

**SUBRATE OFF-NET EXTENSION ARRANGEMENTS
INSTALLATION AND CONNECTIONS
DIGITAL DATA SYSTEM**

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1. GENERAL

1.01 This section contains information concerning installation and connection of the Digital Data System (DDS) equipment required to implement subrate off-net extension service.

1.02 This section is reissued to include information concerning the DATAPHONE® II data sets. All references to the single circuit off-net extension (Mfr Disc) have been deleted. Revision arrows are used to emphasize the more significant changes.

1.03 The entry point of the subrate off-net extension service (analog) into the DDS occurs at a hub office. Subrate off-net extension service is provided by a subrate off-net extension bay which includes up to ten circuits. Subrate off-net extension service is available at bit rates of 2.4, 4.8, and 9.6 kb/s.

1.04 Implementing a subrate off-net extension consists of installing the following equipment:

- 3002-type channel facility from the customer premises to DDS hub office data set
- Appropriate data set (ie, 201C, [Mfr Disc] 208A [Mfr Disc] or 209A [Mfr Disc]) or DS 2024A, 2048A, or 2096A when DATAPHONE II data sets are required
- 500A data service unit (DSU) (Mfr Disc) connected to the DDS network
- Data auxiliary set (DAS) 831A with interconnections to hub office data set and DSU
- DAS 829-type with interconnections to 3002-type channel facility and hub office data set.

1.05 A power unit consisting of a power board (Comcode 842537987) and a power buss connector (Comcode 842537995) makes it possible to use the DATAPHONE II data sets in subrate off-net extension arrangements for DDS. The power board and the power buss supply power to as many as eight 831A DAS elastic store buffers mounted in the 49A1 data mounting. The power unit is necessary because the dc voltages required to power the 831A DAS are not provided at the telephone interface connector of the DATAPHONE II data sets.

1.06 Installation of the data sets is accomplished using sections referenced in Table A. The 3002-type channel facility is covered in Sections 314-410-100, -300, and -500. Installation of the multiple DSU arrangement is covered in Section 595-200-200. Installation of the DAS 829- and 831A-types and interconnection of the hub office equipment are covered in Parts 3 and 4 of this section.

TABLE A

DATA SET INSTALLATION REFERENCES

DATA SET	BIT RATE	INSTALLATION SECTION
201C	2.4 kb/s	592-029-200
208A	4.8 kb/s	592-027-200
209A	9.6 kb/s*	592-032-200
2024A	2.4 kb/s	592-040-220
2048A	4.8 kb/s	592-040-220
2096A	9.6 kb/s	592-040-220

*D-1 conditioning required.

1.07 No line conditioning is required for data sets 201C or 208A; however, when data set 209A is used (9.6-kb/s service), D-1 conditioning is required. The D-1 conditioning is described in Section 314-410-100.

2. OPTIONS

A. DAS 831A

2.01 The options required for DAS 831A are given in Table B. Location of the option terminals is identified in Fig. 1. Table C gives the options required when DATAPHONE II data sets are used for point-to-point operation. The options for DATAPHONE II data set multipoint operation are given in Table D.

TABLE B

DAS 831A REQUIRED OPTIONS

OPTION	REQUIRED WITH	TERMINALS (NOTE)
Y	Data set 201C	E2 strapped to E3
Z	Data set 208A or Data set 209A	E1 strapped to E2

Note: See Fig. 1.

2.02 The options required for the hub office data set are given in Table E. For installation of these options, refer to the appropriate section given

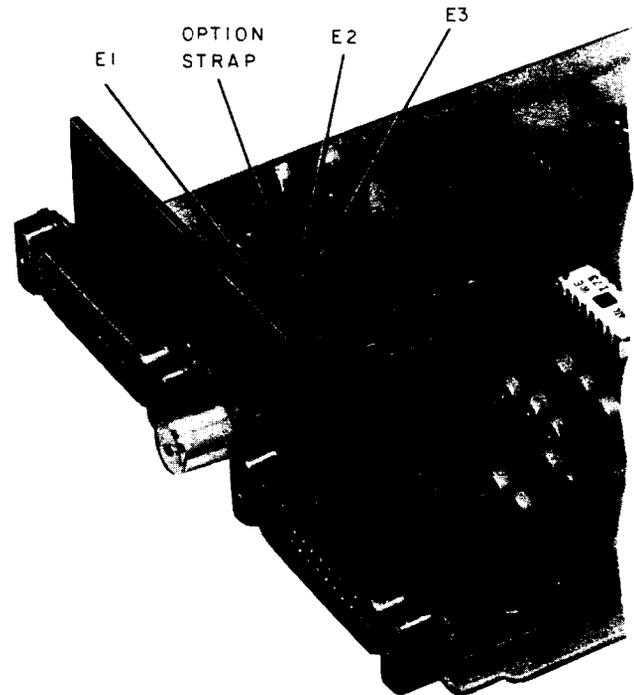


Fig. 1—DAS 831A Options

in Table A. When data set 209A is used, the MULTIPLEX SELECTOR switch must be set to 96.

2.03 The options required for the DSU are given in Table F. For installation of these options, refer to Section 595-200-200.

B. DAS 829A-L1

2.04 Two line termination impedances are provided on the DAS 829A-L1. The straps used for line termination should be placed in either the 600- or 1200-ohm position. Two straps are required in each position. The required option should be specified on the service order. Refer to Fig. 2 for the location of these straps.

2.05 The transmit and receive attenuators on the DAS 829A-L1 should be set to their required settings. The sum of the viewed numbers (1.0, 2.0, 4.0, and 8.0) on the slide switches of the attenuators is the value, in dB, of the setting. An example of this would

♦TABLE C♦

DATA SET OPTIONS--POINT-TO-POINT

OPTION DESIGNATION	OPTION	HUB OFFICE (NOTE)	CUSTOMER PREMISES (NOTE)
A1	Point-to-point control	x	
A2	Point-to-point tributary		x
B2	Slaved timing		x
B3	External timing	x	
C5	Continuous carrier	x	x

Note: x symbol indicates the available option for DS 2024A, 2048A, or 2096A.

♦TABLE D♦

DATA SET OPTIONS--MULTIPOINT

OPTION DESIGNATION	OPTION	HUB OFFICE (NOTE)	CUSTOMER PREMISES (NOTE)
A3	Multipoint control	x	
A4	Multipoint tributary		x
B2	Slaved timing		x
B3	External timing	x	
C5	Continuous carrier	x	
C6	Switched carrier		x
E2	1-second holdover out	x	

Note: x symbol indicates the available option for DS 2024A, 2048A, or 2096A.

be as follows:

12-dB attenuation required on transmit path—set indicated numbers on attenuator designated TRANS to 4.0 and 8.0.

11-dB attenuation required on receive path—set indicated numbers on attenuator designated REC to 1.0, 2.0, and 8.0.

C. DAS 829B-L1

2.06 Three line termination impedances are provided on the DAS 829B-L1. The straps, used in providing line termination, should be placed in either the 150-, 600-, or 1200-ohm position. The required option should be specified on the service order. Refer to Fig. 3 for the location of these straps.

TABLE E
REQUIRED DATA SET OPTIONS

OFFICE	HUB OFFICE (NOTE)	CUSTOMER PREMISES (NOTE)
DRS on in AL mode	*x	Customer option
Transmitter externally timed	x	‡x
Auto retrain	*x	*x
DAS 829-type used	x	Telco option
Switched RS (Data set 208A only)	x	Customer option
Switched carrier	x	§
1-sec holdover	*†x	x
New sync used	‡x	No
Slave in (Data set 209A only)	No	x

Note: x symbol indicates the available option.

*208A and 209A only.

†Required only if customer operates continuous carrier.

‡201C and 208A only.

§Multipoint stations:

1. Recommended for remote stations.
2. Recommended for remote stations on an analog bridge.
3. Not recommended for a control station.
4. Some installations require the continuous carrier option to eliminate customer problems.

2.07 The attenuator, designated TRANS, on the transmit pair of the DAS 829B-L1 consists of four slide switches. The sum of the viewed numbers (1.0, 2.0, 4.0, 8.0) is the value, in dB, of the setting. (See paragraph 2.05 for an example.)

2.08 Four gain strapping options provide the coarse adjustment of the signal level in the receive path. The four receive level strapping options

provide for gain or loss in the receive path and are designated +10, 0, -10, and -20, respectively. Only one of the four options is to be provided. The service order should specify which one of the options is to be connected. A 0- to 10-dB variable gain control, R28, supplements the coarse adjustment. The output level of the receive amplifier is adjusted to the value specified on the service order, using the following guidelines.

TABLE F

DSU REQUIRED OPTIONS

OPTION DESIGNATION	OPTION
YT	Switched request-to-send
YK	Signal ground connected to frame ground
XN	System status installed at front
WV	Fixed line buildout installed

- (a) Set the GAIN strap on the DAS 829B or C according to the value specified on the service order.
- (b) Insert the DAS 829B or C into its data mounting (paragraph 3.09).
- (c) Using a TTS-4B test set or its equivalent, measure and adjust the amplifier gain (or loss) as follows:
- (1) Place the TTS-4B close to the DAS 829 and apply power. Allow the TTS-4B to warm up and stabilize, then calibrate using the instructions printed on the instrument case.
 - (2) Set the controls on the TTS-4B to the following positions:
 - SEND FREQ to 1000
 - SEND LEVEL to estimated receive level at station end
 - SEND IMP to 600
 - FUNCTION to SEND + TALK + REC
 - REC IMP to BRDG (600).
 - (3) Connect a 2P4B cord between the SEND 310 jack on the TTS-4B to the REC INPUT jack (J3) on the DAS 829.
 - (4) Connect another 2P4B cord between the REC 310 jack on the TTS-4B to the REC TST jack (J2) on the DAS 829.
 - (5) Adjust R28 to obtain a level reading on the TTS-4B meter equal to the value specified on the service order.
 - (6) Disconnect and remove the TTS-4B and all cord connections from the DAS 829.

Example of Adjustment:

The receive level at the input to the customer interface is specified to be -16 dBm (-3 TLP). The receive level at the input of the DAS 829 is estimated to be -25 dBm. The DAS 829 receive path is then adjusted for 9 dB gain by inserting an option strap at 0 dB and adjusting R28 for a reading of -16 dBm on the TTS-4B meter.

D. DAS 829C-L1

2.09 Strapping options in the receive path of the DAS 829C-L1 provide slope equalization equivalent to a 359A or 359K equalizer. Two straps are required to select either the 359A or 359K equalizer equivalent. The 359A equalizer is selected by inserting a pair of straps under the column designated 359 and adjacent to the designation A. The 359K equalizer is selected by inserting a pair of straps under the column designated 359 and adjacent to the designation K. The location of these straps is shown in Fig. 4. Having selected an equalizer, the required equalizer characteristics are provided by installing the straps that are specified on the service order, the circuit layout record card (CLRC) or the work order record document (WORD). The straps should be inserted in positions identified by columns A, B, C, and D and rows designated 1, 2, 3, and 4. Strap storage is

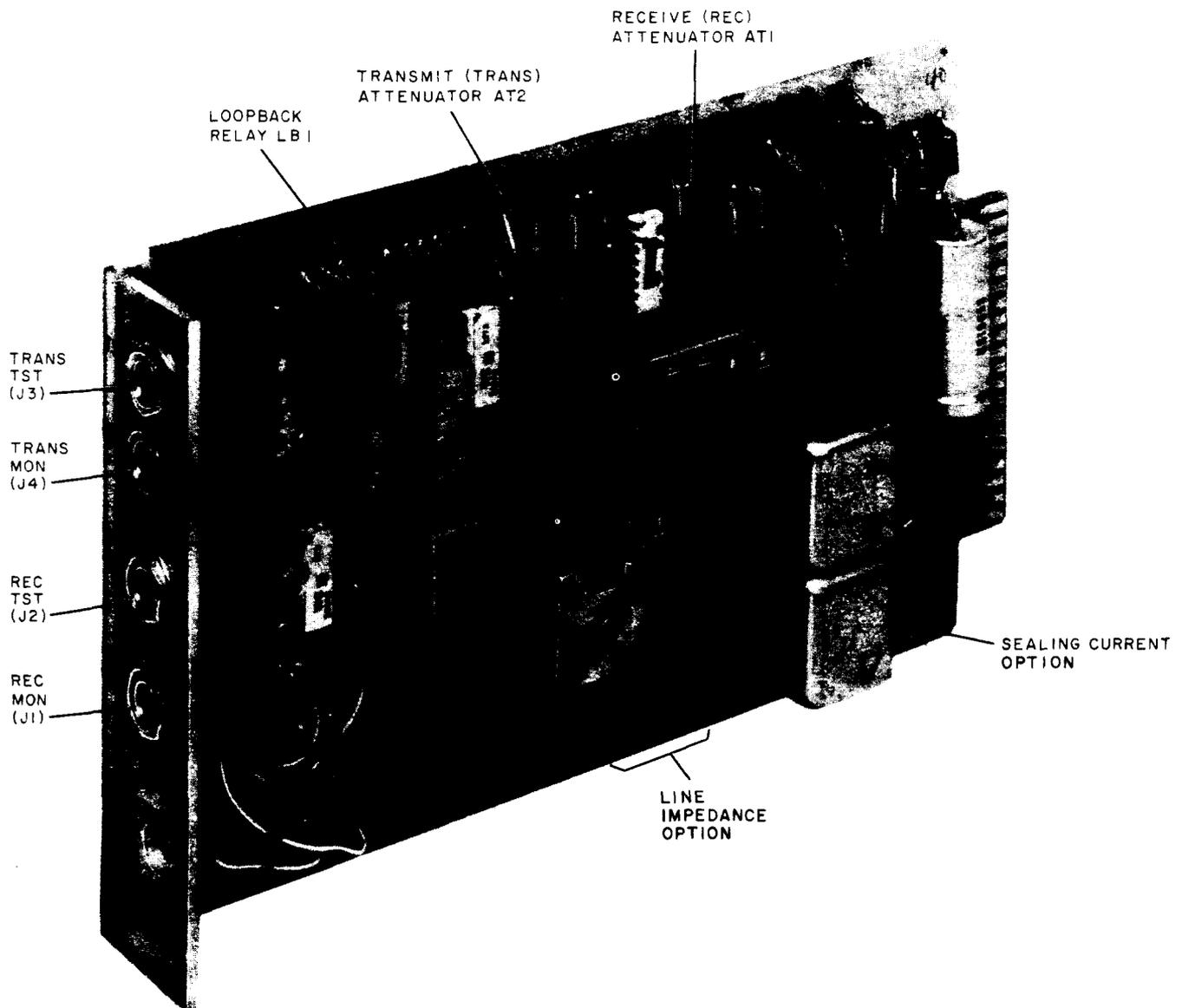


Fig. 2—DAS 829A-L1

provided to the left of each option position under columns designated ST.

2.10 An attenuator, designated TRANS, on the transmit pair of the DAS 829C-L1 consists of four slide switches. The sum of the viewed number is the value, in dB, of the setting. (See paragraph 2.05 for an example.)

2.11 Five gain strapping options provide for coarse adjustment of the signal level in the receive path. The five receive level strapping options provide

for gain or loss in the receive path and are designated +20, +10, 0, -10, and -20, respectively. The service order should specify which option positions are to be connected. A 0- to 10-dB variable control, R28, supplements the coarse adjustment. Refer to paragraph 2.08 for instructions on the adjustment of R28.

E. Sealing Current

2.12 The sealing current option is available on all DAS 829 types. This option consists of a single strap across the sealing current (SC) position of the

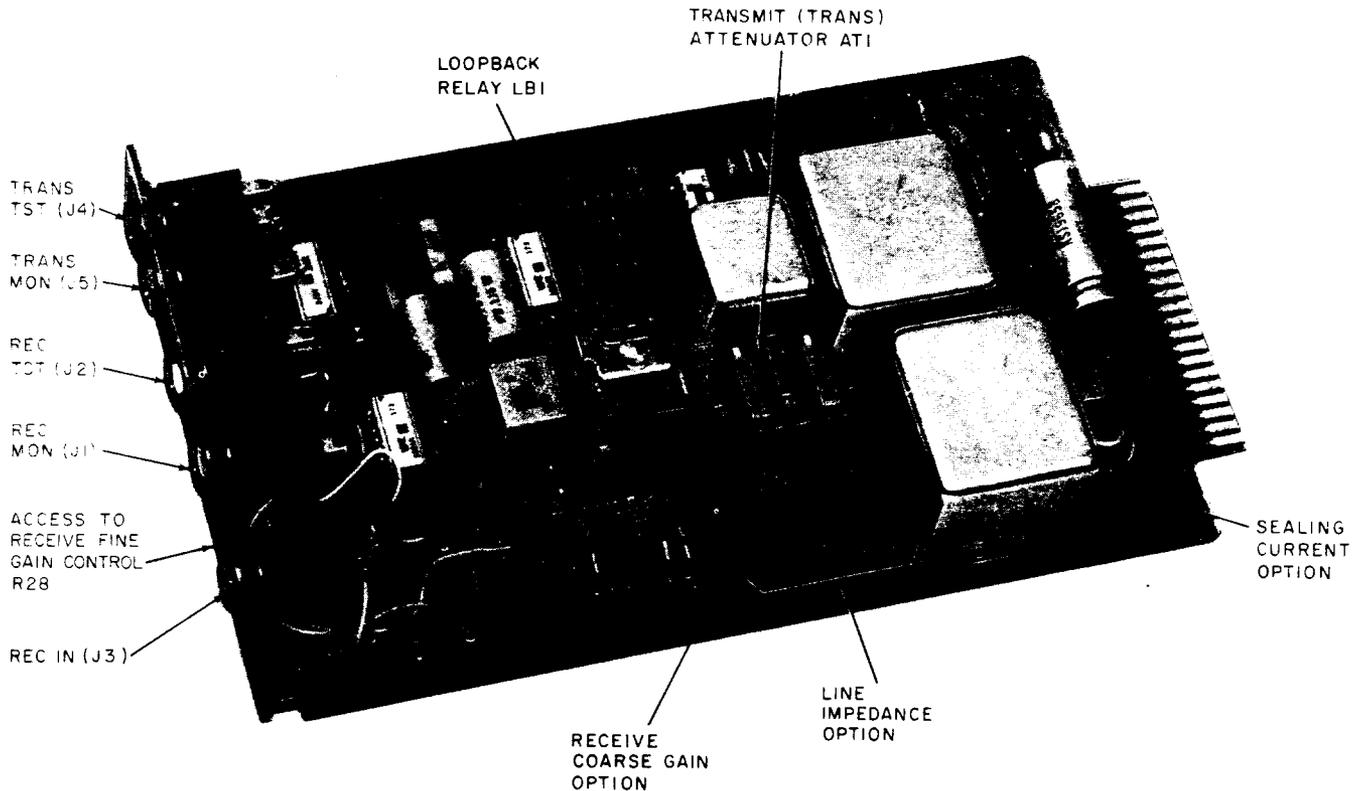


Fig. 3—DAS 829B-L1

DAS 829 types. If the sealing current option is not required, the strap should be positioned in the store (ST) position. The service order will specify if the sealing current option is required.

F. DAS 829A-L1A

2.13 The DAS 829A-L1A (Fig. 5) has all the options of the DAS 829A-L1. The installation of these options is described in paragraphs 2.04 and 2.05. Two additional options are available on the DAS 829A-L1A. These options are the 2-position power supply option and a loopback amplifier gain option.

2.14 The *power supply option* allows the DC power supply to operate on 24 Vac (N position), -24 Vdc (N position), or -48 Vdc (-48 position). The -24 and -48 Vdc inputs are obtained from an external power source. All connections to the DAS 829A-L1A are made through the data mounting.

2.15 The *loopback amplifier gain option* permits operation on either an 8- or 16-dB channel. The loopback control logic has been improved to ensure that the loopback logic will not respond to a 2713-Hz tone while the manual loopback key is operated, and to ensure that release of the manual loopback key will always return the DAS 829A-L1A to the data mode.

G. DAS 829B-L1A

2.16 The DAS 829B-L1A (Fig. 6) has all the options of the DAS 829B-L1. The installation of these options is described in paragraphs 2.06 through 2.08. Two additional options are available on the DAS 829B-L1A. These options are the 2-position power supply option (described in paragraph 2.14) and a loopback amplifier gain option (described in paragraph 2.15). A variable resistor R41 with a 0- to 10-dB amplifier provides a fine adjustment that is associated with the receive coarse gain option.

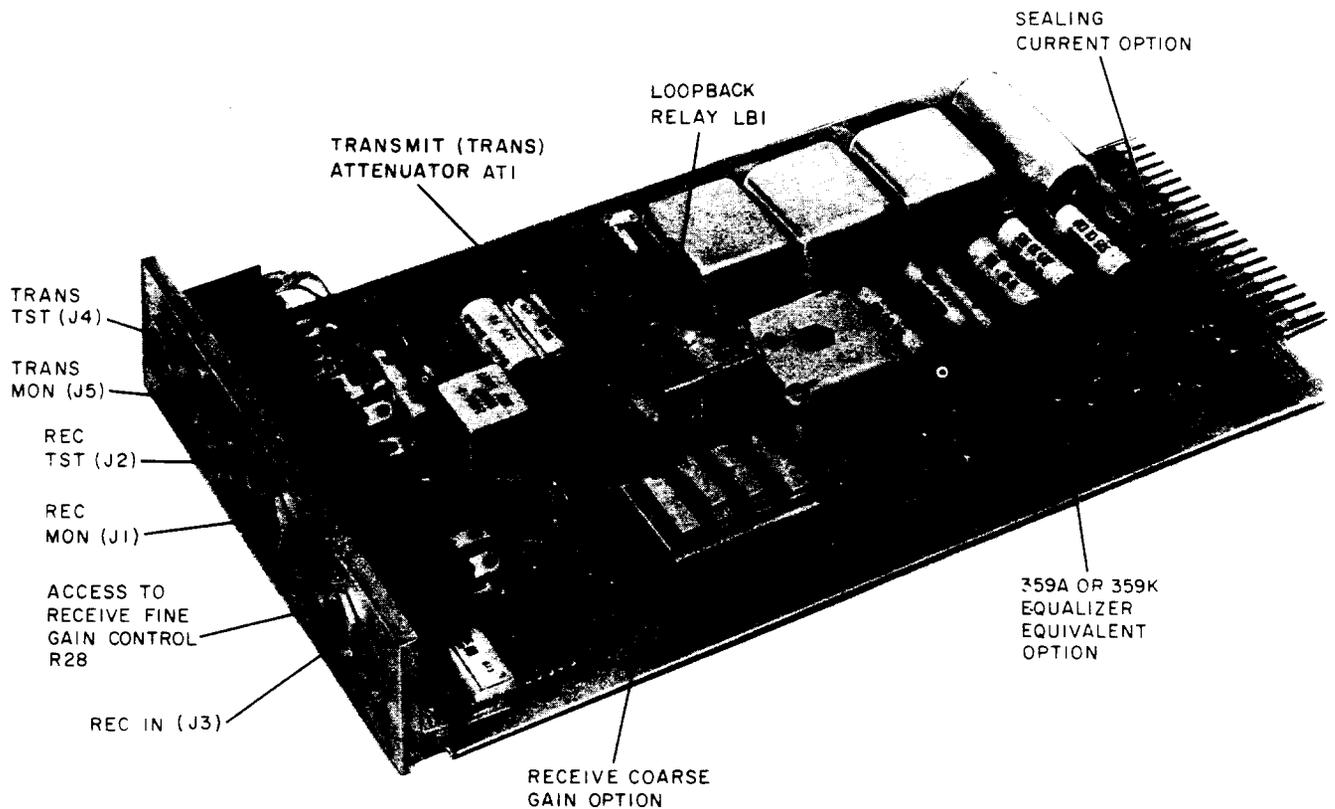


Fig. 4—DAS 829C-L1

H. DAS 829C-L1A

2.17 The DAS 829C-L1A (Fig. 7) has all the options of the DAS 829C-L1. The installation of these options is described in paragraphs 2.09 through 2.11. Two additional options are available on the DAS 829C-L1A. These options are the 2-position power supply option (described in paragraph 2.14) and a loopback amplifier gain option (described in paragraph 2.15). A variable resistor R41 with a 0- to 10-dB amplifier provides a fine adjustment that is associated with the receive course gain option.

3. INSTALLATION

A. Hub Office Configurations

Subrate Off-Net Extension Bay

3.01 Figures 8 and 9 are representative hub office bay arrangements. Data set types 208A and

209A are mounted in the bay using D-180467 and D-180556 brackets, respectively.

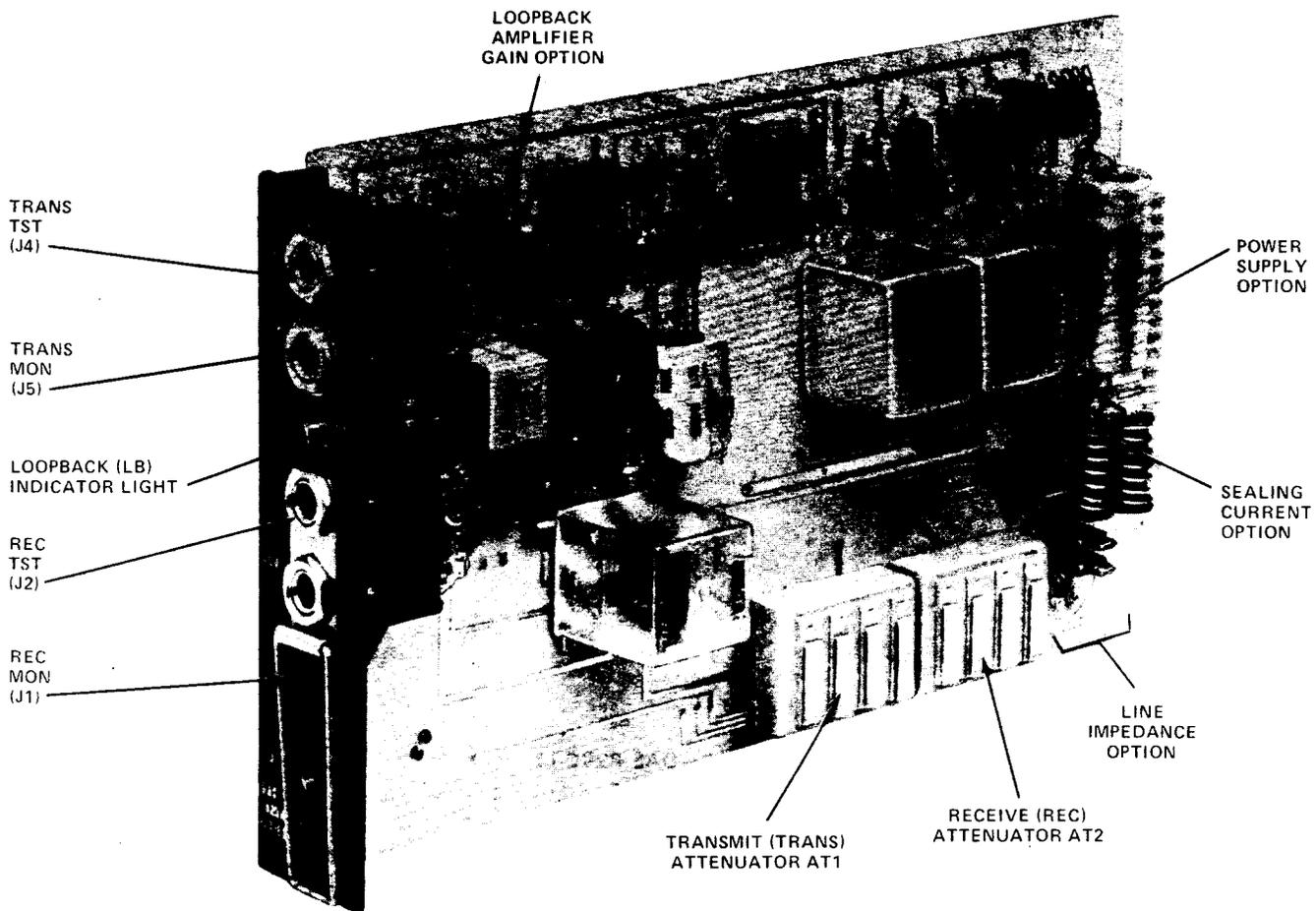
3.02 Figure 10 shows the recommended cable routing to prevent an unsafe condition and an unsightly appearance of the interface cords. The cable in the 7-foot bay is routed the same as in the 11-foot 6-inch bay.

3.03 ♦A KS-20018, L15C cabinet houses the necessary data mountings, data auxiliary sets, and the DATAPHONE II data sets. The KS-20018, L15C cabinet is shown in Fig. 11.♦

B. DAS 831A Installation and Removal Guidelines

3.04 Figures 12 and 13 show the front and rear views of the 49A1 data mounting. Install DAS 831A in the 49A1 data mounting as follows:

- (a) Release the three captive fasteners on the 49A1 data mounting (Fig. 12) by pulling out-



◆Fig. 5—DAS 829A-L1A◆

ward; then pull the retaining bar clear of the card slots.

(b) Slide DAS 831A in the card guide slots until the circuit board mates with the connector on the 49A1 data mounting backplane.

(c) Push the retaining bar into the locking position and secure by pushing inward on the three captive fasteners.

(d) See Part 4 for connection information.

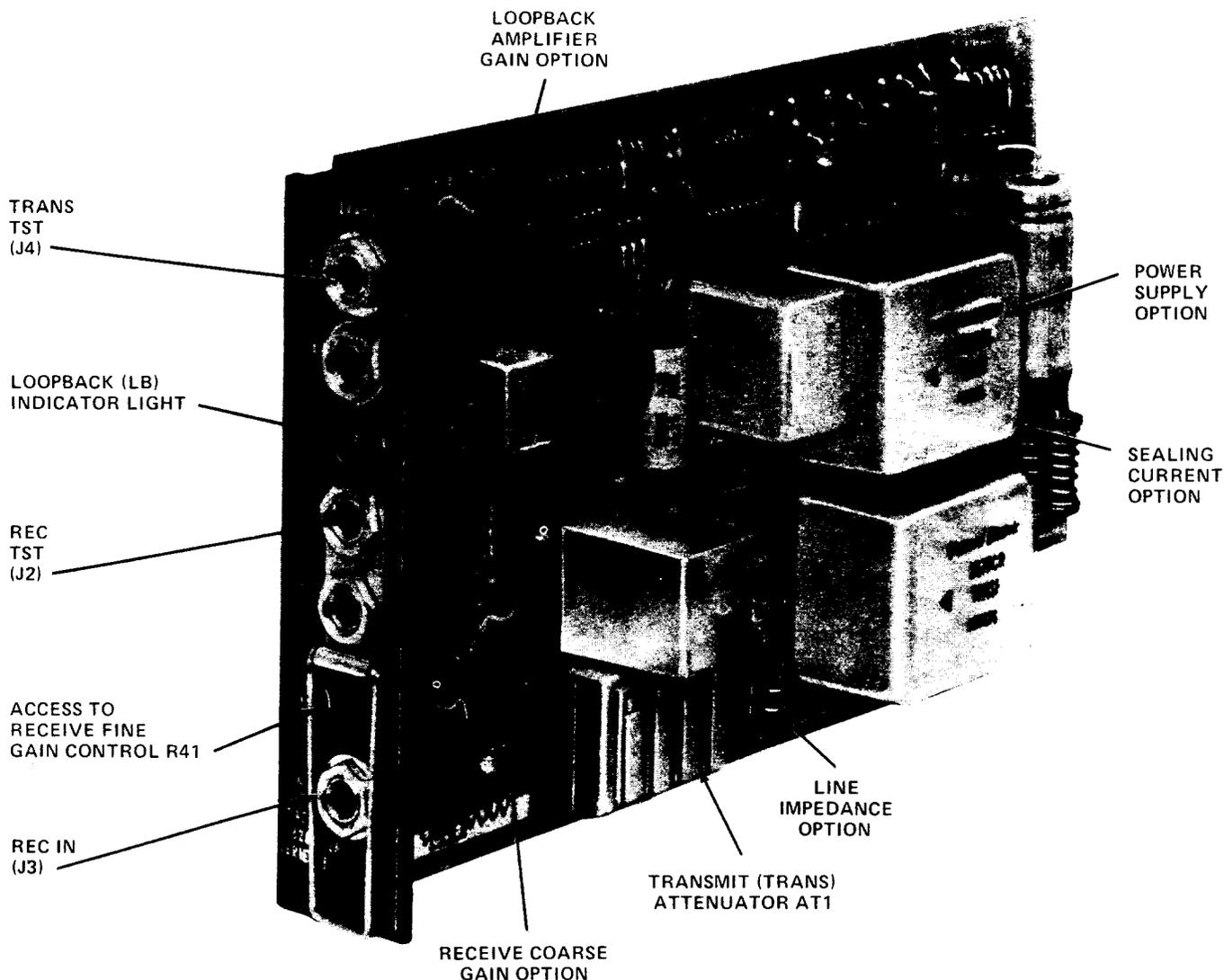
3.05 Remove DAS 831A from the 49A1 data mounting as follows:

(a) Loosen captive screws on the M25A cord connectors and remove connectors.

(b) Release the three captive fasteners on the 49A1 data mounting (Fig. 12) by pulling outward; then pull the retaining bar clear of the card slots.

(c) Remove DAS 831A.

(d) Push the retaining bar into the locking position and secure by pushing inward on the three captive fasteners.



♦Fig. 6—DAS 829B-L1A♦

C. DAS 829-Type Installation and Removal Procedures

3.06 Install the option straps that are required on the DAS 829 types. These should be specified on the service orders.

3.07 Figures 14 and 15 show the front and rear views of the 46D1 data mounting. Install DAS 829 type in the 46D1 data mounting as follows:

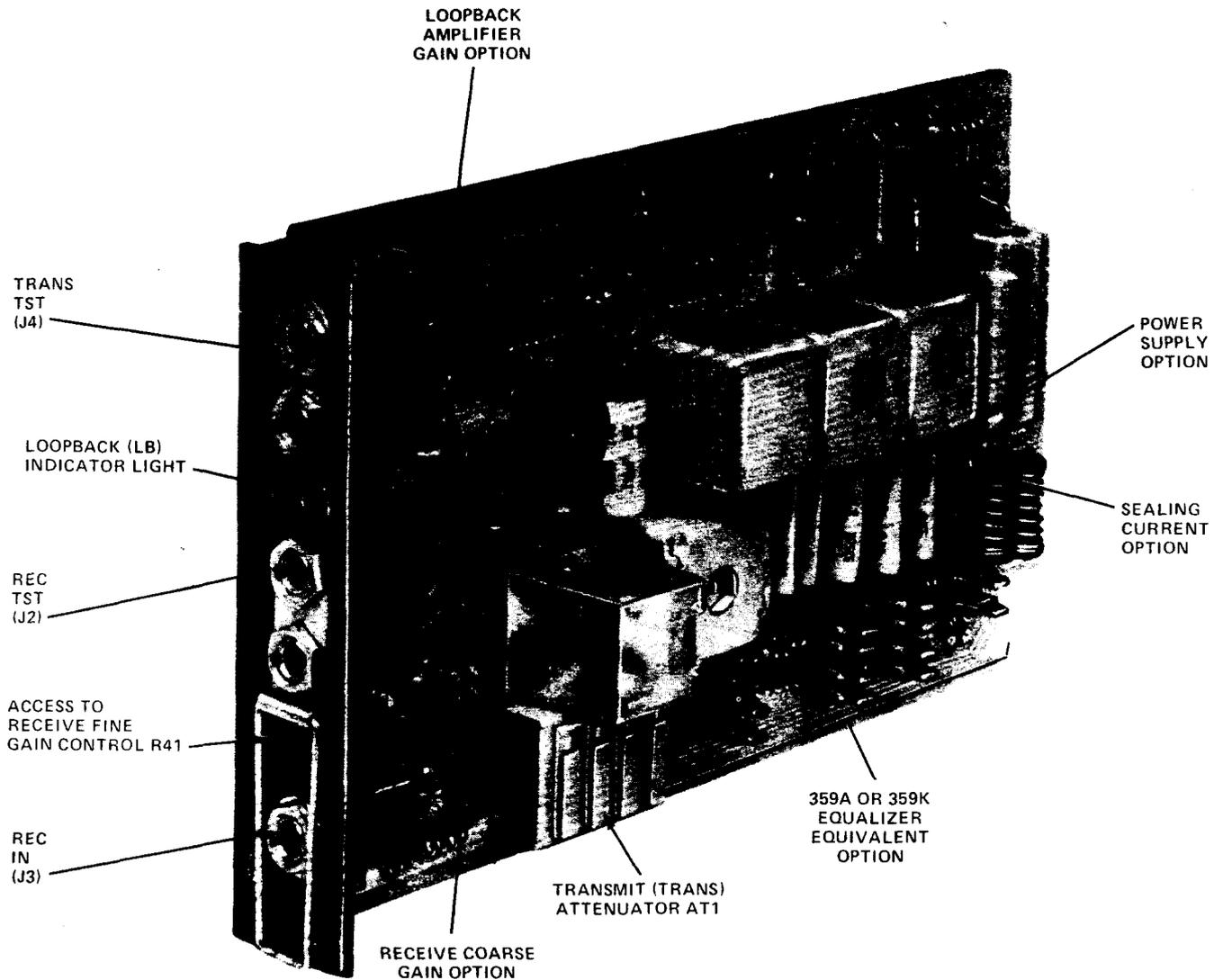
(a) Release the three captive fasteners on the 46D1 data mounting (Fig. 14) by pulling out-

ward; then pull the retaining bar clear of the card slots.

(b) Slide DAS 829 type in the card guide slots until the circuit board mates with the connector on the 46D1 data mounting backplane.

(c) Push the retaining bar into the locking position and secure by pushing inward on the three captive fasteners.

(d) See Part 4 for connection information.



◆Fig. 7—DAS 829C-L1A◆

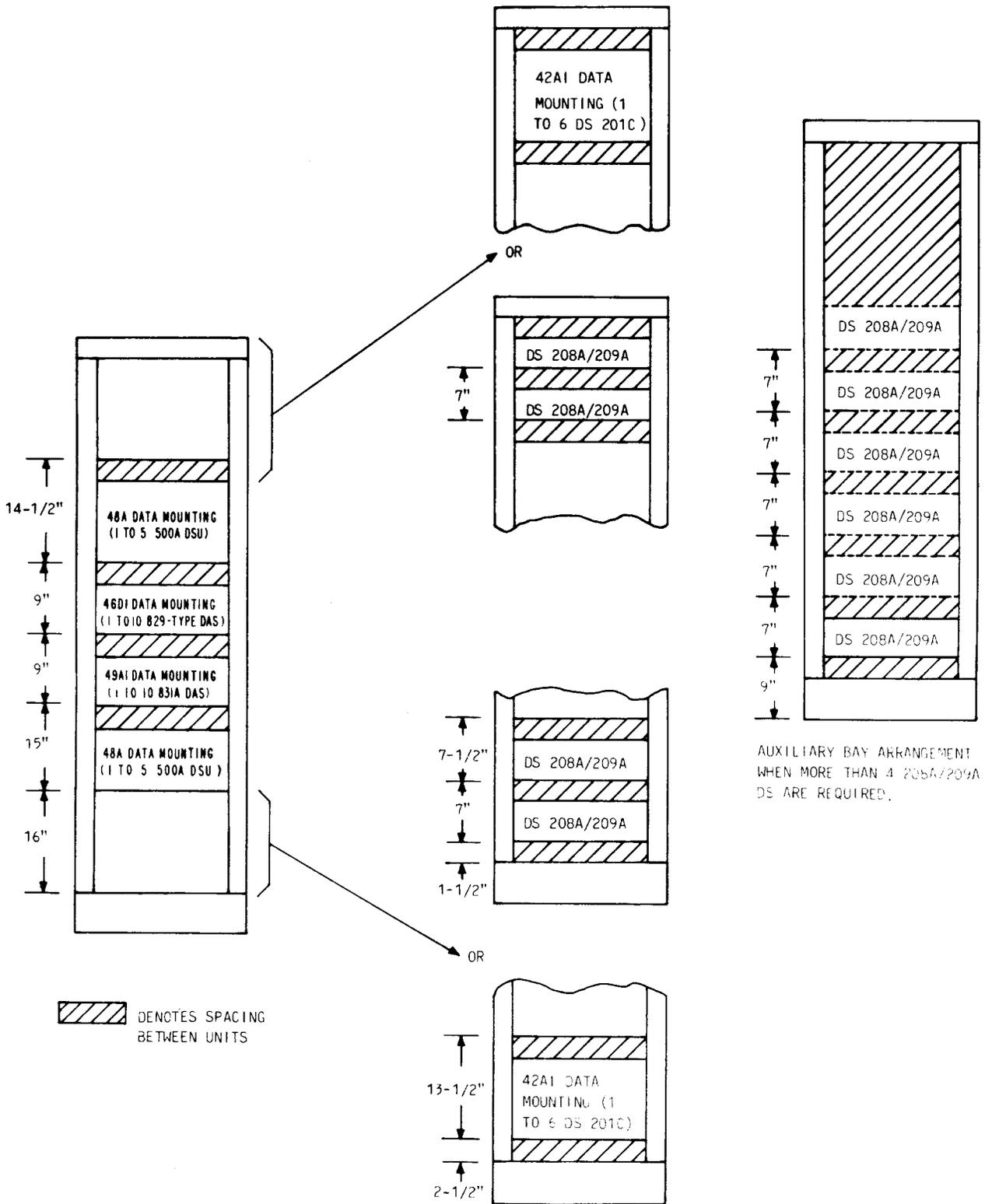
3.08 Remove DAS 829 type from the 46D1 data mounting as follows:

- (a) Release the three captive fasteners on the 46D1 data mounting (Fig. 14) by pulling outward; then pull the retaining bar clear of the card slots.
- (b) Remove DAS 829 type.
- (c) Push the retaining bar into the locking position and secure by pushing inward on the three captive fasteners.

4. CONNECTIONS—HUB OFFICE

4.01 Hub office connections are given in Fig. 16. All connections, except to the 46D1 data mounting, are made with M25A-type cords. Pin assignments for J2 of the 49A1 data mounting and P1 and J11 of the 46D1 data mounting are given in Tables G, H, and I.

4.02 The M25A cords to the DATA SRV UNIT connector (P1) and the DATA SET CUST connector (P2) of DAS 831A must be dressed so they do not interfere with the installation or removal of other DASs 831A and do not block access to the DAS 831A TEST switch. If the 49A1 data mounting is installed



AUXILIARY BAY ARRANGEMENT WHEN MORE THAN 4 DS 208A/209A ARE REQUIRED.

Fig. 8—Representative Hub-Office Bay Arrangement—7-Foot Bay

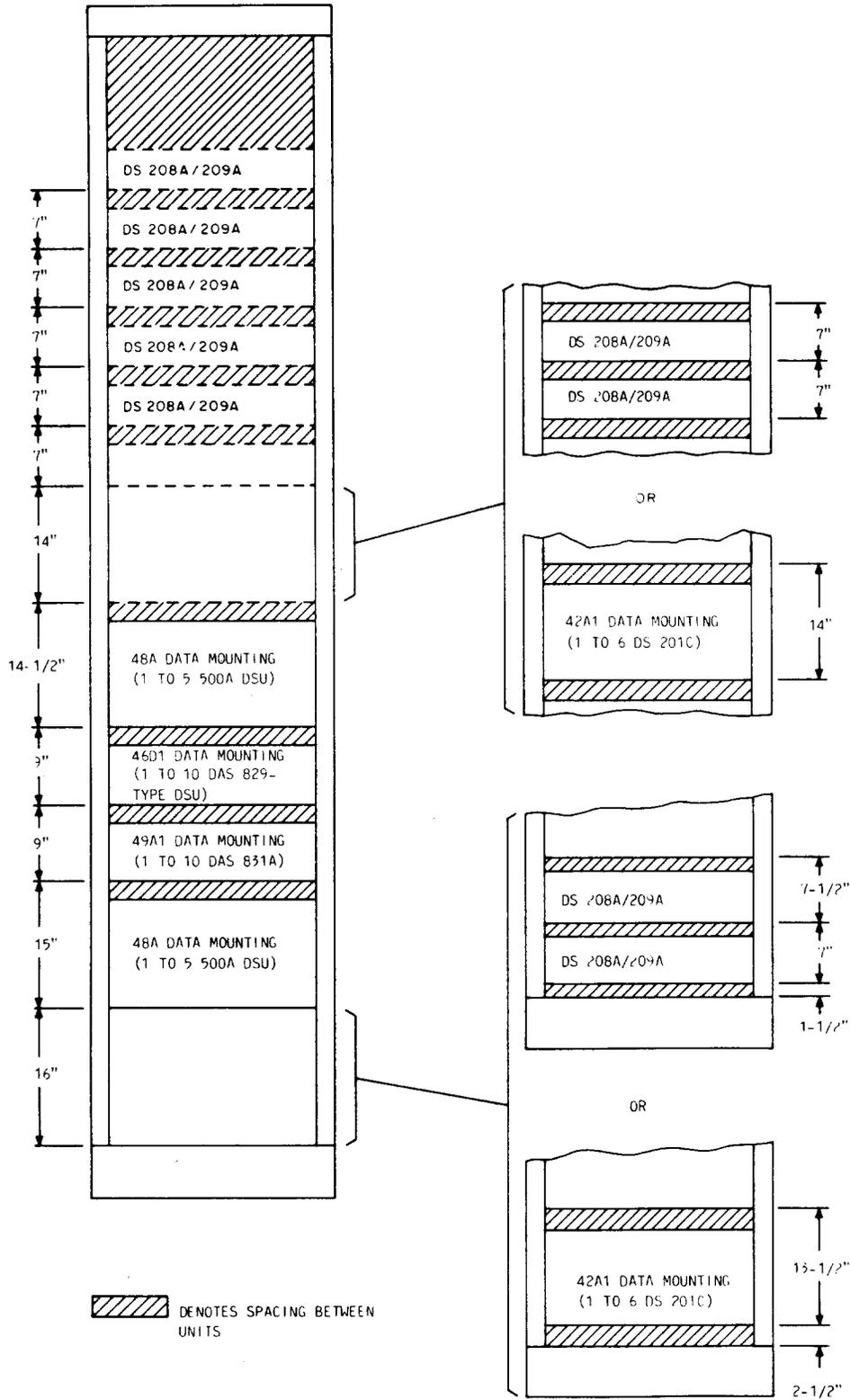


Fig. 9—Representative Hub-Office Bay Arrangement—11-Foot 6-Inch Bay

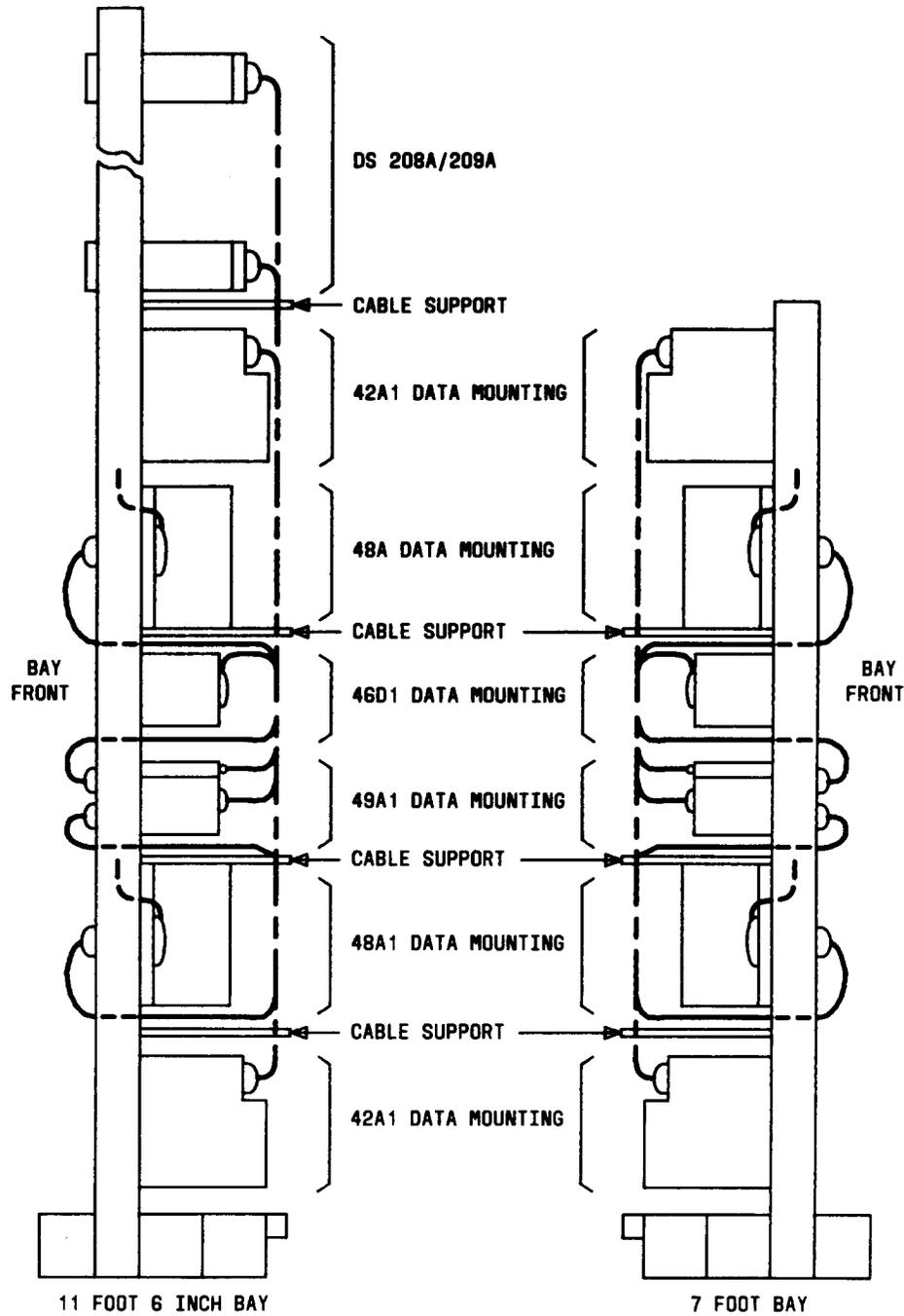
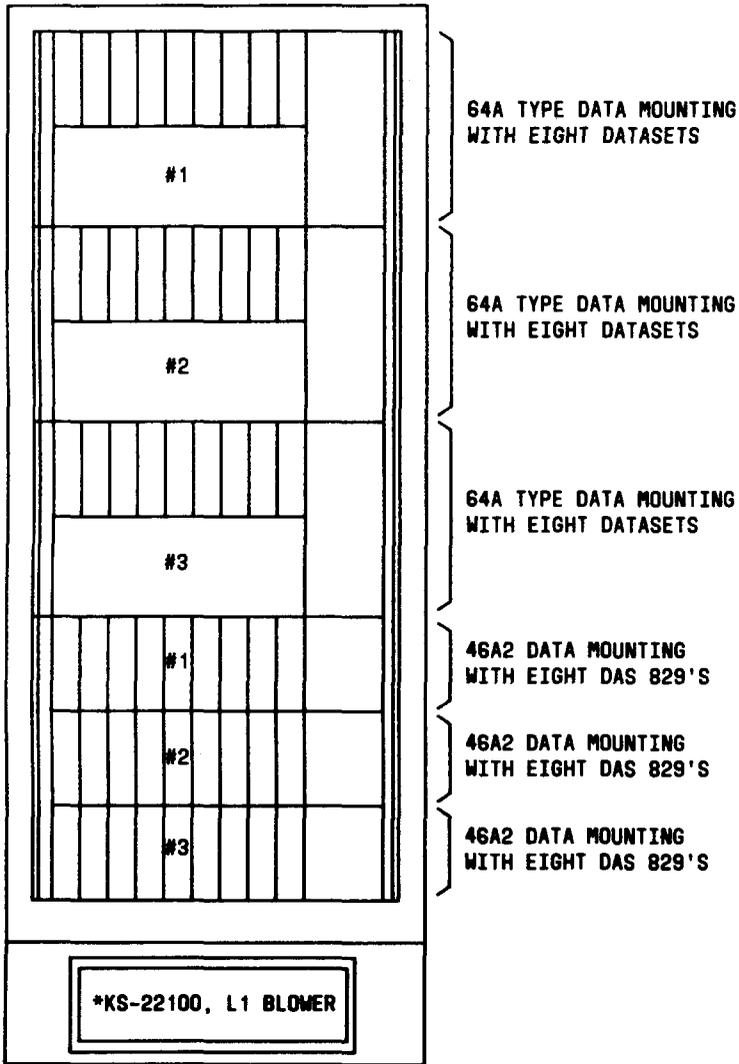


Fig. 10—Typical Cable Routing for Subrate Off-Net Extension Bay

with space above and below, the M25A cord to the DATA SET CUST connector should be routed over the top of the data mounting to the rear of the bay; and the M25A cord to the DATA SRV UNIT connector should be routed below the data mounting to the

rear of the bay. If the 49A1 data mounting is installed with no spacing above and below, these cords may be routed through cutouts in the data mounting. All interconnecting cables should be dressed inside the cable supports.



*OPTIONAL

POWER REQUIREMENTS (APPROX)

DS2096A		DS2048A		DS2024A	
WATTS	AMPS	WATTS	AMPS	WATTS	AMPS
515	4.7	475	4.2	340	3.0
515	4.7	475	4.2	340	3.0
515	4.7	475	4.2	340	3.0
14	.14	14	.14	14	.14
14	.14	14	.14	14	.14
14	.14	14	.14	14	.14
BLOWER					
140	1.5	140	1.5	140	1.5
1727	16.1	1607	14.6	1202	10.9

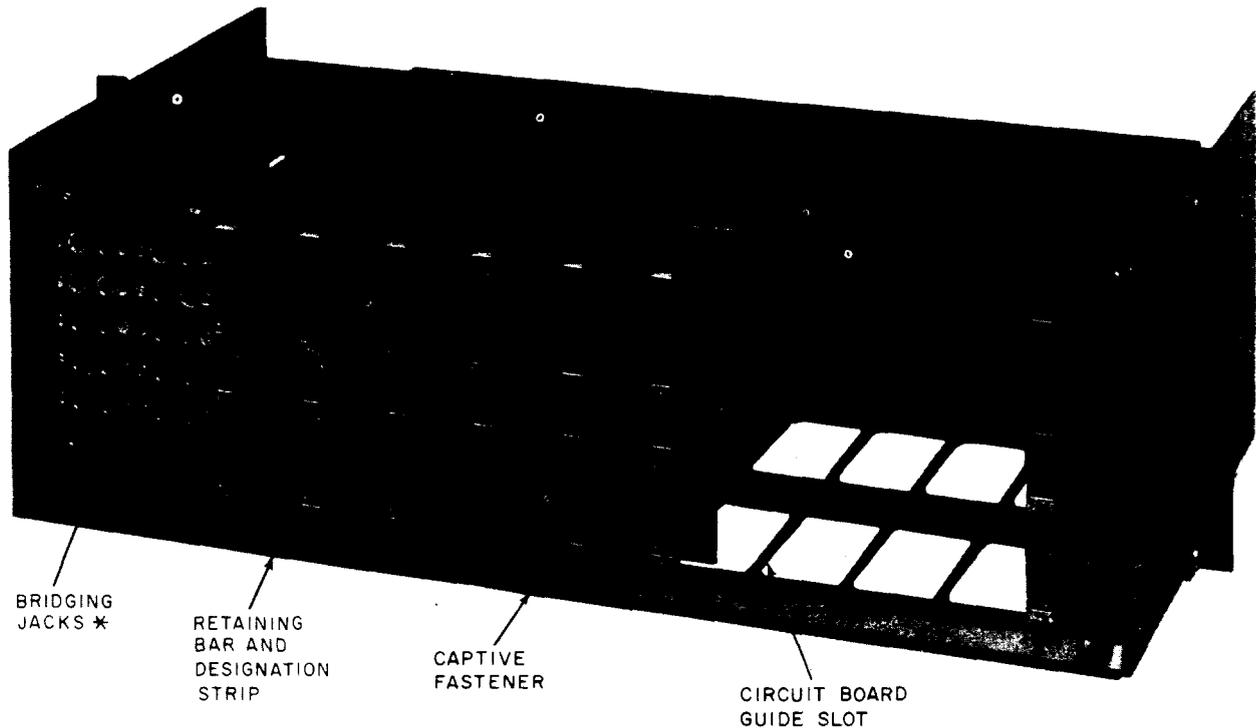
◆Fig. 11—Three 64A-Type Multiple Data Mountings and Three 46A2 Data Mountings Installed in a KS-20018, L15C Cabinet◆

5. CONNECTIONS—CUSTOMER PREMISES

5.01 Data set connections at the customer premises are covered in the sections referenced in Table A. However, in installations using data sets 201C, 208A or equivalent, an M23B cord or equivalent must be used to interconnect the data set to the customer-provided interface cord.

6. INSTALLATION TEST REQUIREMENTS

- 6.01 Test the data set installation and transmission circuit from the customer premises to the DDS hub office using guidelines specified in the data set installation section (Table A).
- 6.02 Test the 500A DSU installation as specified in Section 595-200-200.



* THE BRIDGING JACKS ARE PRESENT ON THE 49A1 DATA MOUNTING, SERIES 1 ONLY; THE JACKS ARE REPLACED BY A BLANK PANEL ON 49A1 DATA MOUNTINGS, SERIES 2 OR HIGHER.

Fig. 12—49A1 Data Mounting—Front View

A. DAS 831A Installation Test

6.03 In conjunction with the DDS, test the DAS 831A installation as follows:

- (a) Depress the DAS 831A TEST switch. The indicator in the center of the button is orange.
- (b) Request the hub office to perform the manual loopback test as given in Section 314-901-500.
- (c) Release the DAS 831A TEST switch. The indicator in the center of the button is black.



The DAS 831A TEST switch must be in the released position (indicator in the center of the button is black) at all times except when performing a loopback test at the DAS 831A.

B. DAS 829-Type Installation Test

6.04 The test guidelines given in this part are followed prior to transmission tests. The DAS 829 type is considered to be part of the private line channel; and transmission tests, such as slope, envelope delay, noise, etc, should be made through the DAS 829 type.

6.05 The checkout and test of the operating performance of the installed DAS 829 type can be made by performing the following tests:

- Local test
- Tone-activated loopback test.

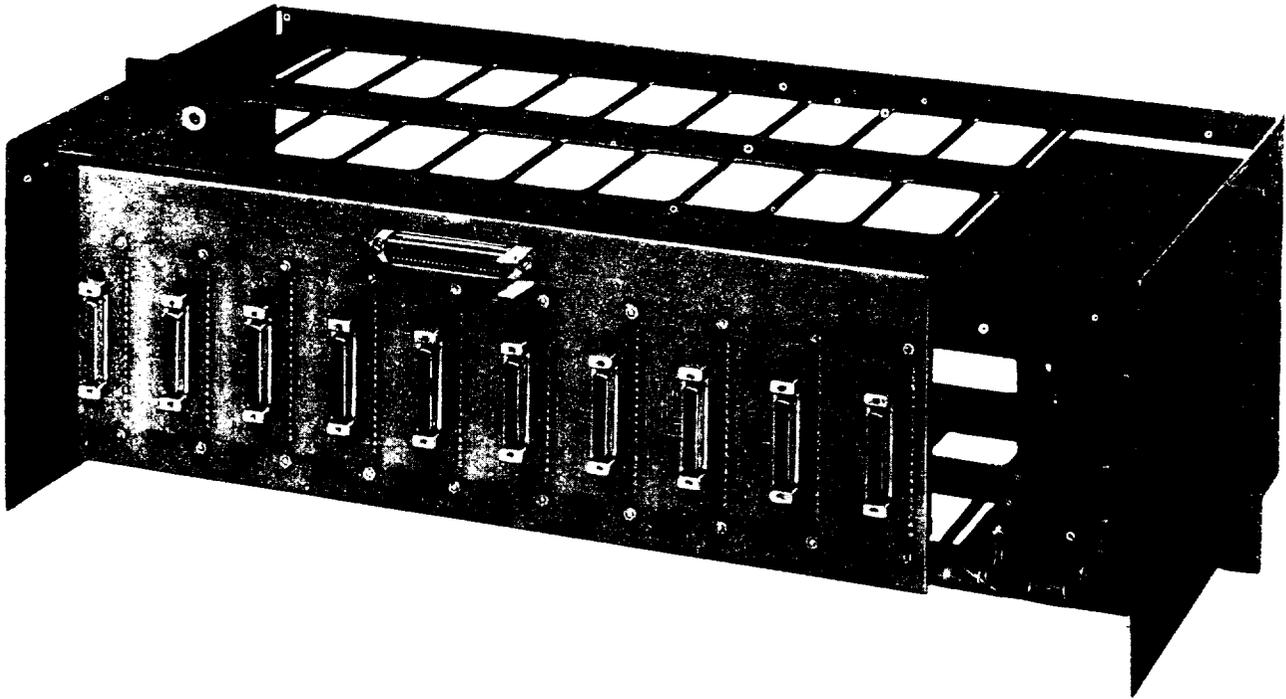


Fig. 13—49A1 Data Mounting—Rear View

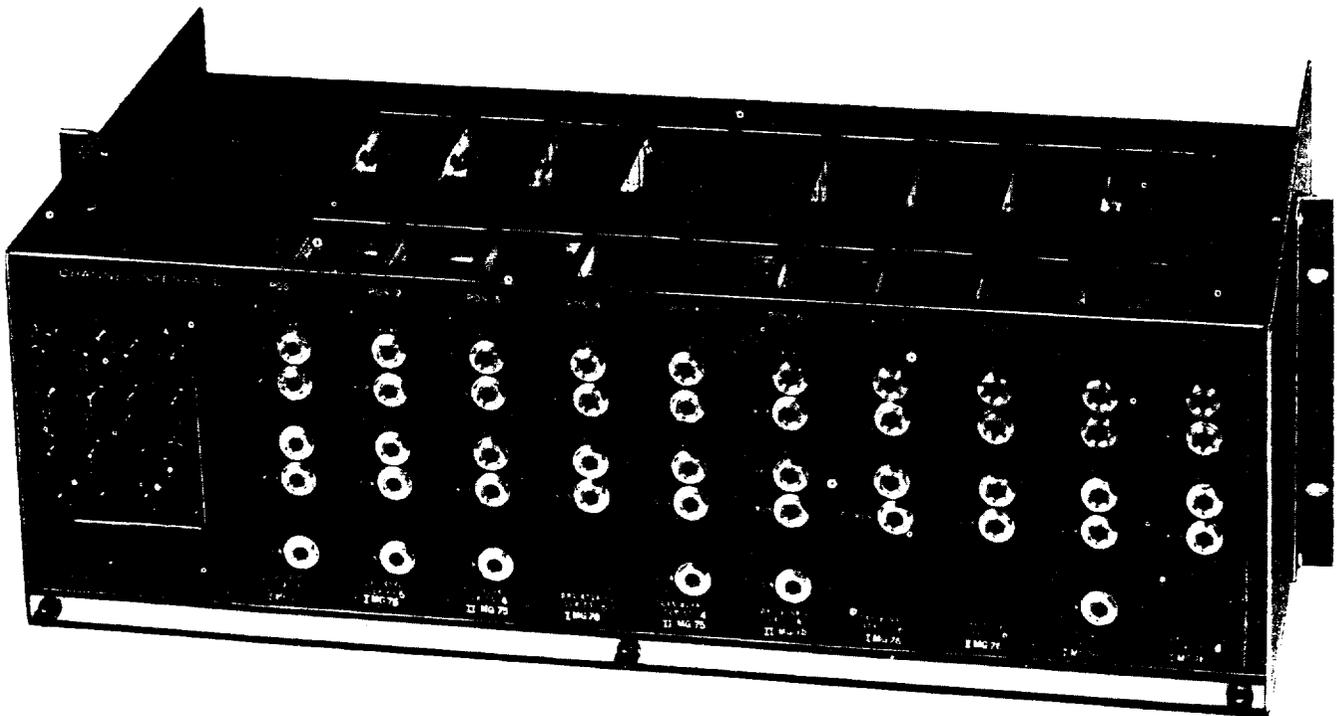


Fig. 14—46D1 Data Mounting—Front View

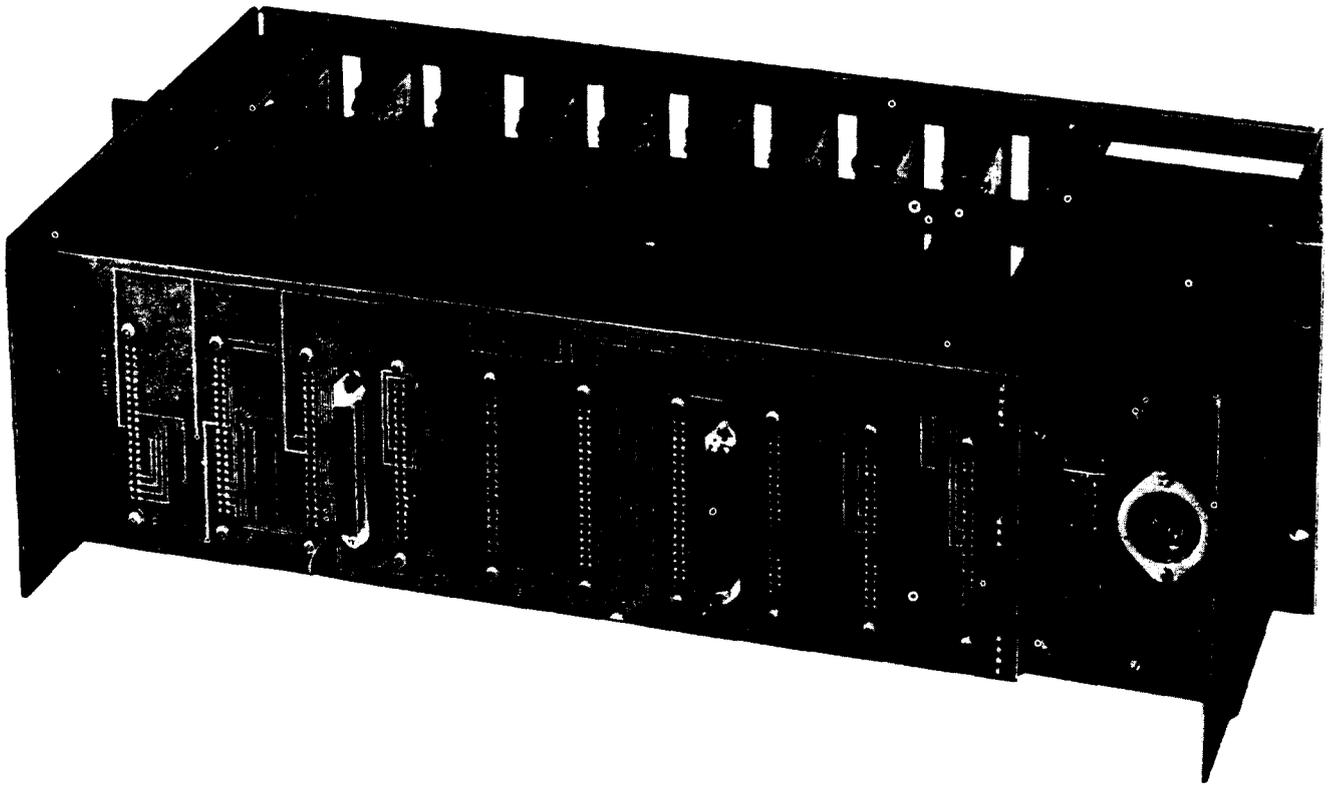


Fig. 15—46D1 Data Mounting—Rear View

6.06 The local test provides DAS 829-type checkout from the DAS 829-type location without the aid of a private line SVB or remote station. The procedures necessary to perform the local test are contained in Section 314-919-500.

6.07 The tone-activated loopback test provides a checkout of the DAS 829-type tone detection circuit from a private line testboard. This test requires an application of a 2713-Hz tone to the DAS 829 type in order to test the tone-detection circuit in the DAS 829 type when benchmark channel measurements are made.

Tone-Activated Loopback Test

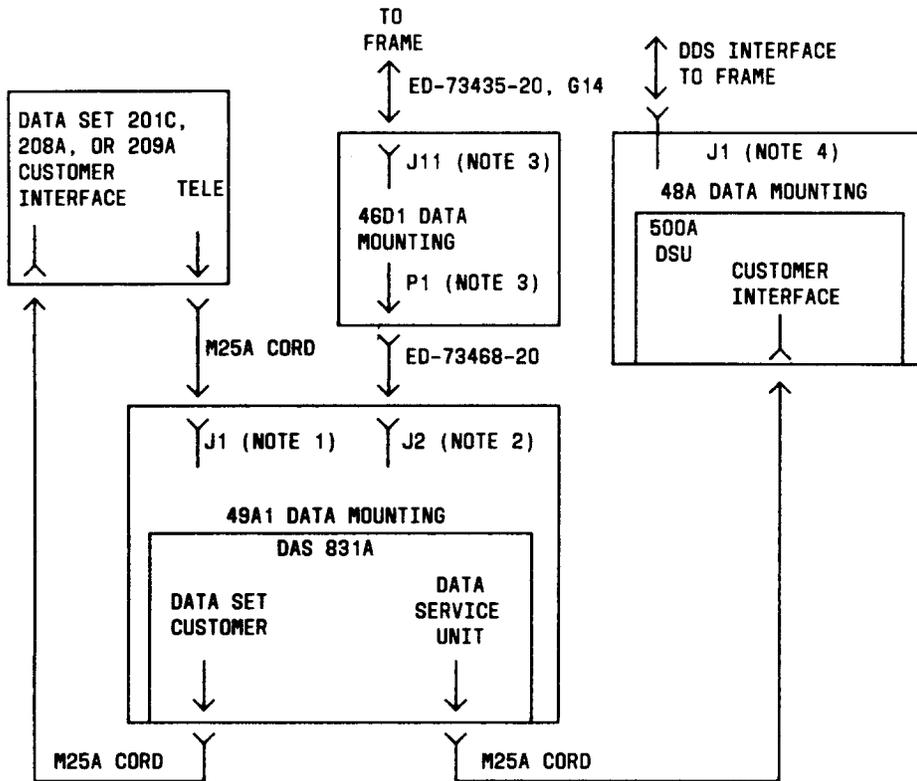
6.08 The loopback circuit in all DAS 829-types provides loopback to the private line testboard for testing. Any of the DAS 829-types may be looped back remotely by application of a 2713-Hz tone which is provided by a 406A tone generator (or equivalent). Perform the following steps for tone-activated loopback.

(a) Check to ensure the 4-wire metallic facility and the local power cord are connected. Contact the DDS private line testboard and request a 2713-Hz tone be transmitted. The tone will operate the loopback relay LB1 after it has been applied for a minimum of 5 seconds and then removed.

(b) Request the DDS private line testboard to send 1004 Hz and if received by the testboard, the loopback state. The testboard may perform any desired measurements at this time.

(c) If all measurements meet requirements, normal operation may be resumed by requesting the DDS private line testboard to send another 2713-Hz tone for 5 seconds to ensure release of the LB1 relay.

(d) The DDS private line testboard should send 1004 Hz to verify release of the loopback state at the DAS 829 type.



NOTES:

1. One J1 connector for each of 10 DAS positions in 49A1 data mounting.
2. Only one J2 connector for each 49A1 data mounting.
3. Only one P1 and J11 connector for each 46D1 data mounting.
4. Only one J1 connector for each 48A data mounting.

Fig. 16—Off-Net Hub Office Connections

6.09 The entire off-net extension is tested by activating the digital loopback (DL) at the customer premises and performing an error run from the DDS private line testboard (Section 314-901-500). The error count must be less than two errors in 5 minutes.

Note: It is not required that tests using a 914-type data test set be performed during installation.

TABLE G

J2 PIN ASSIGNMENTS (49A1 DATA MOUNTING)

DAS 831A INSERTED IN POSITION	R	T	R1	T1
1	1	26	2	27
2	3	28	4	29
3	5	30	6	31
4	7	32	8	33
5	9	34	10	35
6	11	36	12	37
7	13	38	14	39
8	15	40	16	41
9	17	42	18	43
10	19	44	20	45

TABLE H

J11 PIN ASSIGNMENTS (46D1 DATA MOUNTING)

DAS 829-TYPE INSERTED IN POSITION	R	T	R1	T1
1	1	26	2	27
2	3	28	4	29
3	5	30	6	31
4	7	32	8	33
5	9	34	10	35
6	11	36	12	37
7	13	38	14	39
8	15	40	16	41
9	17	42	18	43
10	19	44	20	45

TABLE I

P1 PIN ASSIGNMENTS (46D1 DATA MOUNTING)

DAS 829-TYPE INSERTED IN POSITION	DR	DT	DR1	DT1
1	1	26	2	27
2	3	28	4	29
3	5	30	6	31
4	7	32	8	33
5	9	34	10	35
6	11	36	12	37
7	13	38	14	39
8	15	40	16	41
9	17	42	18	43
10	19	44	20	45