

DATA SET 402D-TYPE RECEIVER INSTALLATION AND CONNECTIONS

	CONTENTS	PAGE
1.	GENERAL	1
2.	TOOLS AND APPARATUS	1
3.	OPTION CONNECTIONS	1
4.	INSTALLATION AND CONNECTIONS . .	3
5.	LOOP LOSS MEASUREMENT, PADDING, AND OUTPUT ADJUSTMENT	4

1. GENERAL

1.01 This section contains installation and connection information for data set 402D-type. The data sets should be installed in accordance with existing installation practices. Refer to the section entitled Data Sets—General Installation and Connection Information (590-010-200).

1.02 This section is reissued to:

- Add the M50G cord for the data auxiliary sets (DASs) 804A8 and 804A6, series 6 and later.
- Show the functional designation of the leads to DAS 804A-type in Figures 1, 2, 3, and 7.
- Add TOOLS and APPARATUS, Part 2, to specify needed test apparatus.

1.03 Information pertaining to data sets 402D1 and D2, which have been rated manufacture discontinued, is retained since many of these data sets are used in the field.

1.04 Data sets 402D3 and 402D4 provide the same features as data sets 402D1 and D2, and provide an additional feature which makes possible alternate use with a TOUCH-TONE® telephone.

The purpose of the feature is to provide access by an attendant at a receive-only station and to permit the attendant to send information to the remote (transmit) station. When data set 402D3 or D4 is used with DAS 804A, one or more TOUCH-TONE telephone sets may be connected to the data set. This feature is available only when connected as shown in Fig. 1. In this case, the transmit-receive (TR) function of the data set is used to connect either the TOUCH-TONE telephone or the combination of data set and DAS to the telephone line. For option information pertaining to DAS 804A, refer to the section entitled Data Auxiliary Set 804A-Type—Description and Operation (598-030-100).



The feature described in 1.04 cannot be provided when the data station is made up of data sets 402D-type and 402C-type instead of a data set 402D-type and DAS 804-type.

1.05 Data set 402D-type may be used in systems with key telephone units (KTUs) by providing "A" lead control.

1.06 Information concerning the associated customer business machine is not covered in this section.

2. TOOLS AND APPARATUS

2.01 A 914-type data test set (DTS) and voiceband transmission test set TTS-4, or equivalent, are needed for installation tests of data set 402D-type.

3. OPTION CONNECTIONS

3.01 Refer to the section entitled Data Set 402D-type Receiver—Maintenance (594-020-300) for cover removal and replacement information.

3.02 Wire the data set according to the wiring options specified on the service order.

◆ TABLE A ◆
SERVICE OPTIONS

FEATURE OR OPTION		WIRING OPTION	STRAP TERMINALS ON TB2	PROVIDE
Common equipment for data sets 402D1 and 402D3 (Note 1)		R	25-26, 11-12	One per station
Common equipment for data sets 402D2 and 402D4 (Note 1)		S	24-25, 12-13 (Note 2)	
Reverse-channel and answer-back power outputs (Note 3)	-3 dBm	Z (Note 4)	4-5, white lead from reverse-channel transmitter to 39	One per station (Note 7)
	-6 dBm	Y (Note 4)	5-6, white lead from reverse-channel transmitter to 38	
	-9 dBm	X (Note 4)	7-8, white lead from reverse-channel transmitter to 37	
Installation with Data Auxiliary Set 804A-type (Note 5)		W (Note 6)	15-16, 50-51, 20-21	When required
Out of service		V	44-45	When required (Note 8)
Unattended answer		N (Note 6)	31-32	

Note 1: Data sets 402D1 and D3 are *not* equipped with a 2A-type data unit (reverse-channel unit) and are factory-wired for option R. If it is desired to store a reverse-channel unit within a data set 402D1- or 402D3-type, the reverse-channel unit must be disconnected and all the leads must be taped and stored. Data sets 402D2 and 402D4 are equipped with 2A-type data units and are wired for option S.

Note 2: Data sets 402D2, all series, and 402D4, series 1, require a strap between terminals 18 and 19 on TB2.

Note 3: Data sets 402D3 and 402D4, series 2 and above, have continuous adjustment (0 to -12 dBm) of the answer-back output, and of reverse-channel output on data set 402D4 only. Adjust each to provide -12 dBm at the central office.

Note 4: Option X, Y, or Z is provided in the field.

Note 5: Unused keys in DAS 804A should be blocked.

Note 6: Options W and N are factory-furnished.

Note 7: Option X, Y, or Z which provides nearest to, but no greater than, -12 dBm at central office is to be connected.

Note 8: Provide option V only when data set is used on receive-only lines.

3.03 Available data set service options are shown in Table A; applicable options must be specified on the service order. All option connections should be made on terminal blocks within the data set and not on external connecting blocks.

3.04 Data sets 402D2, all series, and 402D4, series 1, use a 2A1 data unit. Later models of

data set 402D4 use a 2A2 data unit. The 2A2 data unit provides an adjustable reverse-channel output level to allow a signal output level compatible with the tariff requirements of FCC Tariff No. 263.

3.05 The connections for installing the 2A-type data unit (reverse-channel transmitter) are shown in Table B. When data set 402D3 is converted

TABLE B
CONNECTIONS - 2A-TYPE DATA UNIT

LEAD DESIGNATION	LEAD	CONNECT FROM 2A1 DATA UNIT TO TERMINAL ON TB2	CONNECT FROM 2A2 DATA UNIT TO TERMINAL ON TB2
L2	W-G	26	26
D1	BR	11	11
L1	G	13	13
D2	W-Y	24	24
C1	Y	51	49
C2	W-R	50	48
C3	W-BL	23	23
GTO	W-S	10	10
-9 dBm	S	37	-
-6 dBm	BL	38	-
-3 dBm	W-BR	39	-
A	W	See Table A, Option X, Y, or Z	-
-18V	O	48	47
GND	BK	36	36
+18V	R	52	50

to 402D4 by the addition of the 2A-type data unit (reverse-channel transmitter), nameplate stenciling on the rear of the data set shall be changed accordingly.

4. INSTALLATION AND CONNECTIONS

4.01 The data set must be located within range of the interface connector cord which is supplied by the customer. This cord must not exceed 50 feet in length.

4.02 To avoid interference during data transmission, the following restrictions apply to the data set where practicable:

- Use only on individual lines.
- Do not use extension telephones.

4.03 To minimize inductive interference to data signals on the telephone (data) lines, the line should not be carried in the same run as cable between data set and customer business machine, or lines connected to dc teletypewriter services. If this requirement cannot be met, it will be necessary to run the telephone (data) line in type-SK (shielded) station wire between data set and cable distribution terminal or building entrance. Shield shall be grounded at one end only, preferably the distribution terminal.

4.04 The customer must furnish a 3-wire grounded ac outlet that is not under control of a switch. The outlet must accept a plug having two parallel blades and a U-shaped grounding pin. To avoid the possibility of data errors due to a potential difference between data set ground and business machine ground, the outlet for the data set power cord should be served from the same

SECTION 594-020-200

ac distribution panel as the outlet for the business machine. If they are not served from the same panel, a test using the 6-type impulse counter should be made to detect excessive noise (no counts in 15 minutes with the 6-type set adjusted to 90 dBrn). This test procedure is described in the section entitled Data Set 402D-Type—Test Procedures (594-020-500). If test requirements are not met, data set ground and business machine ground must be bonded together.



The method of providing this bond should be in accordance with local instructions.

4.05 Verify with local test center that loop facilities have been tested and meet transmission requirements specified in the section entitled Data Systems—DATA PHONE® Service—Direct Distance Dialing Network—Test Requirements for Subscriber, Foreign Exchange, and Remote Exchange Lines (314-205-501).

4.06 Connection information for the various service arrangements is shown in Figures 1 through 6.

4.07 If operation with KTUs is required, additional connections must be made. Typical connecting arrangements for providing "A" lead control are shown in Figures 7 and 8.

5. LOOP LOSS MEASUREMENT, PADDING, AND OUTPUT ADJUSTMENT

5.01 The output level of data sets 402D1, 402D2, and 402D3 and 402D4, series 1, may require padding due to the limitations of the available reverse-channel and answer-back output level options. Later models of data set 402D3 and 402D4 are supplied with a variable output power level to allow for compliance with tariff requirements.

5.02 The output signals (reverse-channel and answer-back) must be set so that the signal level reaching the serving central office (SCO) is no greater than -12 dBm.

5.03 In order to determine what the output level of the data set should be, it will be necessary to know the loop loss. To determine loop loss, proceed as follows:

- (1) Connect a TTS-4 transmission test set (or equivalent) across the tip and ring of the data line.

Note: Data set 402D-type must be disconnected from the data line.

- (2) Verify that the TTS-4 is arranged for the proper impedance (900 ohms).
- (3) Dial the SCO milliwatt supply or request the local testboard to send a 1000-Hz tone at 0 dBm on the loop.
- (4) Measure and record the level of the incoming 1000-Hz signal.

Note: The loss (in dB) of the local loop is the negative of the meter reading (including sign).

$$\text{Loop loss} = -(\text{meter reading})$$

- (5) Terminate the call to the 1000-Hz termination by releasing the data line (TTS-4 LINE/MON switch to OPEN position).

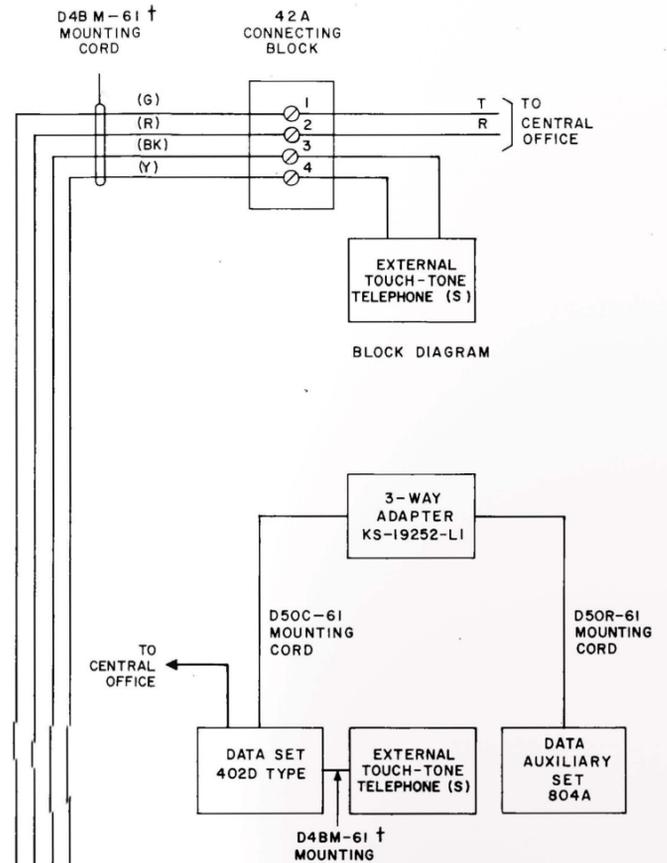
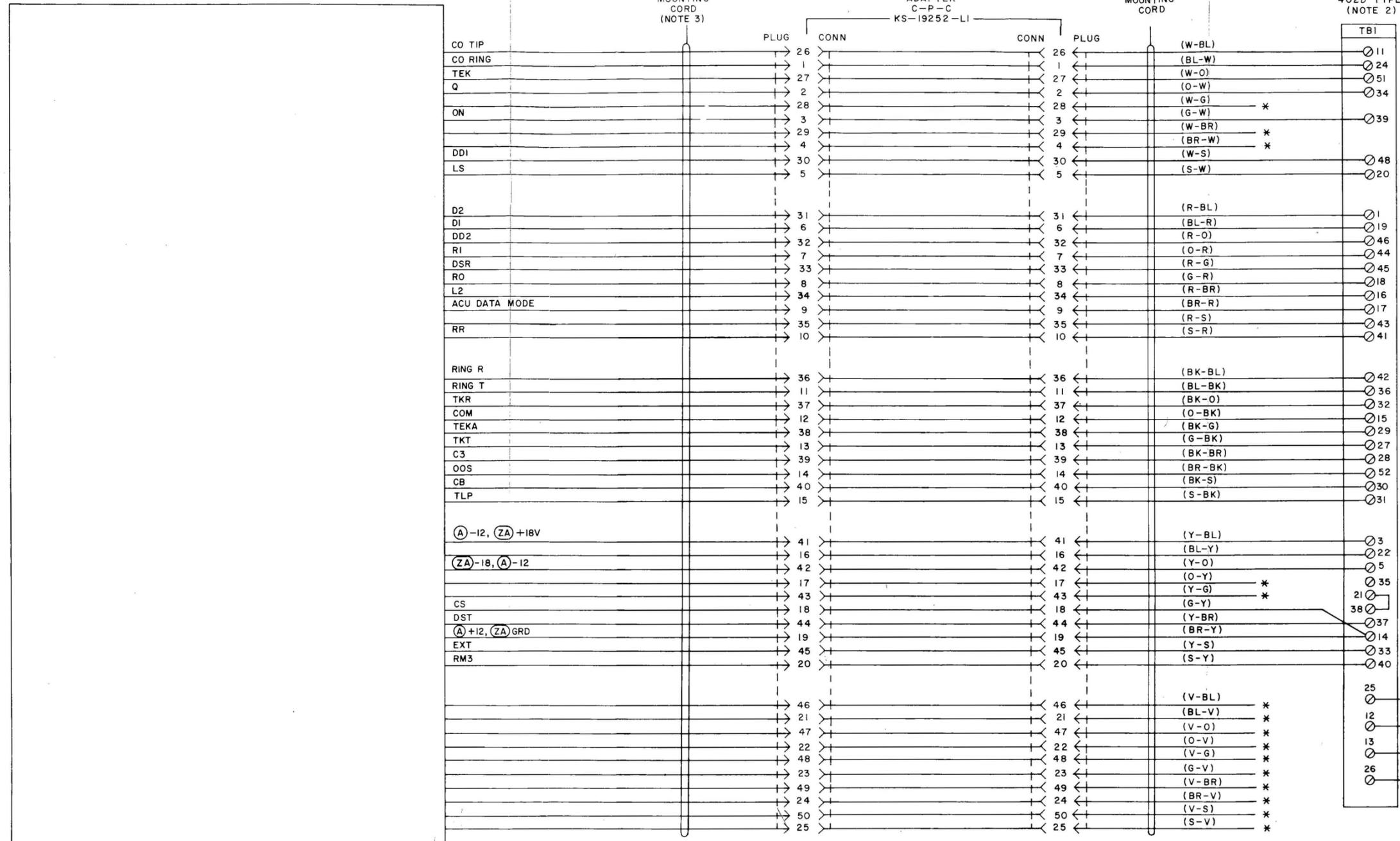
5.04 The output level of data sets 402D1, 402D2, and 402D3 and 402D4, series 1, must be adjusted as shown in Table C. Using the loop loss measurement, set the options in the data set to obtain the output level which allows the data set transmitter signal to reach the SCO at no greater than -12 dBm. For example, if the **meter reading** is -6 dBm, the 1000-Hz loop loss is 6 dB. The data set output signal level should be set to:

$$\begin{aligned} \text{data set output} &= -12 \text{ dBm} + 6 \text{ dB} \\ &= -6 \text{ dBm} \end{aligned}$$

Older model data sets may require an insertion loss pad on some low-loss loops as shown in Table C.

The pad may be ordered, or made up in the field and installed in accordance with Fig. 9.

DATA AUXILIARY SET 804A TYPE (NOTE 1)



- NOTES:
1. IN DATA AUXILIARY SET 804A, CONNECT OPTIONS F, J, K, Q, Z, M, AND B. CONNECT OPTION X, Y OR Z. CONNECT OPTION W OR V. DO NOT CONNECT OPTIONS G, H, M, N, E AND T.
 2. IN DATA SET 402D, OPTION W MUST BE CONNECTED.
 3. DAS 804A8 AND 804A6, SERIES 6 AND LATER USE M50G CORD.
- * TAPE AND STORE INDIVIDUALLY
 † TO BE ORDERED SEPARATELY

Fig. 1—Interconnections—Data Set 402D-Type When Used With Data Auxiliary Set 804A-Type at Receive-Only Terminal With Transmit-Receive (TR) Function Used Between Data Auxiliary Set 804A-Type, Data Set 402D-Type, and External Telephone Set†

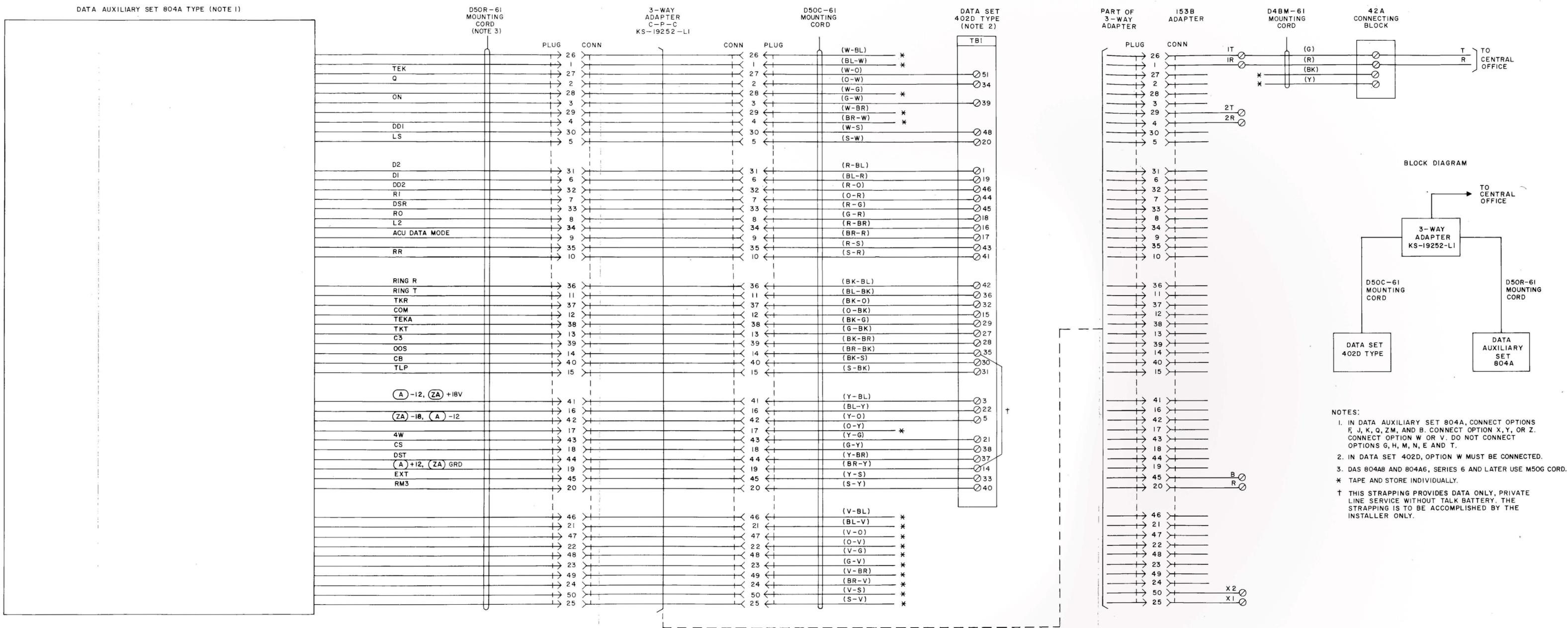


Fig. 2—Interconnections—Data Set 402D-Type When Used With Data Auxiliary Set 804A-Type at Receive-Only Terminal†

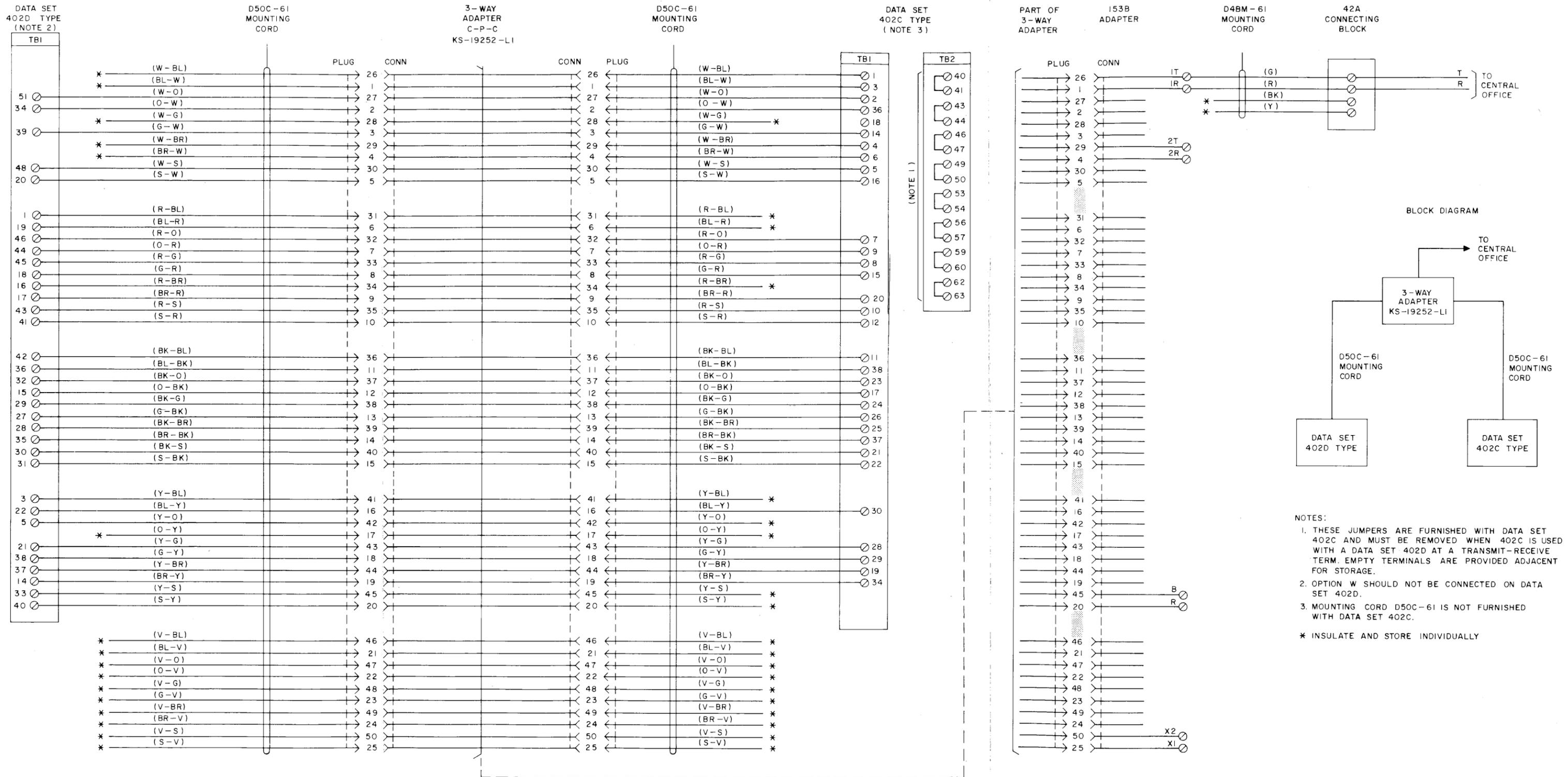


Fig. 4—Interconnections—Data Set 402D-Type When Used With Data Set 402C-Type at Transmit-Receive Terminal

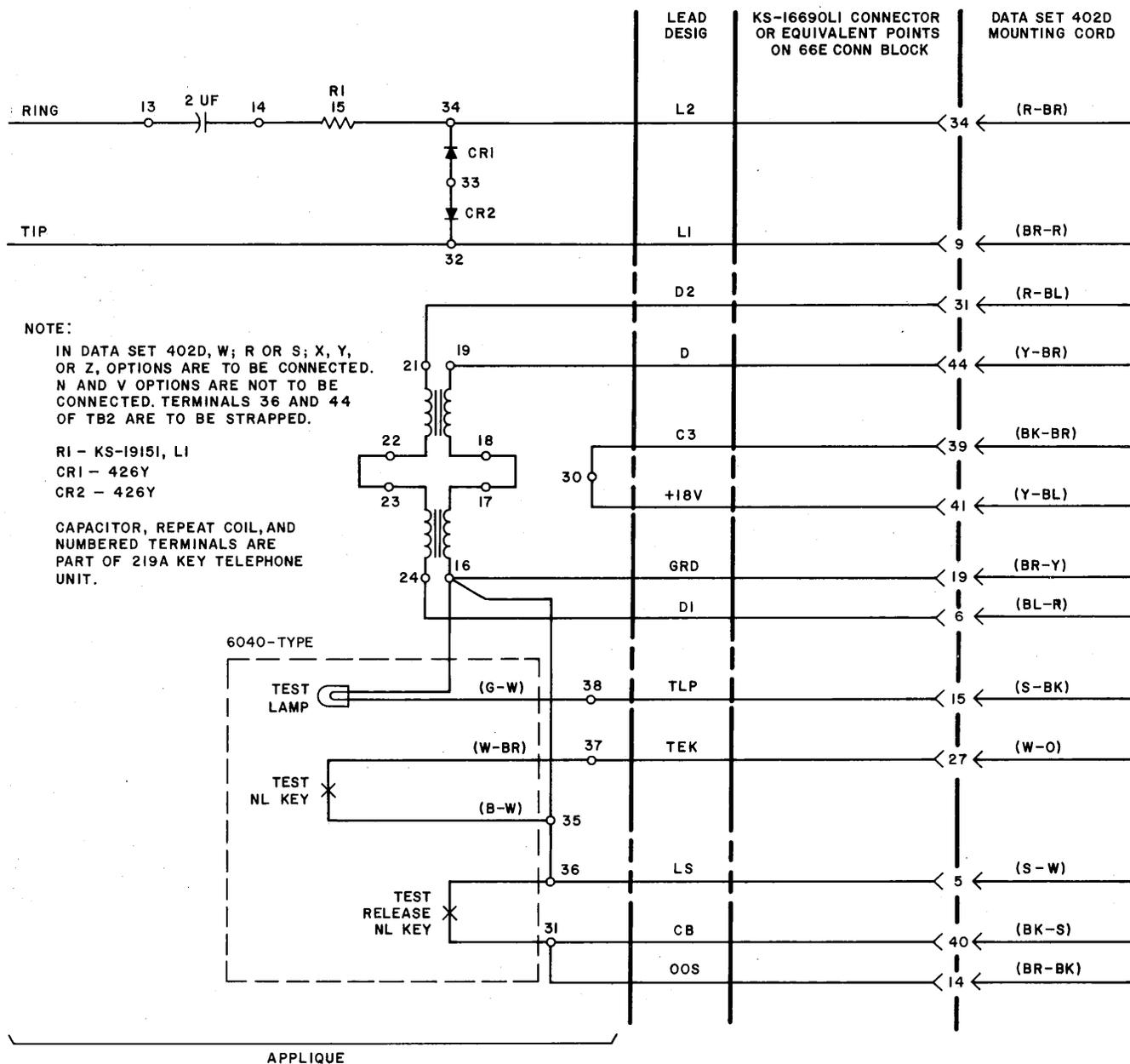


Fig. 5—Data Set 402D-Type Private Line Installation Without Data Auxiliary Set 804A1 or Data Set 402C-Type

5.05 The reverse-channel output on data set 402D4, series 2 and above, must be adjusted as follows:

(2) Condition the TTS-4 for a bridging mode of operation (REC IMP switch set to BRDG/ADD 20 dB).

(1) Connect the data set across tip and ring of the data line.

Note: In this mode, 20 dB must be added to the meter indication.

SECTION 594-020-200

- (3) Using the telephone portion (with the data set in the talk mode), dial a quiet termination.
- (4) At the data set interface connector, strap pins as follows:

Note: This may also be accomplished by properly conditioning either a business machine or a 901-type or 914-type DTS.

- 14 to 24 (Remote Release to Control Ground)
- 16 to 24 (Reverse-Channel Send—On)
- 17 to 24 (T-R Control Lead—Closed)
- 20 to 24 (Data Receive—On)

- (5) The 387-Hz reverse-channel output must be set higher than -12 dBm by the amount of loop loss as recorded in 5.03(4). This is accomplished by adjusting the reverse-channel power output potentiometer (R12) located on the 2A2 data unit as shown in Fig. 10. For example, if the loop loss at 1000 Hz is 6 dB:

$$\begin{aligned} \text{Reverse-channel output} &= -12 \text{ dBm} + 6 \text{ dB} \\ &= -6 \text{ dBm} \end{aligned}$$

The meter will read -26 dBm.

- (6) Remove all previous strapping to the data set interface connector.

5.06 The answer-back output on data sets 402D3 and 402D4, series 2 and above, must be adjusted as follows:

- (1) Connect the data set across tip and ring of the data line.

- (2) Condition the TTS-4 for a bridging mode of operation (REC IMP switch set to BRDG/ADD 20 dB).

Note: In this mode, 20 dB must be added to the meter indication.

- (3) Using the telephone portion (with the data set in the talk mode), dial a quiet termination.
- (4) At the data set interface connector, strap pins as follows:

Note: This may also be accomplished by properly conditioning either a business machine or a 901-type or 914-type DTS.

- 14 to 24 (Remote Release to Control Ground)
- 18 to 24 (Answer-Back A—Transmit)
- 17 to 24 (T-R Control Lead—Closed).

- (5) The answer-back output level must be set higher than -12 dBm by the amount of loop loss as recorded in 5.03(4). This is accomplished by adjusting the answer-back output potentiometer (R6) located on CP 17 as shown in Fig. 10.

- (6) Remove all test connections and restore equipment to normal operating conditions.

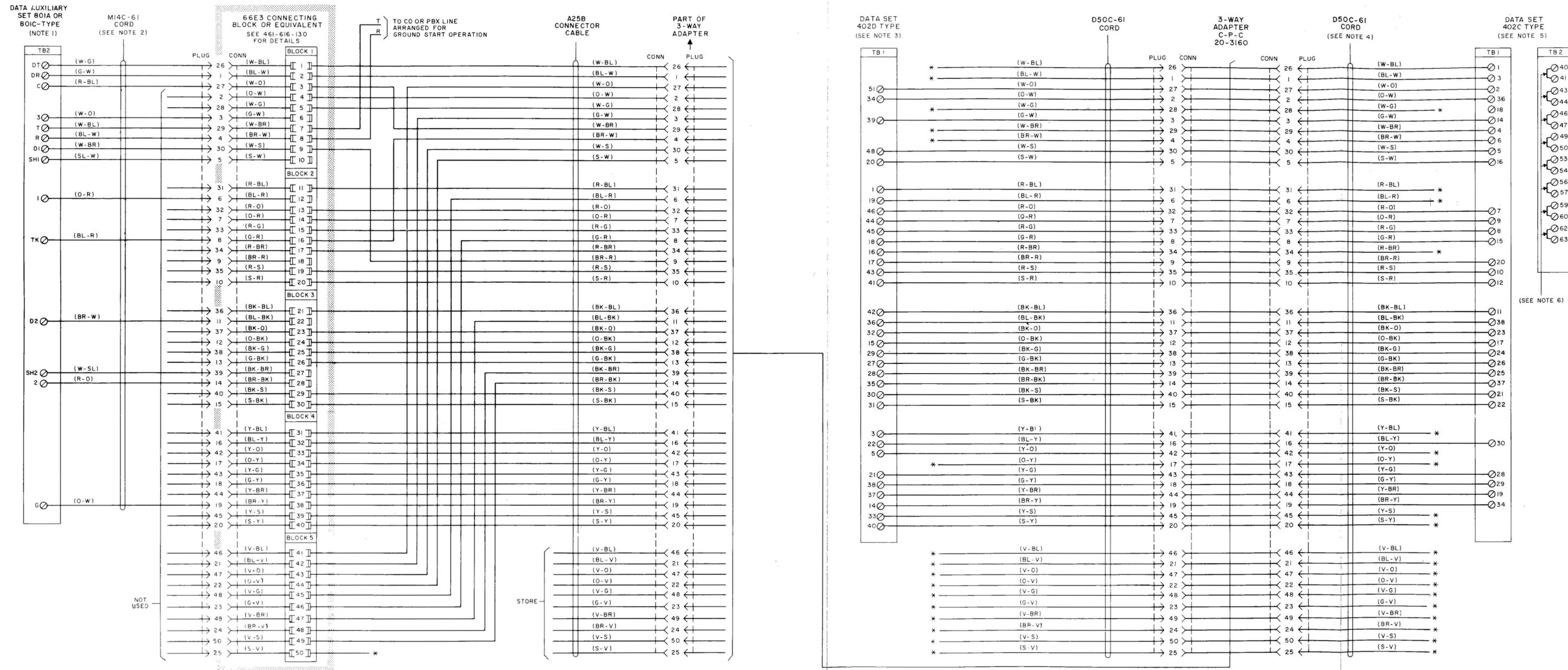


Fig. 6—Interconnections—Data Set 402D-Type When Used With Data Set 402C-Type and Data Auxiliary Set 801A-Type at Transmit-Receive Terminal

DATA AUXILIARY SET 804A-TYPE
(NOTE 1)

D50R-61
MOUNTING
CORD
(NOTE 3)

3-WAY
ADAPTER
C-P-C
KS-19252-L1

D50C-61
MOUNTING
CORD

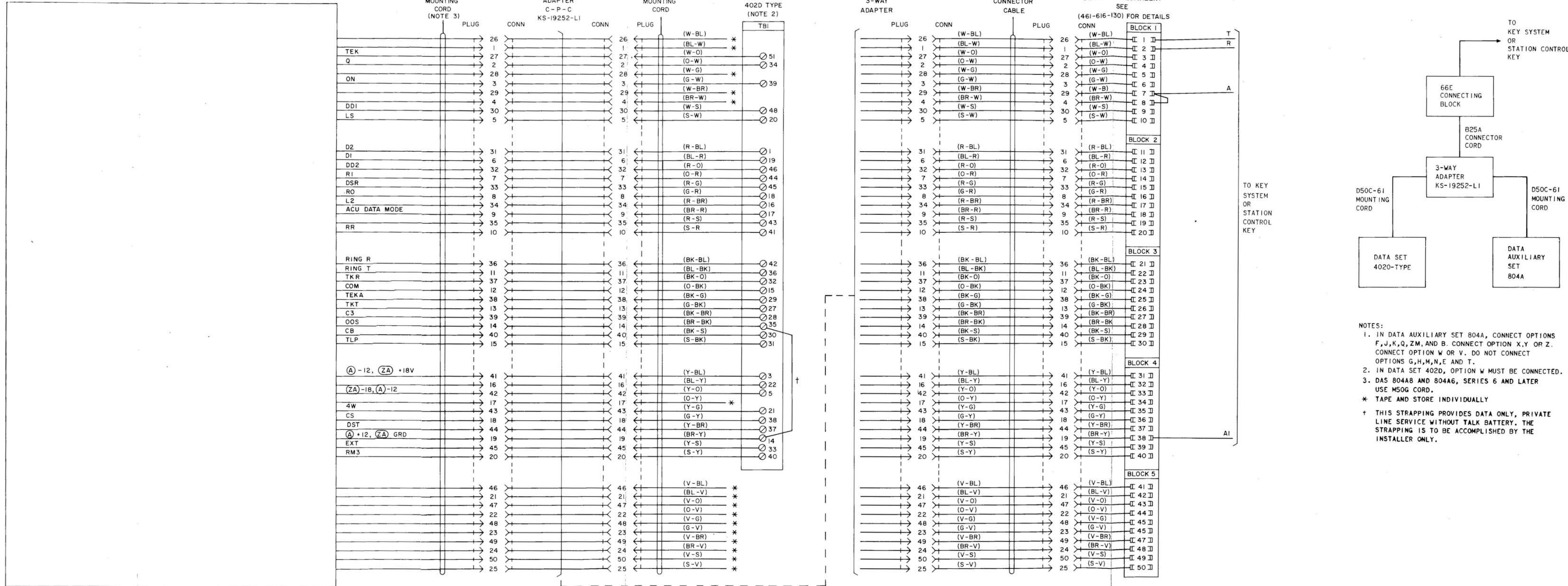
DATA SET
402D TYPE
(NOTE 2)

PART OF
3-WAY
ADAPTER

B25A
CONNECTOR
CABLE

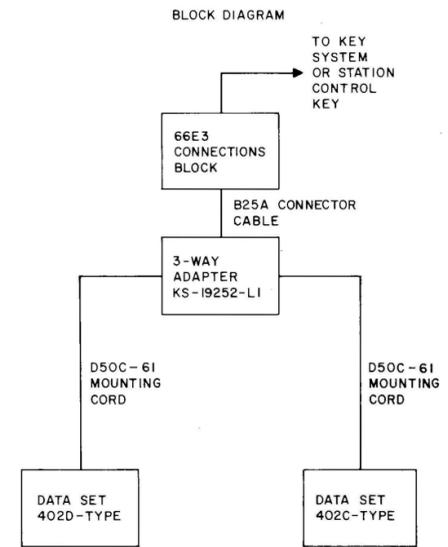
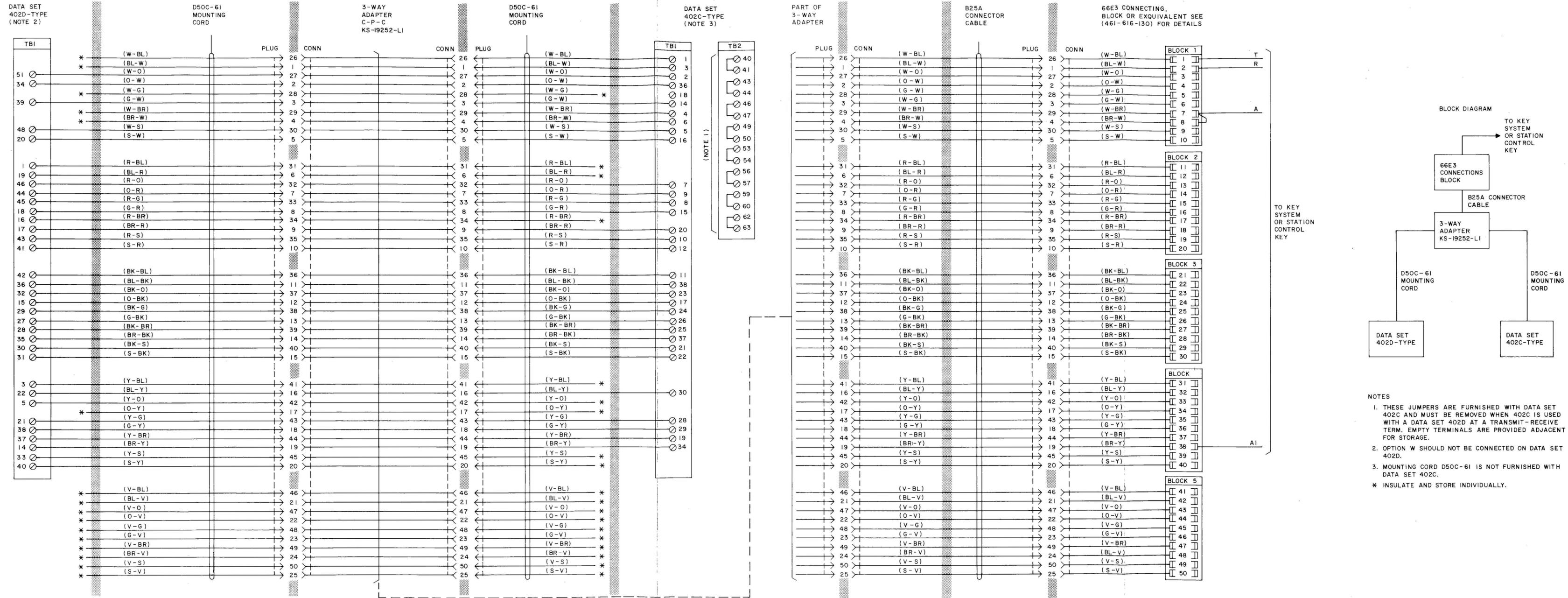
66E3 CONNECTING
BLOCK OR EQUIVALENT
SEE
(461-616-130) FOR DETAILS

BLOCK DIAGRAM



- NOTES:
- IN DATA AUXILIARY SET 804A, CONNECT OPTIONS F, J, K, Q, ZM, AND B. CONNECT OPTION X, Y OR Z. CONNECT OPTION W OR V. DO NOT CONNECT OPTIONS G, H, M, N, E AND T.
 - IN DATA SET 402D, OPTION W MUST BE CONNECTED.
 - DAS 804AB AND 804AG, SERIES 6 AND LATER USE M50G CORD.
- * TAPE AND STORE INDIVIDUALLY
- † THIS STRAPPING PROVIDES DATA ONLY, PRIVATE LINE SERVICE WITHOUT TALK BATTERY. THE STRAPPING IS TO BE ACCOMPLISHED BY THE INSTALLER ONLY.

Fig. 7—Interconnections—Data Set 402D-Type When Used With Data Auxiliary Set 804A-Type at Receive-Only Terminal With "A" Lead Control

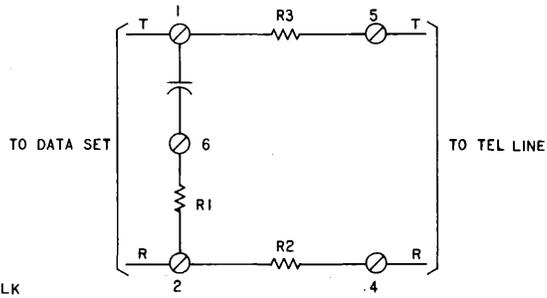
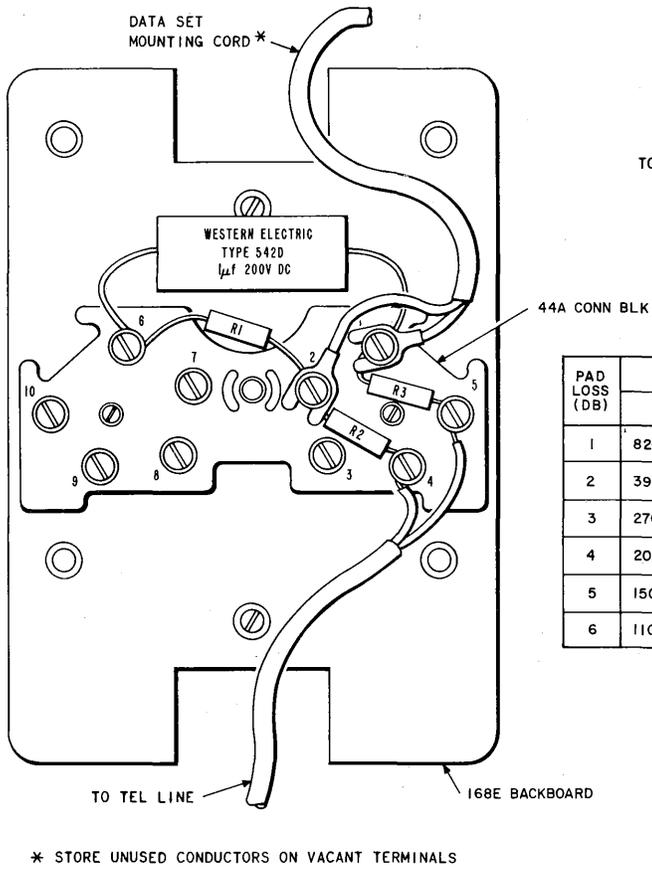


- NOTES**
1. THESE JUMPERS ARE FURNISHED WITH DATA SET 402C AND MUST BE REMOVED WHEN 402C IS USED WITH A DATA SET 402D AT A TRANSMIT-RECEIVE TERM. EMPTY TERMINALS ARE PROVIDED ADJACENT FOR STORAGE.
 2. OPTION W SHOULD NOT BE CONNECTED ON DATA SET 402D.
 3. MOUNTING CORD D50C-61 IS NOT FURNISHED WITH DATA SET 402C.
- * INSULATE AND STORE INDIVIDUALLY.

Fig. 8—Interconnections—Data Set 402D-Type When Used With Data Set 402C-Type at Transmit-Receive Terminal With "A" Lead Control Provided

TABLE C
OUTPUT LEVEL AND PAD LOSS REQUIRED FOR
DIFFERENT VALUES OF LOOP LOSS ON
DATA SETS 402D1 AND 402D2 (ALL SERIES),
402D3 AND 402D4 (SERIES 1)

LOOP LOSS AT 1 KHZ (DB)	DATA SET REVERSE-CHANNEL AND ANSWER-BACK OUTPUT LEVEL (DBM)	PAD LOSS REQUIRED (DB)
0-1	-9	3
1-2	-9	2
2-3	-9	1
3-4	-9	None
4-5	-6	2
5-6	-6	1
6-7	-6	None
7-8	-3	2
8-9	-3	1
9-12	-3	None



PAD LOSS (DB)	RESISTOR VALUE (OHMS)				ORDERING INFORMATION
	R1		R2 AND R3		
1	8200	GRAY RED RED	47	YELLOW VIOLET BLACK	F-58101
2	3900	ORANGE WHITE RED	110	BROWN BROWN BROWN	F-58102
3	2700	RED VIOLET RED	160	BROWN BLUE BROWN	F-58103
4	2000	RED BLACK RED	220	RED RED BROWN	F-58104
5	1500	BROWN GREEN RED	240	RED YELLOW BROWN	F-58105
6	1100	BROWN BROWN RED	270	RED VIOLET BROWN	F-58106

- NOTES:
1. RESISTORS ARE ALLEN BRADLEY, 1 WATT, 5% TOLERANCE (KS-19151 L1). CAPACITOR IS WESTERN ELECTRIC CO. 542D TYPE, 1UF, 200VDC.
 2. A 101C TYPE COVER SHOULD BE USED TO PROTECT THE PAD.
 3. THE PAD VALUE SHOULD BE STENCILED ON COVER FOR FUTURE REFERENCE.

Fig. 9—Insertion Loss Pad Connections

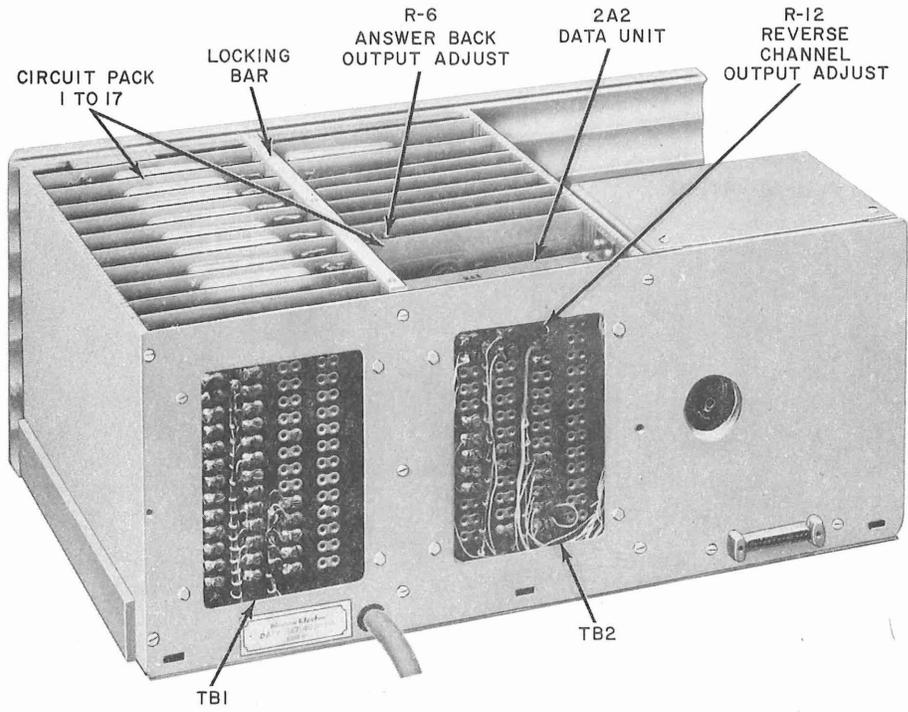


Fig. 10—Data Set 402D2, Rear View, Cover Removed