is necessary to have two marker units in a layer. Both marker units are included at the ***beginning*** of the unit count for the layer.

4.19 In assigning pair identification to "mirror image" design cables, the factory has adopted a direction of counting. Looking into the end of the cable the count is:

- ***Clockwise*** if extra pair 1 (W-R) is to the ***right*** of the marker multiunit(s) in the outside layer. The cable end will have a band of yellow tape.
- ***Counterclockwise*** if extra pair 1 (W-R) is to the ***left*** of the marker multiunit(s) in the outside layer. The cable end will have a band of green tape.

Note: About half the time the counting sequence used to identify defective pairs in "mirror image" cables will not be the sequence defined for the installation (clockwise count with back to reference office). Once extra pair substitutions have been arranged, the installation sequence takes over completely and is the one to be used in labeling 710 connectors or splice bundles.

4.20 ***Core Lay-Ups of 412- and 616-Pair Cables***—The cables have the standard PIC color code, not the "mirror image PIC" design of larger cables.

4.21 ***Low Pair Count Side of Screen:*** Extra pair 1 (W-R) should be substituted for the missing or defective pair with the lowest count observing "tip" for "tip" and "ring" for "ring" extra pair 2 (W-BK) for the next lowest count and so on. The tip-ring order for the standard PIC color code corresponding to W-R for extra 1 is W-BL, W-O, W-G.

4.22 ***High Pair Count Side of Screen:*** Extra pair 10 (Y-V) should be substituted for the missing or defective pair with the highest count, extra pair 9 (BK-V) for the next highest count and so on. In each case the substitution should be for that cable length only.

4.23 ***Straight Field Splices:***

(1) Use the guidelines in Parts 1 and 2.

(2) MAT cables should be spliced like other PIC cables, color-to-color.

Note: If the cable is not CONECS, join pairs with 710C series (filled) connectors. For joining single pairs, use filled 700-type connectors.

(3) Splice together the pairs on one side of the screen. Where a water alarm and fault locate (WAFL) sensor, a 1A sensor, is to be installed in the splice case, turn the cable cores so that the half of the cable which is spliced first is ***not*** the half containing the assigned WAFL pair. Wrap this assembly with polyethylene tape, aluminum tape, and another polyethylene tape so the bare aluminum is not exposed to any pairs. The aluminum tape should extend over the folded back cable screens but must not connect to them electrically.

Electrical continuity of the cable sheath is required as covered in the installation procedures for the particular closure used.

(4) The entire splice is wrapped in polyethylene and enclosed.

4.24 ***Splicing MAT Cables in Cable Entrance Facilities:***

ABAM or ARAM tip cables should be plugged at the terminating end to prevent condensation from forming in the splice.

(1) ***Carrier Pairs:***

(a) Carrier pairs in the units in MAT cable should be spliced to the tip cables (which are provided with protectors) color-to-color, starting with the white-blue pair.

(b) The tip cable connector panel is installed in the bay of the distributing frame as designated on the work print.

(2) ***Service Pairs:***

(a) Service pairs should not be terminated in the same tip cable as the carrier pairs. Service pairs from both sides of the screen may be spliced in the same tip cable. In this case, it will be necessary to violate continuity of the PIC color code from the service pair binder units to the tip cable.

(b) When CO protection is not required for the service pairs, they may be spliced to tip or ABAM cable which is terminated on a terminal strip. (See Table C for suggested numbering system.)

(c) When CO protection is required, one of the following connectors may be used:

TYPE OF CONNECTOR	TYPE OF FRAME
302E1-100	Modular
302E3-100	Double-Sided
303E3-100	MDF
307-type	COSMIC II

(d) ***Unused Tip Cable Pairs:*** Pairs should not be terminated on the distributing frame or terminal strip. Trim off conductors at each end of the cable. Subsequent tip cable should be sequentially terminated on the same main frame or terminal strip.

TABLE C

MAT CABLE: SUGGESTED T-CARRIER SERVICE PAIRS' NUMBERING SYSTEM

PAIR COLORS	LOW PAIR COUNT SIDE OF SCREEN							HIGH PAIR COUNT SIDE			
	W-R BINDER PAIRS	412 PRS 1–12	616 PRS 1–16	1024 PRS 1–24	1228 PRS 1–14	1432 PRS 1–16	1840 PRS 1–20	BL-O BINDER PAIRS	1228 PRS 15–28	1432 PRS 17–32	1840 PRS 21–40
W BL	T1			ORDER WIRE				T26	MISCELLANEOUS		
W O	T2							T27			
W G	T3							T28			
W BR	T4							T29			
W S	T5							T30			
R BL	T6				FAULT LOCATE			T31	FAULT LOCATE		
R O	T7							T32			
R G	T8							T33			
R BR	T9	Pressure Mon						T34			
R S	T10							T35			
BK BL	T11	Misc						T36			
BK O	T12	WAFL						T37			
BK G	T13		Pressure Mon		Pressure Mon			T38	WAFL		
BK BR	T14		Misc					T39			
BK S	T15							T40			
Y BL	T16		WAFL			Pressure Mon		T41	WAFL		
Y O	T17							T42			
Y G	T18							T43			
Y BR	T19						Pressure Mon	T44			WAFL
Y S	T20							T45			
V BL	T21			Pressure Mon				T46			
V O	T22							T47			
V G	T23			Misc				T48			
V BR	T24			WAFL				T49			
V S	T25							T50			

C. Screened ICOT Cables (MCM and MLM)

4.25 Core lay-ups of MCM and MLM cables all feature:

(a) A bisecting, insulated aluminum screen with edges extending around the core.

(b) An extra unit of service pairs. The number of service pairs is: two fault locate pairs for each 50 cable pairs plus two extra pairs per cable for all cables of 400 pairs and less, and one fault locate pair for each 50 cable pairs plus four extra pairs for cables of 600 pairs and larger. The service pairs are assembled in one unit with a W-R binder and located on the low pair count side of the screen. The service pairs should ***not*** be used as spares to replace defective digital pairs.

Note: The service pairs are included in the cable pair count.

4.26 The ICOT cables (24 gauge, low capacitance) are for use in the suburban, intercity, and outstate trunk plant.

4.27 ***Core Lay-ups:*** The sequence of counting the 25-pair color groups of pairs is indicated by unit binders with the same color sequence as the pairs (blue-white, orange-white, green-white, etc). Figure 13 shows the lay-ups of air core and waterproof ICOT cables in pair sizes 54 through 314 pairs. These sizes of cables are made up of 12-, 13-, and 25-pair units plus the W-R service pair unit. Figure 14 shows the lay-ups of air core and waterproof ICOT cables in pair sizes 418 through 922 pairs. These sizes of cables are made up of 50- or 100-pair multiunits for 418- and 616-pair cable and 75-pair multiunits for 922-pair cable. Each unit has the standard PIC color code for pair identification.

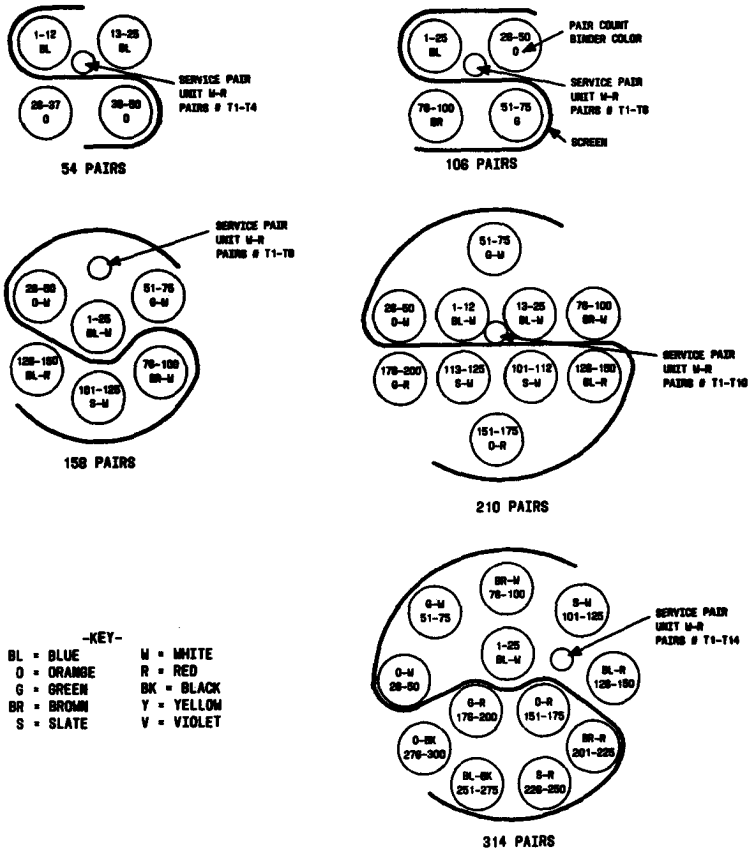


Fig. 13—54- Through 314-Pair ICOT Cable Lay-Ups (MCM and MLM)

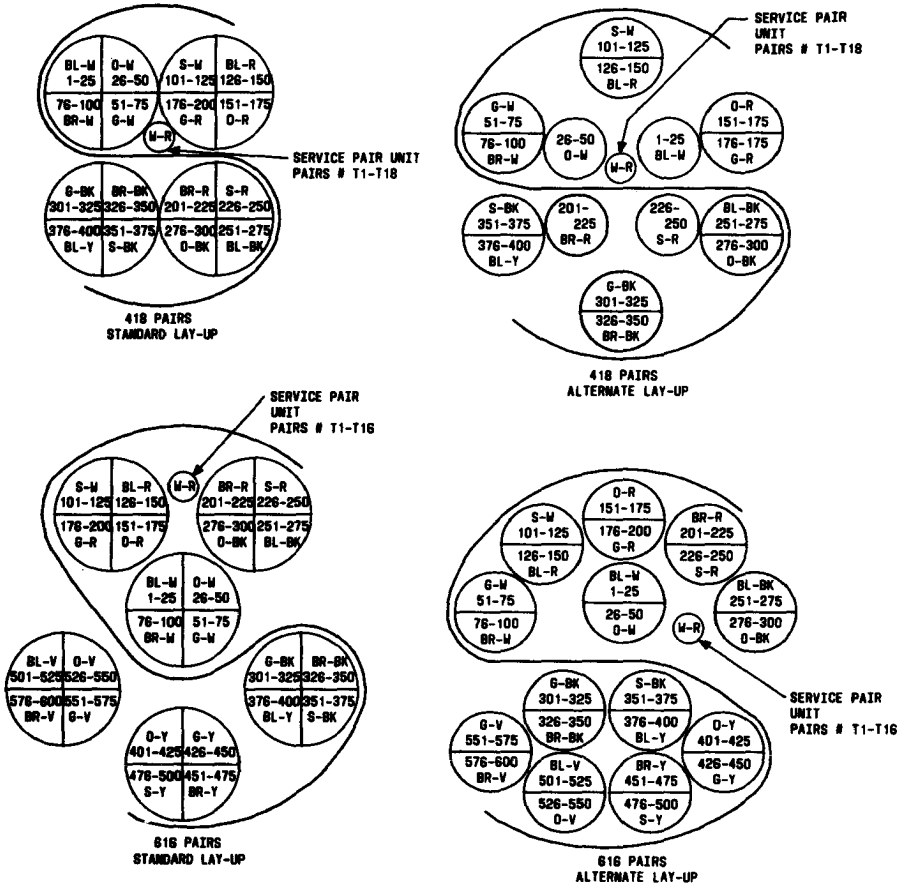


Fig. 14—418- Through 922-Pair ICOT Cable Lay-Ups (MCM and MLM) (Sheet 1)

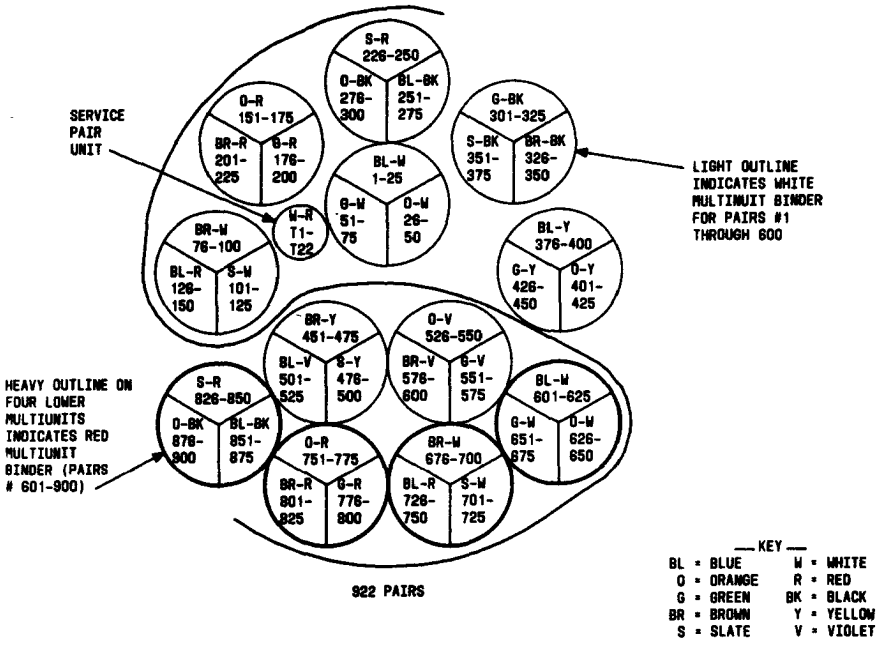


Fig. 14—418- Through 922-Pair ICOT Cable Lay-Ups (MCM and MLM) (Sheet 2)

4.28 ***Multiunit Lay-Ups:***

(a) ***50-Pair Multiunit***—These multiunits have white binders and consist of four units with 12, 13, 12, and 13 pairs. The first two units have blue binders and constitute a 25-pair group. The second two units have orange binders and constitute a 25-pair group.

(b) ***75-Pair Multiunit***—These multiunits (922-pair cable only) have white binders for pairs through 600. The remaining multiunits have red binders. The unit binders have the standard PIC color-code sequence.

4.29 ***Treatment of Screen at Splices:*** Prepare the screen in the manner described for air core and waterproof screened cables in paragraphs 4.01 through 4.16.

4.30 ***Straight Field Splices:***

(1) Use the guidelines in Parts 1 and 2.

(2) Prepare the sheath per the 632-316 layer of the Bell System Practices.

(3) Use the procedures for splicing PIC color-coded pairs and units per Section 632-410-200.

4.31 ***Office End Splices:*** The work print will indicate the pair count in the PIC color-coded plastic-insulated tip cables and in ICOT cable. Before splicing make certain the PIC pair sequence in the carrier cable agrees with the pair number sequence in the tip cable.

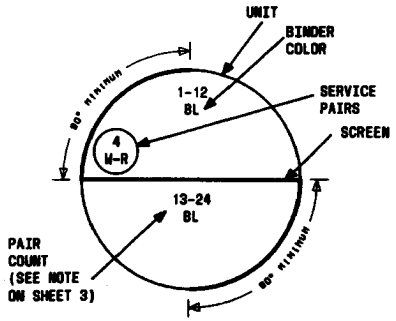
D. Screened Air Core PIC Cables (KHA)

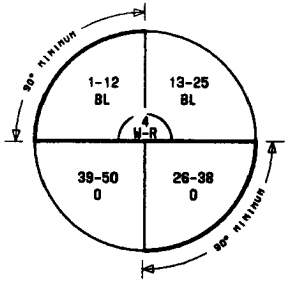
4.32 Core lay-ups of KHA (22-gauge copper) are shown in Fig. 15. Features are:

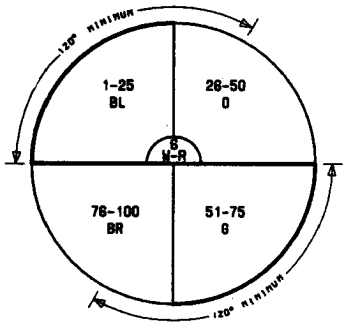
(1) Plastic Insulated Pairs—KHA has polyethylene insulation.

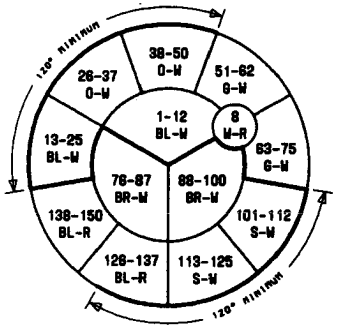
(2) Standard PIC color-coded pairs, units, and binders.

(3) A bisecting insulated screen which traverses the core symmetrically.









ALTERNATE LAY-UPS

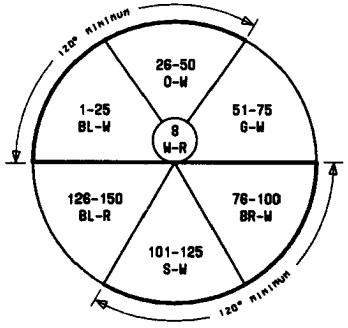
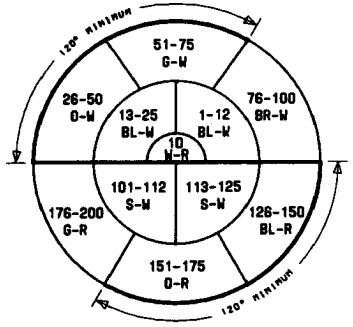
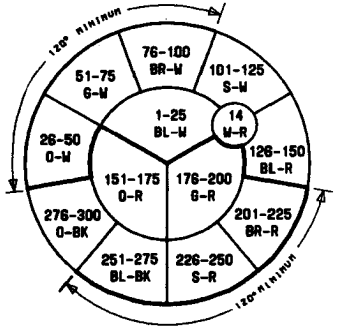


Fig. 15—Screened Air Core PIC Cables (KHA)—Core Lay-Ups (Sheet 1)





ALTERNATE LAY-UPS

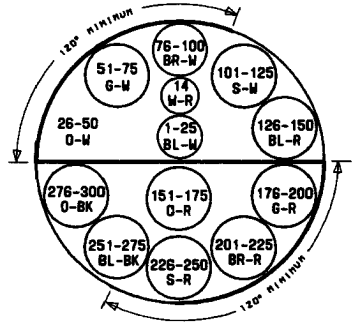
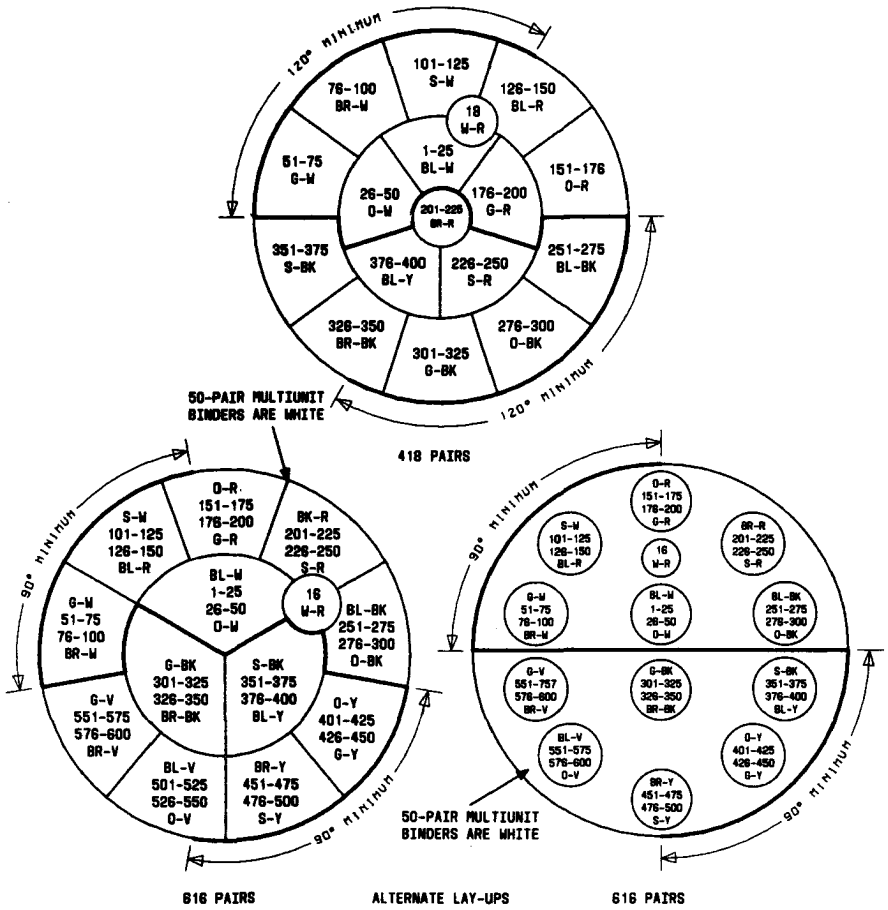


Fig. 15—Screened Air Core PIC Cables (KHA)—Core Lay-Ups (Sheet 2)



NOTE: CLOCKWISE PAIR COUNTING SEQUENCE IS SHOWN IN ILLUSTRATIONS.

-KEY-

BL = BLUE	W = WHITE
O = ORANGE	R = RED
G = GREEN	BK = BLACK
BR = BROWN	Y = YELLOW
S = SLATE	V = VIOLET

Fig. 15—Screened Air Core PIC Cables (KHA)—Core Lay-Ups (Sheet 3)

4.33 ***Treatment of Screen at Splices:*** Prepare the screen in the manner described for air core screened cables in paragraph 4.01 through 4.06.

4.34 ***Straight Field Splices:***

(1) Use the guidelines in Parts 1 and 2.

(2) Prepare the sheath per 632-316 layer of Bell System Practices.

(3) Use the procedures for splicing PIC color-coded pairs and units per Section 632-410-200.

4.35 ***Office End Splices:*** The work print will indicate the pair count in the PIC color-coded plastic-insulated tip cables and in KHA carrier cable. Before splicing, make certain that the PIC pair sequence in the carrier cables agrees with the pair number sequence in the tip cable.

E. Screened Waterproof PIC Cables (KJA and KLA)

4.36 Core lay-ups of KJA and KLA cable (22-gauge copper) are shown in Fig. 16. Features are:

(1) Plastic Insulated Pairs—KJ series cables have PIC. KL series cables have DEPIC.

(2) Standard PIC color-coded pairs, units, and binders.

(3) Filling compound through the core.

(4) A bisecting insulated screen which traverses the core symmetrically.

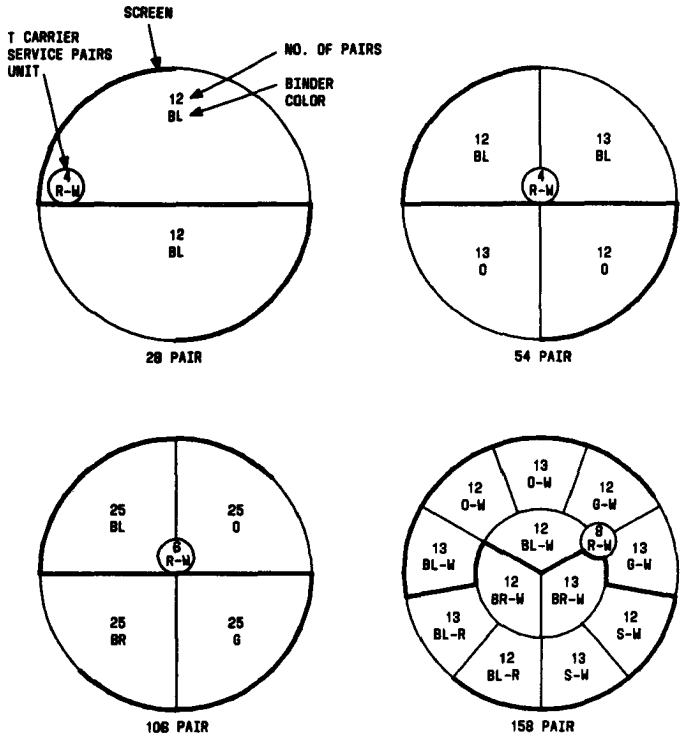
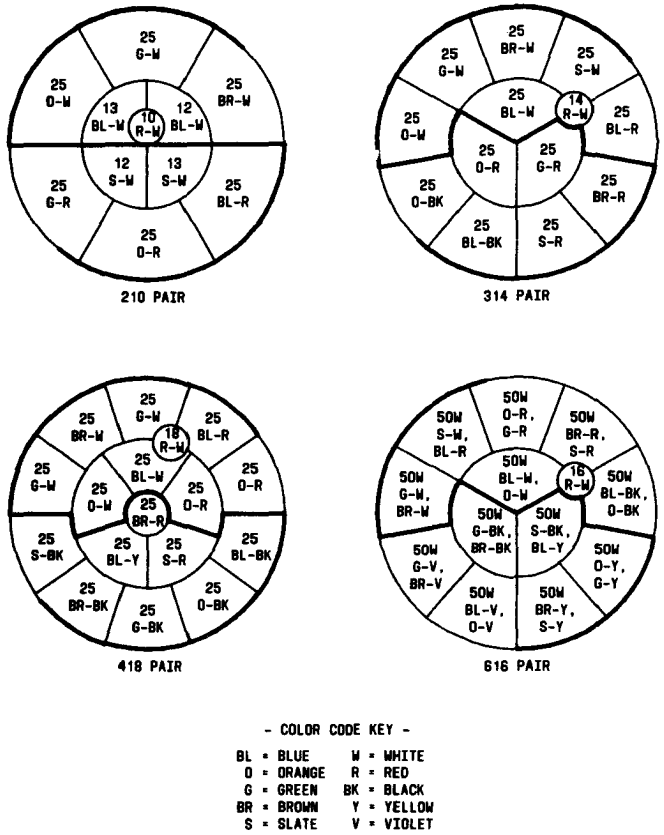


Fig. 16—Screened Waterproof PIC Cables (KJA and KLA)—Core Lay-Ups (Sheet 1)



- COLOR CODE KEY -

BL	= BLUE	W	= WHITE
O	= ORANGE	R	= RED
G	= GREEN	BK	= BLACK
BR	= BROWN	Y	= YELLOW
S	= SLATE	V	= VIOLET

Fig. 16—Screened Waterproof PIC Cables (KJA and KLA)—Core Lay-Ups (Sheet 2)

4.37 ***Treatment of Screen at Splices:*** After removing the sheath and preparing the butts for the type of closure to be used, prepare the screen in the manner described in paragraphs 4.07 through 4.15.

4.38 ***Splicing Methods:*** Both in-line and foldback methods of splicing may be used. However, the in-line method is recommended because it conserves space within the closure and is easier to fill. The methods for restoration of the screen and filling the two sides of the cable consume more of the space inside of the closure than nonscreened waterproof cables of the same size. Therefore, when selecting a 16-type closure for a particular size cable per Section 633-500-104, use

the next larger closure. (Use 2D2 closure on larger size cables.) All wire joints must be spliced using 700, 701, or 710 connectors.

4.39 ***Terminating Screened Cable at Main Frame Location:*** Screened waterproof PIC cable is spliced to the main frame tip cable in the same manner as nonscreened waterproof cable.

(1) Use guidelines in Parts 1 and 2.

(2) Prepare sheath per 632-316 layer of the Bell System Practices.

(3) Trim and fold back the screen as covered in paragraph 4.02.

(4) Use the procedures for splicing PIC color-coded pairs and units per Section 632-410-200.

F. Nonscreened Air Core Cables (BHA and CDA)

4.40 ***Straight Field Splices:***

(1) Use guidelines in Parts 1 and 2.

(2) Prepare the sheath per 632-316 layer of the Bell System Practices.

(3) For PIC cable, use procedures per Section 632-410-200. For pulp, use procedures per Section 632-032-201.

4.41 ***Office End Splices:*** The work print will indicate the pair count in the PIC color-coded tip cables and in the carrier cables. Before splicing make certain that the pair count sequence in the carrier cables agrees with the pair number sequence in the tip cables.

5. SPLICING CABLES FOR T2 (LOCAP) CARRIER

A. General

5.01 Cable ***assigned to two-cable operation*** is used only for ***T2 carrier*** transmission. The two directions (east-west and west-east) of transmission must be in separate cable sheaths. Any ***LOCAP cable pairs*** not used for T2 systems or their associated maintenance circuit ***will not be used for any other purpose.*** At straight field splices, these unused pairs are spliced through. The maintenance circuits are used for fault locating, order wire, telemetry, and gas pressure monitoring. The only pairs that must maintain the tip and ring identity throughout the length of the cable are the fault locating pairs.

B. LOCAP Cable Description

5.02 Waterproof (LLAW) and air core (LCAT) LOCAP cables consist of mated 22-gauge copper conductors insulated with DEPIC. Mated pairs do not have the tip-ring color identification. Both conductors of a pair have the same color of insulation. Tip-ring identification is not required for the T2 digital line; however, tip-ring identification is required for the service pairs. The service pairs have the standard PIC color coding.

5.03 The core makeups and pair identification of LLAW and LCAT cables are the same. Figure 17 shows the waterproof and air core cable makeups.

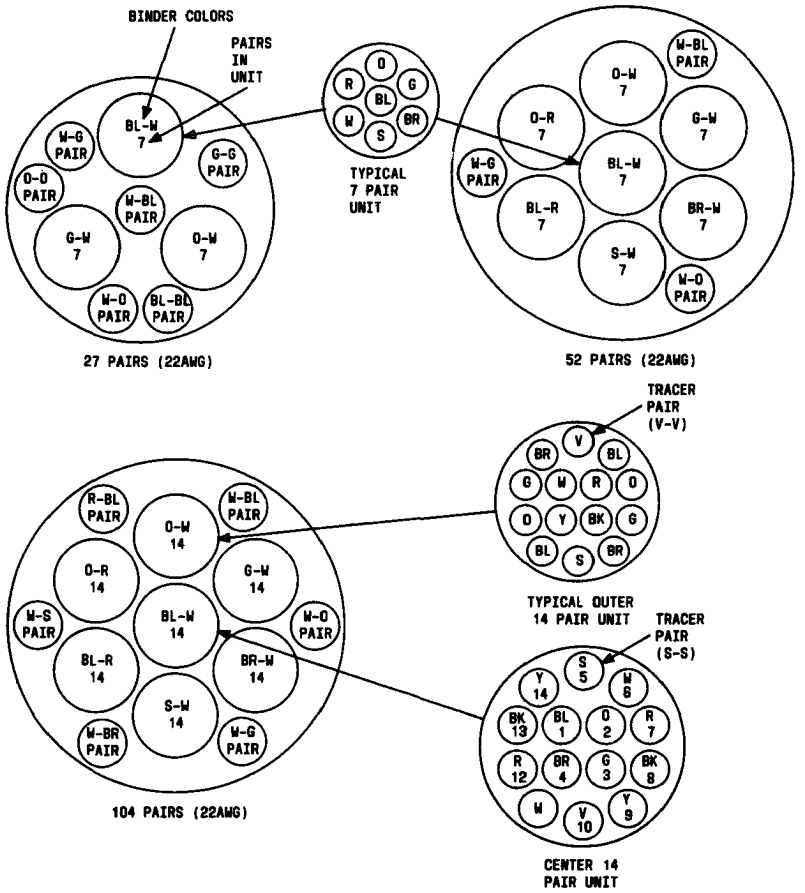
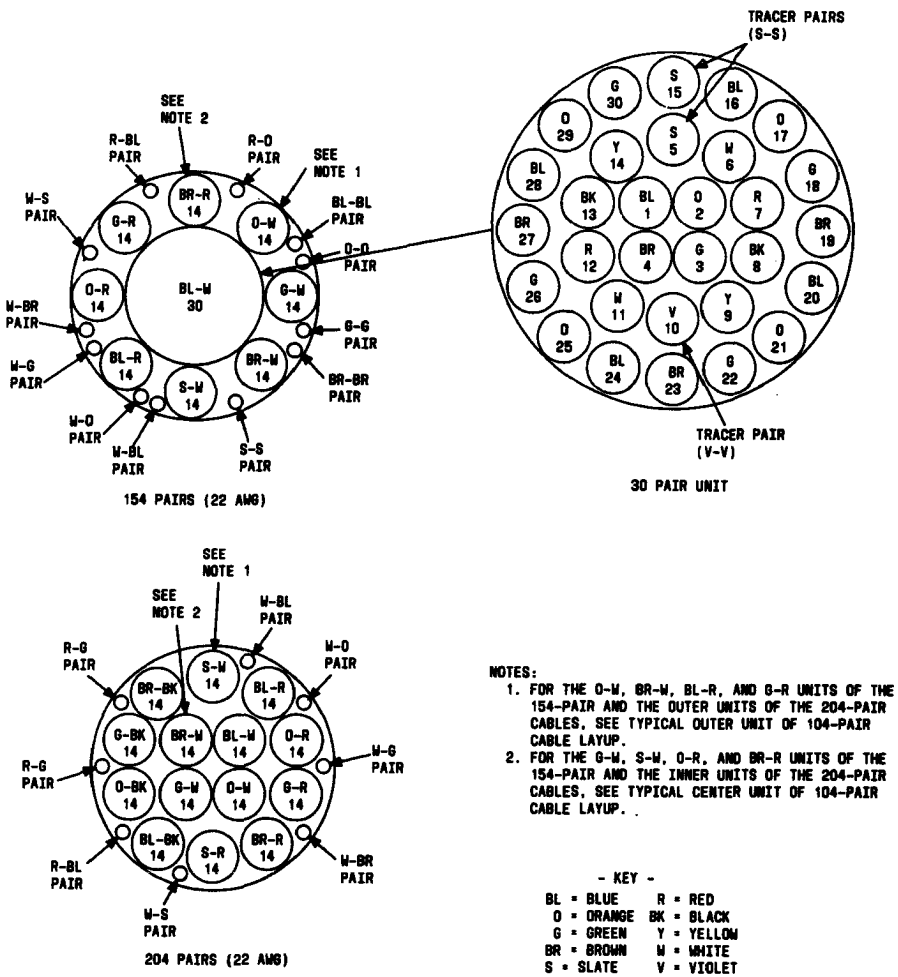


Fig. 17—LOCAP Cables (LLAW and LCAT)—Core Lay-Ups (Sheet 1)



NOTES:
1. FOR THE O-W, BR-W, BL-R, AND G-R UNITS OF THE 154-PAIR AND THE OUTER UNITS OF THE 204-PAIR CABLES, SEE TYPICAL OUTER UNIT OF 104-PAIR CABLE LAYUP.
2. FOR THE G-W, S-W, O-R, AND BR-R UNITS OF THE 154-PAIR AND THE INNER UNITS OF THE 204-PAIR CABLES, SEE TYPICAL CENTER UNIT OF 104-PAIR CABLE LAYUP.

- KEY -

BL = BLUE	R = RED
O = ORANGE	BK = BLACK
G = GREEN	Y = YELLOW
BR = BROWN	W = WHITE
S = SLATE	V = VIOLET

Fig. 17—LOCAP Cables (LLAW and LCAT)—Core Lay-Ups (Sheet 2)

5.04 ***27- and 52-Pair Core Makeups:*** The color coding of the matched pairs and the color-coded unit binders enable each pair in a cable to be readily identified as to pair number. The 27- and 52-pair cables are constructed with seven-pair units made with color-coded mated pairs using the five standard ring colors (blue, orange, green, brown, and slate) and the first two tip colors (white and red). All seven-pair units have the same color-code. Each seven-pair unit is successively identified with color-coded binders (bl-w, o-w, etc). To provide mated pairs for 24 T2 digital systems, the 27-pair cables have 3 additional mated pairs in the outer interstices between the units. In addition, both the 27- and 52-pair cables have three color-coded auxiliary pairs (bl-w, o-w, and g-w) in the interstices.

5.05 ***104-Pair Core Makeup:*** The 104-pair cables are constructed with 14-pair units made with color-coded mated pairs. Since there are only a total of ten standard tip and ring colors, four pair colors are repeated once in the outer layer of each 14-pair unit. The like-colored pairs in each unit are distinguished from each other with the use of a tracer pair (slate or violet). In addition, the 14-pair units have two different color codings (one for the center unit and one for the outer units). For the center unit, the pair sequence can easily be remembered by noting that the first ten pairs are in standard order, starting with the ring colors. The last four pairs are the first four tip colors repeated. In the outer units the sequence of the tip and ring colors are reversed (ie, the first ten pairs are in standard order starting with the tip colors). The last four pairs are the first four ring colors repeated. Each 14-pair unit is successively identified with color-coded binders. In addition, the 104-pair cables have six color-coded auxiliary pairs located in the outer interstices.

5.06 ***154-Pair Core Makeup:*** The 154-pair cables are constructed with one 30-pair center unit, eight 14-pair outer units, and 12 color-coded auxiliary pairs. The binder and pair colors are similar to the 14-pair outer units of the 104-pair cable. The 30-pair center unit is similar to the 14-pair units except that an additional layer of 16 pairs is used to complete the 30-pair count.

5.07 ***204-Pair Core Makeup:*** The 204-pair cables are constructed with four 14-pair center units, ten 14-pair outer units, and 8 color-coded auxiliary pairs. The 14-pair center and outer units are similar to the center and outer units of the 104-pair cable.

C. Splicing Mated Pair LOCAP Air Core and Waterproof Cables

5.08 ***Straight Splices:***

(1) Use the guidelines in Parts 1 and 2.

(2) Prepare the sheath per 632-316 layer of Bell System Practices.

(3) After the sheath and core wrap have been removed, wrap the individual units and subgroups for pair identification purposes as shown in Fig. 18. The example in the illustration is applicable for the 14-pair units in the 104-, 154-, and 204-pair cables and the 14 pairs in the center of the 30-pair unit of the 154-pair cable. The outer 16 pairs of the 30-pair unit should be separated into subgroups and taped for identification also.

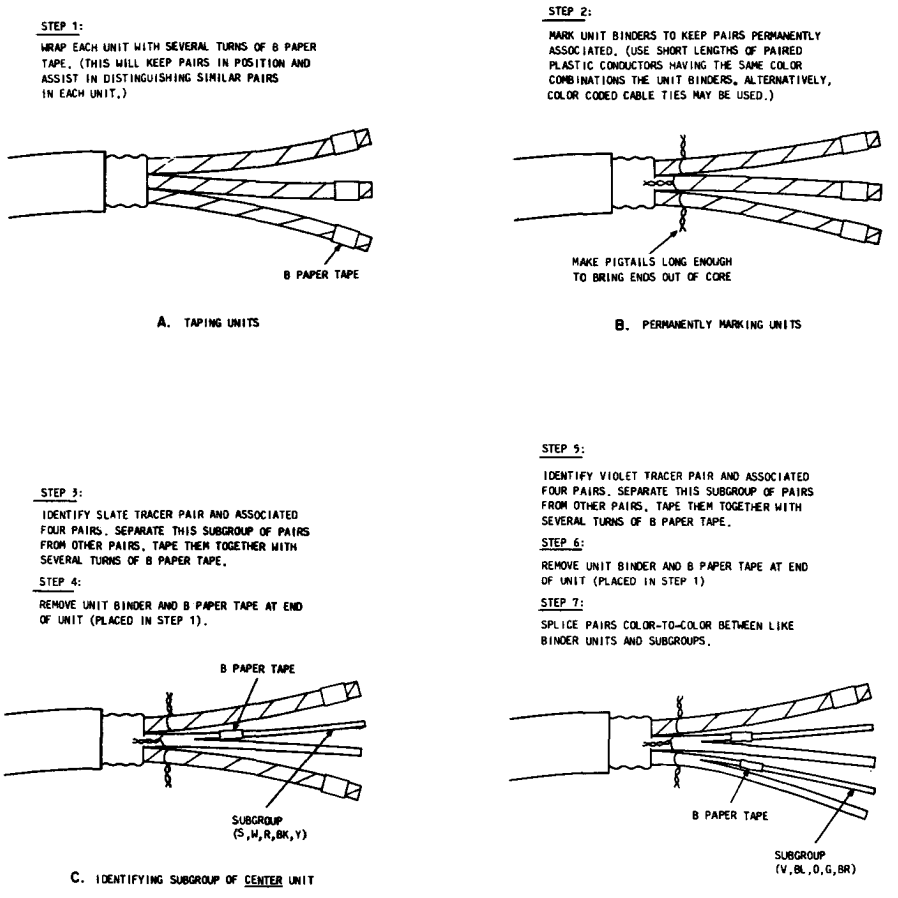


Fig. 18—Separating Units Into Subgroups—LOCAP Cable

5.09 When splicing ***27- and 52-pair cables,*** match unit binder colors to like unit binder colors. Join mated pairs with like pair color(s). Tip and ring identities are not necessary except on auxiliary pairs which have different tip and ring insulation colors. In the 52-pair cable, eg, match the unit binder colors in accordance with the PIC binder color code, match and splice like-colored pairs in each unit. Maintain pair identity by establishing subgroups and splicing color-to-color between like unit binders and subgroups. The interstitial pairs are usually used for fault locating, order wire, and gas pressure monitoring. At least three interstitial pais have different colors for tip and ring conductors. For these pairs, tip-ring identity must be maintained.

5.10 When splicing ***104-pair cables,*** match unit binder colors to like unit binder colors. Join mated pairs with like pair color(s). Tip and ring identities are not necessary except on auxiliary pairs that have different tip and ring insulation colors. Pairs in the center unit have a different color code than pairs in the outer units. The lowest numbered pair in each of the units is in the center of the unit. Pair numbering sequence and color codes are shown in Fig. 19.

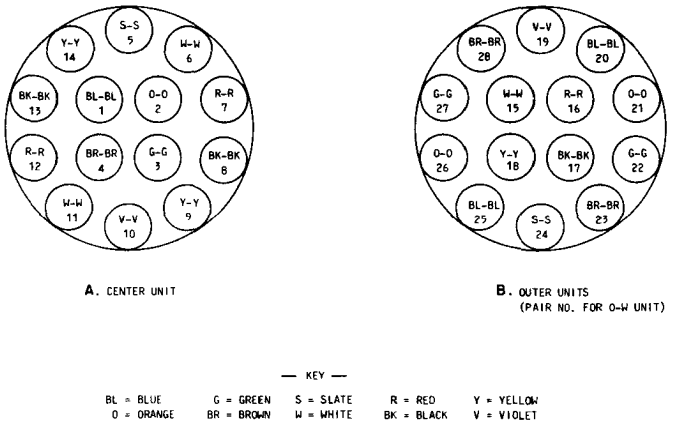


Fig. 19—Unit Pair Count and Color Sequence in 104-Pair LOCAP Cable

5.11 When splicing ***154-pair cables,*** match unit binder colors to like unit binder colors. The 14-pair outer units have pair color codes the same as the outer units of the 104-pair cables and are treated in the same manner when splicing. The 30-pair unit requires careful attention to maintain pair-count continuity. The 14 pairs in the center of the 30-pair unit are color-coded the same as the center unit in a 104-pair cable. The 16 outer pairs include the ***S*** tracer pair and then ***B, O, G, BR, B, O, G, BR,*** etc, to complete the 16 pairs. Tip and ring identities are not necessary except on auxiliary pairs that have different tip and ring insulation colors.

5.12 When splicing ***204-pair cables,*** match unit binder colors to like unit binder colors. Join mated pairs with like pair colors. Tip and ring identities are not necessary except on auxiliary pairs that have different tip and ring insulation colors. Pairs in the center units have a different color code than pairs in the outer units and are the same as the units in the 104-pair cables, with the lowest numbered pairs being in the center of the unit.

5.13 ***Splicing LOCAP Carrier Cables to 136A2A-52 Protectors in Cable Entrance Facilities:*** At these locations, LOCAP

carrier cables are spliced to stub cables which are provided with 136A2A-52 protectors. The pairs in the LOCAP cable are divided into three categories: T2-quality pairs which are used for ***T2 lines, spares,*** (except in 27-pair cable which has no spare pair), and ***auxiliary pairs*** for DC and VF applications. The following splicing format is based on grouping the spare pairs with their 48-pair line complement, and placing the three auxiliary pairs per line complement on the last three positions of the protector serving that complement. (The 46-pair complements with spares and auxiliaries will fill the protector while 24 pairs plus three auxiliaries only partially fill the protector.)

- ***For 27-Pair Cable:*** Splice pairs 1 through 24 to protector positions 1 through 24. Splice pairs 25 through 27 to protector positions 50 through 52.

- ***For 52-Pair Cable:*** Splice one-for-one.

- ***For 104-Pair Cable:*** Splice pairs 1 through 48 to protector positions 1 through 48 of the ***first protector.*** Splice pair 97 (ie, first spare pair) to first protector position 49. Splice pairs 99 through 101 (ie, first complement of auxiliary pairs) to first protector positions 50 through 52. Similarly, splice pairs 49 through 96 to protector positions 1 through 48 of the ***second protector.*** Splice pair 98 to protector position 49. Splice pairs 102 through 104 to protector positions 50 through 52.

- ***For 154-Pair Cable:*** Splice cable pairs to protector positions in accordance with the following list:

Protector No. 1

Ca Pr	Position
1-48	1-48
145	49
148-150	50-52

Protector No. 2

49-96	1-48
146	49
151-153	50-52

Protector No. 3

97-144	1-48
147	49
154	50
	51, 52 vacant

- ***For 204-Pair Cable:*** Splice cable pairs to protector positions in accordance with the following list:

Protector No. 1

Ca Pr	Position
1-48	1-48
193	49
197-198	50-52

Protector No. 2

49-96	1-48
194	49
200-202	50-52

Protector No. 3

97-144	1-48
195	49
203	50
	51, 52 vacant

Protector No. 4

145-192	1-48
196	49
204	50
	51,52 vacant