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

CONTENTS PAGE

1. GENERAL

1.01 This section covers the installation and connections of data set 109A-type Single Private Line Station using data auxiliary set (DAS) 820D-type. For the purpose of this section, DAS 820D-type (Fig. 1) equipped with data set 109A-type (Fig. 2) is referred to as a data station.

Note: ▶Data set 109A-type has been rated manufacture discontinued (MD).◀

1.02 This section is reissued to include:

(a) Notice that data set 109A-type is rated MD.

(b) Information pertaining to the DAS 820D-L1 and 820D-L1A which replace DAS 820D1 and 820D2, respectively. DAS 820D1 and 820D2 are rated MD.

(c) Information pertaining to the use of DAS 830C with DAS 820D-type to provide a 3- or 4-wire, 20-mA neutral current interface to the data terminal.

1.03 The data station is designed to provide single private line low-speed (up to ▶150◀ bauds), half-duplexed (HDX), serial data communication over a 2-wire metallic private line facility. The data station uses the 3-mA polar dc transmission scheme for the transmission of data.

1.04 ▶The data station can be arranged for either a voltage or neutral current interface by options provided in the AR17 circuit pack (CP). The voltage interface option signals conform to the Electronic Industries Association (EIA) Standard RS-232B. The AR17 CP current interface option signals ***do not*** conform to the requirements of any of the interface specification technical references.

1.05 The DAS 820D-type arranged for EIA interface can be used with the DAS 830C to provide a 3- or 4-wire, 20-mA neutral current interface. In this case, the interface signals conform to the requirements of the technical references entitled, 30-Baud Private Line Channels Interface Specifications and 45-, 55-, and 75-Baud Private Line Channels Interface Specifications.◀

1.06 This section does not include specific installation information about the associate equipment of the data station such as the data terminal equipment (whether customer-provided or Bell System-provided).

1.07 The procedures outlined in this section are for the installation of either model of DAS 820D-type.

(a) DAS 820D ▶-L1◀ can be installed on any surface (desk, table, etc) that is convenient for the customer's use and within the maximum length of the interface cord which is supplied by the customer.

(b) DAS 820D ▶-L1A◀ can be installed only in Bell System-provided Model 35-type teletypewriters (TTYs).

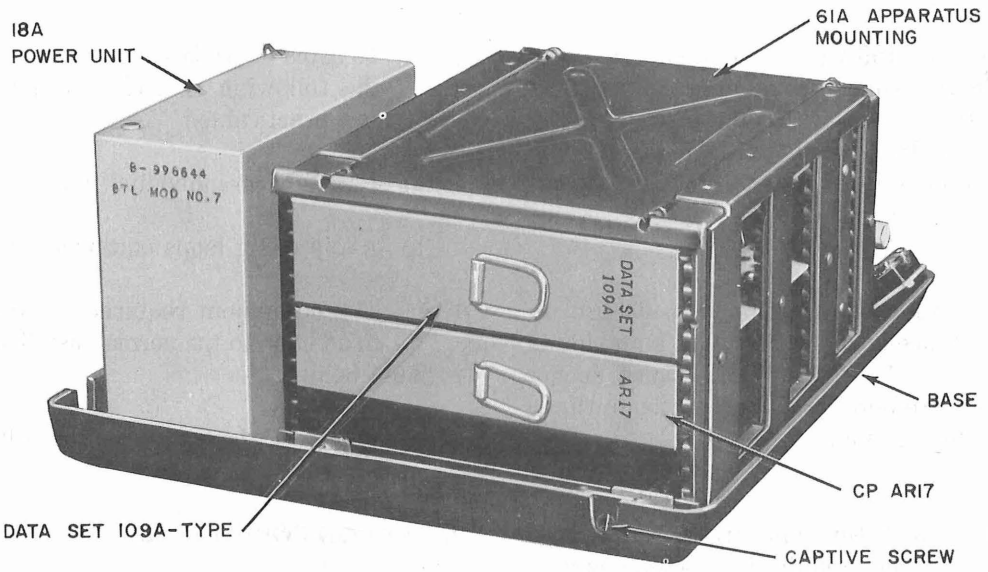
1.08 The procedures for removing the covers of DAS 820D ▶-L1◀ and for the replacement of the entire data station, or only a CP card (AR17 CP, or AR16 CP and data set 109A-type) of the data station, are covered in the section entitled Data Set 109A-Type Single Private Line Station Using Data Auxiliary Set 820D-Type, Maintenance (591-024-301).

1.09 ▶The procedures for the installation and testing of DAS 830C are given in the section entitled, Data Auxiliary Set 830C-Type, Description, Installation, and Test Procedures (598-083-103).◀

1.10 The data station is limited to use on a 2-wire metallic line because data set 109A-type will operate only over a closed loop. The transmission loop used by the data station cannot be equipped with anything that will break the dc path of the loop. The loop cannot be carrier-derived or use ground return.

Note: For the purpose of this section, a transmission loop is the 2-wire metallic line that connects data set 109A-type and data set 109-type.

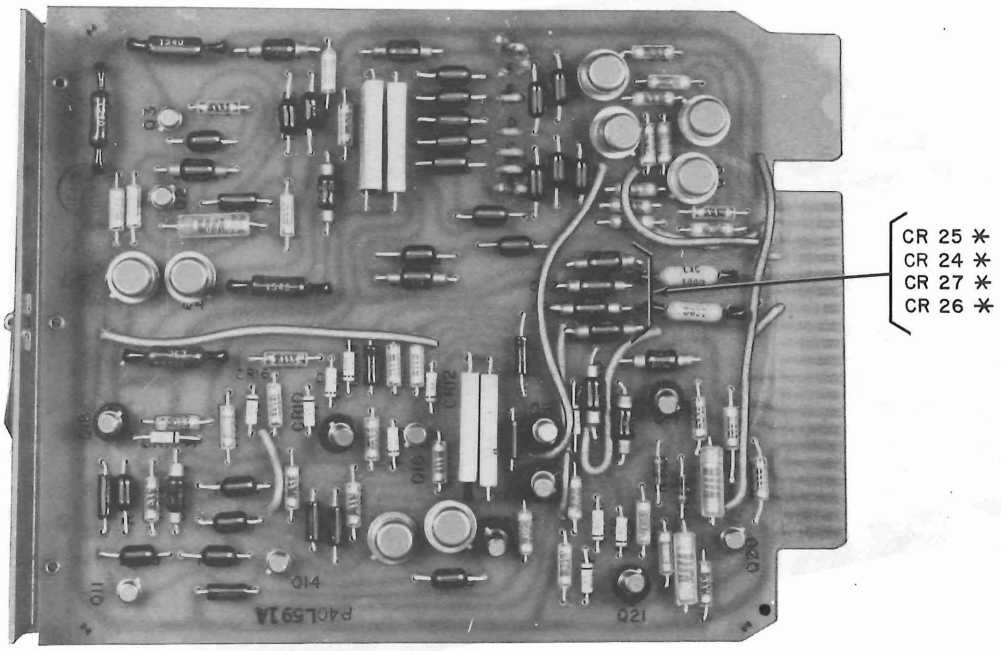
DAS 820D-LI OR 820DI (MD)



DAS 820D-LIA OR 820D2 (MD)
(DAS 820DI OR 820D-LI WITH COVERS REMOVED)

NOTE:
THE TEST KEY IS OPERATIVE ON DAS 820D-LI OR LIA ONLY. ALL OTHER DAS 820D-TYPES HAVE TEST KEY BUT IT IS NOT OPERATIVE AND DOES NOT LIGHT WHEN DEPRESSED.

Fig. 1—DAS 820D-Type, Front View



* THESE COMPONENTS ARE USED FOR LIGHTNING PROTECTION AND ARE ONLY PROVIDED ON DATA SET 109AI.

Fig. 2—Data Set 109A-Type

1.11 The data set 109A-type employs the 3-mA polar dc transmission scheme to transmit and receive data with a distant data set 109-type location. The dc loop resistance to obtain the 3-mA of current depends on the operational arrangement of the data station.

(a) In station-to-hub operation, the design dc loop resistance is 2000 ohms with a maximum capacitance of 1 μF. Those loops which do not meet this requirement are handled as outlined in Part 4 of this section.

(b) In station-to-station operation, the design dc loop resistance required is 1800 ohms with a maximum capacitance of 1 μF. Those loops which do not meet this requirement are handled as outlined in Part 4 of this section.

1.12 If the numerical value of the dc loop resistance for the transmission loop is not provided, a dc loop resistance measurement of the loop must be made as outlined in Part 4 of this section.

1.13 To avoid degradation during data transmission, the following restrictions apply to the data line where practicable.

(a) Use only on individual lines.

(b) Avoid using loops equipped with bridge taps.

1.14 The equipment required for this installation, in addition to the normal installation equipment, is listed below:

1—KS-16979-type volt-ohm-milliammeter, or equivalent.

2. OPTION CONNECTIONS

2.01 The options of the data station are made by opening or closing the screw switches on AR17 CP (Fig. 3) or AR16 CP (Fig. 4) DAS 830C (if used) options are to be made by installation or removal of links on the DAS 830C (see Section 598-083-103). The option connections are normally made prior to the installation of the data station as specified on the service order or circuit layout record card (CLRC) for the installation. The

option connections can be changed at any time if necessary to meet changes in the customer's operations.

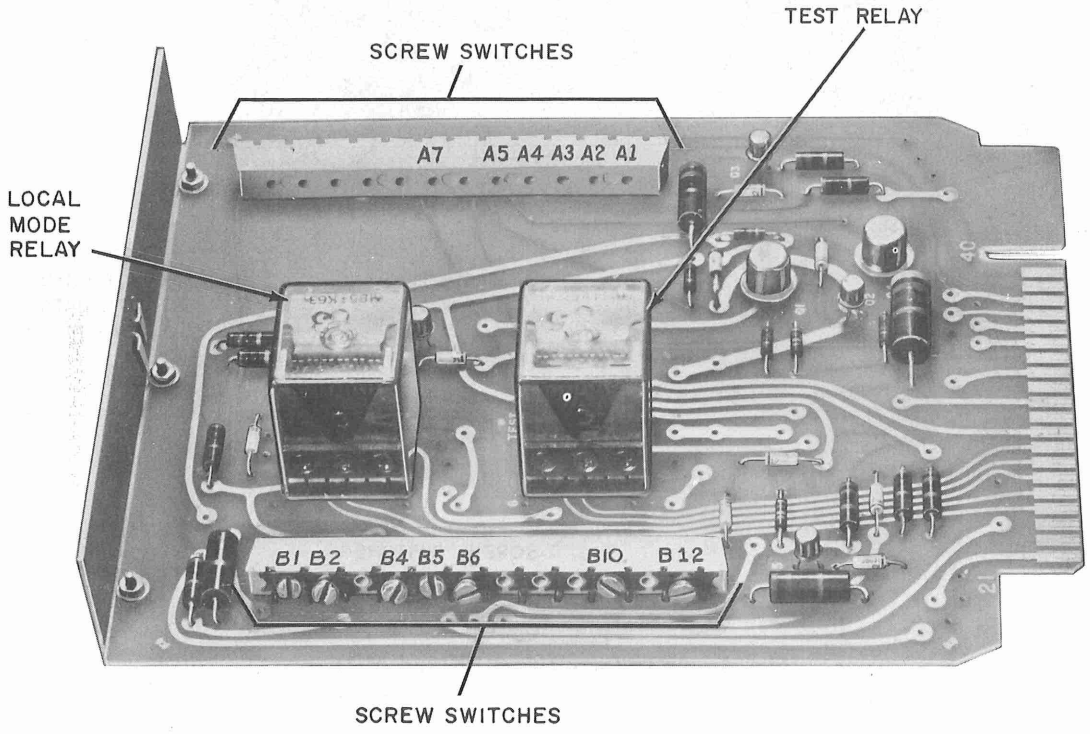


Fig. 3—AR17 Circuit Pack

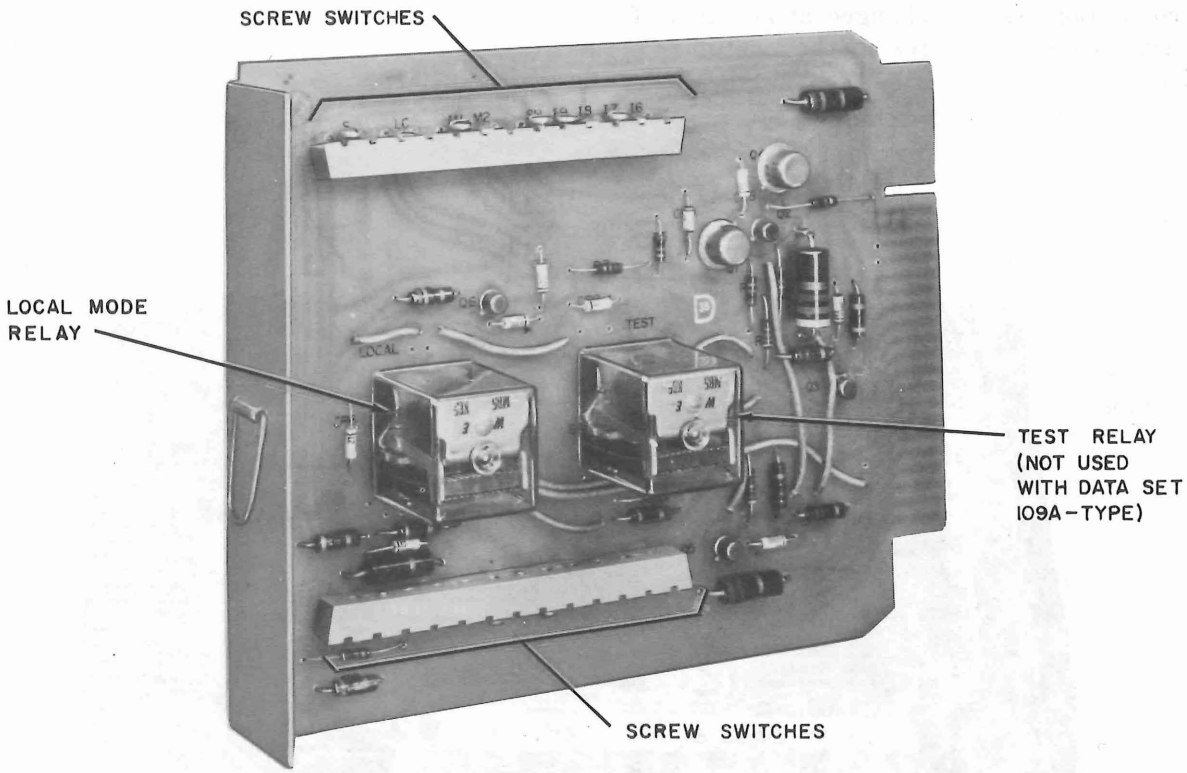


Fig. 4—AR16 Circuit Pack (Rated MD)

Note: Some earlier models of the data station were equipped with AR16 CP (Fig. 4) which is rated Manufacture Discontinued (MD). The options are made on AR16 CP in the same manner as on AR17 CP.

Warning: Care must be taken to avoid stripping the threads in the plastic strip of the circuit pack when tightening the screws to make the option connections.

2.02 The procedure for connecting the options of the data station is as follows:

(a) Remove AR17 CP (or AR16 CP) from DAS 820D-type as outlined in Section 591-024-301.

Note: If DAS 820D ▶-L1◀ is used, remove the covers as outlined in Section 591-024-301 before removing AR17 CP.

(b) Make the option connection by loosening or tightening the screw switches of AR17 CP as indicated in Table A.

(1) Turn the screw clockwise to tighten for a closed condition.

(2) Turn the screw counterclockwise to loosen for an open condition.

(c) Reinstall AR17 CP (or AR16 CP) in DAS 820D-type as outlined in Section 591-024-301.

3. INSTALLATION PROCEDURES

3.01 The data station shall be installed in conformance with existing sections covering installation of station sets. See the section entitled Data Sets—General Installation Information (590-010-200).

3.02 The installation of DAS 820D-type is covered under the following headings:

(a) Installation of DAS 820D ▶-L1 (or 820D1)◀

(b) Installation of DAS 820D ▶-L1A (or 820D2).◀

Warning: 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 as outlined in this section.

INSTALLATION OF DAS 820D ▶-L1 (OR 820D1)◀

3.03 After positioning DAS 820D ▶-L1,◀ remove the cover as outlined in Section 591-024-301.

3.04 Connect the options requested on the installation service order as outlined in Part 2 of this section.

3.05 Insert the proper data set 109A-type into the top mounting position of DAS 820D ▶-L1◀ (Fig. 1) and perform the following steps.

Note: Ensure that a good connection is made between the data set and DAS 820D ▶-L1◀ by using sufficient force when pushing the data set into position.

(a) Connect the ac power cord to the ac connector of DAS 820D ▶-L1◀ (Fig. 5) and then to the customer-provided wall receptacle.

(b) Measure the voltage output of the data station as follows:

(1) Set the volt-ohm-milliammeter to 12 on the DC VOLTS scale.

(2) Connect the positive (+) lead of the meter to terminal 2 of terminal strip ▶TB1 [(TB)A of DAS 820D1]◀ (Fig. 5) and the negative (−) lead of the meter to terminal 1 of ▶TB1 [(TS)A of DAS 820D1].◀

(3) A reading within the range of 3.9 through 4.7 volts must be made to indicate proper operation of the data station. ***Note:*** A reading within the range of 3.9 through 4.7 volts indicates a marking condition, whereas a reading within the range of 12.5 through 13.3 volts indicates a spacing condition. If the reading is not within the range of 3.9 through 4.7 volts, perform the tests outlined in the section entitled Data Set 109A-Type Single Private Line Station Using Data Auxiliary Set 820D-Type, Test Procedures (591-024-501) to determine and correct the malfunction of the data station.

(c) Disconnect the ac power cord from the customer-provided wall receptacle.

→TABLE A←

AR17 AND AR16 CP OPTIONS

OPTION FEATURE	AR17 CP			AR16 CP (MD)		QUANTITY
	OPT DESIG	SCREW OPEN	SCREW CLOSED	SCREW OPEN	SCREW CLOSED	
EIA Interface (Note 1)	W	B2, B4, B6 A2, A4	B1, B5, A1 A3	I2, I3, I5 I7, I9	I1, I4, I6 I8	Choose One
Current Interface (Note 2)	V	B1, B5, A1 A3	B2, B4, B6 A2, A4	I1, I4, I6 I8	I2, I3, I5, I7, I9	
Copy in Test Mode	T	—	B12	M2	M1	Not Used With Data Set 109A-Type
No Copy in Test Mode	S	B12	—	M1	M2	
Local Copy	R	—	B10	—	LC	Choose One
No Local Copy	Q	B10	—	LC	—	
Mark Hold on Carr Fail	N	—	A5	—	SH	Choose One With Current Interface
Space Hold on Carr Fail	M	A5	—	SH	—	
Carr Squelch on Carr Fail	K	—	A7	—	S	Not Used With Data Set 109A-Type
No Carr Squelch on Carr Fail	J	A7	—	S	—	

Note 1: When DAS 830C is to be used with DAS 820D-type, AR17 CP must be equipped with option W (EIA interface).

Note 2: The AR17 CP 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.

Warning: To prevent possible damage to the electrical components of the data station, ensure that the ac power cord of the station is removed from the customer-provided wall receptacle.

3.06 Connect the interface connection cord ▶of the TTY, CPE, or DAS 830C◀ to interface connector J3 (Fig. 5) on DAS 820D ▶-L1◀ and repeat the procedures outlined in 3.05(a), (b), and (c). ▶An interface connection cord provided by the customer should not exceed 50 feet in length.◀ The interface leads to the customer-provided terminal (CPT) are shown in Table B. Those pins of interface connector J3 not shown in Table B are not used.

Note: If a meter reading within the range of 12.5 through 13.3 volts is made, the customer's equipment is transmitting a space to the data station. Appropriate action should be taken to get the terminal equipment to transmit a steady mark (the idle condition), 3.9 to 4.7 volts.

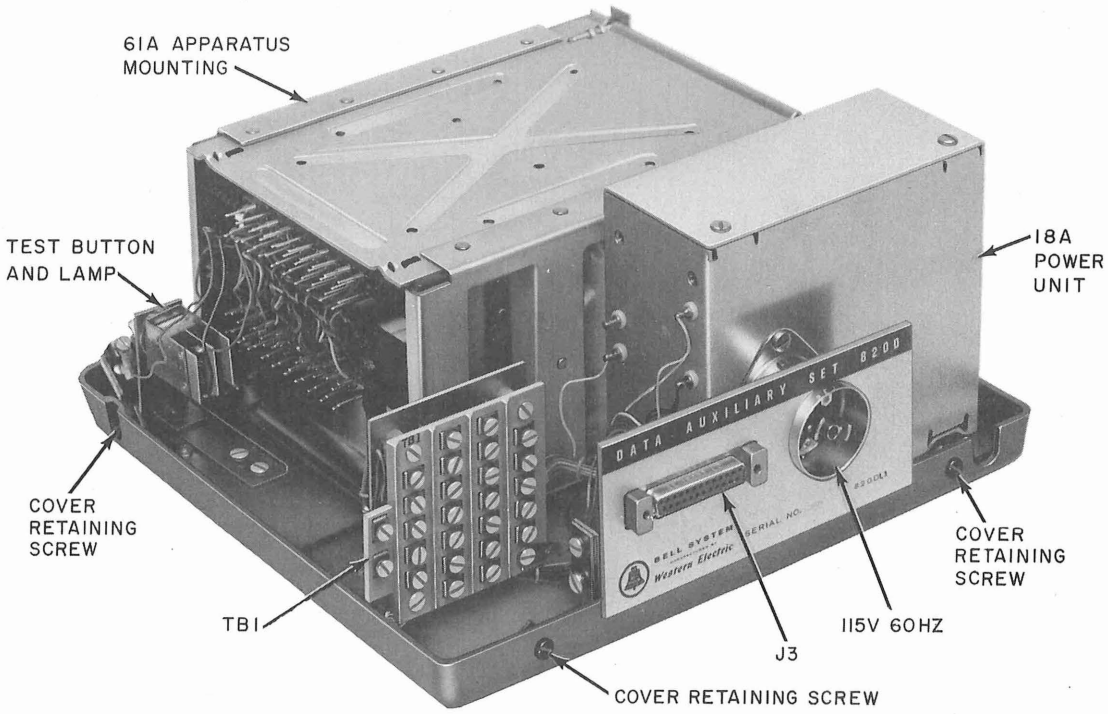


Fig. 5—DAS 820D-L1 (Rear View—Cover Removed) or DAS 820D-L1A

3.07 Connect the leads of the incoming transmission loop to TB1 of DAS 820D -L1 [(TS)A of DAS 820D1] as outlined in Part 4 of this section.

3.08 Connect the ac power cord to the ac power connector (Fig. 5) and then to the customer-provided wall receptacle.

3.09 If the DAS 830C is used, perform the installation and test procedures given in Section 598-083-103.

3.10 Perform the operational test of the data station as outlined in the section entitled Data Set 109A-Type Single Private Line Station Using Data Auxiliary Set 820D-Type, Test Procedures (591-024-501).

3.11 After successfully completing the operational test, replace the DAS 820D -L1 cover to complete the installation of the data station.

INSTALLATION OF DAS 820D -L1A (OR DAS 820D2)

3.12 DAS 820D -L1A is designed to be mounted in the kneewell of a Model 35-type TTY position. The parts required to mount the unit in the TTY position are listed in Table C.

Caution: To avoid possible personal injury and/or damage to the electrical components of the data station, disconnect the TTY ac power plug from the customer-provided wall receptacle before beginning installation of DAS 820D -L1A .

3.13 Use the following procedure to install the mounting apparatus for DAS 820D -L1A in the kneewell of the TTY position.

(a) Remove the kneewell cover using the procedures outlined in Table D.

(b) Mount the 96A brackets to the equipment frame in the kneewell of the respective TTY positions as shown in Fig. 6. The brackets are connected to the frame as shown in Fig. 7.

(c) Mount the 180A backboard on the 96A brackets as shown in Fig. 7.

3.14 Prior to mounting DAS 820D ➧-L1A➧ on the 180A backboard, complete the following operations.

TABLE B

INTERFACE LEAD ASSIGNMENTS

EIA INTERFACE LEAD ASSIGNMENT		
PIN NO.	DESIGNATION	LEAD ASSIGNMENT
1	AA	Protective Ground
2	BA	Data Transmitted
3	BB	Data Received
4	CA	Request-to-Send
5	CB	Clear-to-Send
6	CC	Data Set Ready
7	AB	Signal Ground
8	CF	Data Carrier Detector
9	+P	+24 Volt Power
10	—P	—24 Volt Power
12	CX	Local Mode Control
CURRENT INTERFACE LEAD ASSIGNMENT		
PIN NO.	DESIGNATION	LEAD ASSIGNMENT
2 10	Transmit	Transmit Loop
3 10	Receive	Receive Loop
8 9	Carrier Detector	Data Carrier Detector Loop
12 9	Local Mode Control	Local Mode Control Loop

TABLE C

EQUIPMENT REQUIRED FOR INSTALLATION OF DAS 820D-L1A IN TTY POSITION

TTY MODEL	QUANTITY PER TTY POSITION	EQUIPMENT
35-type	1 ea	96A Mounting Bracket
	1 ea	180A Backboard
	1 ea	TP327470 Cable (See Note 1)
	1 ea	M3AY Cord (See Note 2)
	1 ea	TP 327538 Bracket (See Note 3)
	4 ea	TP 151631 Screws (See Note 3)
	4 ea	TP 2191 Lockwashers (See Note 3)
	4 ea	TP 76099 Flatwashers (See Note 3)

Note 1: The free conductor end of the TP327470 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 DAS 820D-L1A.

Note 2: One end of the cord should be equipped with a 7593 Hubbell body for connection to the DAS 820D-L1A, while the other end of the cord is equipped with 105 cord tips for connection to the TTY.

Note 3: This equipment is only required when a 13A1 data unit is needed to build out the resistance of the incoming transmission loop.

(a) Connect the options requested in the installation service order as outlined in Part 2 of this section.

(b) Insert the proper data set 109A-type into the top mounting position of DAS 820D ▶-L1A◀ (Fig. 1).

Note: Ensure that a good connection is made between the data set and DAS 820D ▶-L1A◀ by using sufficient force when pushing the data set into position.

3.15 Use the following procedure to install the data station in the kneewell of the TTY position.

(a) Loosen the spring clips of the 180A backboard.

(b) Place the data station on the 180A backboard as shown in Fig. 6 for the respective TTY positions. Make sure that the base of DAS 820D ▶-L1A◀ is under the bracket of the spring clips.

(c) Tighten the spring clips.

Note: Ensure that the spring clips are tight in order to prevent the data station from moving on the backboard.

(d) Perform the following steps.

TABLE D

REMOVAL OF 35 TTY KNEEWELL COVER

TTY	PROCEDURE
35 ASR TTY	(1) Remove the chad container by sliding it to the left, raising the right side, and sliding it to the right. (2) Operate the two pushbutton fasteners located at the top of the lower compartment panel. (3) Depress the spring clip underneath the keyboard, then pivot the lower compartment panel to the floor. (4) Disengage the panel from pivot screws and remove panel.
35 RO TTY	Same as the 35 ASR TTY with the exception that only one pushbutton fastener is used to hold the lower compartment panel, and no chad container is provided.

(1) Connect the cord tip end of the M3AY to the T terminal block on the 35-TTY electrical service unit (ESU) as follows:

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

(2) Connect the 7593 Hubbell body end of the M3AY cord to the ac power connector on the DAS 820D ▶-L1A◀ (Fig. 5).

(3) Connect the TTY ac power plug to the customer-provided wall receptacle.

(4) Measure the output voltage of the data station as follows:

- Set the volt-ohm-milliammeter to 12 on the DC VOLTS scale.
- Connect the positive (+) lead of the meter to terminal 2 of ▶TB1 [(TS)A of DAS 820D2]◀ (Fig. 5) and the negative (−) lead of the meter to terminal 1 of ▶TB1 [(TS)A of DAS 820D2]◀ (Fig. 5).
- A reading within the range of 3.9 through 4.7 volts must be made to indicate proper operation of the data station. ***Note:*** A reading within the range of 3.9 through 4.7 volts indicates a marking condition whereas a reading between 12.5 to 13.3 volts indicates a spacing condition. If the reading is not within the range of 3.9 through 4.7 volts, perform the tests outlined in Section 591-024-501 to determine and correct the malfunction of the data station.

(5) Disconnect the TTY ac power plug from the customer-provided wall receptacle.

(e) ▶If the DAS 830C ***is*** used, perform the installation and test procedures given in Section 591-083-103.◀

(f) Connect the interface cord to interface connector J3 on DAS 820D ▶-L1A◀ (Fig. 7).

(g) ▶If the DAS 830C ***is not*** used,◀ connect the other end of the interface cord to the T terminal block on the 35-TTY ESU 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.

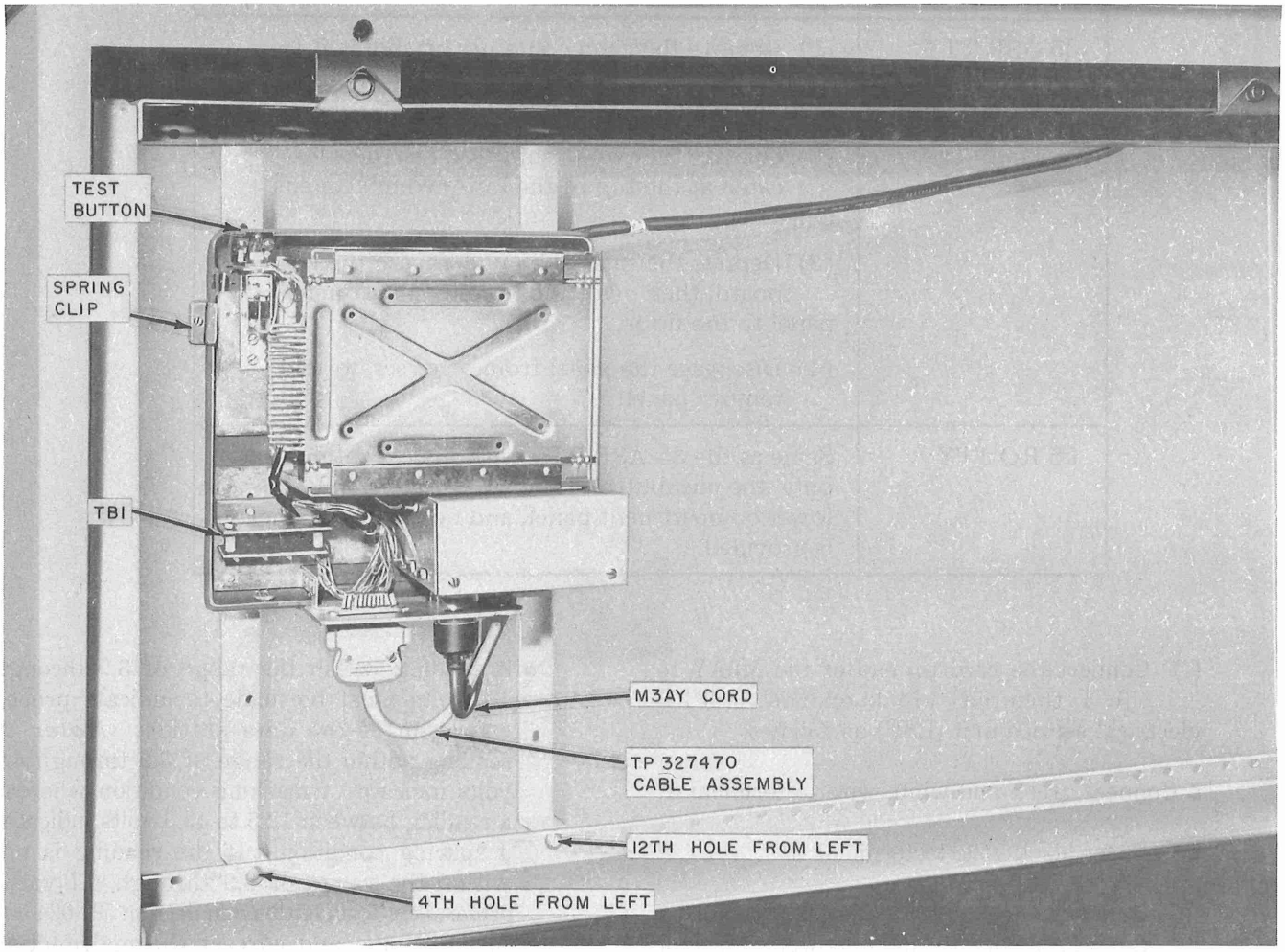


Fig. 6—DAS 820D-L1A Mounted in Model 35 TTY

(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.

(h) Perform the procedures outlined in (d) above.

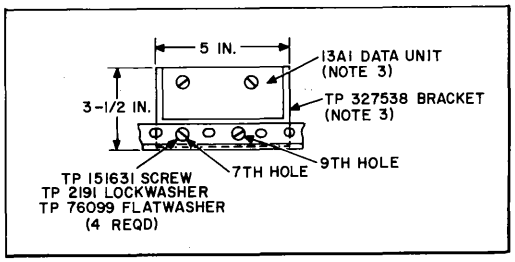
Note: If a meter reading within the range of 12.5 through 13.3 volts is made, the customer's equipment is transmitting a space to the data station. Appropriate action should be taken to get the terminal equipment to transmit a steady mark (idle condition), 3.9 to 4.7 volts.

(i) Connect the leads of the incoming transmission loop to ▶TB1 [(TS)A of DAS 820D2]◀ on DAS 820D ▶-L1A◀ (Fig. 5) as outlined in Part 4 of this section.

(j) Connect the TTY ac power plug to the customer-provided wall receptacle.

(k) Perform the operational test of the data station outlined in Section 591-024-501.

3.16 After successfully completing the operational test of the data station, replace the kneewell cover by reversing the procedures outlined in Table C. This completes the installation of DAS 820D ▶-L1A.◀



NOTES:
1. 96A BRACKET CONSISTS OF TWO P42D302 BRACKETS WITH THE REQUIRED MODIFICATION.
2. THE DAS 820D2 IS SHOWN MOUNTED WITH A PLASTIC COVER IN PLACE BUT ACTUALLY THE DAS 820D2 IS NOT EQUIPPED WITH A PLASTIC COVER.
3. THE TP 327598 BRACKET AND MOUNTING APPARATUS (SCREWS AND WASHERS) ARE ONLY REQUIRED WHEN A 13A1 DATA UNIT MUST BE USED TO BUILD OUT THE INCOMING TRANSMISSION (TELEPHONE LINE) LOOP TO THE DAS 820D2.

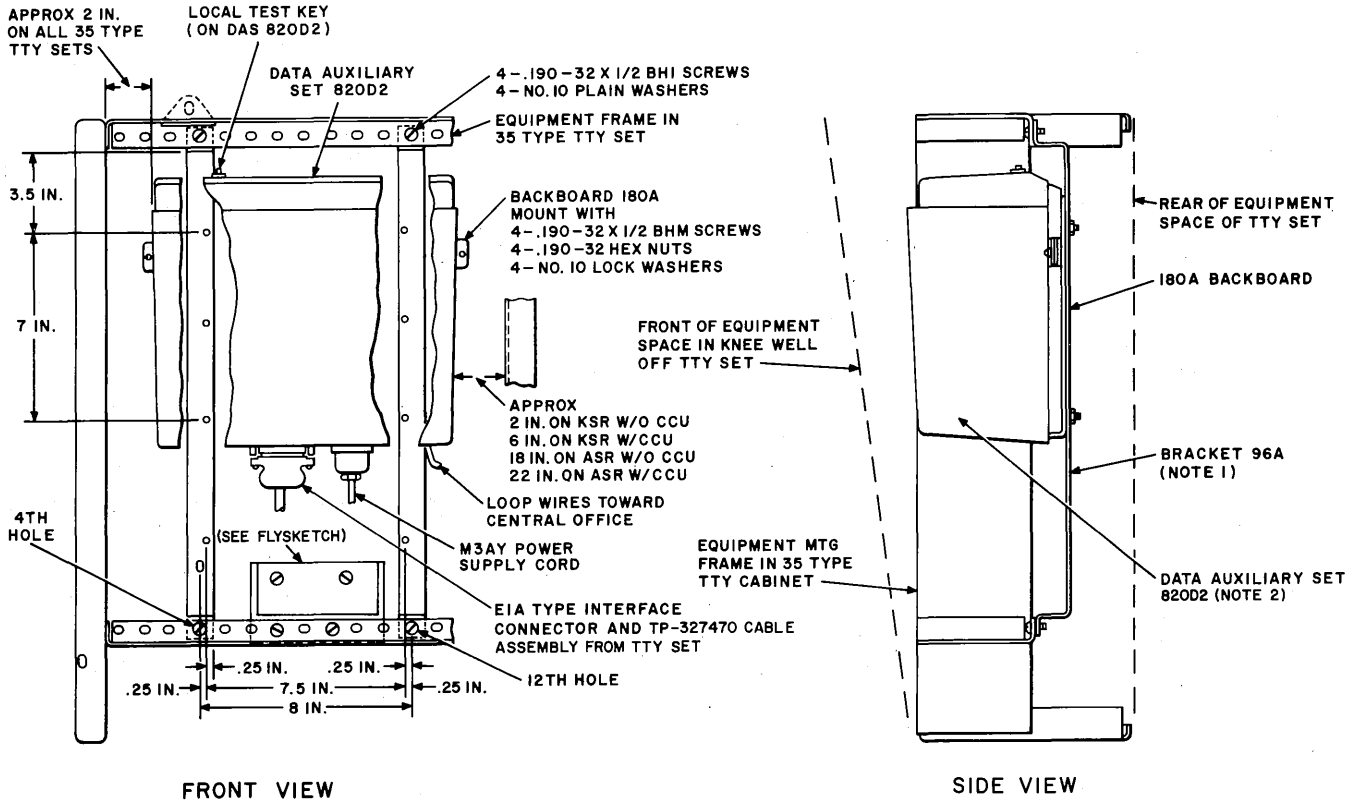
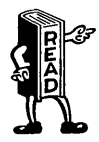


Fig. 7—Mounting Diagram for DAS 820D-L1A Mounted in TTY

4. TIP AND RING LEAD CONNECTION OF INCOMING TRANSMISSION LOOP



To ensure the proper operation of the data station, the following procedures for the connection of the incoming transmission loop leads must be used.

4.01 To determine whether voltage is present across the leads of the incoming transmission loop, perform the following steps.

Note: Voltage present across the loop leads indicates that the distant station is connected to the loop. Voltage not present across the loop leads indicates that either the distant

station is not connected or the path of the transmission loop is open.

(a) Set the volt-ohm-milliammeter on 12 of the DC VOLTS scale.

(b) Connect the leads of the meter at random across the leads of the incoming transmission loop for a voltage.

Note: Switch the leads of the meter across the loop leads to insure the correct reading across the leads.

(1) The voltage reading that should be made is either 3.2 through 4.7 volts, which indicates voltage across the loop, or 0 volts, which indicates voltage not across the loop.

- A reading within the range of 3.2 through 4.7 volts indicates that the distant station is transmitting a mark.

- If a reading between 3.2 to 4.7 volts is made, tag the loop lead that is connected to the positive (+) lead of the meter, ring (+): and tag the loop lead that is connected to the negative (−) lead of the meter, tip (−).

(2) If the voltage reading is more than 4.7 volts, switch the meter from 10 to 60 on the DC VOLTS scale for an exact reading of the voltage across the loop leads. Report this reading to the proper personnel of the local telephone company, because the connection of the loop leads cannot be completed until the voltage reading across the loop leads is either 0 volts or within the range of 3.2 through 4.7 volts.

- A reading within the range of 10.5 through 13.3 volts across the loop leads indicates that the distant station is transmitting a space.

- A voltage reading across the loop leads of more than 13.3 volts indicates a trouble condition which should be cleared by using test procedures outlined in Section 591-024-501, if applicable.

(c) To proceed with the connection of the transmission loop leads, refer to the following:

(1) If 0 volt is across the loop leads, refer to the procedures outlined under the heading Voltage Not Present on Incoming Transmission Loop.

(2) If 3.2 through 4.7 volts are across the loop leads, refer to the procedures outlined under the heading Voltage Present on Incoming Transmission Loop.

VOLTAGE NOT PRESENT ON INCOMING TRANSMISSION LOOP

4.02 If a voltage is not present across the loop leads, verify the continuity of the transmission loop to the distant station by using the standard procedures.

4.03 After verifying that the transmission loop is good, connect the leads of the incoming transmission loop to ▶TB1 [(TS)A of DAS 820D1 or D2]◀ of DAS 820D- ▶L1 or L1A◀ as follows:

(a) Connect one lead of the loop to terminal 2 (Fig. 8). This lead is not designated as the ring lead of the loop.

(b) Connect the remaining lead of the loop to terminal 1 (Fig. 8). This lead is now designated as the tip lead of the loop.

TABLE E

STRAPPING FOR STATION-TO-STATION OPERATION

METER READING RANGE	EQUIVALENT LOOP RESISTANCE RANGE	EQUIVALENT RESISTANCE REQUIRED	13A1 DATA UNIT				
			LEAD DESIGNATION				STRAP TERMINALS
			T	R	T1	R1	
			CONNECT TO TERM.				
1.40-2.15 mA	2500-1500Ω	Not Reqd	—	—	—	—	—
2.15-2.54 mA	1500-1200Ω	294Ω	T2	R2	T1	R1	—
2.54-3.08 mA	1200-900Ω	632Ω	T3	R3	T2	R2	—
3.08-3.92 mA	900-600Ω	928Ω	T4	R4	T3	R3	—
3.92-5.40 mA	600-300Ω	1222Ω	T4	R4	T1	R1	T2,T3,R2,R3
5.40-9.50 mA	300-0Ω	1560Ω	T4	R4	T2	R2	—

Note: The above connections, which should be made in accordance with local standards, complete the connection of the incoming transmission loop leads when voltage is not present across the loop leads. [Refer to 3.10 for DAS 820D ➧-L1➧ or 3.15(j) for DAS 820D ➧-L1A].➧

VOLTAGE PRESENT ON INCOMING TRANSMISSION LOOP

4.04 Before proceeding with the connection procedures, perform the following steps.

(a) Determine whether the local station is to be arranged for station-to-hub operation or station-to-station operation.

Note: For station-to-hub operation, the distant station is equipped with a data set 109B-type. For station-to-station operation the distant station is equipped with a data set 109A-type. ***The type of operation must be known before proceeding with the connection of the transmission loop leads.***

(b) Determine whether the local data station is grounded or equipped with a floating ground.

(c) Determine whether the distant station is grounded or equipped with a floating ground.

Note: When the signal and chassis grounds are tied together, the station is grounded, but when the grounds are not tied together, the station is equipped with a floating ground.

(1) If the distant station is grounded, proceed to 4.05.

(2) If the distant station is equipped with a floating ground, proceed to 4.06 for the connection of the loop leads.

4.05 Measure the magnitude and the difference in potential (voltage) between the positive (ring) lead of the incoming transmission loop and the chassis ground of the local data station to ensure that the loop is acceptable.

(a) Measure the difference in potential as follows:

(1) Set the volt-ohm-milliammeter to 60 on the DC VOLTS scale.

(2) Connect the positive (+) lead of the meter to the positive (ring) lead of the loop

and the negative (−) lead of the meter to the chassis ground of the local data station.

Note: It may be necessary to switch the meter leads to make the required reading of potential difference.

(3) Record the reading of the meter.

- If the reading is 20 volts or below, the data set 109A-type system will function whether the local station is grounded or equipped with a floating ground.

- If the reading is more than 20 volts, the system will not function unless one of the stations is equipped with a floating ground.

Note: If the difference in potential exceeds 20 volts and both stations must be grounded, ***the data set 109A-type system cannot be used.***

(b) Measure the magnitude between the positive lead of the loop and the chassis ground of the local data station as follows:

(1) Set the volt-ohm-milliammeter to 60 on the AC VOLTS scale.

(2) Connect the leads of the meter between the positive (ring) lead of the incoming transmission loop and the chassis ground of the local data station.

(3) Record the reading of the meter.

- If the reading is 14 volts or below, the data set 109A-type system will function whether the local station is grounded or equipped with a floating ground.

- If the reading is more than 14 volts ac, the system will not function unless one of the stations is equipped with a floating ground.

Note: The system must meet both requirements (the magnitude and the difference in potential) before the system is acceptable for use.

4.06 Measure the current in the incoming transmission loop to determine if the dc resistance of the loop is acceptable as follows:

TABLE F

CURRENT ON TRANSMISSION LOOP FOR STATION-TO-HUB OPERATION

METER READING RANGE	EQUIVALENT LOOP RESISTANCE RANGE	LOOP ACCEPTABLE
0.8-1.05 mA	2500-1800Ω	YES
1.05-2.0 mA	1800-0Ω	NO*

* The J70165D-1 line adjusting resistor unit for adjusting loop resistance is located at the hub location.

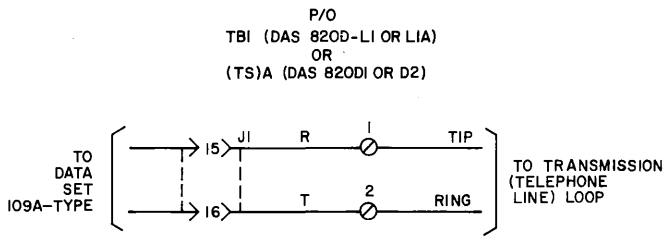


Fig. 8—Telephone Line Connection for Station-to-Hub Operation or Station-to-Station Operation When No Voltage Present on Incoming Transmission Loop

(a) Set the volt-ohm-milliammeter to 12 on the DC MA (milliampere) scale.

(b) Connect the positive (+) lead of the meter to the positive (ring) lead of the loop and the negative (−) lead of the meter to the negative (tip) lead of the loop.

(c) Record the current reading.

(1) If station-to-station operation is to be used, refer to Table E to determine if the loop resistance is acceptable as indicated by the current reading.

(2) If station-to-hub operation is to be used, refer to Table F to determine if the loop resistance is acceptable or not as indicated by the current reading.

4.07 When voltage is present across the leads of the incoming transmission loop, the actual connection procedure of the loop leads depends on whether the local data station is to be arranged for station-to-hub operation or station-to-station operation.

STATION-TO-HUB OPERATION

4.08 If the dc resistance of the incoming transmission loop is between 1800 and 2500 ohms [see 4.06(c)] and the maximum capacitance of the loop does not exceed 1 μF, the loop is acceptable. Connect the loop leads (tip and ring) to TB1 [(TS)A of DAS 820D1 or D2] of DAS 820D -L1 or L1A as shown in Fig. 8 and complete the following steps.

(a) Contact the hub location.

(b) Request the proper personnel at the hub location to verify the dc resistance of the transmission loop as outlined in the section entitled Data Set 109B-Type, Installation (312-802-300).

(c) Refer to 3.10 for DAS 820D1 or L1 or 3.15(j) for DAS 820D1 or L1A.

4.09 If the dc resistance of the incoming transmission loop is below 1800 ohms, connect the loop leads (tip and ring) to TB1 [(TS)A of DAS 820D1 or D2] of DAS 820D-L1 or L1A as shown in Fig. 8, and perform the following procedures.

(a) Inform the hub location.

(b) Request that the proper personnel at the hub location build out the dc resistance of the loop to 2000 ohms as outlined in the section entitled Data Set 109B-Type Installation (312-802-300).

Note: The additional resistance is provided by adjusting a circuit of the J70165D-1 line adjusting resistor unit at the hub.

(c) Refer to 3.10 for DAS 820D1 or L1 or 3.15(j) for DAS 820D2 or L1A.

STATION-TO-STATION OPERATION

4.10 If the dc resistance of the incoming transmission loop is between 1500 and 2500 ohms [see 4.06(c)] and the maximum capacitance of the loop does not exceed 1 MF, the loop can be used without adding a line build-out unit. Connect the leads (tip and ring) of the incoming transmission loop to TB1 [(TS)A of DAS 820D1 or D2] of DAS 820D- L1 or L1A as follows:

(a) Connect the ring (+) lead of the loop to terminal 1 as shown in Fig. 9.

(b) Connect the tip (−) lead of the loop to terminal 2 as shown in Fig. 9.

Note: The above connection procedure for the loop leads ***must be used*** to ensure proper operation of the data set 109A-type system when voltage is present across the leads of the transmission loop and a line build-out unit

is not required. [Refer to 3.10 for DAS 820D1 ▶or L1◀ or 3.15(j) for DAS 820D2 ▶or L1A].◀

4.11 If the dc resistance of the incoming transmission loop is below 1500 ohms [see 4.06(c)], the resistance of the loop must be built out to 1800 ohms by using a 13A1 data unit.

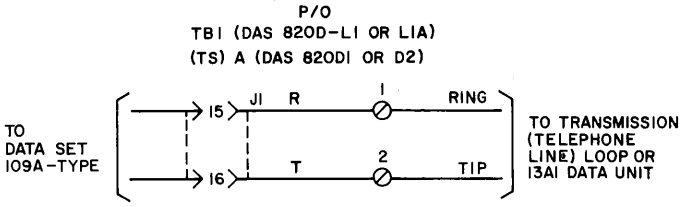


Fig. 9—▶Telephone Line Connection for Station-to-Station Operation When Voltage is Present on Incoming Transmission Loop◀

Connect the loop leads (tip and ring) and the 13A1 data unit to the DAS 820D-type as follows:

(a) The 13A1 data unit is located external to the DAS 820D-type as follows:

(1) When the DAS 820D ▶-L1◀ is used, the location of the data unit should be specified by the local telephone company engineering group.

(2) When the DAS 820D ▶-L1A◀ is used, the 13A1 is located on a TP 327538 bracket as shown in Fig. 7.

(b) Connect the tip (−) and ring (+) leads of the loop to the 13A1 data unit according to Table E [see 4.06(c)] and as shown in Fig. 10.

(c) Connect the data unit to the DAS 820D-type as follows:

(1) Designate and tag the leads of a proper size 2-conductor wire as tip (T) and ring (R).

(2) Connect the tip (T) and ring (R) leads of the wire to the 13A1 data unit according to Table E [see 4.06(c)] and as shown in Fig. 10.

(3) Measure the voltage across the leads of the wire from the 13A1 data unit as follows:

Note: This measurement must be made to ensure that no opens exist in the 13A1 data unit.

- Set the volt-ohm-milliammeter to 12 on the DC VOLTS scale.
- Connect the positive (+) lead of the meter to the ring (R) lead of the wire and the negative (−) lead of the meter to the tip (T) lead of the wire.
- A reading within the range of 3.2 through 4.7 volts indicates that no opens exist in the 13A1 data unit.

(4) Connect the tip and ring leads of the wire from the 13A1 data unit to ▶TB1 [(TS)A of DAS 820D1 or D2]◀ of DAS 820D- ▶L1 or L1A◀ as follows:

- Connect the tip (T) lead of the wire to terminal 2 as shown in Fig. 9.
- Connect the ring (R) lead of the wire to terminal 1 as shown in Fig. 9.
- Refer to 3.09 for DAS 820D1 ▶or L1◀ or 3.15(j) for DAS 820D2 ▶or L1A.◀

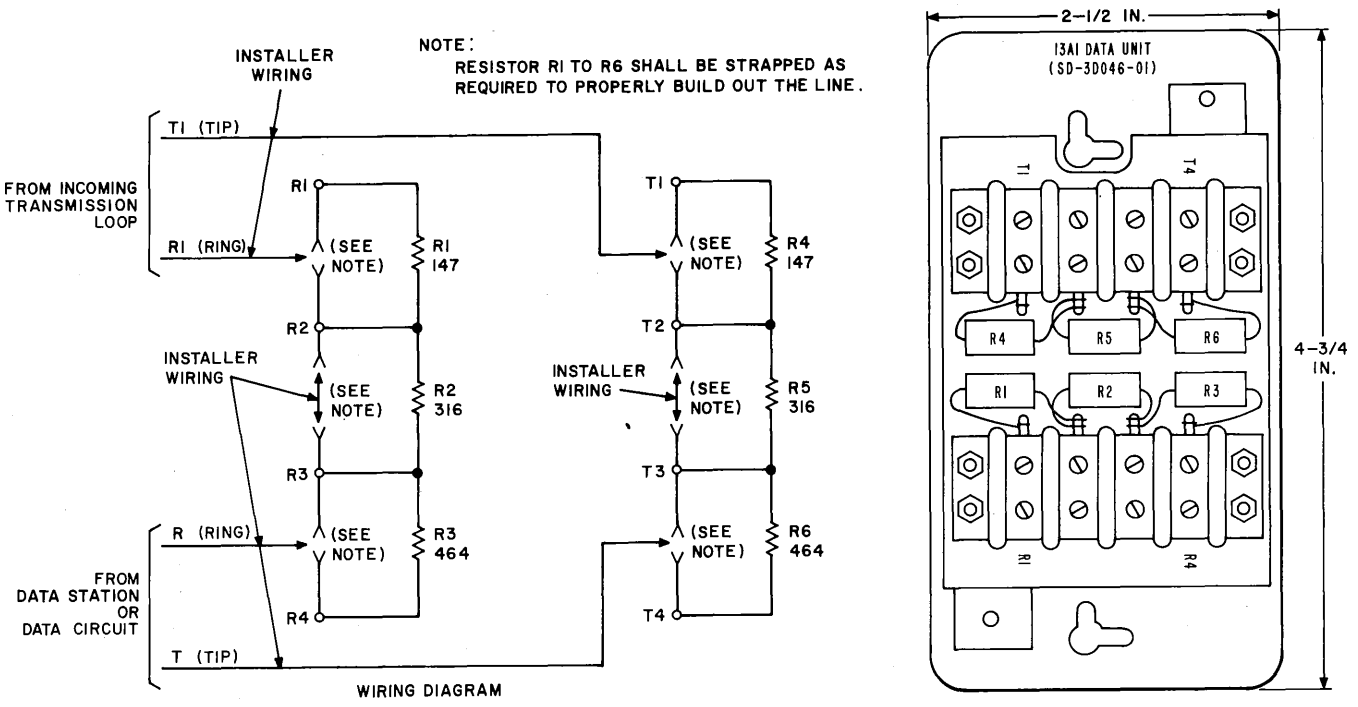


Fig. 10—13A1 Data Unit and Wiring Diagram