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The Pacific Telephone and Telegraph Company
Southern California Area

BELL SYSTEM PRACTICES
Outside Plant Construction
and Maintenance

SECTION G31.141.1-S
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OPEN WIRE

R1 TRANSPOSED LINES

GENERAL

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1. GENERAL

1.01 This section describes the general construction features of the R1 Transposition System, as applied to exchange open wire lines.

1.02 All exchange wire placed shall be transposed in accordance with the R1 Transposition System, except as indicated below:

(a) Exchange wire placed on brackets on branch service leads of not more than 1/4 mile in length and located on private property or along private driveways or lanes need not be transposed.

NOTE: The term, "branch service lead" as used in the above, means the portion of the line between the main lead and the customers building. It does not include branch lines located on public roads or highways since such lines may be extended in the future.

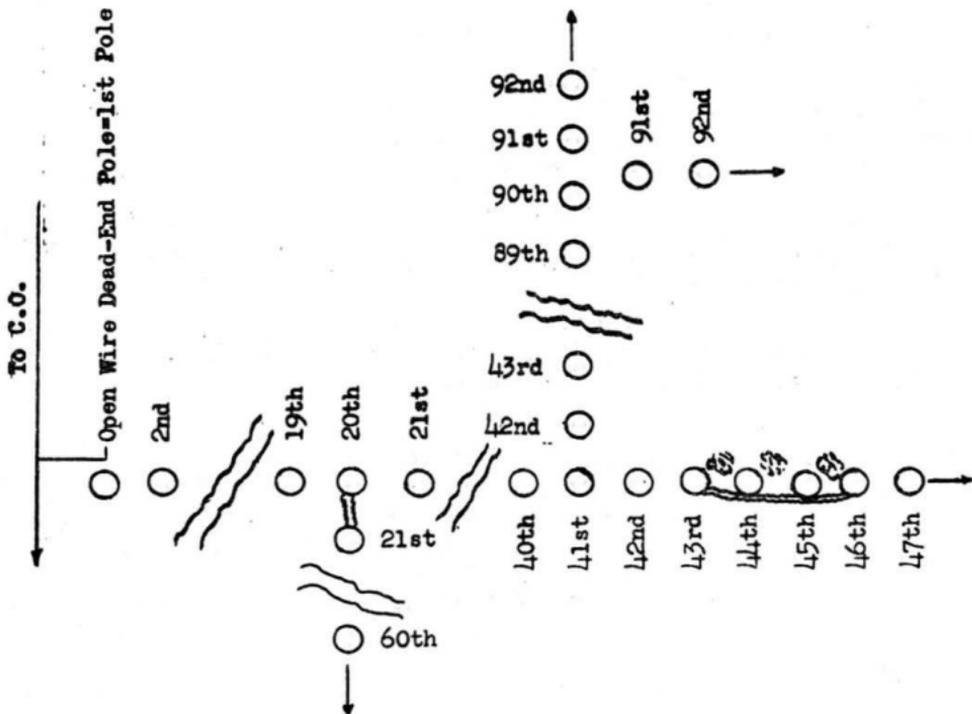
(b) Where exchange wire is placed on toll leads that are carrier transposed, consult your supervisor for detail instructions.

(c) Where exchange wire is placed on a foreign company's pole line carrying communication circuits (Forest Service, Oil Companies, etc.), some modification of the R1 Transposition System may be required. In this case, consult your supervisor for detail instructions.

1.03 Where Tree Wire is placed in lieu of open wire, transpositions shall be placed as required for open wire.

1.04 Where Drop Wire or Bridle Wire is placed in an open wire circuit, the R1 Transposition System shall be disregarded on poles or in the span(s) where this covered wire is placed.

1.05 In this area the exchange pole lines are not necessarily numbered consecutively. Therefore, in order to determine the pole number to apply to the R1 Transposition System, the poles shall be counted starting with the open wire deadend pole nearest the terminal pole as illustrated below.



2. DESCRIPTION OF PRINCIPAL FEATURES OF R1 TRANSPOSITION SYSTEM AS APPLYING TO CROSSARM LINES

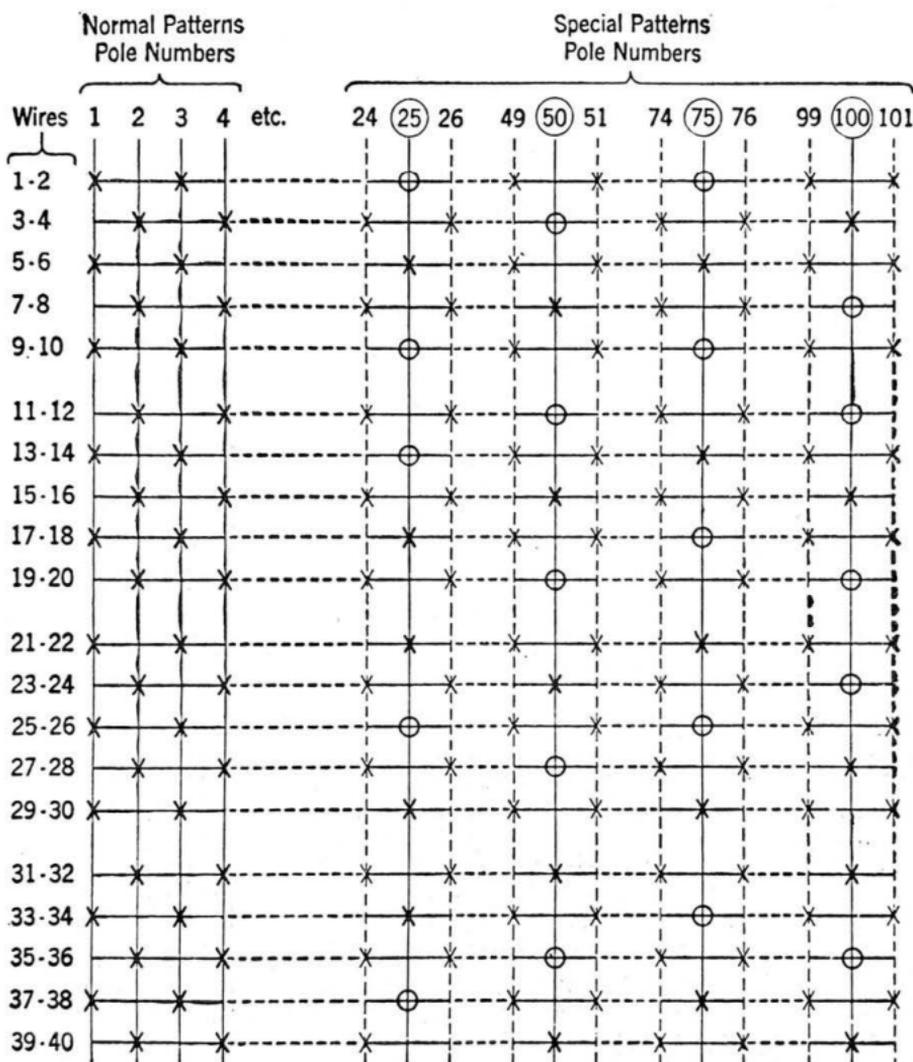
2.01 In the R1 Transposition System, a pair of wires is generally transposed at every other pole. Likewise, alternate pairs on the same pole will be transposed. Thus, if a particular pair on a crossarm, say on pins 13-14, is not transposed, the adjacent pairs on either side and the adjacent pairs immediately above and below will be transposed at that pole. This arrangement results in half of the total pairs in a line being transposed at odd-numbered poles and the other half at even-numbered poles in any line having consecutively numbered poles. The exception to this general rule occur at special points ("25"poles, etc.) as shown in the diagrams in Paragraph 2.02, and described in Paragraph 2.03.

2.02 The following diagram illustrates the arrangement of the transpositions on a line supporting:

(a) Four or less crossarms carrying 10 or less wires on each crossarm.

R1 TRANSPOSITION DESIGN

Arrangement of Transpositions *



* This design can be used on 2-4-6-8 or 10-pin crossarm.

○ Indicates transposition omitted.

When pole No.1 is a deadend pole, the transpositions at that pole shall be omitted.

R1 TRANSPOSITION DESIGN

Arrangement of Transpositions

		Normal Patterns Pole Numbers				Special Patterns Pole Numbers			
		1	2	3	4 etc.	24(25)26	49(50)51	74(75)76	99(100)101
1st Arm	1-2	*	*	*		○	*	*	*
	3-4	*	*	*		*	○	*	*
	5-6	*	*	*		*	*	*	*
	7-8	*	*	*		*	*	*	*
	9-10	*	*	*		○	*	*	*
2nd Arm	11-12	*	*	*		*	*	*	*
	13-14	*	*	*		*	*	○	*
	15-16	*	*	*		*	*	*	○
	1-2	*	*	*		*	*	*	*
	3-4	*	*	*		○	*	*	*
3rd Arm	5-6	*	*	*		*	*	*	*
	7-8	*	*	*		*	*	○	*
	9-10	*	*	*		*	*	*	○
	11-12	*	*	*		*	*	*	*
	13-14	*	*	*		*	*	*	○
4th Arm	15-16	*	*	*		*	*	*	*
	1-2	*	*	*		*	*	*	*
	3-4	*	*	*		*	*	○	*
	5-6	*	*	*		*	○	*	*
	7-8	*	*	*		*	*	*	*
	9-10	*	*	*		*	*	*	*
	11-12	*	*	*		*	*	*	*
	13-14	*	*	*		*	*	*	○
	15-16	*	*	*		*	*	○	*

- × Indicates transposition.
- Indicates transposition omitted.

When pole No. 1 is a deadend pole, the transposition at that pole shall be omitted.

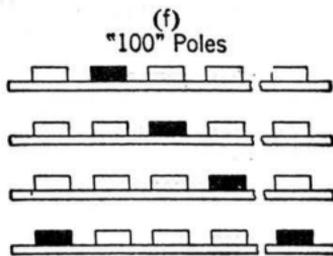
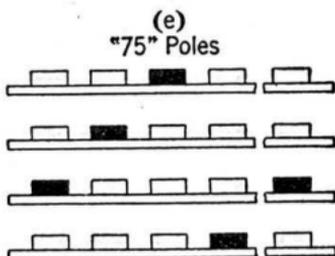
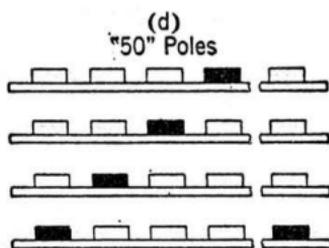
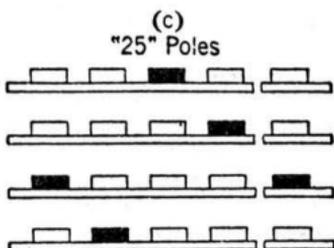
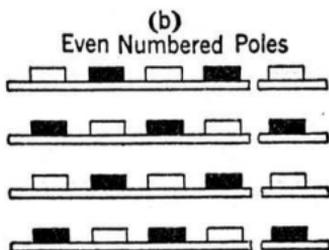
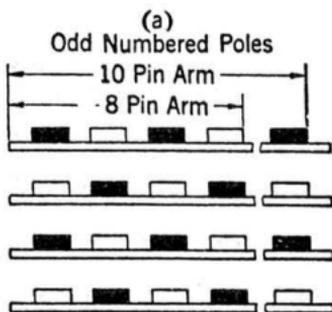
NOTE: When 16-pin crossarms are used on the same poles with 10-pin or smaller crossarms with circuits transposed to the R1 system, omit all transpositions on the 16-pin arms at poles 12 and 13, 37 and 38, 62 and 63, 87 and 88, 112 and 113, 137 and 138, etc..

2.03 It will be noticed in the diagrams in Paragraph 2.02 (a) and (b) that the transpositions on the odd-numbered poles repeat themselves on all the odd-numbered poles and those on the even-numbered poles repeat themselves on all the even-numbered poles, except on those poles numbered 25, 50, 75, 100, etc. As indicated in the diagram, the transpositions on the latter poles are arranged differently in order to provide additional crosstalk control in the telephone circuits. The arrangement shown for "25" poles repeats itself on poles numbered 125, 225, 325, etc. Correspondingly, the arrangements at "50", "75" and "100" poles are repeated similarly.

2.04 The following diagrams of pole head patterns show the locations at which transpositions in wires supported on crossarms occur under various conditions. These diagrams indicate the locations as they appear when looking along the line in the direction of increasing pole numbers. They furnish the same information expressed in a different manner, that is contained in the diagrams in Paragraph 2.02.

(a) 10-pin or smaller crossarms.

**R1 TRANSPOSITION SYSTEM
POLE HEAD TRANSPOSITION BRACKET PATTERNS
FOR LINES EQUIPPED WITH CROSSARMS**



■ Indicates presence of transposition

□ Indicates absence of transposition

NOTE: All patterns are as viewed with back toward central office or cable pole. For lines equipped with 2, 4 or 6-pin crossarms, the patterns for the appropriate number of pairs should be selected from the left hand side of the above pole heads in the same manner as the 8-pin design has been obtained from the 10-pin arrangement.

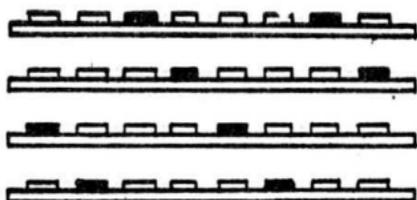
(b) 16-pin crossarms.

R1 TRANSPOSITION SYSTEM
 POLE HEAD TRANSPOSITION BRACKET PATTERNS
 FOR LINES EQUIPPED WITH 16-PIN CROSSARMS

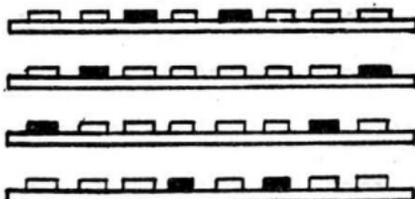
6(a)
 ODD NUMBERED POLES



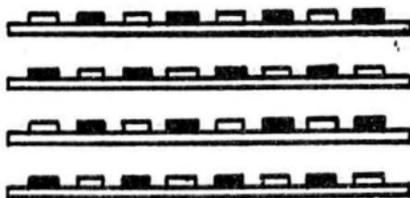
6(c)
 "25" POLES



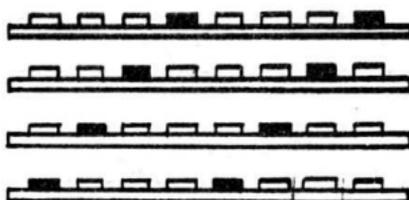
6(e)
 "75" POLES



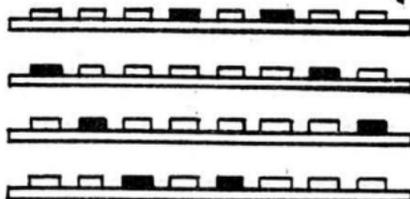
6(b)
 EVEN NUMBERED POLES



6(d)
 "50" POLES



6(f)
 "100" POLES



■ Indicates presence of transposition.

□ Indicates absence of transposition.

NOTE: All patterns are as viewed with back toward central office or cable pole. When 16-pin crossarms are used on the same poles with 10-pin or smaller crossarms with circuits transposed to the R1 system, omit all transpositions on the 16-pin arms at poles 12 and 13, 37 and 38, 62 and 62, 87 and 88, 112 and 113, 137 and 138, etc..

2.05 The pole head patterns in Paragraph 2.04 (a) illustrate in detail the conditions where the crossarms will ultimately carry 8 or 10 wires. In the case of crossarms which will carry an ultimate load of 6 or less wires, follow the recommendations contained in the note under the diagram in Paragraph 2.04 (a).

2.06 Where, because of line changes or other reasons, the poles in an existing line are not numbered consecutively and the wires on that line are to be transposed to the R1 design, proceed as follows:

(a) Disregard the association between odd or even pole numbers and the arrangement of transpositions shown in the diagrams.

(b) Continue with the plan of locating transpositions in a given pair on alternate poles and staggering them on adjacent pairs on the same pole as shown in the above diagrams until a total of 24 or approximately 24 poles are involved in the section.

(c) If more than 25 poles are involved in the line and the original consecutive numbering of the poles has been disturbed, due to the addition or removal of poles at one or more points, and the association between odd or even numbered poles and transposition arrangements has been lost, it is desirable to introduce a pole having the transposition arrangements for a "25" pole at a convenient point, approximately the 25th pole in the line. The pole preceding the "25" pole should, of course, have the arrangements applying to an even-numbered pole. Beyond the "25" pole, the arrangements should be according to the plan, insofar as practicable.

2.07 Where, because of line changes, poles are added to or removed from an existing section of line which has been transposed to the R1 design, treat the wires on the poles directly involved in the change as follows.

NOTE: If an odd number of transpositions are added or removed in a given pair due to changes in the line as outlined below, the polarity of the stations beyond this point will be reversed and must be corrected.

(a) If only one pole is added to the line at the point where the line change occurs, omit transpositions on that pole and leave the transpositions on adjacent poles as they are.

(b) If only one pole is removed from the line (not shifted) at the point where the line change occurs, cut out the existing transpositions on one of the adjacent poles and leave the remainder of transpositions as they are.

(c) If a pole is merely shifted in location, retain the existing transpositions.

(d) If an even number of poles is involved in the rearrangements at a given location, apply the R1 design to these poles and leave all existing transpositions on other poles as they are.

(e) If an odd number of poles is involved in the rearrangements at a given location, apply the R1 design to all of these poles, except the last pole. At the last pole, omit all transpositions and leave existing transpositions on poles not involved in the rearrangements as they are.

2.08 Where additional wire is being placed on lines with established R1 transposition scheme and due to line changes (as covered in Paragraph 2.07) poles have been added or removed, the transpositions in the wire being placed should be in accordance with the existing scheme. That is, if the transpositions have been omitted in the wire on a pole due to line changes, the transpositions should also be omitted in additional wire placed on that pole.

3. FEATURES APPLYING PARTICULARLY TO BRACKET LINES

3.01 The following diagrams show the locations at which the transpositions will be made for both odd-numbered and even-numbered poles in a bracket line:

RI TRANSPOSITION SYSTEM Pole Head Transposition Bracket-Patterns for Bracket Lines

