

DATA SET 109E-TYPE
SINGLE PRIVATE LINE STATION
USING DATA AUXILIARY SET 820D-TYPE
INSTALLATION AND CONNECTIONS

1. GENERAL

1.01 This section provides the information necessary to install Data Set 109E-type Single Private Line (PL) Station using Data Auxiliary Set (DAS) 820D-type. For purposes of this section, DAS 820D-type equipped with Data Set 109E-type is referred to as a data station.

1.02 Data Set 109E-type Single Private Line Station consists of a Data Auxiliary Set 820D-type, Data Set 109E-type, and AR17 circuit pack (Fig. 1).

1.03 Information in this section applies to series 1 and series 2 of Data Set 109E-type. Both series 1 and series 2 are electrically identical.

1.04 This section covers information pertaining to later models of DAS 820D-type [DAS 820D-L1 and DAS 820D-L1A (Fig. 2)]. Detailed information pertaining to models of DAS 820D-type can be found in Section 598-058-100.

1.05 The procedures for removing and replacing the cover of DAS 820D1 and for replacing the entire data station or individual circuit packs (AR17 circuit pack or Data Set 109E-type) are covered in Section 591-036-302.

1.06 The data station using DAS 820D-L1 can be installed on any surface (desk, table, etc) that is convenient for customer use and within range of the interface cord supplied by the customer. The data station using DAS 820D-L1A should be installed in the kneewell of a Bell System Model 35 teletypewriter (TTY) (Fig. 3) or the pedestal of a Bell System 37 TTY.

Note: Data terminals must conform to Electronic Industries Association (EIA) Standard RS-232-B.

1.07 The following loop restrictions are to be observed where applicable when installing the data station.

- (a) The loop cannot be equipped with anything that can break the dc path of the loop.
- (b) The loop cannot be carrier derived or use a ground return.
- (c) Bridge taps are to be avoided.
- (d) Only individual lines are to be used.

2. TOOLS AND APPARATUS

2.01 The following equipment is required for installing the data station.

1—KS-20538-L1 volt-ohm-milliammeter (VOM) or equivalent.

1—MOLLY[®] jacknut installer tool or MOLLY jacknut friction wrench.

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3. OPTION CONNECTIONS

3.01 Data station options are installed by opening and closing screw switches on Data Set 109E-type (Table A) and AR17 circuit pack (Table B). These option connections are normally made prior to the installation of the data station as specified on the circuit layout record card. The option connections may be changed at any time, if necessary, to meet changes in the customer operations.

3.02 The data set options consist of current squelch, BB lead mark or space hold, and

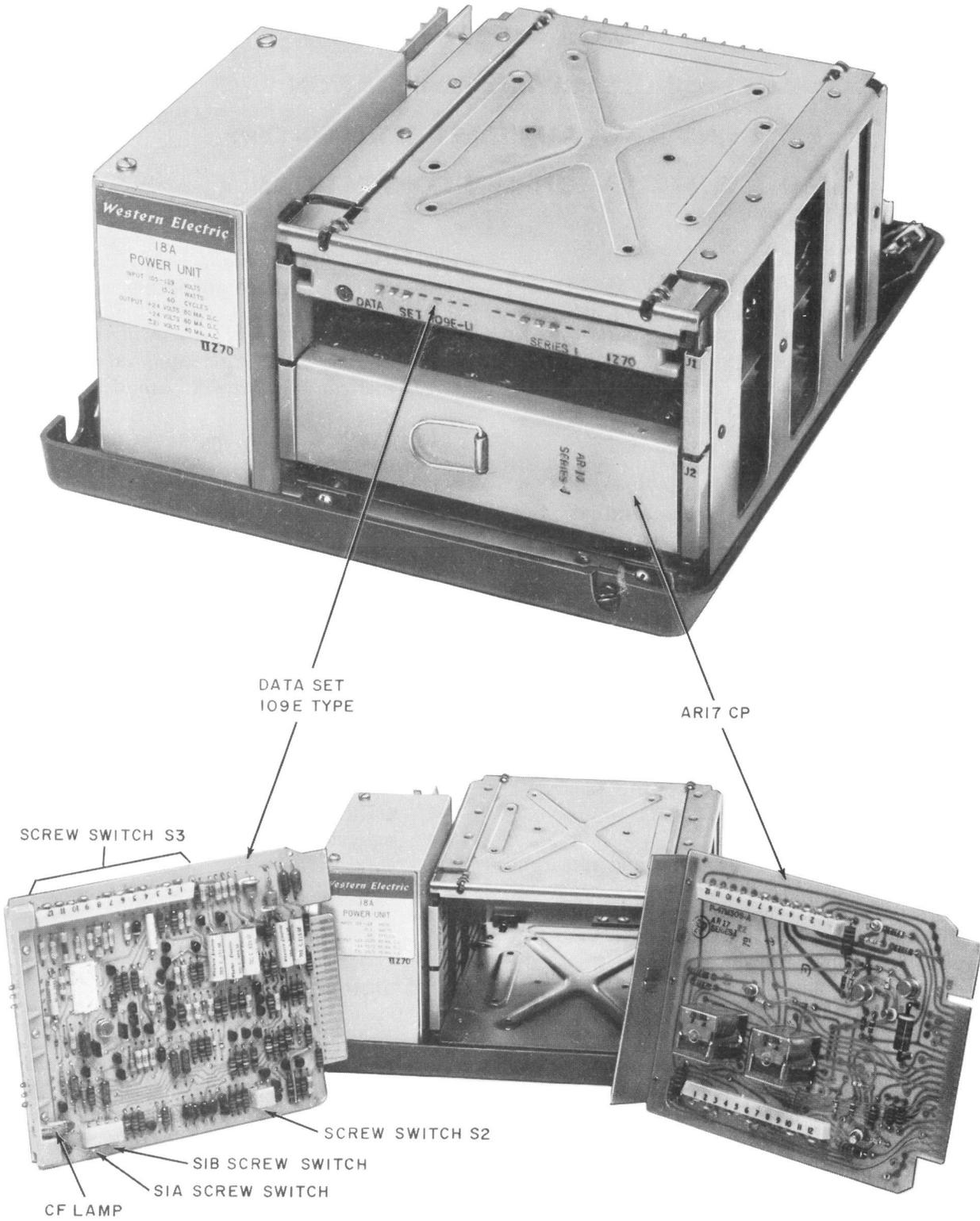
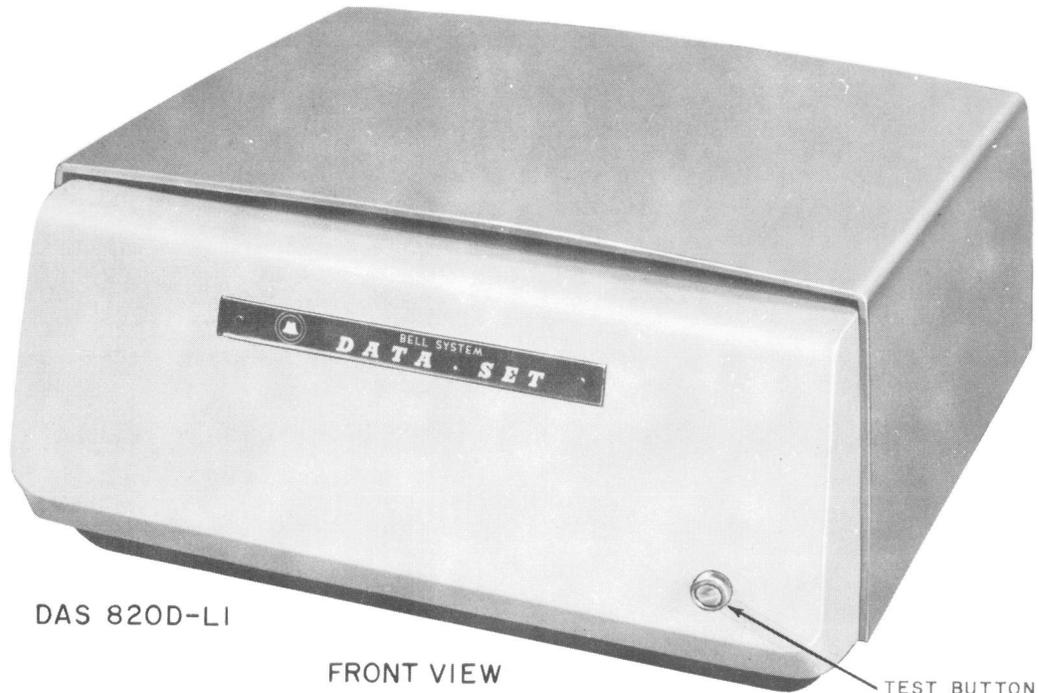


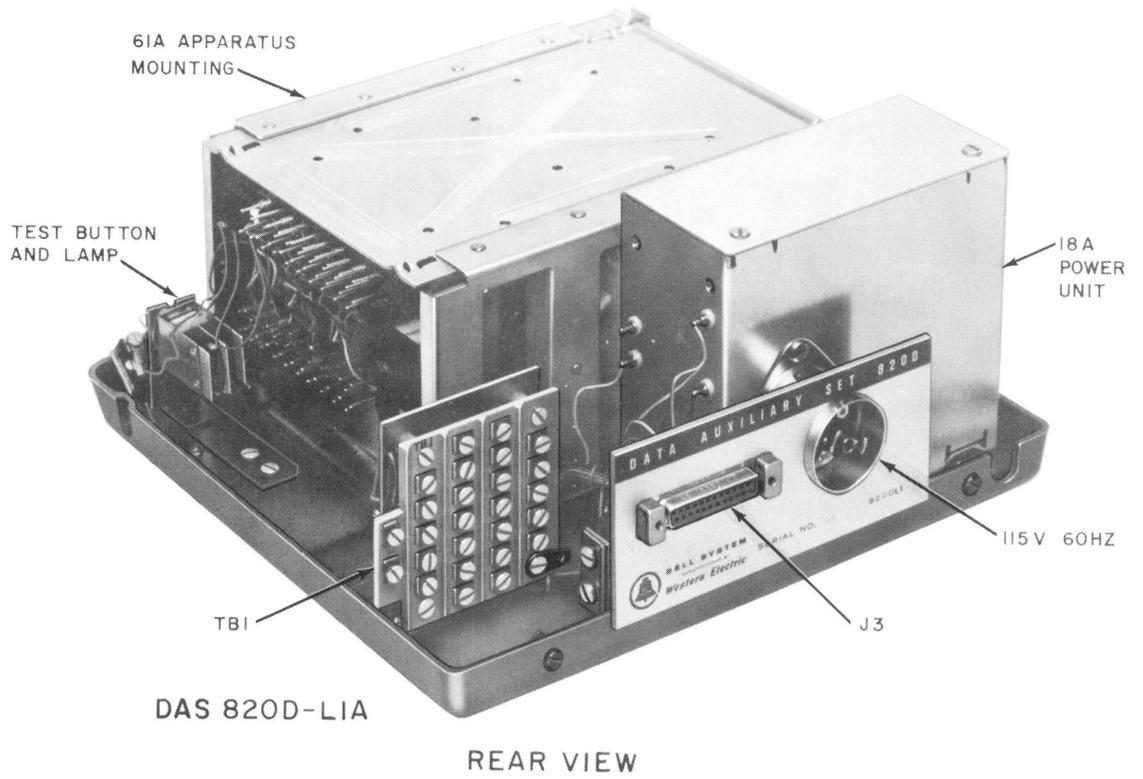
Fig. 1—Data Auxiliary Set 820D-Type With Data Set 109E-Type and AR17 Circuit Pack



DAS 820D-L1

FRONT VIEW

TEST BUTTON AND LAMP



6A APPARATUS MOUNTING

TEST BUTTON AND LAMP

18A POWER UNIT

TBI

J3

115V 60HZ

DAS 820D-L1A

REAR VIEW

Fig. 2—Data Auxiliary Set 820D-Type

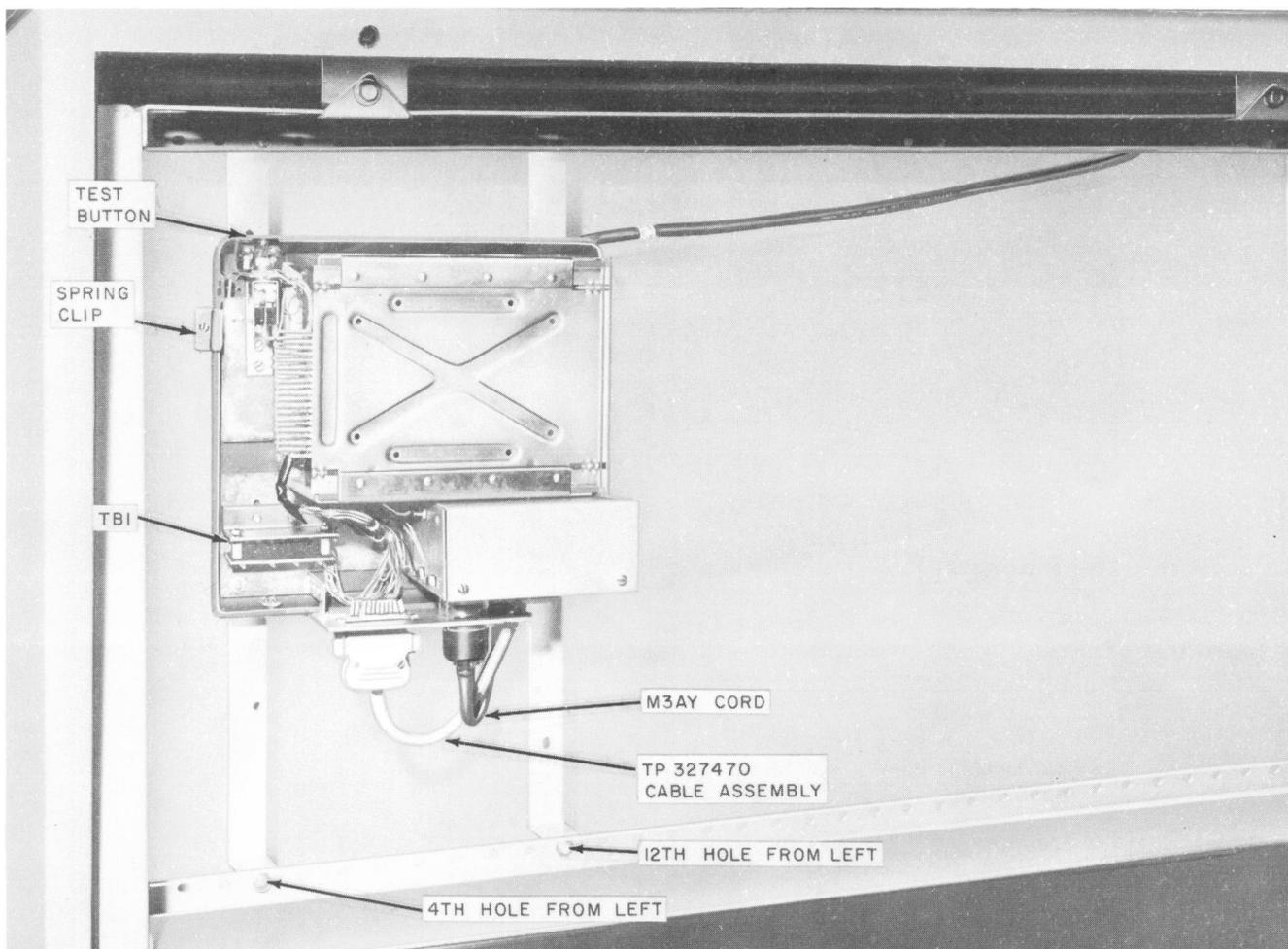


Fig. 3—Data Auxiliary Set 820D-L1A Mounted in a 35-Type TTY

crossover shift. These options are defined as follows.

Option Y (No Current Squelch)—This option allows data on the BA lead to always cause the transmitter to apply a mark or space voltage which is to be applied to the loop. This option must be implemented for PL installations.

Note: Option Z (current squelch) is not used with PL telegraph and is not implemented for PL installations.

Option U (BB Lead-Mark Hold)—This option causes the BB lead to be clamped to a mark when the loop current falls below

minimum requirements for more than 15 ms.

Option V (BB Lead-Space Hold)—This option causes the BB lead to be clamped to a space when the loop current falls below minimum requirements for more than 15 ms.

Option R (Space Crossover Shift)—This option slightly shifts the receiver slicing level current away from zero so that zero level loop current will guarantee that the BB lead is clamped to a space. After 15 ms, the RS lead will

clamp the BB lead marking or spacing (depending on Options U and V).

Option Q (Mark Crossover Shift)—This option operates similarly to Option R with the exception that the BB lead is held marking for the initial 15 ms instead of spacing. After the 15 ms of no loop current, the RS lead will cause the BB lead to continue spacing or marking (depending on Options U and V).

Option P (No Crossover Shift)—This option guarantees that the receiver slicing level current is not shifted so that zero loop current remains the slicing level. The BB lead is held either marking or spacing (depending on Options U and V) after the normal 15-ms loop current loss. This option is implemented for PL installations to give the minimum possible distortion.

3.03 Option connections on the AR17 circuit pack are listed in Table B. These options are defined as follows.

Option W (EIA Interface)—This option provides EIA interface (Table A in Section 591-036-102) toward the data terminal.

Option V (Current Interface)—This option provides current interface (Table B in Section 591-036-102) toward the data terminal.

Option T (Copy in Test Mode)—This option allows a copy of the data which is being looped around through the data set to be sent to the receive lead of the data terminal when the station is in the TEST mode.

Option S (No Copy in Test Mode)—This option prevents data from being sent to the receive lead of the data terminal when the station is in the TEST mode.

Option R (Local Copy)—This option causes data which is being sent by the data terminal to be coupled to the receive lead.

Option Q (No Local Copy)—This option prevents data which is sent by the data terminal from appearing on the receive lead.

Option N (Mark Hold on Carrier Fail)—This option provides a mark hold condition on the receive (BB) lead when the loop current falls below the minimum value for 15 ms (Section 591-036-102).

TABLE A
DATA SET 109E-TYPE SCREW SWITCH SETTINGS FOR OPTIONS
USED IN SINGLE PRIVATE LINE STATIONS

OPTION		FACTORY EQUIPPED	SCREW SWITCH SETTING	
			CLOSE	OPEN
BB LEAD	SPACE HOLD (V)		S1A (Note 1)	S1B (Note 1)
	MARK HOLD (U)	✓	S1B (Note 1)	S1A (Note 1)
CROSSOVER SHIFT	SPACE (R)		S3-2	S3-1
	MARK (Q)	✓		S3-1 and S3-2
	NONE (P) (Note 3)		S3-1	S3-2
CURRENT SQUELCH (Z)		✓	S2	
NO CURRENT (Y) SQUELCH (Note 2)				S2

Note 1: Screw should not be inserted in the center position of screw switch S1.

Note 2: Y option must be implemented for PL arrangements.

Note 3: P option should be implemented for PL arrangements for minimum distortion.

TABLE B
OPTION CONNECTIONS FOR AR17 CIRCUIT PACK

OPTION FEATURE	AR17 CIRCUIT PACK				QUANTITY
	OPT DESIG	FACTORY PROVIDED	SCREW OPEN	SCREW CLOSED	
EIA Interface	W	√	B2, B4, B6, A2, A4	B1, B5, A1 A3	One per data set as specified on circuit layout record card
Current Interface (See Note 1)	V		B1, B5, A1, A3	B2, B4, B6, A2, A4	
Copy in Test Mode	T	√	—	B12	One per data set as specified on circuit layout record card
No Copy in Test Mode	S		B12	—	
Local Copy	R		—	B10	One per data set as specified on circuit layout record card
No Local Copy	Q	√	B10	—	
Mark Hold on BB Lead	N		—	A5	One per data set as specified on circuit layout record card
Space Hold on BB Lead	M	√	A5	—	

Note 1: The current interface option can only be used when the terminal equipment (Bell System-provided or customer-provided) is equipped with 680-ohm resistance impedance input in the receiver and a contact closure output in the transmitter with both isolated from ground.

Note 2: Options J and K are not used in PL arrangements and therefore, are not shown in this table.

Option M (Space Hold on Carrier Fail)—This option operates similarly to Option N except that the BB lead is held spacing instead of marking. This option is used with current interface only.

3.04 Line pad resistance adjustments are made on Data Set 109E-type by screw switch settings in the same manner that the options are installed. These line pad adjustments are normally made prior to the installation of the data station as specified on the circuit layout record card (See 5.04). These adjustments may be changed at any time, if necessary, to meet changes in the loop resistance.

3.05 If the line pad resistance is not specified on the circuit layout record card, perform steps to adjust the line pad resistance per 5.06 or 5.07. The procedure outlined in 5.07 is preferable.

3.06 The procedure for installing the data set options and adjusting the line pad is as follows.

- (1) Remove the AR17 circuit pack and/or Data Set 109E-type from the DAS as outlined in Section 591-036-302.
- (2) Install the options and adjust the line pad switches per—
 - (a) Table A for options on Data Set 109E-type
 - (b) Table B for options on AR17 circuit pack
 - (c) Table C for adjusting the line pad resistance.
- (3) Reinstall Data Set 109E-type and/or AR17 circuit pack in DAS 820D-type as outlined in Section 591-036-302.

4. INSTALLATION PROCEDURES

4.01 The installation procedures are covered for data stations using DAS 820D-L1 and DAS 820D-L1A. No parts are needed to mount DAS 820D-L1 except the customer-provided EIA interface

TABLE C
LINE PAD ADJUSTMENTS

LINE PAD RESISTANCE (OHMS)	SCREW SWITCH S3-SETTINGS	
	CLOSE	OPEN
0	4, 5, 6, 7, 9, 10, 11, 12	
136.2	4, 5, 6, 10, 11, 12	7, 9
266.0	4, 5, 7, 9, 11, 12	6, 10
402.2	4, 5, 11, 12	6, 7, 9, 10
522.0	4, 6, 7, 9, 10, 12	5, 11
658.2	4, 6, 10, 12	5, 7, 9, 11
788.0	4, 7, 9, 12	5, 6, 10, 11
924.2	4, 12	5, 6, 7, 9, 10, 11
1022.0	5, 6, 7, 9, 10, 11	4, 12
1158.2	5, 6, 10, 11	4, 7, 9, 12
1288.0	5, 7, 9, 11	4, 6, 10, 12
1424.2	5, 11	4, 6, 7, 9, 10, 12
1544.0	6, 7, 9, 10	4, 5, 11, 12
1680.2	6, 10	4, 5, 7, 9, 11, 12
1810.0	7, 9	4, 5, 6, 10, 11, 12
1946.2		4, 5, 6, 7, 9, 10, 11, 12

cord. Parts needed to mount DAS 820D-L1A are listed in Table D.



To avoid possible damage to the electrical components of the data station, do not connect the power to DAS 820D-type until directed to do so in this section.

DAS 820D-L1

4.02 After positioning DAS, remove the cover as outlined in Section 591-036-302.

4.03 Connect the options requested on installation service order or circuit layout record card as outlined in Part 2 of this section.

4.04 Insert the proper Data Set 109E-type into the top mounting position (J1) of the DAS and insert the AR17 circuit pack into the bottom mounting position (J2) of the DAS (Fig. 1).

4.05 Connect the customer-provided interface connector to J3. (Fig. 1).

Note: The customer-provided interface cord should not exceed 50 feet in length.

TABLE D
EQUIPMENT REQUIRED FOR INSTALLATION OF DAS 820D-TYPE
IN MODEL 35-TYPE TTY POSITION

DAS MODEL	EQUIPMENT	QUANTITY PER TTY POSITION
820D-L1A	180 backboard	1 each
	96A mounting bracket	1 each
	TP-327470 cable	1 each (Note 1)
	TP-327538 bracket	1 each (Note 2)
	TP-151631 screws	4 each (Note 2)
	TP-2191 lockwashers	4 each (Note 2)
	TP-76099 flatwashers	4 each (Note 2)

Note 1: The free conductor end of the TP-327470 cable should be equipped with connecting clips as required to match the 35 TTY terminals while the other end is equipped with a 25-pin male interface connector for connection to interface connector J3 of the DAS.

Note 2: This equipment is only required when a 13A1 Data Unit is needed to build out the resistance of the incoming transmission loop.

DAS 820D-L1A in a Model 35 TTY

4.06 Perform the procedure outlined in the following text to install the DAS in the 35-type TTY.

4.07 Remove front cover of 35-type TTY pedestal as follows.

- (1) Remove chad container by sliding it to the left, raising the right side, then sliding it to the right and out.
- (2) Operate the two pushbutton fasteners at the top of the cover.
- (3) Depress the spring clip underneath the keyboard and pivot the lower compartment to the floor.
- (4) Disengage the cover from the pivot screws and remove it from the pedestal.

4.08 If TTY is model 35 KSR, perform the preceding steps except that only one pushbutton fastener is provided to hold the lower panel and no chad container is provided.

4.09 Install the 96A bracket, 180A backboard, and DAS 820D-L1A equipped with the data set and AR17 circuit pack inside the TTY pedestal as follows (Fig. 4).

- (1) Position the 96A bracket inside the TTY pedestal and tighten the screws.
- (2) Mount the 180A backboard on the 96A bracket and tighten screws.
- (3) Verify that the data set and AR17 circuit pack are securely seated in their slots.
- (4) Loosen the spring clips on the 180A backboard and position DAS 820D-L1A as shown in Fig. 3.
- (5) Verify that the DAS baseplate is under the spring clips and tighten the spring clip screws.

Caution: Before releasing grip on the DAS, ensure that it is securely in place.

DAS 820D-L1A in Model 37 TTY

4.10 When the data terminal is a 37 TTY, the data set is to be installed on the right inside of the TTY pedestal on a 98A bracket as follows:

- (1) If 98A bracket mounting hole is not furnished, locate and drill one 7/16-inch hole in bottom of TTY pedestal as shown in Fig. 5.
- (2) Using MOLLY jacknut installer tool No. 1956 or MOLLY jacknut friction wrench and a screwdriver, install one jacknut-type 8-S JN 1/4-20 (supplied with 98A bracket).
- (3) Using four P-181454 (0.164-32 x 1/2 inch) binding head machine screws (furnished with 98A bracket), mount DAS 820D-L1A on the 98A bracket.

Note: DAS 820D-type should be mounted on the 98A bracket with the TEST key facing the front of the TTY.

- (4) Install 98A bracket in TTY pedestal and screw the spring-ejected panel fastener No. 53-11-410-24 into the jacknut.

5. CONNECTIONS

Warning: *Do not attempt to make any connections until the TTY power plug is disconnected from the customer-provided receptacle.*

DAS 820D1 and DAS 820D-L1

5.01 The 115-volt ac power is connected to the power plug located on the rear of DAS 820D-L1. DAS 820D-L1 is supplied with a KS-14532-L16 (10-foot) flexible power cord. The cord is equipped at one end with a parallel blade grounding-type molded plug for connection to the outlet. The other end is equipped with a Hubbell connector for connection to the DAS. Ensure that the 115-volt 60-Hz ac power outlet is of polarized grounding-type and is available within 10 feet of the desired location of the DAS. Do not connect power to the DAS before completion of procedures outlined in 5.07.

5.02 The customer interface connections are made through jack J3 located on the rear of the DAS. Ensure that the customer-provided interface

cord will reach the desired location of the DAS. Do not connect the interface cord to the DAS until option selection and data set adjustments have been completed.

DAS 820D2 and DAS 820D-L1A

5.03 Power for DAS 820D2 and DAS 820D-L1A is supplied by any 115-volt 60-Hz ac source. The power cord for these points is an M3AY cord consisting of a 7593 Hubbell body for connection to the TTY. The M3AY cord is provided with DAS 820D-L1A; it is not supplied with DAS 820D2 and should be ordered separately. Power connections for the DAS are made to the T terminal block on the 35 or 37 TTY Electrical Service Unit (ESU) with the cord tips of the M3AY cord. Connect the cord tips as follows.

- (1) Connect green and white wire to terminal 1.
- (2) Connect black wire to terminal 2.

Do not connect power to the DAS before completion of procedures outlined in 5.07

5.04 The TTY interface connections are made between jack J3 located on the rear of the DAS and the T terminal block on the 35 TTY ESU. the TP 327470 cable should be equipped with an interface connector (for connection to the DAS), and cord tips (for connection to TTY). Connect the interface cord to the TTY as follows:

- (1) Strap between terminals 6 and 8 on the T terminal block of the ESU.
- (2) Connect yellow wire of TP 327470 cable to terminal 5 of T terminal block.
- (3) Connect red wire of TP 327470 cable to terminal 4 of T terminal block.
- (4) Connect black 20-gauge wire of TP 327470 cable to frame ground of the ESU.
- (5) Connect black 24-gauge wire of TP 327470 cable to terminal 6 of T terminal block.

DAS 820D-Type

5.05 Before connecting the transmission line to the DAS, perform the following steps.

NOTES:

1. 96A BRACKET CONSISTS OF TWO P42D302 BRACKETS WITH THE REQUIRED MODIFICATION.
2. THE DAS 820D-L1A IS SHOWN MOUNTED WITH A PLASTIC COVER IN PLACE BUT ACTUALLY THE DAS 820D-L1A IS NOT EQUIPPED WITH A PLASTIC COVER.

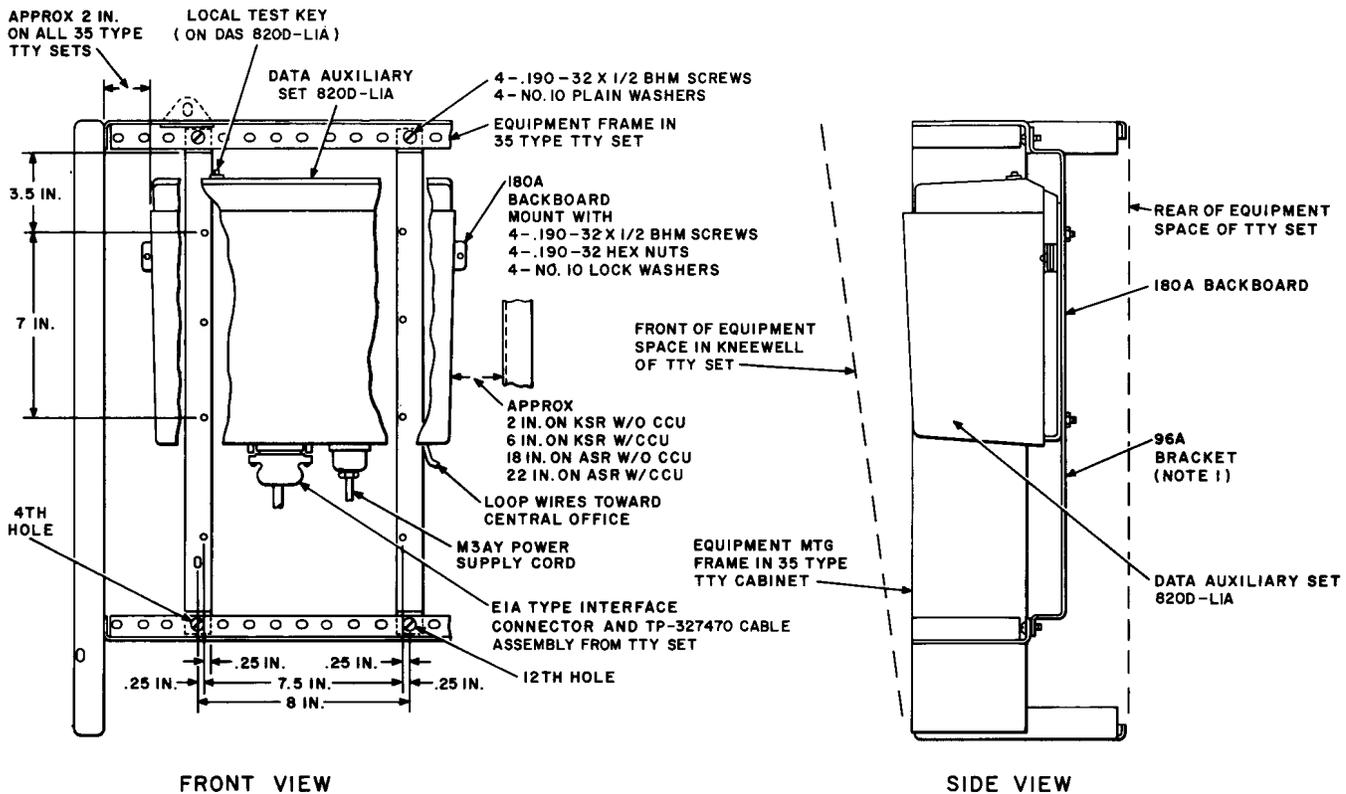


Fig. 4—Layout of Model 35 TTY with Data Auxiliary Set 820D-L1A

- (1) Condition VOM to measure 12 volts dc.
- (2) Connect the positive (+) lead of the VOM to terminal 2 of TB1 on the DAS and the negative (-) lead of the VOM to terminal 1 of TB1 on the DAS.
- (3) Apply power to DAS 820D-L1 or connect the power cord of the TTY to DAS 820D-L1A and push the ON button.
 - A reading within the range of +3.9 through +4.7 volts must be made to indicate proper operation of the data station when the data set is transmitting a mark. If the reading is not within the range of +3.9 through +4.7 volts, verify that the data set should

be transmitting a mark, then perform the test outlined in Section 591-036-502 to determine and correct the malfunction of the data station.

- (4) Disconnect power cord of the TTY or DAS.
- (5) Disconnect VOM from terminals of TB1 on the DAS.

5.06 The transmission loop can be adjusted for the proper resistance when the remote station is not installed by performing the following steps.

- (1) Verify the line pad resistance already installed in the local station data set by observing

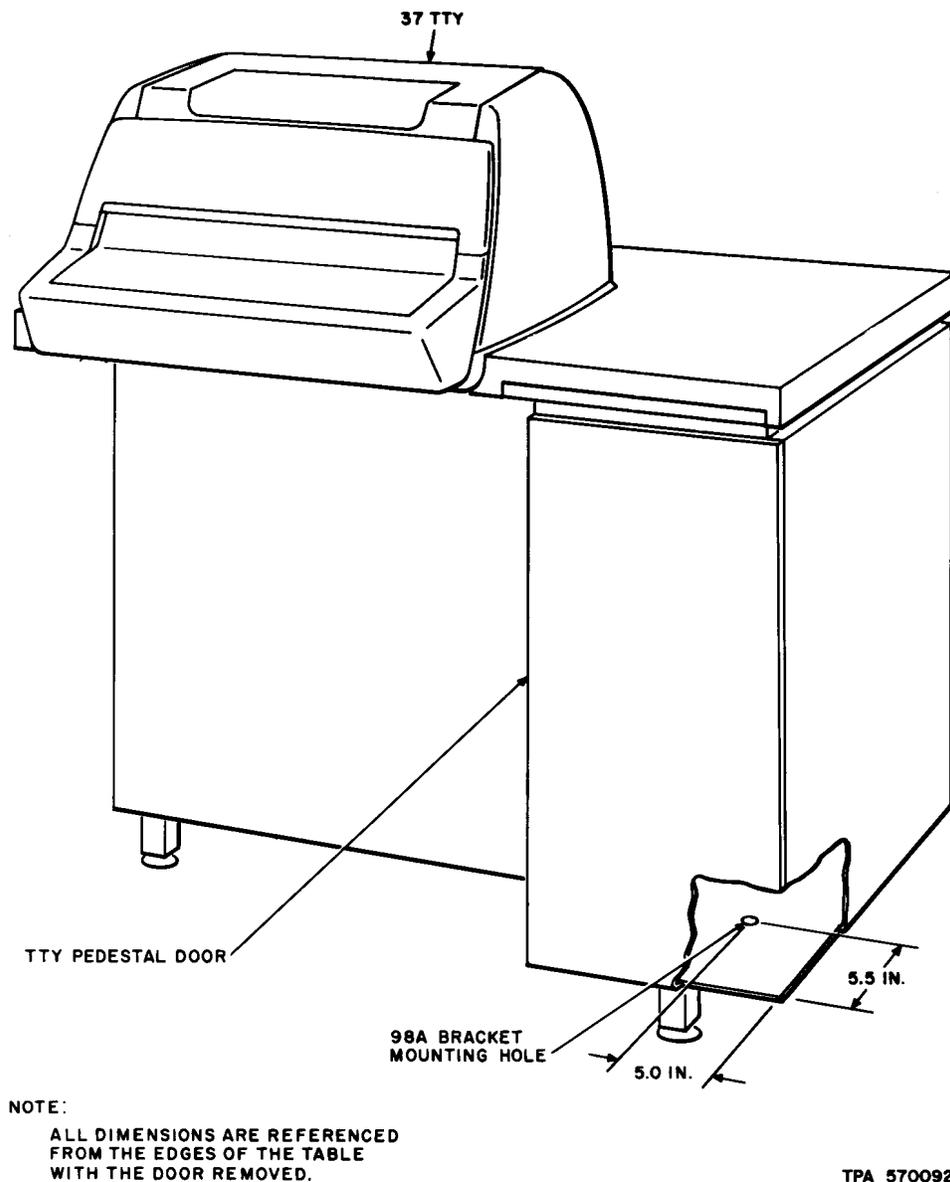


Fig. 5—98A Bracket Hole Position in Model 37 TTY

the screw switch settings and determining the resistance according to Table C.

(2) Determine the loop resistance and remote station line pad resistance as indicated on the circuit layout record card.

(3) Add the value of the remote station line pad resistance and the loop resistance and subtract this value from the optimum 2000-ohm transmission

loop resistance. The remaining value is the pad resistance which is to be inserted in the loop.

(4) When inserting pad resistance, the difference in resistance between the local station and the remote station must not exceed 1000 ohms (eg, 1500 ohms in the local station, 500 ohms in the remote station).

Note: When the actual loop resistance is between 2000 and 2500 ohms, the pad resistance

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in the local and remote data sets must be set at zero.



Verify that the remote station is connected before performing the following procedures. If the remote station is not connected, the transmission leads can be connected to TB1 terminals 1 and 2, indiscriminately.

5.07 When the remote station is installed, the line pad resistance can be accurately adjusted by performing the following procedure.

Note: The following procedure is performed assuming that the remote station is marking. If the remote station is not making, request that the remote station be placed in a marking state.

DAS 820D-type can not be grounded when performing this test and the signal can not be connected to chassis ground. Disconnecting the EIA connector guarantees separation of chassis ground and signal ground.

- (1) Condition the VOM to measure 12 volts dc.
- (2) Connect the positive lead of the VOM to one of the transmission leads.
- (3) Connect the negative lead of the VOM to the other transmission lead.
- (4) If the meter deflects downscale, reverse the VOM leads.
- (5) If the meter deflects upscale, the transmission lead connected to the positive VOM lead will be the positive transmission lead; the lead connected to the negative VOM lead will be the negative transmission lead. Tag these leads.
- (6) Disconnect VOM leads.
- (7) Connect the negative transmission lead to terminal 2 of TB1 as shown in Fig. 6.
- (8) Condition to VOM to measure 12 mA dc.
- (9) Connect the negative VOM lead to terminal 1 of TB1.

- (10) Connect the positive VOM lead to the disconnected transmission lead.

Requirement: Meter indicates +3.0 to +3.2 mA.

- (11) When the measured current is greater than 3 mA, additional resistance will have to be added to the circuit by opening one or more of the screw switches in each side of the line. If the measured current is less than 3 mA, the screw switches will have to be closed to remove some of the pad resistance.

- (12) The screw switches are designated by pairs, one pair serving both sides of the line. The following switches are treated as pairs:

- (a) S3-9 and S3-7
- (b) S3-10 and S3-6
- (c) S3-11 and S3-5
- (d) S3-12 and S3-4.

These switches are always opened and closed in pairs so that resistance will always be equal in both sides of the line. Table C gives the resistance provided by these switches.

Note: The S3-9 and S3-7 screw switches can be thought of as representing a basic unit of resistance and the opening of these screw switches, in each side of the line, will add resistance to the line. Therefore, opening the screw switches S3-10 and S3-6 adds twice as much resistance as S3-9 and S3-7, opening the S3-11 and S3-5 screw switches adds four times the resistance of S3-9 and S3-7. Closing the screw switches removes the resistance in the same increments.

- (13) In order to adjust the line current to +3.0 to 3.2 mA, observe the line current, remove the data set, and open or close the screw switch pairs and replace the data set. By observing the change in the current, the amount of resistance that is required can be judged. This trial and error method can be repeated until a current level between +3.0 and 3.2 mA is obtained. This method provides a quick way of adjusting the loop current when a connection to a far end data set can be made.

- (14) Disconnect the VOM leads and connect the positive transmission lead to terminal 1 of TB1.
- (15) If the data station uses DAS 820D-L1A, replace the cover of the TTY by reversing

the procedure outlined in 4.07 and connect the power to the data station.

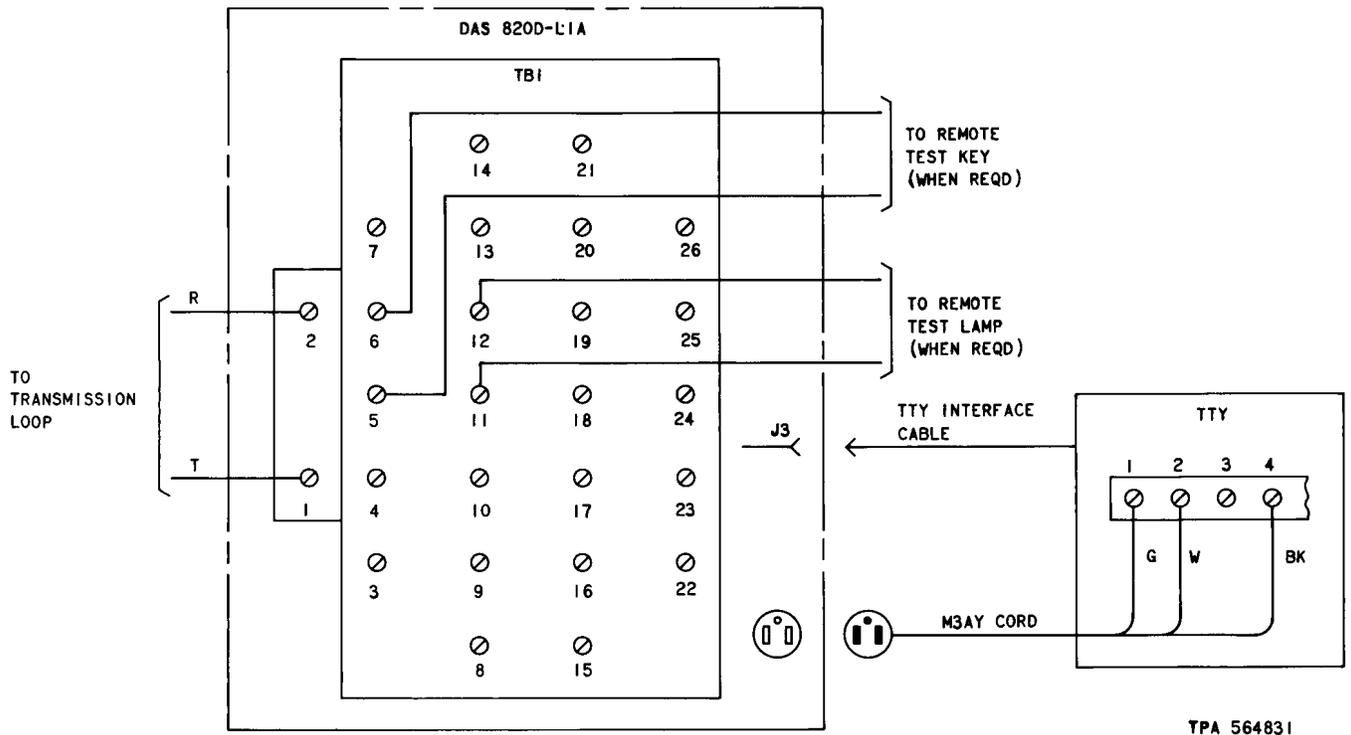


Fig. 6—Interconnection Diagram for Data Set 109E-Type Single PL Station Using Data Auxiliary Set 820D-L1A