

PRIVATE LINE INTERCONNECTION ARRANGEMENT FOR LINE SIDE OF 10-TYPE DATA LINE CONCENTRATOR INSTALLATION AND CONNECTION

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1. GENERAL

1.01 This section covers the procedures to be followed and connections to be made when installing private line (PL) interconnection arrangements for the line side of the 10-type data line concentrator.

1.02 This section is reissued to:

- (a) Include Addendum 591-811-202, Issue 1.
- (b) Include information pertaining to the AR463, Series 2 circuit pack. The AR463, Series 1

circuit pack has been rated manufacture discontinued (MD).

(c) Remove all references to the acronym DATREX.

(d) Include information related to the use of Data Sets 109D and 109E as the line-side data set.

1.03 These arrangements provide the interface circuitry, receive supervisory circuitry, and data sets for connection of PL voiceband or PL telegraph channels to the 10-type data line concentrator. One such arrangement (Fig. 1) consists of a 28A1 Data Mounting, a line-side data set (Data Set 108A, 109A, 109D, or 109E), an AR463, Series 2 circuit pack, a concentrator-side data set (Data Set 109D or 109E), and a 208A adapter. Some of the early installations may use the AR463, Series 1 circuit pack (Fig. 2). In addition, either or both circuit packs may be used in an installation.

1.04 The 28A1 Data Mounting will mount in 23- or 25-inch racks and is capable of housing and delivering power to three interconnection arrangements when Data Set 108A or 109A is used as the line-side data set, or to four interconnection arrangements when Data Set 109D or 109E is used as the line-side data set. The power is supplied to the 28A1 Data Mounting by a KS-20575-L1 rectifier which is mounted on the mounting or by some other suitable power source.

1.05 Removal and replacement procedures for the circuit packs and the data sets can be found in the section entitled Private Line Interconnection Arrangements for Line Side of 10-Type Data Line Concentrator—Maintenance Procedures (591-811-302).

1.06 A TTS-28 portable station, or equivalent, test set is required for making the data set level adjustments outlined in Part 6 of this section.

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1.07 General data set installation practices as outlined in the section entitled Data Sets—General Installation and Connection Information (590-010-200) should be followed in addition to the steps outlined in this section.



Do not connect power to the equipment until instructed to do so in this section.

2. OPTIONS

AR463-Type Circuit Pack

2.01 At installations where the loop between the concentrator-side data set and the trunk terminating data set consists of *less* than 6 miles of cable, install option Z in the AR463-type circuit pack by closing the Z screw switch.

2.02 At installations where the loop between the concentrator-side data set and the trunk terminating data set is *more* than 6 miles of cable, install option Y in the AR463-type circuit pack by opening the Z screw switch.

Data Sets 109D- and 109E-Type

2.03 The same options are provided in both the Data Sets 109D- and 109E-type. Identical options have been assigned the same option designations in both data sets. They only differ in the method of installation and switch designations.

2.04 The options provided are as follows:

- (a) Current squelch (option Z)
- (b) No current squelch (option Y)
- (c) Space-hold on BB lead (option V)
- (d) Mark-hold on BB lead (option U)
- (e) Space crossover shift (option R)
- (f) Mark crossover shift (option Q)
- (g) No crossover shift (option P)

Concentrator-Side Data Set

2.05 The interconnection arrangements for the line side of the 10-type data line concentrator require the installation of options Z, U, and R in the concentrator-side data set.

2.06 If Data Set 109D-type is to be used, install options Z, U, and R as follows.

- (a) Option Z—Close screw switch S4.
- (b) Option U—Open screw switch S2.
- (c) Option R—Install shorting link between 4 and 5 of S5 and remove shorting link from between 3 and 4 of S5.

2.07 If Data Set 109E is to be used, install options Z, U, and R as follows.

- (a) Option Z—Close screw switch S2.
- (b) Option U—Open screw switch S1A and close screw switch S1B.
- (c) Option R—Open screw switch S3-1 and close screw switch S3-2.

Line-Side Data Set

2.08 The interconnection arrangements for the line side of the 10-type data line concentrator require the installation of options Y, V, and P in the line-side data set.

2.09 If Data Set 109D is to be used, install options Y, V, and P as follows.

- (a) Option Y—Open screw switch S4.
- (b) Option V—Close screw switch S2.
- (c) Option P—Remove shorting links from between 3, 4, and 5 of S5.

2.10 If Data Set 109E is to be used, install options Y, V, and P as follows.

- (a) Option Y—Open screw switch S2.
- (b) Option V—Open screw switch S1B and close screw switch S1A.

- (c) Option P—Open screw switch S3-2 and close screw switch S3-1.

Data Sets 108A- and 109A-Type

- 2.11 There are no options provided in either Data Set 108A- or 109A-type.

3. PREINSTALLATION ADJUSTMENTS

A. Data Set 108A

Desensitizing Pad Strapping

3.01 Verify that the PL facilities have been tested and meet the requirements outlined in the section entitled Private Line Data Circuits—Voice Bandwidth Circuits for Miscellaneous Data—Overall Tests and Requirements (314-410-500). Loop loss testing procedures and requirements for Data Set 108A-type are given in the section entitled Private Line Interconnection Arrangements for Line Side of 10-Type Data Line Concentrator—Test Procedures (591-811-502).

3.02 Screw switch D was closed to provide maximum sensitivity (maximum gain of receive-amplifier stage) during manufacturing tests. The gain of the stage may be reduced in 4-dB steps and should be adjusted to meet the requirements of each individual installation. Table A shows the condition of the screw switches for each gain setting. The screw switches should be set according to the service order or circuit layout record card.

TABLE A
SCREW SWITCH D SETTINGS FOR DESENSITIZING PAD STRAPPING FOR DATA SET 108A

FACILITY LOSSES	DESENSITIZING PAD TO BE USED	SCREW SWITCH D	
		OPEN	CLOSED
0-3 dB	8 dB	1-2, 3-4	
3.1 — 7 dB	4 dB	3-4	1-2
7.1 dB and greater	0 dB	1-2	3-4

Hybrid Network Strapping

3.03 Strapping of the hybrid is determined by the loop impedance of the facility. Table B shows typical loop impedance when the cable makeup is known. Select the proper facility makeup under the TYPICAL FACILITY column. Find the typical loop impedance, and refer to Table C for the strapping required for the trans-hybrid balance. Set screw switch C and strap E-F as indicated in the table.

TABLE B
TYPICAL LOOP IMPEDANCE

TYPICAL FACILITY	LOOP IMPEDANCE
26 NL (HC)	650
24 NL (HC)	500
22 NL (HC)	400
19 NL (HC)	280
16 NL (HC)	200
26 H88 (HC)	1300
24 H88 (HC)	1260
22 H88 (HC)	1250
19 H88 (HC)	1240
16 H88 (HC)	1340

NL — Nonloaded (HC) — High Capacity

B. Data Set 109A

Line Pad Adjustment

3.04 All of the line padding for installations using Data Set 109A as the line-side data set should be inserted in the line at the hub. Therefore, it is only necessary to verify that the proper padding has in fact been inserted at these installations.

C. Data Set 109D or 109E (Concentrator Side)

Line Pad Adjustments

3.05 In order to properly adjust the line pads for Data Set 109D or 109E being installed as the concentrator-side data set, it is necessary to know the resistance of the trunk between

TABLE C
HYBRID NETWORK STRAPPING
FOR DATA SET 108A

LOOP IMPEDANCE	CLOSE SCREW SWITCH C	E-F CONNECTION
1255	2-3	Open
900	2-3	Strapped
850	1-2	Open
750	3-4	Open
575	1-2, 3-4	Open
500	1-2	Strapped
410	3-4	Strapped
220	1-2, 3-4	Strapped

Note: The hybrid network strapping arrangement should be provided on the service order or circuit layout record card.

the concentrator and the trunk-side data set (including any padding that has been inserted in the trunk-side data set), in addition to the resistance of the loop between the concentrator-side data set (Data Set 109D or 109E) and the concentrator. This information should be found on the service order or circuit layout record card. To determine the amount of padding to insert in the data set, add the resistance of the trunk loop (including any padding inserted in the trunk-side data set) to the resistance of the concentrator-side data set loop. The difference between this sum and 1600 ohms is the amount of padding that should be inserted into the concentrator-side data set. When the concentrator-side data set is a Data Set 109D-type or a Data Set 109E-type being used in the HDX mode, the sum of the trunk loop resistance plus the concentrator-side data set loop resistance is allowed to be as high as 2100 ohms. However, the 1600-ohm figure is always to be used when determining the amount of padding to insert in the concentrator-side data set.

3.06 Data Set 109D is provided with a set of shorting links for a series of resistors which may be inserted in each side of the loop. Data Set 109E is provided with screw switches for the same purpose. After determining the amount of padding to be inserted as described in 3.05, locate

the resistance value nearest to but not greater than the padding needed in the PAD RESISTANCE (OHMS) column of Table D for Data Set 109D, or Table E for Data Set 109E. Install the shorting link or open and close the screw switches given for this value in the INSTALL LINKS BETWEEN SCREWS column of Table D (Data Set 109D) or SCREW SWITCH SETTINGS column of Table E (Data Set 109E).

TABLE D
LINE PADS LINKS FOR DATA SET 109D

PAD RESISTANCE (OHMS)	INSTALL LINKS BETWEEN SCREWS
0	L and P, N and J, D and G, F and B
294	L and P, K and J, D and G, C and B
632	L and P, M and J, D and G, E and B
926	L and M, J and K, D and E, B and C
1238	L and P, J and H, D and G, B and A
1532	L and H, J and K, D and A, B and C
1870	L and H, J and M, D and A, B and E

D. Data Set 109D or 109E (Line Side)

Line Pad Adjustments

3.07 In order to properly adjust the line pads for a Data Set 109D or 109E being installed as the line-side data set, it is necessary to know the resistance of the loop between the interconnection arrangement and the hub data set. This information should be found on the service order or circuit layout record card. To determine the amount of resistance to insert in the line-side data set, add the resistance of the loop to the padding that is to be installed in the hub data set. The difference between this sum and 2000 ohms is the amount of padding that should be inserted in the data set.

TABLE E
LINE PAD SCREW SWITCH SETTINGS FOR DATA SET 109E

PAD RESISTANCE (OHMS)	SCREW SWITCH S3 SETTINGS	
	OPEN	CLOSE
0	—	4, 5, 6, 7, 9, 10, 11, 12
136.2	7, 9	4, 5, 6, 10, 11, 12
266	6, 10	4, 5, 7, 9, 11, 12
402.2	6, 7, 9, 10	4, 5, 11, 12
522	5, 11	4, 6, 7, 9, 10, 12
658.2	5, 7, 9, 11	4, 6, 10, 12
788	5, 6, 10, 11	4, 7, 9, 12
924.2	5, 6, 7, 9, 10, 11	4, 12
1022	4, 12	5, 6, 7, 9, 10, 11
1158.2	4, 7, 9, 12	5, 6, 10, 11
1288	4, 6, 10, 12	5, 7, 9, 11
1424.2	4, 6, 7, 9, 10, 12	5, 11
1544	4, 5, 11, 12	6, 7, 9, 10
1680.2	4, 5, 7, 9, 11, 12	6, 10
1810	4, 5, 6, 10, 11, 12	7, 9
1946.2	4, 5, 6, 7, 9, 10, 11, 12	—

Note: Screw switch S3-3 and S3-8 should contain no screws.

Note: At installations where a Data Set 109E is being used as the line-side data set, a Data Set 109G is being used as the hub set, and the loop resistance is 1500 ohms or less, the hub data set (Data Set 109G) should always have 522 ohms of padding inserted.

3.08 After the proper amount of padding has been determined, insert that amount of padding in the line-side data set in the same manner as described for the concentrator-side data set (see 3.06).◆

4. INSTALLATION

A. General

4.01 This part describes the installation procedures for three PL interconnection arrangements when the Data Set 108A or 109A is used as the line-side data set or four PL interconnection arrangements when the Data Set 109D or 109E is used as the line-side data set◆ for the line side of the 10-type data line concentrator.

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B. Installation Using Data Set 108A or 109A as the Line-Side Data Set

4.02 This installation requires one 28A1 Data Mounting, three Data Sets 108A or 109A, three Data Sets 109D or 109E, three AR463-type circuit packs, two 208A adapters, and an appropriate power source, such as KS-20575-L1 rectifier.

4.03 Three such arrangements require the use of both connectors J1 and J2 along with slots 1, 2, 3, 4, 5, 8, 11, 12, and 14 of the 28A1 Data Mounting (see Fig. 3). At installations where only one or two arrangements are required, connectors J1 and J2 along with the data mounting slots will be used as follows.

- (a) Two arrangements—Use J1 and slots 1, 2, 3, 4, 5, and 8, (J2 and slots 11 through 16 are left available for use with other circuits).
- (b) One arrangement—Use J1 and slots 1, 2, and 5 or J2 and slots 9, 10, and 13 or 11, 12, and 14 (this leaves one-half of the data mounting available for use with other circuits).

28A1 Data Mounting

4.04 The 28A1 Data Mounting may be arranged to mount in either 23-inch (ie, KS-20018-type cabinet) or 25-inch (ie, KS-20093-type cabinet) racks by adjustment of the mounting brackets on each end of the data mounting. If the 28A1 Data Mounting is to be installed in a 23-inch rack, arrange the mounting brackets with the long sides against the data mounting. For 25-inch racks, arrange the mounting brackets with the short sides against the data mounting.

4.05 If the KS-20575-L1 rectifier is to be used to power the data sets and circuit packs, perform the following.

- (1) Mount the rectifier in the space provided on the front left-hand side of the data mounting.
- (2) Route the ac power cord from the rectifier to the rear of the data mounting via the slot in the top of the mounting.

4.06 Using eight 12-24 BHM screws, mount the 28A1 Data Mounting in the rack.

Data Sets, Circuit Packs, and Adapters

4.07 Verify that the proper options are installed in the data sets and circuit packs as required in Part 2 of this section. Verify that the TEST switches on the AR463-type circuit packs are in the normal position (pushed in for AR463, Series 1 or in the NORMAL position for AR463, Series 2). Install the line-side data sets (Data Set 108A or 109A), concentrator-side data sets (Data Set 109D or 109E), and circuit packs (AR463-type) in the 28A1 Data Mounting slots as shown in Fig. 3.

Note: For installations requiring only two arrangements, connector J1 and slots 1, 2, 3, 4, 5, and 8 of the data mounting are all that are used. Installations requiring only one arrangement may use connector J1 and slots 1, 2, and 5 or connector J2 and slots 9, 10, and 13 or 11, 12, and 14 of the data mounting.

4.08 Install the 208A adapters into connectors J1 and J2 of the 28A1 Data Mounting.

Note: Installations requiring only two arrangements use only one 208A adapter in connector J1. Installations requiring only one arrangement use only one 208A adapter in connector J1 (when slots 1, 2, and 5 are utilized) or J2 (when slots 9, 10, and 13, or 11, 12, and 14 are utilized).

C. Installation Using Data Set 109D or 109E as the Line-Side Data Set

4.09 This installation requires one 28A1 Data Mounting, eight Data Sets 109D or 109E, four AR463-type circuit packs, two 208A adapters, and an appropriate power source, such as the KS-20575-L1 rectifier.

4.10 Four such arrangements require the use of connectors J1 and J2 along with slots 1, 2, 3, 4, 5, 6, 9, 10, 11, 12, 13, and 14 of the 28A1 Data Mounting (see Fig. 3). At installations where three or less arrangements are required, connectors J1 and J2 along with the data mounting slots will be used as follows.

- (a) Three arrangements—Use J1, J2 and slots 1, 2, 3, 4, 5, 6, 9, 10, and 13.

(b) Two arrangements—Use J1 and slots 1, 2, 3, 4, 5, and 6 or J2 and slots 9, 10, 11, 12, 13, and 14. (This leaves one-half of the data mounting available for use with other circuits).

(c) One arrangement—Use J1 and slots 1, 2, and 5 or 3, 4, and 6 or J3 and slots 9, 10, and 13 or 11, 12, and 14 (this leaves one-half of the data mounting available for use with other circuits).

28A1 Data Mounting

4.11 Install the 28A1 Data Mounting and, if used, KS-20575-L1 rectifier as described in 4.04 through 4.06.

Data Sets, Circuit Packs, and Adapters

4.12 Verify that the proper options are installed in the data sets and circuit packs as required in Part 2 of this section. Ensure that the TEST switches on the AR463-type circuit packs are in the normal position (pushed in for AR463, Series 1 or in the NORMAL position for AR463, Series 2). Install the data sets and circuit packs in the 28A1 Data Mounting slots as shown in Fig. 3.

Note: For installation requiring only two arrangements, connector J1 and slots 1, 2, 3, 4, 5, and 6 or J2 and slots 9, 10, 11, 12, 13, and 14 are all that are used. Installations requiring only one arrangement may use connector J1 and slots 1, 2, and 5 or 3, 4, and 6 or connector J2 and slots 9, 10, and 13 or 11, 12, and 14.

4.13 Install the 208A adapters into connectors J1 and J2 of the 28A1 Data Mounting.

Note: Installation requiring two or less arrangements use only one 208A adapter in connector J1 if slots 1 through 8 are utilized or J2 when slots 9 through 16 are utilized.◆

5. CONNECTIONS

5.01 Connect the 28A1 Data Mounting as follows.

- (1) Plug the 50-pin connector end of the line cable into P3 of the data mounting.
- (2) Route the line cable through the hole (behind J1, J2, and P3) in the data mounting to an intermediate distribution frame (IDF) or connector block.
- (3) ◆If the installation uses Data Set 108A or 109A as the line-side data set, proceed to (5) and omit (7) and (8).
- (4) If the installation uses Data Set 109D or 109E as the line-side data set, omit (5) and (6).◆
- (5) Connect leads 1, 3, 5, 8, 9, 11, 13, and 14 of the line cable to the IDF (or connector block).
- (6) Connect leads 26, 28, 30, 33, 34, 36, 38, and 39 of the line cable to the IDF (or connector block).
- (7) ◆Connect leads 1, 3, 5, 6, 9, 11, 13, and 14 of the line cable to the IDF (or connector block).
- (8) Connect leads 26, 28, 30, 31, 34, 36, 38, and 39 of the line cable to the IDF (or connector block).◆
- (9) Insulate and store the remainder of the line cable leads.
- (10) ◆Connect power to the 28A1 Data Mounting as described in 5.02 of this section.
- (11) If the installation uses Data Set 109A, 109D, or 109E as the line-side data set, omit (12).◆
- (12) Perform the Data Set 108A-type level adjustment described in Part 6 of this section.
- (13) Cross-connect tip and ring of the PL facilities in accordance with Table F.

TABLE F
CROSS-CONNECTIONS FOR PRIVATE LINE FACILITIES

PRIVATE LINE FACILITY FOR ARRANGEMENT USING	CONNECT TIP TO	CONNECT RING TO
Slots 1, 2, and 5	P3-5	P3-30
Slots 3, 4, and 6	P3-6	P3-31
Slots 3, 4, and 8	P3-8	P3-33
Slots 9, 10, and 13	P3-13	P3-38
Slots 11, 12, and 14	P3-14	P3-39

- (14) Cross-connect L1 and L2 of concentrator lines in accordance with Table G.
- (15) Perform the installation tests in accordance with the section entitled Private Line Interconnection Arrangements for Line Side of 10-Type Data Line Concentrator—Test Procedures (591-811-502).

TABLE G
CROSS-CONNECTIONS FOR CONCENTRATOR LINES

CONCENTRATOR LINE FOR ARRANGEMENT USING	CONNECT L1 TO	CONNECT L2 TO
Slots 1, 2, and 5	P3-1	P3-26
Slots 3, 4 and 6	P3-3	P3-28
Slots 3, 4, and 8	P3-3	P3-28
Slots 9, 10, and 13	P3-9	P3-34
Slots 11, 12, and 14	P3-11	P3-36

5.02 Connect power as follows.

- (1) If a separate power source is to be used for both halves of the 28A1 Data Mounting, omit (2).

- (2) If one power source is to be used to power both halves of the data mounting, strap terminals 1, 2, and 3 of TB1 on the data mounting to terminals 4, 5, and 6, respectively, and omit (7) through (10).
- (3) Connect terminal 8 of TB1 to frame ground.
- (4) Connect terminal 3 of TB1 to the SIG GRD lead of the power source.
- (5) Connect terminal 1 of TB1 to the +24 volts dc lead of the power source.
- (6) Connect terminal 2 of TB1 to the -24 volts dc lead of the power source.
- (7) Connect terminal 4 of TB1 to the SIG GRD lead of the second power source.
- (8) Connect terminal 5 of TB1 to the +24 volts dc lead of the second power source.
- (9) Connect terminal 6 of TB1 to the -24 volts dc lead of the second power source.
- (10) If the KS-20575 rectifier is used as the power source, connect the rectifier power cord to a 117-volt 60-Hz ac outlet.

6. DATA SET 108A LEVEL ADJUSTMENT



Tip and ring from the data set being tested must be disconnected from the transmission facility before the data set level adjustment is performed.

- 6.01** Connect the + and - terminals of the TTS-28 portable station test set to TP1 and TP2, respectively, of Data Set 108A. Set FUNCTION switch of TTS-28 to DBM 900Ω TERM 0 position. Adjust potentiometer R11 on Data Set 108A for the output level specified on the service order sheet or circuit layout record card.

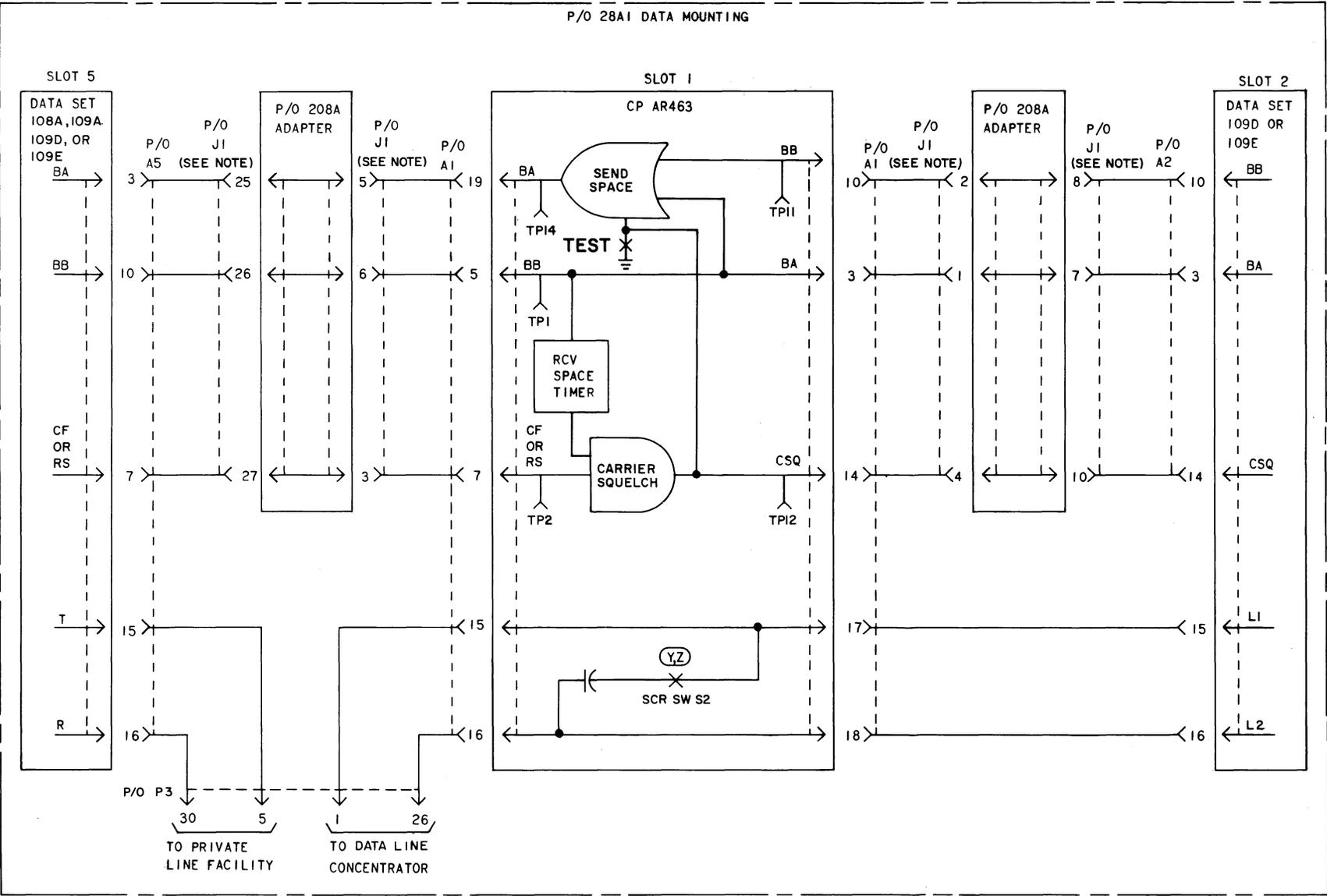


Fig. 1—Functional Block Diagram of 10-Type Data Line Concentrator Private Line Interconnection Arrangement Using AR463, Series 2 Circuit Pack and Slots 1, 2, and 5.

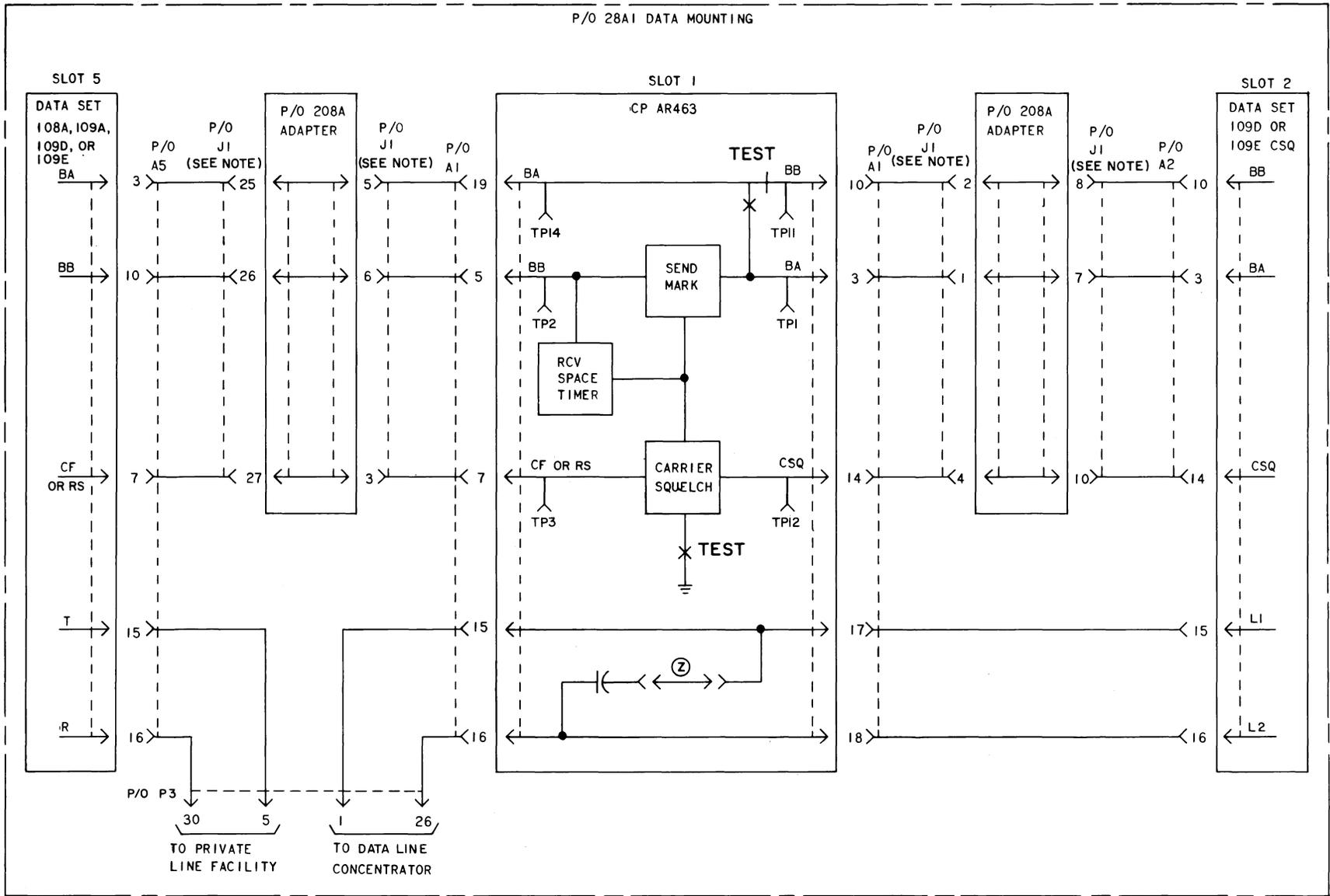
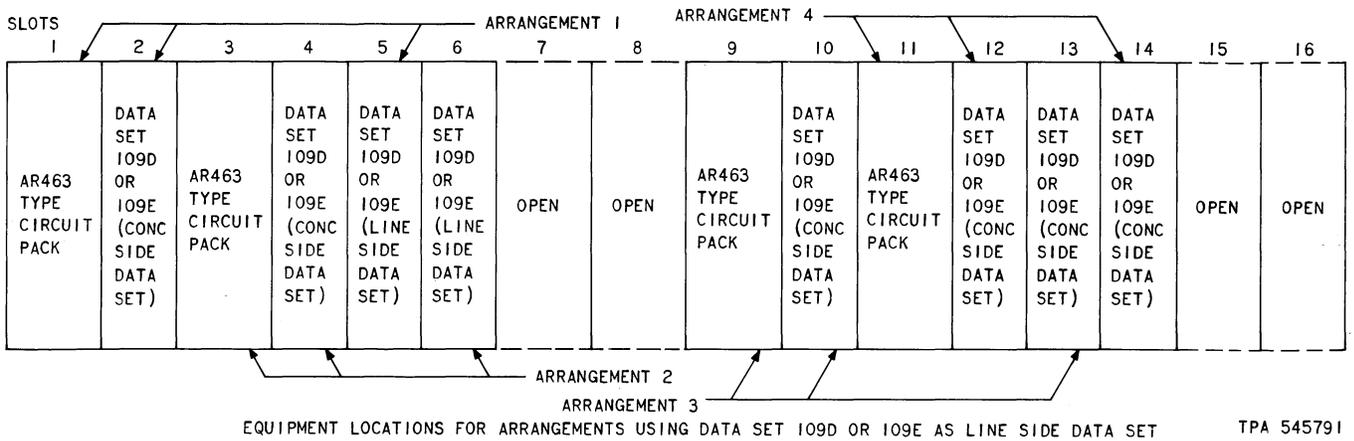
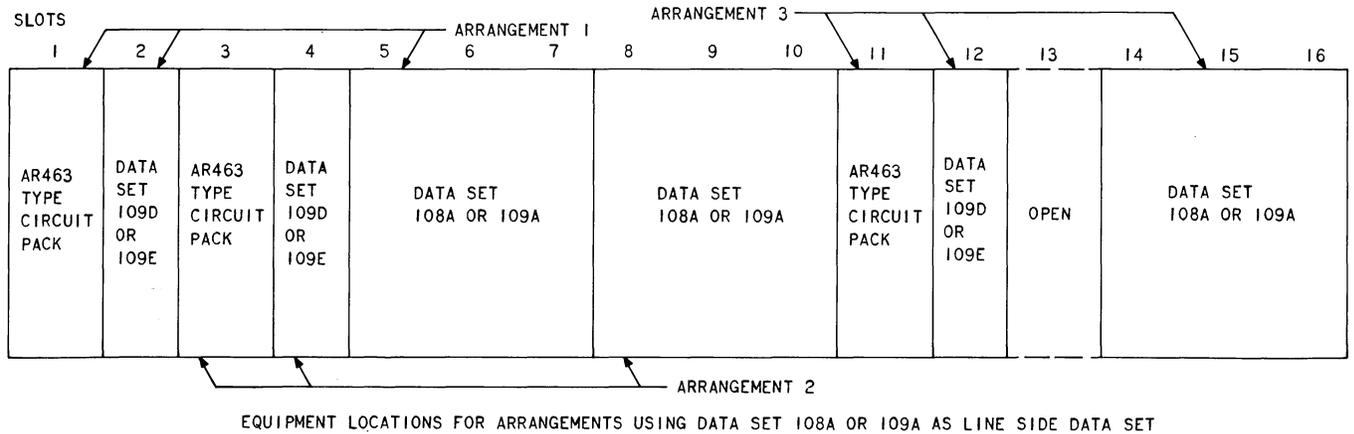


Fig. 2—Functional Block Diagram of 10-Type Data Line Concentrator Private Line Interconnection Arrangement Using AR463, Series 1 Circuit Pack and Slots 1, 2, and 5.



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Fig. 3—Data Set and Circuit Pack Locations for 10-Type Data Line Concentrator Private Line Interconnection Arrangement