

**DATA AUXILIARY SET 829-TYPE
MULTIPLE CHANNEL ARRANGEMENTS
(SWITCHED DIAL BACKUP)
INSTALLATION AND CONNECTIONS**

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1. GENERAL

1.01 This section contains information and instructions for the installation and connection of switched dial backup to multiple arrangements of 4-wire private line (PL) voiceband data channels. It also contains information on the installation of alternate voice (FDA) circuits using a 48D1 data unit and an 18- or 30-button key telephone. These units are used in conjunction with data auxiliary set (DAS) 829-type. This section does not cover the installation of modems used in conjunction with the data units and associated data mountings.

1.02 Whenever this section is reissued, the reason for reissue will be listed in this paragraph.

1.03 The function of switched dial backup is provided by the 48B1, 48C1, and 48D1 data units and the 46C1 data mounting in conjunction with DAS 829-type. These units are shown in Fig. 1. The DAS 829-types are referred to as channel interface units (CIUs). The CIUs provide standard, prewired, tested station arrangements for terminating 4-wire PL voiceband data channels. The standard data transmission arrangement is referred to as a full data (FD) arrangement. Descriptive information on the DAS 829-type is given in Section 598-082-100.

1.04 The 48B1, 48C1, and 48D1 data units are used to add a switched dial backup arrangement to FD and or full data/alternate voice (FDA) multiple arrangements provided by DAS 829-type.

1.05 The 48B1, 48C1, and 48D1 data units are compatible with the same modems that work with DAS 829-type. Switchable dial backup service is intended for use with telephone company (telco) modems only. In the case of a customer-provided modem, the customer is required to access the switched network through data access arrangements (DAAs) and must assume responsibility for providing the switching arrangements to transfer the modem from the PL to the switched network as well as any level adjustments that may be required.

1.06 The 46C1 data mounting provides a housing for a maximum of two 48B1 data units and a maximum of six 48C1 data units. Both the 46C1 data mounting and the 48D1 data unit are intended for rack mounting on 19- or 23-inch relay racks or KS-20018-type cabinets.

1.07 The 48D1 data unit is intended to be mounted directly under the 46C1 data mounting when a switched dial backup arrangement is provided.

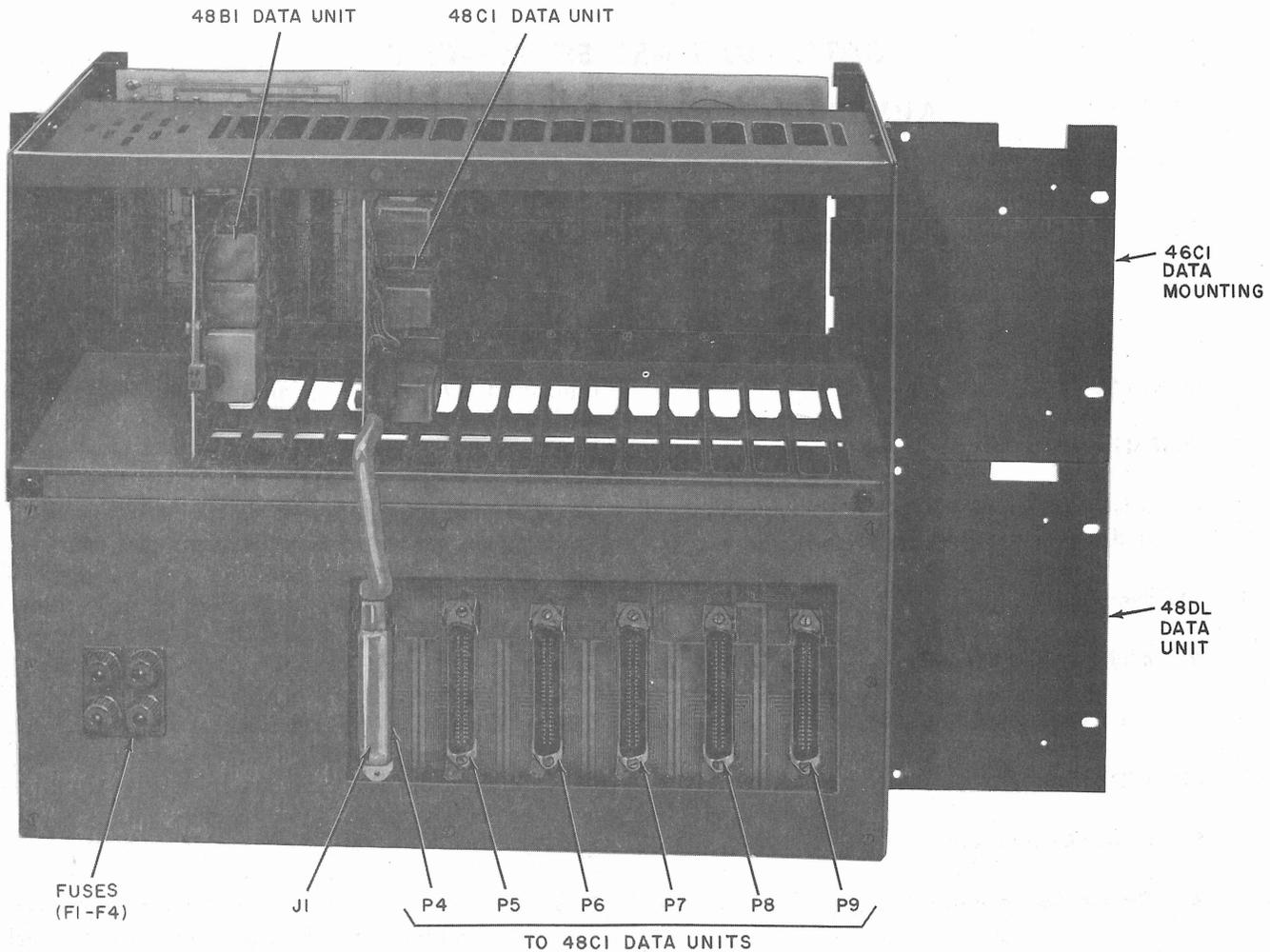


Fig. 1—Front View of 48D1 Data Unit and 46C1 Data Mounting

2. INSTALLATION

2.01 No special tools are required to install the data units and data mountings.

2.02 The data units and mountings are to be installed in accordance with general instructions given in sections covering installation of station sets. Refer to Section 590-010-200 entitled Data Sets, General Installation Information.

A. Rack-Mounted (46C1 Data Mounting and 48D1 Data Unit)

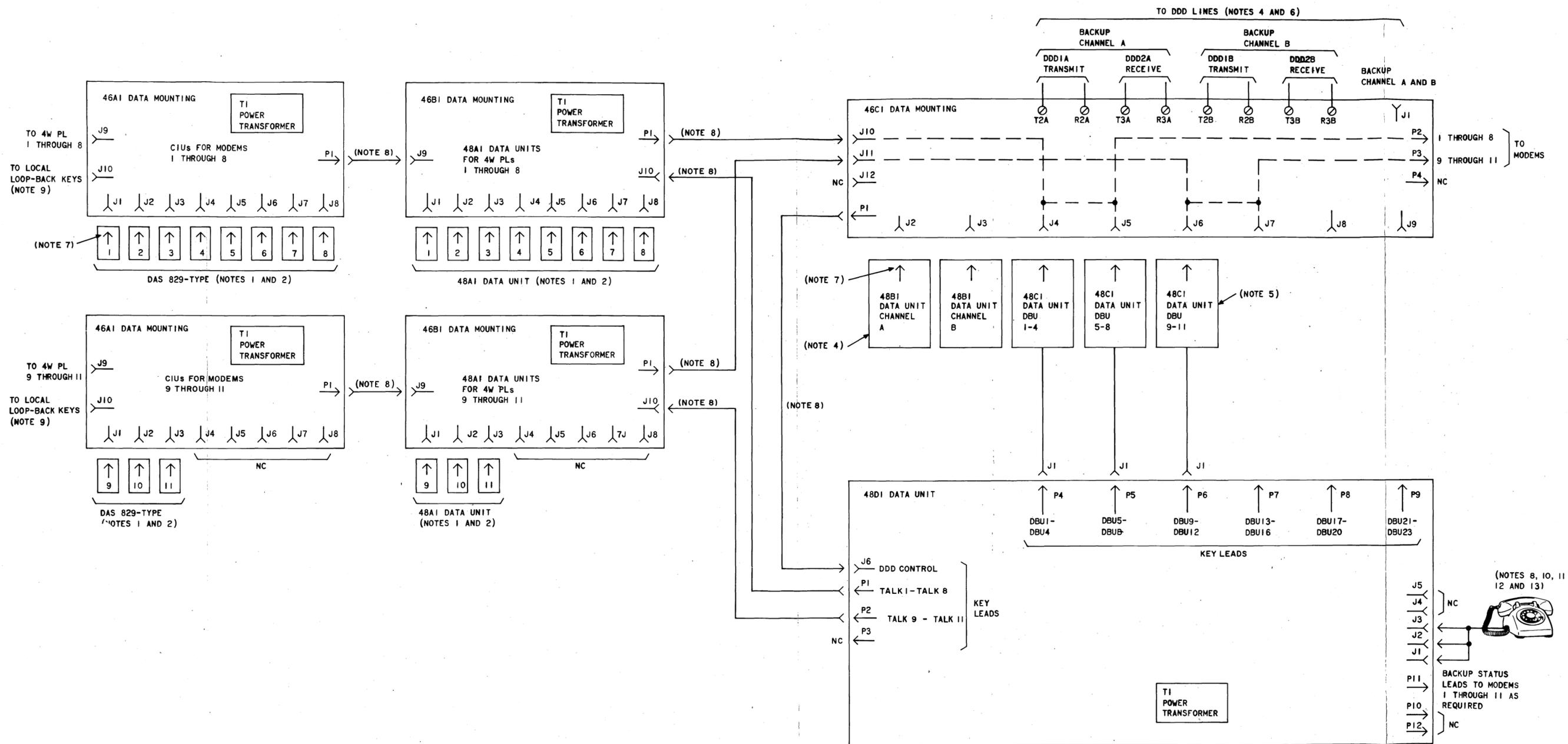
2.03 The multiple installation FD or FDA using the 46A1 and 46B1 data units are described in Part 3 of Section 598-082-201.

2.04 The installation procedure for a rack-mounted (multiple) installation for switchable dial backup is as follows:

- (1) Assemble and set up relay rack or mounting bars in the cabinet.
- (2) Mount the 46C1 data mounting and the 48D1 data unit to the relay rack mounting bars.

Note: The 48D1 data unit mounts directly under the 46C1 data mounting.

- (3) Connect the necessary interconnecting cables between the data unit and data mountings as required. Typical installations are shown in Fig. 2, 3, and 4.

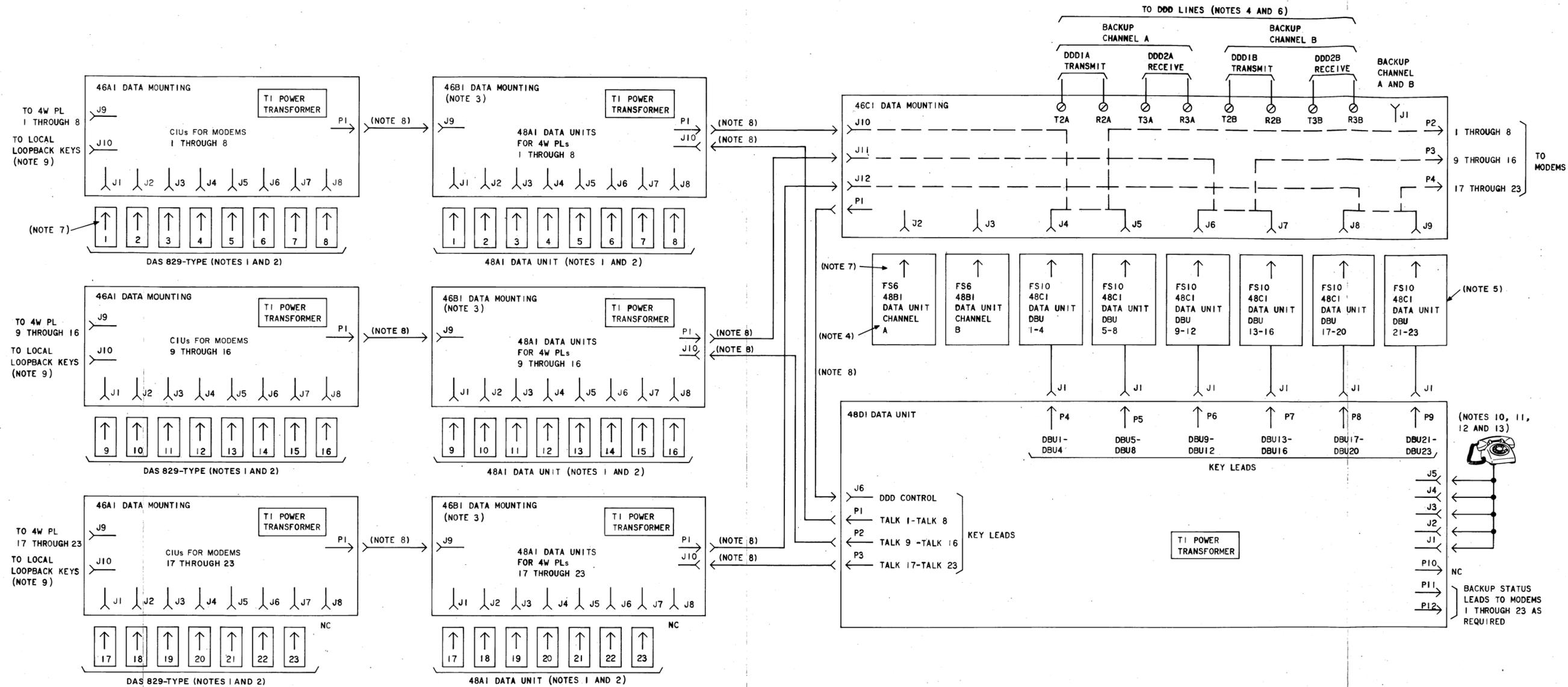


- NOTES:
1. A MAXIMUM OF ELEVEN FDA ARRANGEMENTS WITH SWITCHABLE DIAL BACKUP SERVICE TO ONE OF TWO BACKUP CHANNELS MAY BE PROVIDED AS SHOWN. AN FDA ARRANGEMENT IS PROVIDED FOR THE NTH 4W PL WHEN THE NTH DAS 829-TYPE AND 48A1 DATA UNIT ARE PROVIDED. UNUSED POSITIONS IN BOTH THE 46A1 AND THE 46B1 DATA MOUNTINGS ARE LEFT UNTERMINATED.
 2. AN FD ARRANGEMENT IS PROVIDED FOR THE NTH 4W PL WHEN THE NTH DAS 829-TYPE IS PROVIDED AND THE NTH 48A1 DATA UNIT IS NOT PROVIDED. UNUSED POSITIONS IN THE 46B1 DATA MOUNTING ARE LEFT UNTERMINATED.
 3. WHEN ALTERNATE VOICE SERVICE IS NOT REQUIRED, OR ONLY REQUIRED ON SOME PORTION OF THE 4W PLs PROVIDED, IT MAY BE POSSIBLE TO ELIMINATE ALL, OR PART, OF THE INDICATED 46B1 DATA MOUNTINGS.
 4. THE ARRANGEMENT SHOWN PROVIDES TWO DIAL BACKUP CHANNELS. WHEN ONE OF THE BACKUP CHANNELS IS NOT REQUIRED, THE 48B1 DATA UNIT ASSOCIATED WITH THAT CHANNEL AND THE DDD LINES REQUIRED FOR THAT CHANNEL ARE NOT PROVIDED.
 5. WHEN SWITCHABLE DIAL BACKUP SERVICE IS NOT REQUIRED ON SOME PORTION OF THE SERVICE, IT MAY BE POSSIBLE TO REDUCE THE NUMBER OF 48C1 DATA UNITS REQUIRED.
 6. THE DDD LINES MAY BE TERMINATED THROUGH USE OF EITHER A SCREW TERMINAL STRIP OR CONNECTOR J1.
 7. PLUG SHOWN FOR EITHER THE DAS 829-TYPE OR 48-TYPE DATA UNIT IS THE 40-PIN PLUG FORMED BY THE TERMINATION ON THE EDGE OF THE PRINTED WIRING BOARD.
 8. REFER TO FIG. 6 FOR CONNECTING CABLE RESTRICTIONS.
 9. LOCAL LOOP-BACK KEYS ARE NORMALLY NOT PROVIDED.
 10. A 630DA2-(COLOR) OR 2630DA2-(COLOR) 18-BUTTON KEY TELEPHONE SET MUST BE PROVIDED FOR CONTROL OF THE 2 BY 11 SWITCHING MATRIX AND ALTERNATE VOICE CIRCUITS. CONVERT THE TELEPHONE SET AS FOLLOWS:

SCREW TERMINAL LEADS			
COLOR	W-0	V-G	O-W
REMOVE FROM	7	5	5
CONNECT TO	TAPE AND STORE	7	7
ADD: STRAP BETWEEN 7 AND 24			

11. TO PROVIDE THE SERVICE SHOWN THE TELEPHONE KEY STRIP SHALL BE AS FOLLOWS:
- | REL | RING | TALK-DBU6 |
|-------|-----------|------------|
| DDD1A | TALK-DBU1 | TALK-DBU7 |
| DDD2A | TALK-DBU2 | TALK-DBU8 |
| DDD1B | TALK-DBU3 | TALK-DBU9 |
| DDD2B | TALK-DBU4 | TALK-DBU10 |
| HOLD | TALK-DBU5 | TALK-DBU11 |
- WHEN SOME PORTION OF THE SERVICE IS NOT PROVIDED THE KEY STRIPS SHALL BE MODIFIED ACCORDINGLY.
12. CONVERT THE 1ST PICKUP KEY OF THE 1ST KEY MODULE (REL TO A NONLOCKING KEY).
 13. CONVERT THE 1ST PICKUP KEY OF THE 2ND KEY MODULE (RING) TO A NONLOCKING KEY.

Fig. 2—Multiple FDA or FD Arrangement With Switchable Dial Backup for Eleven Modems or Less



- NOTES:
1. A MAXIMUM OF TWENTY-THREE FDA ARRANGEMENTS WITH SWITCHABLE DIAL BACKUP SERVICE TO ONE OF TWO BACKUP CHANNELS MAY BE PROVIDED AS SHOWN. AN FDA ARRANGEMENT IS PROVIDED FOR THE NTH 4W PL WHEN THE NTH DAS 829-TYPE AND 48A1 DATA UNIT ARE PROVIDED. UNUSED POSITIONS IN BOTH THE 46A1 AND THE 46B1 DATA MOUNTINGS ARE LEFT UNTERMINATED.
 2. AN FD ARRANGEMENT IS PROVIDED FOR THE NTH 4W PL WHEN THE NTH DAS 829-TYPE IS PROVIDED AND THE NTH 48A1 DATA UNIT IS NOT PROVIDED. UNUSED POSITIONS IN THE 46B1 DATA MOUNTING ARE LEFT UNTERMINATED.
 3. WHEN ALTERNATE VOICE SERVICE IS NOT REQUIRED, OR ONLY REQUIRED ON SOME PORTION OF THE 4W PL'S PROVIDED, IT MAY BE POSSIBLE TO ELIMINATE ALL OR PART, OF THE INDICATED 46B1 DATA MOUNTINGS.
 4. THE ARRANGEMENT SHOWN PROVIDES TWO DIAL BACKUP CHANNELS. WHEN ONE OF THE BACKUP CHANNELS IS NOT REQUIRED, THE 48B1 DATA UNIT ASSOCIATED WITH THAT CHANNEL AND THE DDD LINES REQUIRED FOR THAT CHANNEL ARE NOT PROVIDED.
 5. WHEN SWITCHABLE DIAL BACKUP SERVICE IS NOT REQUIRED ON SOME PORTION OF THE SERVICE IT MAY BE POSSIBLE TO REDUCE THE NUMBER OF 48C1 DATA UNITS REQUIRED.
 6. THE DDD LINES MAY BE TERMINATED THROUGH USE OF EITHER A SCREW TERMINAL STRIP OR CONNECTOR J1.
 7. PLUG SHOWN FOR EITHER THE DAS 829-TYPE OR THE 48-TYPE DATA UNIT IS THE 40-PIN PLUG FORMED BY THE TERMINATIONS ON THE EDGE OF THE PRINTED WIRING BOARD.
 8. REFER TO FIG. 6 FOR CONNECTING CABLE RESTRICTIONS.
 9. LOCAL LOOPBACK KEYS ARE NORMALLY NOT PROVIDED.
 10. A 631DA3-(COLOR) OR 2631DA3-(COLOR) 30 BUTTON KEY TELEPHONE SET MUST BE PROVIDED FOR CONTROL OF THE 2 BY 23 SWITCHING MATRIX AND ALTERNATE VOICE CIRCUITS. CONVERT THE TELEPHONE SET AS FOLLOWS:

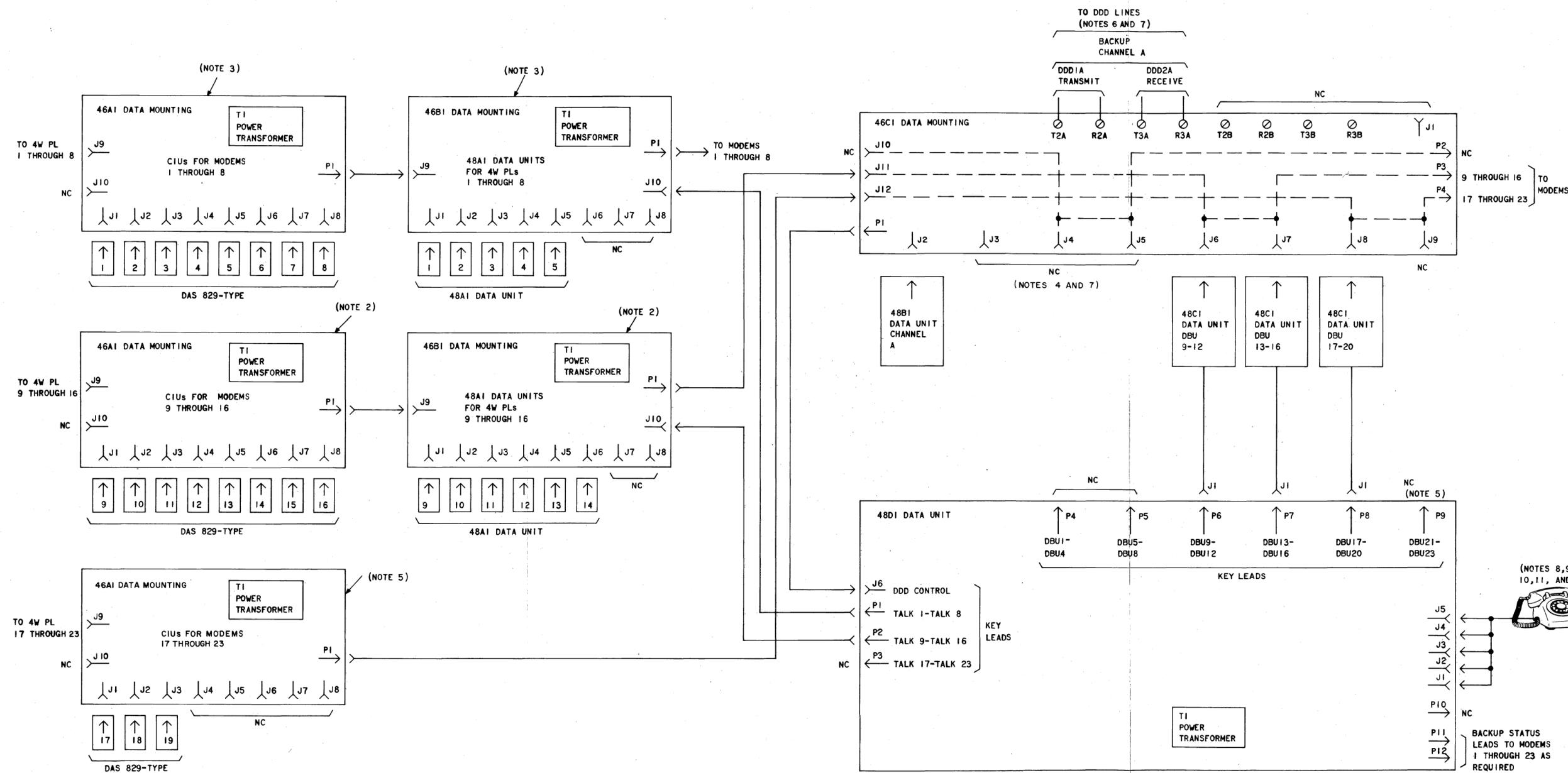
SCREW TERMINAL LEADS			
COLOR	W-O	V-G	O-W
REMOVE FROM	7	5	5
CONNECT TO	TAPE AND STORE	7	7
ADD: STRAP BETWEEN 7 AND 24			

11. TO PROVIDE THE SERVICE SHOWN THE TELEPHONE KEY STRIP SHALL BE AS FOLLOWS:

REL	RING	TALK-DBU6	TALK-DBU12	TALK-DBU18
DDD1A	TALK-DBU1	TALK-DBU7	TALK-DBU13	TALK-DBU19
DDD2A	TALK-DBU2	TALK-DBU8	TALK-DBU14	TALK-DBU20
DDD1B	TALK-DBU3	TALK-DBU9	TALK-DBU15	TALK-DBU21
DDD2B	TALK-DBU4	TALK-DBU10	TALK-DBU16	TALK-DBU22
HOLD	TALK-DBU5	TALK-DBU11	TALK-DBU17	TALK-DBU23

- WHEN SOME PORTION OF THE SERVICE IS NOT PROVIDED THE KEY STRIPS SHALL BE MODIFIED ACCORDINGLY.
12. CONVERT THE 1ST PICKUP KEY OF THE 1ST KEY MODULE (REL) TO A NON-LOCKING KEY.
 13. CONVERT THE 1ST PICKUP KEY OF THE 2ND KEY MODULE (RING) TO A NON-LOCKING KEY.

Fig. 3—Multiple FDA or FD Arrangement With Switchable Dial Backup for Twenty-Three Modems or Less



NOTES:

1. THE ARRANGEMENT SHOWN ILLUSTRATES THE VARIETY OF SERVICES WHICH MAY BE CONTROLLED THROUGH USE OF A 30-BUTTON KEY TELEPHONE SET. THE ARRANGEMENT SHOWN PROVIDES ELEVEN FDA ARRANGEMENTS AND EIGHT FD ARRANGEMENTS. SWITCHED DIAL BACKUP SERVICE, TO ONE BACKUP CHANNEL, IS PROVIDED FOR SIX OF THE FDA ARRANGEMENTS AND FIVE OF THE FD ARRANGEMENTS. LOCAL LOOPBACK KEYS ARE NOT PROVIDED.
2. A MAXIMUM OF EIGHT FDA ARRANGEMENTS WITH SWITCHABLE DIAL BACKUP SERVICE TO ONE BACKUP CHANNEL MAY BE PROVIDED FOR 4W PLs 9 THROUGH 16 WITH THE INDICATED 46AI AND 46BI DATA MOUNTING. POSITIONS 15 AND 16 OF 46BI DATA MOUNTING HAVE BEEN LEFT UNTERMINATED. THESE POSITIONS PROVIDE FD ARRANGEMENTS.
3. A MAXIMUM OF EIGHT FDA ARRANGEMENTS MAY BE PROVIDED FOR 4W PLs 1 THROUGH 8 WITH THE INDICATED 46AI AND 46BI DATA MOUNTINGS. POSITIONS 6, 7 AND 8 OF THE 46BI DATA MOUNTING HAVE BEEN LEFT UNTERMINATED; HENCE THESE POSITIONS PROVIDE FD ARRANGEMENTS. THESE DATA MOUNTINGS ARE NOT CONNECTED TO THE 46CI DATA MOUNTING AS DIAL BACKUP IS NOT REQUIRED. THE 46BI DATA MOUNTING IS CONNECTED TO THE 48BI DATA UNIT TO PROVIDE FOR KEY CONTROL OF THE FDA ARRANGEMENTS ON 4W PLs 1 THROUGH 5.
4. THE 48C1 DATA UNITS PROVIDING SWITCHING MATRICES FOR MODEMS 1 THROUGH 4 AND 5 THROUGH 8 ARE NOT PROVIDED AS DIAL BACKUP SERVICE IS NOT REQUIRED FOR THESE 4W PLs.
5. A MAXIMUM OF SEVEN FD ARRANGEMENTS WITH SWITCHABLE DIAL BACKUP SERVICE TO ONE BACKUP CHANNEL MAY BE PROVIDED FOR 4W PLs 17 THROUGH 23 WITH THE INDICATED 46AI DATA MOUNTING. POSITIONS 17, 18 AND 19 OF THE 46AI DATA MOUNTING PROVIDE FOR THREE FD ARRANGEMENTS. THE SWITCHING MATRIX (48C1 DATA UNIT) REQUIRED TO PROVIDE DIAL BACKUP FOR POSITIONS 17 THROUGH 20 HAS BEEN PROVIDED. THE SWITCHING MATRIX FOR POSITIONS 21 THROUGH 23 IS NOT PROVIDED AS THESE LINES ARE NOT TERMINATED. IF LINES 21 THROUGH 23 ARE TO BE TERMINATED THE SWITCHING MATRIX FOR THESE POSITIONS IS REQUIRED.
6. THE SCREW TERMINAL STRIP HAS BEEN USED TO TERMINATE THE PAIR OF DDD LINES REQUIRED TO PROVIDE BACKUP CHANNEL A. THE 48BI DATA UNIT REQUIRED FOR CHANNEL A HAS BEEN PROVIDED.
7. THE BACKUP CHANNEL B HAS NOT BEEN PROVIDED; HENCE THE 46BI DATA UNIT PROVIDING THE CONTROL OF CHANNEL B HAS NOT BEEN PROVIDED.
8. A 631DA3-(COLOR) OR 2631DA3-(COLOR) 30-BUTTON KEY TELEPHONE MUST BE PROVIDED FOR CONTROL OF THE SWITCHING MATRIX AND ALTERNATE VOICE CIRCUITS. CONVERT THE TELEPHONE SET AS FOLLOWS:

SCREW TERMINAL LEADS			
COLOR	W-O	V-G	O-W
REMOVE FROM	7	5	5
CONNECT TO	TAPE AND STORE	7	7

ADD: STRAP BETWEEN 7 AND 24

9. TO PROVIDE THE SERVICE SHOWN THE TELEPHONE KEY STRIP SHALL BE AS FOLLOWS:

REL	RING	TALK-DBU12	DBU 18
DDD1A	TALK 1	TALK-DBU13	DBU 19
DDD2A	TALK 2	TALK-DBU14	
	TALK 3	TALK-DBU9	DBU 15
	TALK 4	TALK-DBU10	DBU 16
HOLD	TALK 5	TALK-DBU11	DBU 17

10. THE PICKUPS KEYS PROVIDING CONTROL OF 4W PLs ARE IDENTIFIED AS FOLLOWS:
 DBU N - CONTROLS THE SWITCHING MATRIX FOR POSITION N.
 TALK N - CONTROLS THE ALTERNATE VOICE CIRCUIT FOR POSITION N.
 TALK-DBU N - CONTROLS THE ALTERNATE VOICE AND SWITCHING MATRIX FOR POSITION N.
 BLANK - ALTERNATE VOICE CIRCUIT NOT PROVIDED AND SWITCHING MATRIX IS NOT PROVIDED OR IS NOT USED.
11. CONVERT THE 1ST PICKUP KEY OF THE 1ST KEY MODULE (REL) TO A NONLOCKING KEY.
12. CONVERT THE 1ST PICKUP KEY OF THE 2ND KEY MODULE (RING) TO A NONLOCKING KEY.

Fig. 4—Multiple FDA and FD Arrangement With and Without Switchable Dial Backup

- (4) Install the 48B1 and 48C1 data units in the 46C1 data mounting as specified on the service order.
- (5) Perform required wiring changes and connect the key telephone set (Call Director®) to J1-J5 for 30-button set, J1-J3 for 18-button set on the 48D1 data unit.
- (6) Connect the power cord from P13 on the 48D1 data unit to the 117 Vac power strip.

3. CONNECTIONS

3.01 The data units and data mountings associated with DAS 829-type and providing switchable dial backup allow for a wide variation of station arrangements. Fig. 2 shows a multiple FDA or FD arrangement with switchable dial backup for 11 modems. All interconnections between the data units and the 46C1 data mounting are provided on a plug-in basis using 50-pin connectors. To provide a particular multiple service arrangement the required circuit pack cards (consisting of DAS 829-type, and the 48A1, 48B1, and 48C1 data units) are installed in the appropriate 46-type data mountings.

3.02 The modem interconnection arrangements for the 46A1 data mounting are given in Section 598-082-100. These arrangements also apply to the 46C1 data mounting with the exception that modems requiring the additional interface pair indicating dial backup cannot use the KS-21253, L1 adapter.

A. Multiple Arrangements

3.03 The DAS 829-type and the 48A1, 48B1, and 48C1 data units are used to provide a variety of multiple arrangements. Information on connections for multiple FD arrangements is given in Section 598-082-200. Information on connections for multiple FDA arrangements is given in Section 598-082-201. The following provides connection information on the equipment required to provide switchable dial backup service for FD and/or FDA arrangements. This connection information is intended to show multiple switched backup for a variety of arrangements having a common controlling key telephone set.

3.04 The following rules should be used to determine the equipment required to provide a given multiple arrangement.

(1) Determine the number of FD and/or FDA arrangements to be provided with switchable dial backup. When the number of arrangements is 11, or less, an 18-button Call Director is used to control the service. When the number of arrangements is 23, or less, a 30-button Call Director is used to control the service. When the number of arrangements is greater than twenty-three, more than one Call Director will be required; for example, forty-six FDA arrangements with dial backup service would require two separate arrangements.

(2) Determine the number of FDA arrangements, without switchable dial backup service, to be provided. When possible, concentrate the control for the FDA arrangements in the key telephone set being used to control the customer's switchable dial backup arrangement. Table A provides guidelines for using a 30-button key telephone set to control FDA arrangements provided with, or without, dial backup service. When control of the required number of FDA arrangements cannot be concentrated in the key telephone set being used to control the customer's switchable dial backup service, or when no switchable dial backup service is provided, the FDA arrangements should be provided as given in Section 598-082-201.

(3) Determine the number of FD arrangements, having no dial backup service, to be provided. These arrangements do not require key telephone control and normally would be provided as given in Section 598-082-200. However, when FDA arrangements, without dial backup service, are being provided, there may be terminations available for FD circuits. For example, if twelve FDA arrangements are required, the multiple arrangement provided (two sets of properly interconnected 46A1 and 46B1 data mountings) would provide for sixteen FDA arrangements. The four terminations not used for FDA arrangements could be used to provide FD arrangements.

3.05 Two multiple arrangements will be used to explain the above design rules. The examples chosen illustrate the interconnections required between the 48C1 and 48D1 data units and the 46-type data mountings.

TABLE A

COMMON CONTROL OF FDA ARRANGEMENTS PROVIDED
WITH, AND WITHOUT DIAL BACKUP SERVICE

NUMBER OF FD AND/OR FDA ARRANGEMENTS PROVIDED WITH SWITCHABLE DIAL BACKUP SERVICE	NUMBER OF PICKUP KEYS AVAILABLE FOR CONTROL OF FDA ARRANGEMENTS	PICKUP KEY ASSIGNMENT	
		FOR DIAL BACKUP SERVICE. KEYS DESIGNATED DBU OR TALK-DBU	FOR FDA SERVICE. KEYS DESIGNATED TALK
1 through 7	1 through 16	17 through 23	1 through 16
8 through 15	1 through 8	9 through 23	1 through 8
16	1 through 7	1 through 16	17 through 23
17 through 23	none	1 through 23	none

Twenty-Three FDA Arrangements with Switchable Dial Backup Service

3.06 The first example shown in Fig. 3, is a multiple arrangement consisting of twenty-three FDA arrangements with switchable dial backup service to one of two backup channels. Referring to rule number 1, it can be seen that one 30-button Call Director can be used to control the desired multiple arrangement. Rules numbered 2 and 3 do not apply to this example. The twenty-three FDA arrangements required are provided by interconnecting three sets of 46A1 and 46B1 data mountings as shown in Fig. 3. The three 46A1 data mountings provide for the twenty-three DAS 829-type used to terminate the 4W PLs. The three 46B1 data mountings provide for the twenty-three 48A1 data units used to add alternate voice service to the terminations. Each DAS 829-type and 48A1 data unit has been identified by a number (N) from one to twenty-three. The Nth DAS 829 terminates the Nth 4W PL. The Nth 48A1 data unit adds alternate voice service to the 4W PL terminated by the Nth DAS 829-type. The key leads controlling the FDA arrangements housed in each 46B1 data mounting are concentrated in connector J10. The key leads controlling FDA arrangements 1 through 8 are connected through connector P1, of the 48D1 data unit, to the keys designated 1 through 8 on the 30-button Call Director. Similarly, the key leads controlling FDA arrangements 9 through 16, and 17 through 23 are connected through connectors

P2 and P3, respectively, of the 48D1 data unit, to the appropriate keys on the Call Director. The key controlling the Nth FDA circuits is designated TALK N when only an FDA arrangement is provided. This key should be designated TALK-DBU N when an FDA arrangement with switchable dial backup is provided.

3.07 The interface leads for FDA and/or FD arrangements to be provided with switchable dial backup service must be connected to the appropriate part of the switching matrix. Connector J10, of the 46C1 data mounting, connects the modem interface leads from FDA arrangements 1 through 8 to the switching matrix provided by the pair of 48C1 data units installed in connectors J4 and J5 of the 46C1 data mounting. The key leads controlling the switching matrix for the switchable dial backup arrangements 1 through 8 are connected through connectors P4 and P5, of the 48D1 data unit, to keys designated 1 through 8 on the 30-button Call Director. The key controlling the Nth switchable dial backup arrangement should be designated DBU N when only a switchable dial backup arrangement is provided. This key should be designated TALK-DBU N when an FDA arrangement with switchable dial backup is provided. The interface leads, and the key leads controlling the switching matrix for FDA arrangements 9 through 16, and 17 through 23 are provided in a fashion similar to that shown for FDA arrangements 1 through 8.

3.08 The modem interface leads are concentrated in connectors P2, P3 and P4. The modems may be terminated, as required, using the variety of arrangements shown in Section 598-082-200.

3.09 The backup channels for the required multiple arrangements are provided by the two 48B1 data units installed in connectors J2 and J3 of the 46C1 data mounting. The four direct distance dialing (DDD) lines required for the two dial backup channels are connected to the 46C1 data mounting through use of a screw terminal strip or through use of connector J1. The key leads controlling the dial backup channels A and B are connected through connector J6, of the 48D1 data unit, to the keys designated DDD1A, DDD2A, DDD1B, DDD2B and REL on the 30-button Call Director.

3.10 The 631DA- or the 2631DA-type key telephone set, with the wiring modifications given in Fig. 3, is connected to connectors J1 through J5. This completes the example of providing twenty-three FDA arrangements with switchable dial backup to one of two backup channels. The next example will illustrate a variety of services being controlled through use of one Call Director.

Multiple FD and FDA Arrangements With, and Without, Switchable Dial Backup Service

3.11 This example shows that the customer requires eleven FDA arrangements and eight FD arrangements. The customer also requires a switchable dial backup arrangement, providing one backup channel, for six of the FDA arrangements and for five of the FD arrangements. The service to be provided is shown in Fig. 4. The rules (given in 3.04) are used to illustrate how the service shown in Fig. 4 was determined.

3.12 Using rule number 1, it can be seen that one 18-button Call Director can be used to control the switching matrix required for the eleven arrangements (six FDA and five FD arrangements) requiring dial backup service.

3.13 A total of five FDA arrangements do not require dial backup service. Using rule number 2 and referring to Table A, it can be seen that when eleven FD and/or FDA arrangements are provided with switchable dial backup service, there are up to eight pickup keys available for control of FDA arrangements when a 30-button Call Director is provided. For this example a 30-button

key telephone set, connected to J1 through J5 of the 48D1 data unit, is used to control the entire service arrangement.

3.14 Table A recommends that pickup keys designated 1 through 8 be assigned to the FDA arrangements. Pickup keys 9 through 23 should be assigned to the FD and/or FDA arrangement requiring dial backup service.

3.15 The required five FDA arrangements are provided by the 46A1 and 46B1 data mountings terminating the 4W PLs designated 1 through 8. Positions 1 through 5 provide the required five FDA arrangements. Positions 6 through 8 provide three FD arrangements (rule number 3). The modems for channels 1 through 8 are connected to connector P1 of the 46B1 providing services for channels 1 through 8. The key lead control of alternate voice circuits 1 through 8 is connected to connector P1 of the 48D1 data unit. Positions 1 through 5 are alternate voice circuits. The pickup keys for these positions are therefore designated TALK 1 through TALK 5, respectively. Positions 6 through 8 require no key lead control functions hence these keys are left blank.

Note: The 48C1 data units are not provided in connectors J4 and J5 of the 46C1 data mounting. These connectors are left unterminated as switched dial backup service is not required on channels 1 through 8.

3.16 The required six FDA arrangements to have switched dial backup service are provided by the 46A1 and 46B1 data mountings terminating the 4W PLs designated 9 through 16. Positions 9 through 14 provide the required six FDA arrangements. Positions 15 and 16 provide two of the five FD arrangements to be provided with dial backup service. The key lead control of alternate voice circuits 9 through 16 is connected to connector P2 of the 48D1 data unit.

3.17 The modem interface leads for channels 9 through 16 are connected through the 48C1 data units installed in connectors J6 and J7 of the 46C1 data mounting. These 48C1 data units provide the required switching matrix for channels 9 through 16. The modems for channels 9 through 16 are connected to connector P3 of the 46C1 data mounting.

3.18 The pickup keys for positions 9 through 14 control FDA arrangements with switchable dial backup service and are designated TALK-DBU 9 through TALK-DBU 14, respectively. The pickup keys for positions 15 and 16 control FD arrangements with switchable dial backup service and are designated DBU 15 and DBU 16, respectively.

3.19 Three more FD arrangements with switchable dial backup service are required to complete the required service arrangement. The arrangements are provided by the 46A1 data mounting terminating the 4W PLs designated 17 through 23. The modem interface leads for channels 17 through 23 are connected through the 48C1 data units installed in connectors J8 and J9 of the 46C1 data mounting. The 48C1 data unit installed in connector J8 provides the required switching matrix for channels 17 through 20. Channels 21 through 23 are not required for switchable dial backup. The 48C1 data unit providing the switching matrix for these channels is not provided. Channels 21 through 23 cannot be used unless a 48C1 data unit is provided in connector J9. The modems for channels 17 through 23 are connected to connector P4 of the 46C1 data mounting.

Note: The connectors, J4 through J9, do not provide a through connection for the modem interface leads when unterminated. Hence, in this example, positions 21 through 23 cannot be used to provide FD arrangements.

3.20 The pickup keys for positions 17 through 19 control FD arrangements with switchable dial backup and are designated DBU 17 through DBU 19. The pickup keys for positions 20 through 23 are not used and are left blank.

3.21 Only one dial backup channel is to be provided in this example. The 48B1 data unit installed in connector J2 of the 46C1 data mounting provides the required dial backup channel termination. The DDD lines required for channel A are shown connected to the following screw terminals provided on the back of the 46C1 data mounting: T2A, R2A, T3A, and R3A. The DDD lines and the 48B1 data unit required for dial backup channel B are not provided. The key leads controlling the dial backup channels are connected through connector J6, of the 48D1 data unit, to the keys designated DDD1A, DDD2A, and REL of the 30-button Call Director. The 4th and 5th pickup keys of the 1st

key module providing key lead control for DDD1B and DDD2B are not required and are left blank.

B. 46C1 Data Mounting

3.22 For switchable dial backup service, the 46C1 data mounting is used to house a maximum of two 48B1 data units and a maximum of six 48C1 data units. A rear view of the data mounting is shown in Fig. 5.

Note: Installation of the 48C1 data units requires that the 48D1 data unit is mounted directly below the 46C1 data mounting.

3.23 All interface connections to the 46C1 data mounting are made through 50-pin connectors. Connection to Bell System provided data sets is made at connectors P2, P3 and P4. Connection to up to three 46A1 data mountings for FD service or connection to up to three 46B1 data mountings for FDA service is made at connectors J10, J11, and J12. Connection to the 48D1 data unit (Call Director adapter) is made at connector P1. Direct connection to two dial backup channels (four DDD lines) is made at connector J1 or screw terminals T2A, R2A, T2B, R2B, T3A, R3A, T3B, and R3B. Connection to the 48D1 data unit is made at connector P1.

Note: Interconnection between the 46C1 data mounting and the 48D1 data unit is made by using B25A cables. These cables are not furnished with the data mounting or data unit and must be ordered separately.

C. 48D1 Data Unit

3.24 The 48D1 data unit is a Call Director interface adapter and is used to connect a Call Director to a 46B1 and/or a 46C1 data mounting. For switchable dial backup service, the direct interconnection to a maximum of six 48C1 data units (mounted in a 46C1 data mounting) is made at connector plugs P4 to P9. These connectors are shown in Fig. 1.

Note: Installation of the 48C1 data units requires that the 48D1 data unit is mounted directly below the 46C1 data mounting.

3.25 A rear view of the 48D1 data unit showing the various connector jacks and plugs is shown in Fig. 5. Connection to the 46B1 data

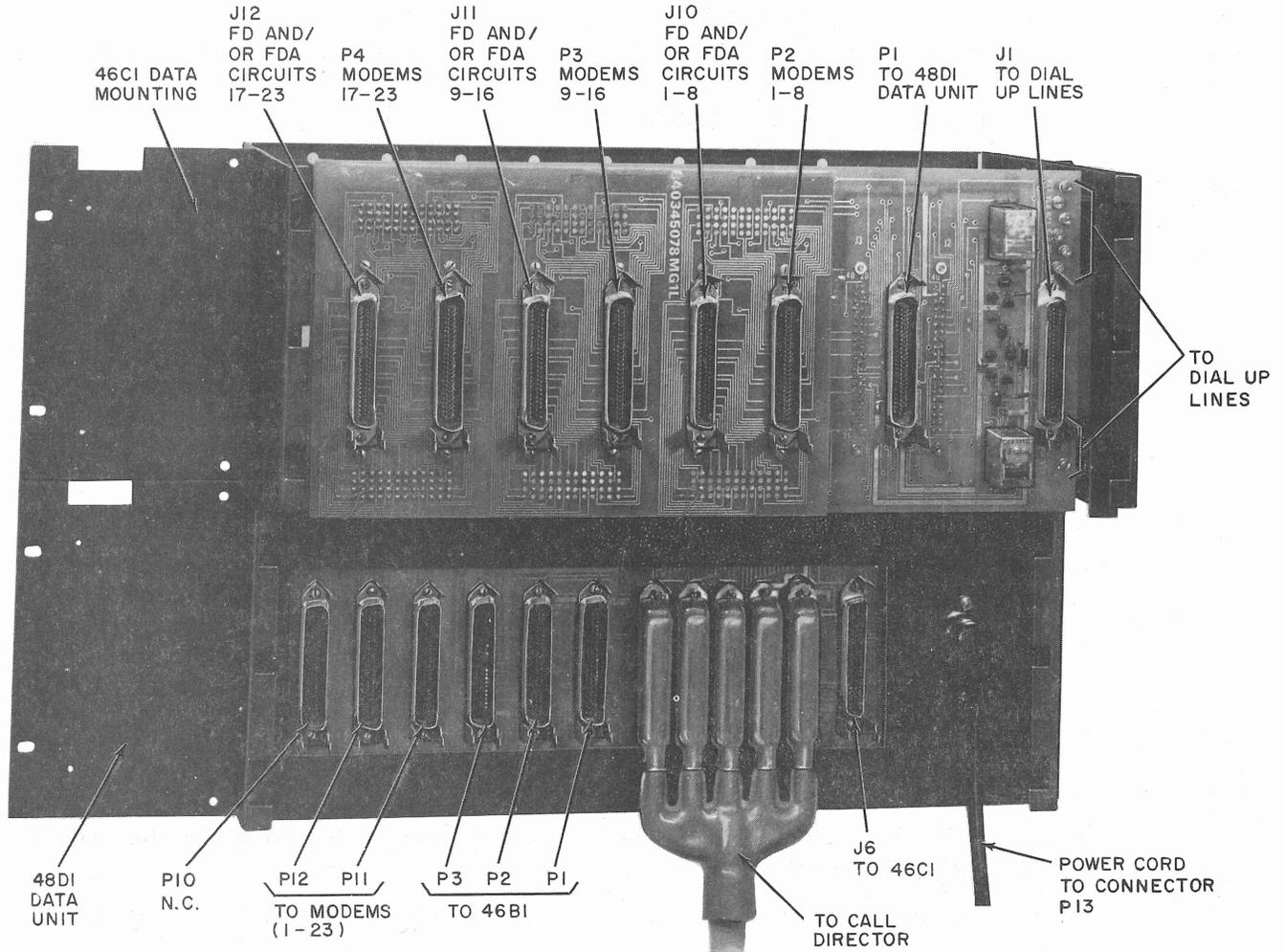


Fig. 5—Rear View of 48DI Data Unit and 46CI Data Mounting

mounting for FDA service is made at connectors P1, P2, and P3. Connection to the 46CI data unit for switchable dial backup is made at connector J6. Connections to Bell System modems is made at connector plugs P11 and P12 when dial backup status indications are to be provided (see Fig. 6 and 7). Plug P10 is provided for future growth

and is not connected at this time. Connections to the Call Director are made at connector jacks J1 to J5. For an 18-button key telephone set, jacks J1 to J3 are used; while for a 30-button key telephone set, jacks J1 to J5 are used. The telephone key strip should be labeled as follows:

Key Assignment for 30-button Call Director

Key Assignment for 18-button
Call Director

REL (NOTE 1)	RING (NOTE 4)	6	12	18
DDD1A (NOTE 2)	1 (NOTE 5)	7	13	19
DDD2A (NOTE 2)	2	8	14	20
DDD1B (NOTE 3)	3	9	15	21
DDD2B (NOTE 3)	4	10	16	22
HOLD	5	11	17	23

Notes:

1. When switchable dial backup service is provided, the 1st pickup key of the 1st key module will be nonlocking and will be in designated REL.
2. When dial backup channel A is provided, designations DDD1A and DDD2A will be provided as shown.
3. When dial backup channel B is provided, designations DDD1B and DDD2B will be provided as shown.
4. When alternate voice service is provided, the 1st pickup key of the 2nd key module will be nonlocking and will be designated RING.
5. Pickup keys numbered 1 to 23 are used to control alternate voice arrangements and/or switched dial backup arrangements provided for 4W PLs designated 1 through 23 (see Fig. 2, 3, and 4). The numbered pickup keys will be identified in one of the following four ways:
 - (a) BLANK KEY — Provided when key is not used to control alternate voice or switched dial backup service.
 - (b) TALK
N Provided when key is used to control the alternate voice arrangement of 4W PL designated N.
 - (c) DBU
N Provided when key is used to control the switchable dial backup arrangement for 4W PL designated N.
 - (d) TALK-
DBU N Provided when key is used to control the alternate voice and the switchable dial backup arrangement for 4W PL designated N.

Note: Interconnection between the 46C1 data mounting and the 48D1 data unit is made by using B25A cables. These cables are not furnished with the data mounting or data unit and must be ordered separately.

3.26 A multiple arrangement showing the connections used in providing an FDA arrangement with switched dial backup is shown in Fig. 6. The B25A cable is used to interconnect the 48D1 data unit and the 46A1, 46B1, and 46C1 data mountings. The B75A cable is used to interconnect the 48D1 data unit and the 630DA- or the 2630DA-type key telephone set. The B75A and the B50A cables are used to interconnect the 48D1 data unit and the 631DA- or the 2631DA-type key telephone set.

3.27 The cable length restriction on the distance between the 46B1 or the 46C1 data mounting and the key telephone set is also shown in Fig. 6. The distance between the 46B1 or the 46C1 data mounting and the key telephone set is limited to 400 feet (or a maximum loop resistance of 20 ohms). This will ensure that the pickup keys and lamps function properly.

D. Power Connections

3.28 The power supply for switchable dial backup is contained in the 48D1 data unit. The 24 Vac transformer, bridge rectifier, regulated power supply, the protective fusing, and the 6-foot power cord are an integral part of the 48D1 data unit. This single power supply provides voltage for the operation of the 48B1 data unit, the 48C1 data unit, and the Call Director's buzzer and lamp indications.

3.29 The power cord connects from connector plug P13 on the 48D1 data unit to a 117 Vac source. This power cord will connect to a power strip that can be equipped in the KS-20018-type cabinet. Information on the KS-20018-type cabinets is given in Section 590-010-201.

E. Option Connections

46B1 Data Mounting

3.30 The ringing supply for the 48D1 data unit requires that an installer option be provided on the 46B1 data mounting. When used with the 48D1 data unit or when it is used in a locally engineered key system, the installer option on the

backplane of the 46B1 must be in the "EXT" position. When the 46B1 data mounting is used with the 830- and 2830-type key telephone set, the installer option must be in the "INT" position.

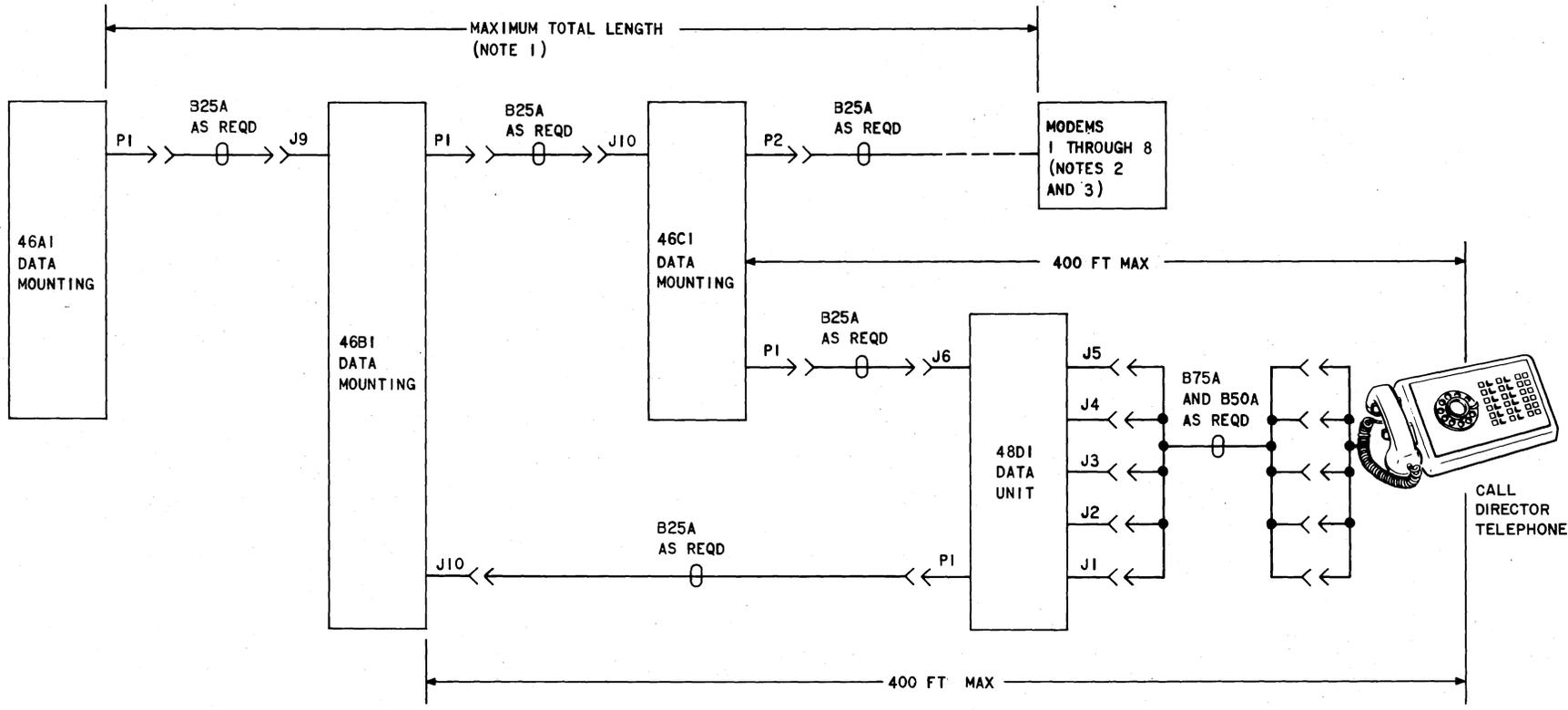
Note: The designation "EXT" indicates a ring supply external to the 46B1 data mounting while the designation "INT" indicates the ring supply is internal.

48B1 Data Unit

3.31 The 48B1 data unit has one installer option to provide 4 dB of slope equalization on the receive pair. The 4-dB slope equalizer is provided when the option designated "4" is provided. The slope equalizer is bypassed when the option designated "0" is provided. It is expected that most data sets will perform better with the 4-dB slope equalizer option provided; however, if the data set has provision for dial backup slope equalization, the 48B1 data unit should be provided with the 4-dB slope equalizer bypassed ("0" option). The service order should specify whether the strap is to be in the 0- or 4-dB position on the board.

3.32 The gain of the receive amplifier determines the receive signal level arriving at the modem and is a function of the total losses of the switched telecommunications network. By controlling the losses of the metallic facilities connecting the near and distant end 48B1 data units to their serving central offices (COs), it is possible to provide a receive level to the data set which should be satisfactory. The loss due to the transmit leg of the metallic facilities is controlled by requiring the signal reaching the local serving CO to be less than, or equal to, -12 dBm. The loss due to the receive leg of the metallic facilities is controlled by establishing a requirement on the level of the signal received from the milliwatt source of the local serving CO at the REC TEST jack on the 48B1 data unit. A functional diagram showing these receive levels is given in Fig. 8. Determination of receive levels is shown in Table B. The receive amplifier will be adjusted to provide a gain of 3.7 dB from the local serving CO. The received signal from the near end will then be approximately -16 dBm for toll calls. For local calls a received level of -8.3 dBm could occur.

3.33 Adjust the output level of the receive amplifier using the following procedure. A front view



NOTES:

1. DATA SET MAX LENGTH IN FT

201C	1400
202D	500
202T	200
208A	1400
209A	1400 (SEE FIG. 7)
2. THE ARRANGEMENT SHOWN ILLUSTRATES THE CABLE LENGTH RESTRICTIONS APPLICABLE TO MODEMS AND KEY TELEPHONE SETS CONNECTING TO THE B29 FAMILY OF CHANNEL INTERFACE UNITS.
3. ALL MODEM INTERCONNECTION ARRANGEMENTS PREVIOUSLY SHOWN FOR THE 46A1 DATA MOUNTING APPLY TO THE 46C1 DATA MOUNTING. THE FAN-OUT ARRANGEMENT USING THE KS-21253-L1 ADAPTER AS SHOWN IN SECTION 598-082-200 IS APPLICABLE HERE ONLY FOR MODEMS USING THE STANDARD 6-LEAD INTERFACE. MODEMS REQUIRING THE ADDITIONAL INTERFACE PAIR INDICATING DIAL BACKUP SUCH AS THE 209A DATA SET, MUST USE THE KS-21253-L4 ADAPTER AS SHOWN IN FIG. 7.

Fig. 6—Connection Diagram Showing Cable Length Restrictions

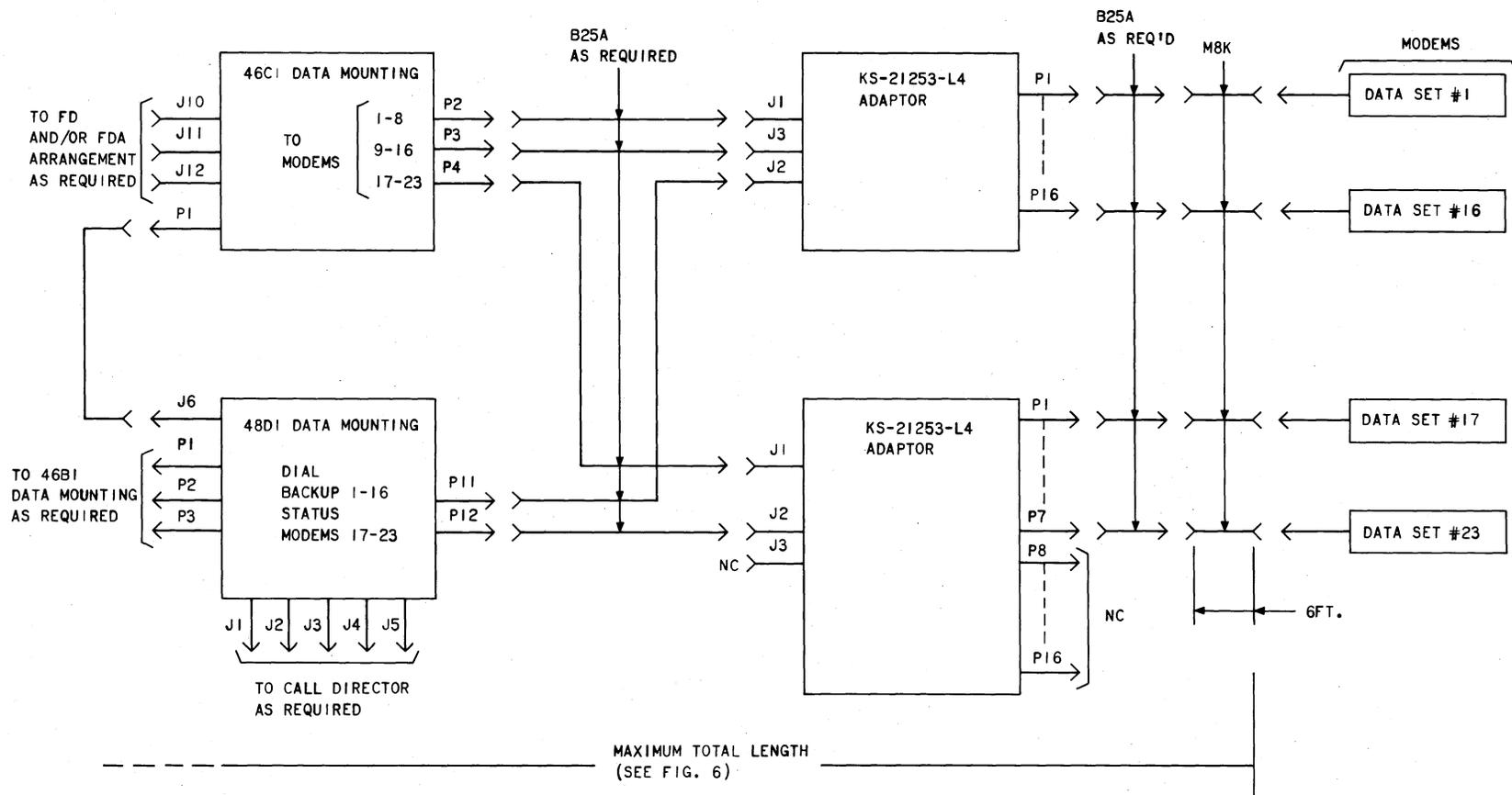
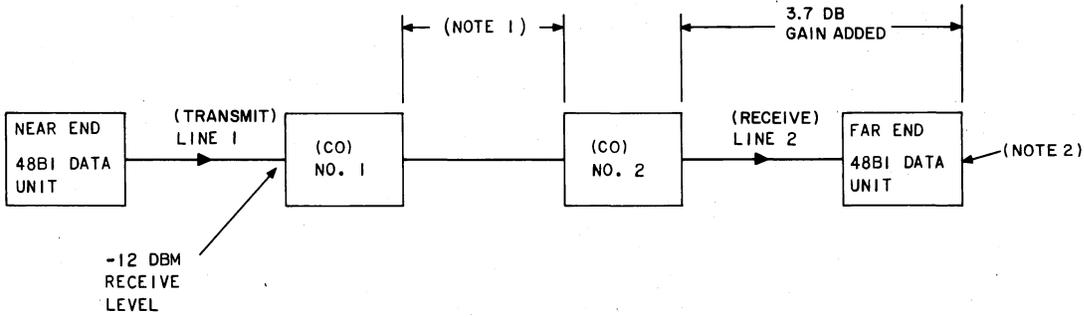


Fig. 7—Block Diagram of Multiple Arrangement Requiring Additional Interface Pair Indicating Dial Backup



NOTES:
 1. REFER TO TABLE B FOR 1000-HZ LOSS BETWEEN END OFFICES.
 2. REFER TO TABLE B FOR ESTIMATED RECEIVE LEVEL AT FAR END (THE LEVEL MEASURED AT THE REC TEST JACK OF THE 48BI DATA UNIT TERMINATED IN 600 OHMS).

Fig. 8—Example of Receive Level at End Station

TABLE B
 DETERMINATION OF STATION
 RECEIVE LEVELS (TOLL CALLS)

1000-HZ LOSS BETWEEN END OFFICES			ESTIMATED RECEIVE LEVEL (DBM)	
CIRCUIT LENGTH (IN MILES)	AVERAGE LOSS (dB)	STANDARD DEVIATION (dB)	AVERAGE LEVEL (dBm)	STANDARD DEVIATION (dB)*
Short (Up to 180)	6.5	±2.0	-14.8	±2.0
Medium (180 to 725)	7.3	±2.3	-15.6	±2.3
Long (Over 725)	7.7	±2.5	-16.0	±2.5

* The variation in the adjustment of the transmitted signal to provide a -12 dBm receive level at the serving central office and the variation in the 3.7 dB gain adjustment are not included.

of the 46C1 data mounting equipped with a 48B1 data unit is shown in Fig. 1.

is installed in J2. The 46B1 data unit for channel B is installed in J3.

Note: The 48D1 data unit is required in this procedure and must also be installed at this time.

(2) Connect the switched network facilities for channel A to the backplane of the 46C1 data mounting by either connecting the DDD1A line to terminals R2A and T2A and the DDD2A line to terminals R3A and T3A, or by concentrating the DDD1A and DDD2A lines in a 25-pin cable terminating on J1 connector of 46C1 data mounting (see Fig. 2). Connect the switched network

- (1) Insert the 48B1 data unit, with the required slope equalizer option installed, into the 46C1 data mounting. The 48B1 data unit for channel A

facilities for channel B to the backplane of the 46C1 data mounting by either connecting the DDD1B line to terminals R2B and T2B and the DDD2B line to terminals R3B and T3B, or by concentrating the DDD1B and DDD2B lines in a 25-pair cable terminating on J1 connector of 46C1 data mounting (see Fig. 2).

- (3) Connect the key telephone set to the 48D1 data unit by connecting the telephone set cord to jacks J1 to J5 for 30-button key telephone or to jacks J1 to J3 for 18-button key telephone.
- (4) Using the TTS-4B test set or its equivalent, prepare to measure and adjust the receive amplifier gain for channel A as follows:

- (a) Place the TTS-4B close to the 45A1 data mounting and apply power to the TTS-4B. Allow time to warm up and stabilize, then calibrate using the instructions printed on the test set case.

- (b) Set the controls on the TTS-4B to the following positions:

FUNCTION to REC + TALK

REC IMP to 600Ω

REC LEVEL to +7

- (5) Take the telephone handset off-hook and depress the DDD1A line key.

Requirement: Dial tone should be heard in the handsets receiver.

- (6) Dial the directory number of the milliwatt supply in the local serving CO using line 2A on the telephone set.

- (7) When connection to the milliwatt supply is completed, depress the HOLD key and then release it.

Requirement: The DDD1A line lamp illuminates and the DDD1A key releases on the up-stroke of the HOLD key.

- (8) Place the telephone handset on-hook and connect a 2P4B cord between the REC 310 jack on the TTS-4B to the REC TEST jack on the 48B1 data unit.

- (9) Measure the receive level of the milliwatt supply and adjust R9 on the 48B1 data unit for a reading of +3.7 dBm on the TTS-4B meter.
- (10) Take the telephone receiver off-hook and depress the REL key and release.

Requirement: The DDD1A line lamp extinguishes indicating call has been disconnected.

- (11) Disconnect and remove the TTS-4B and cord connection from the channel A 48B1 data unit. The preceding procedure can be repeated for the channel B 48B1 data unit using DDD1B line key and line 2B on the telephone set.

3.34 Attenuator AT1 is used to set the transmit signal level arriving at the CO. The attenuation to be provided by AT1 is established by determining the loss from the CO to the line side of the transmit transformer (T2A and R2A for channel A and T2B and R2B for channel B). Once the loss is known, the attenuator setting can be found by knowing (1) what the modem transmit level is and (2) what level is required at the CO.

3.35 The following is an example of transmit level adjustment. It is expected that modems using the DAS 829-type will transmit at 0 dBm. The level required at the serving CO is less than, or equal to, -12 dBm. Assume the installer measures a 4-dB loss on line 1A; this measurement should be made using the milliwatt source and measuring the loss by placing a meter across R2A and T2A. The attenuator setting required for the channel A 48B1 data unit is calculated as follows:

$$\text{attenuator setting} = (\text{modem transmit level}) \\ - (\text{required CO level}) - (\text{line 1} \\ \text{loss}) - (\text{transformer loss}).$$

If a nominal transformer loss of 0.5 dB is assumed, the attenuator setting would be $0 - (-12) - 4 - 0.5 = 7.5$ dB. The attenuator, in this example, is set to provide 8.0 dB of loss.

Note: The attenuator setting is adjustable in 1-dB steps.

4. INSTALLATION TESTING

- 4.01** After completing the installation and connection procedures for switchable dial backup, the

SECTION 598-082-202

units should be tested as outlined in Section 598-082-502. This section will test the ability of the Call Director to set up and switch a dial backup channel to a modem.

5. REFERENCES

5.01 For additional information on installing the data units and data mountings, refer to the following sections:

SECTION	TITLE
461-604-100	Connecting Blocks 66-Type—Tools, Terminating, Adapters, and Maintenance
463-140-100	Equipment Cabinets and Apparatus Mountings—Installation
590-010-200	Data Sets—General Installation and Connection Information
590-010-201	Data Sets—Multiple Installation Information

SECTION	TITLE
598-082-100	Data Auxiliary Set 829-Type Channel Interface Unit—Voiceband Private Line Channel—Description
598-082-101	Data Auxiliary Set 829-Type—Supplementary Functions for Voiceband Private Line Channels (Alternate Voice and Dial Backup)—Description
598-082-500	Data Auxiliary Set 829-Type Channel Interface Unit—Voiceband Private Line Channel—Maintenance and Test Procedure
598-082-501	Data Auxiliary Set 829-Type—Supplementary Functions for Voiceband Private Line Channels (Alternate Voice and Dial Backup)—Test Procedures
598-082-502	Data Auxiliary Set 829-Type—Multiple Channel Arrangements (Switched Dial Backup)—Test Procedures.