

DATA SET 109A-TYPE
MULTIPLE PRIVATE LINE STATION
USING DATA AUXILIARY SET 820E2 AND KS-20093 CABINET
INSTALLATION AND CONNECTIONS

CONTENTS	PAGE
1. GENERAL	1
2. OPTION CONNECTIONS	3
3. INSTALLATION INFORMATION	5
4. INSTALLATION PROCEDURES	5
5. TIP AND RING LEAD CONNECTION OF INCOMING TRANSMISSION LOOP	12
VOLTAGE NOT PRESENT ON INCOMING TRANSMISSION LOOP	13
VOLTAGE PRESENT ON INCOMING TRANSMISSION LOOP	13
STATION-TO-HUB OPERATION	15
STATION-TO-STATION OPERATION	16

1. GENERAL

1.01 This section covers the installation and connections of the Data Set 109A-type Multiple Private Line Station using Data Auxiliary Set (DAS) 820E2 and KS-20093 Cabinet. For the purpose of this section, the KS-20093 L1 Cabinet equipped with Data Set 109A-type mounted in DAS 820E2 (Fig. 1) is referred to as a data station.

Note: For the purpose of this section, any reference to a cabinet pertains to the KS-20093 L1 Cabinet.

1.02 The data station is designed to provide multiple private line low-speed (up to 300 bauds), half-duplex (HDX), serial data communication over 2-wire metallic private lines. The data station

utilizes the 3-mA polar dc transmission scheme for the transmission of data.

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

1.04 A maximum of three data circuits can be mounted on DAS 820E2 (Fig. 1).

Note: For the purpose of this section, a data circuit consists of a Data Set 109A-type (Fig. 2) and its associated circuit pack (CP) AR17 (Fig. 3) card.

1.05 A data circuit is limited to use on a 2-wire metallic line because a Data Set 109A-type will operate only over a closed loop. The transmission loop used by the data circuit cannot be equipped with anything that will break the 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.

1.06 Data Set 109A-type employs the 3-mA polar dc transmission scheme to transmit and receive data with the 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 circuit.

(a) In station-to-hub operation, the design dc loop resistance required is 2000 ohms with a maximum capacitance of 1 μ F. Those loops which do not meet this requirement are handled as outlined in Part 5 of this section.

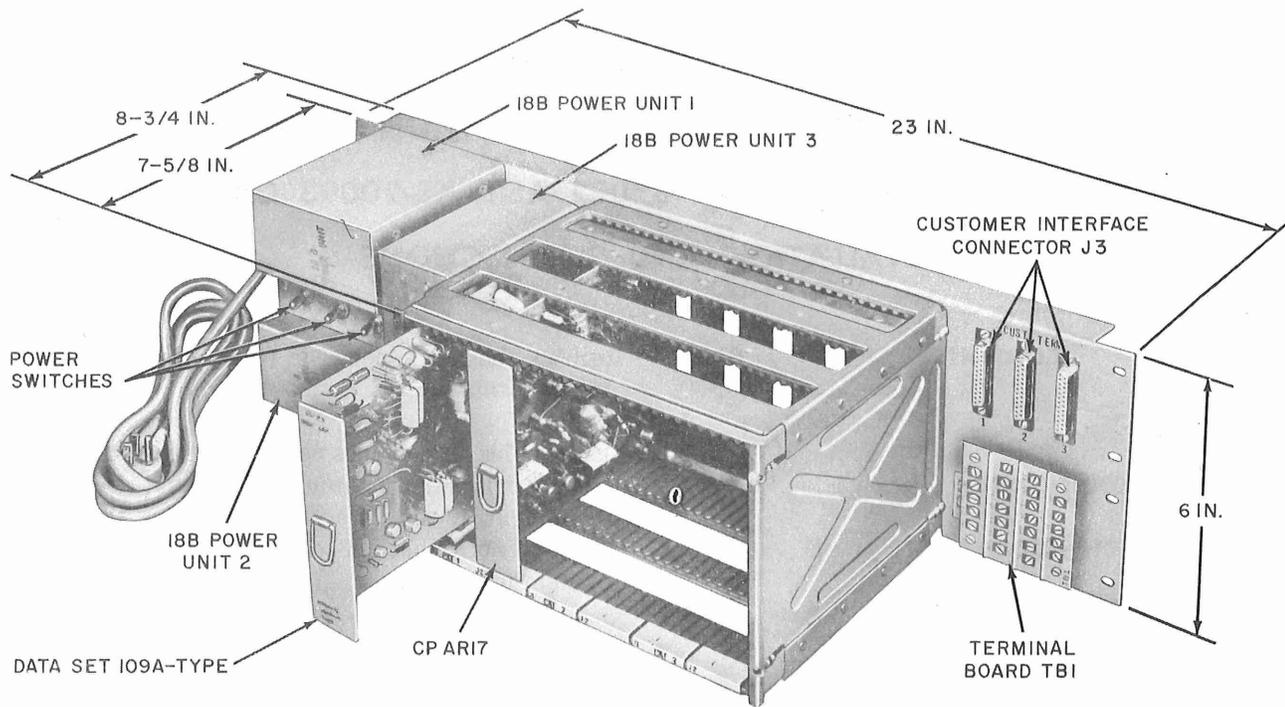
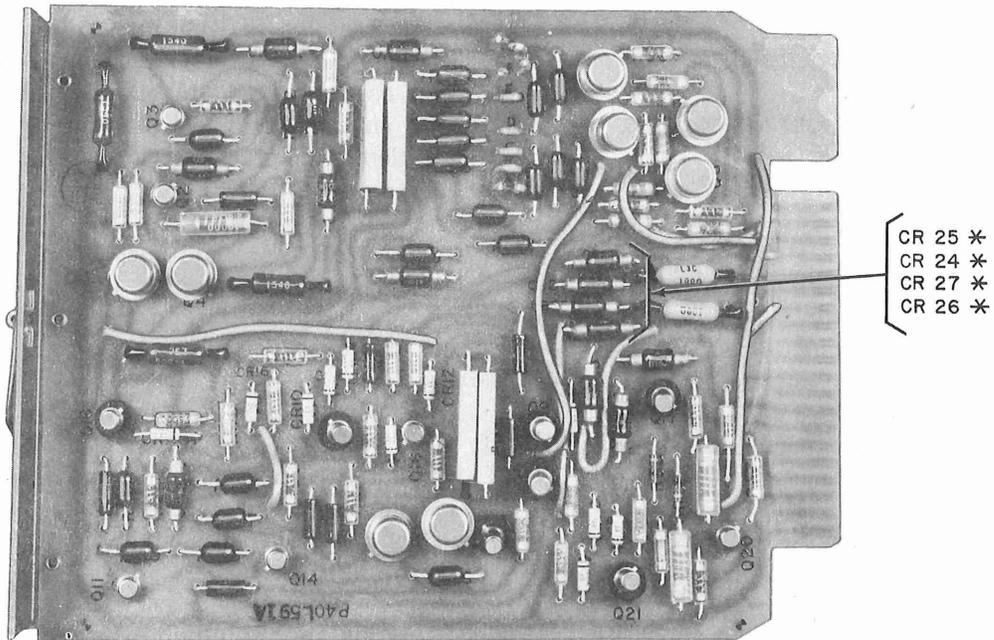


Fig. 1—Data Auxiliary Set 820E2 With Data Set 109A-Type (Extended), Front View



* THESE COMPONENTS ARE USED FOR LIGHTNING PROTECTION AND ARE ONLY PROVIDED ON DATA SET 109A1.

Fig. 2—Data Set 109A1

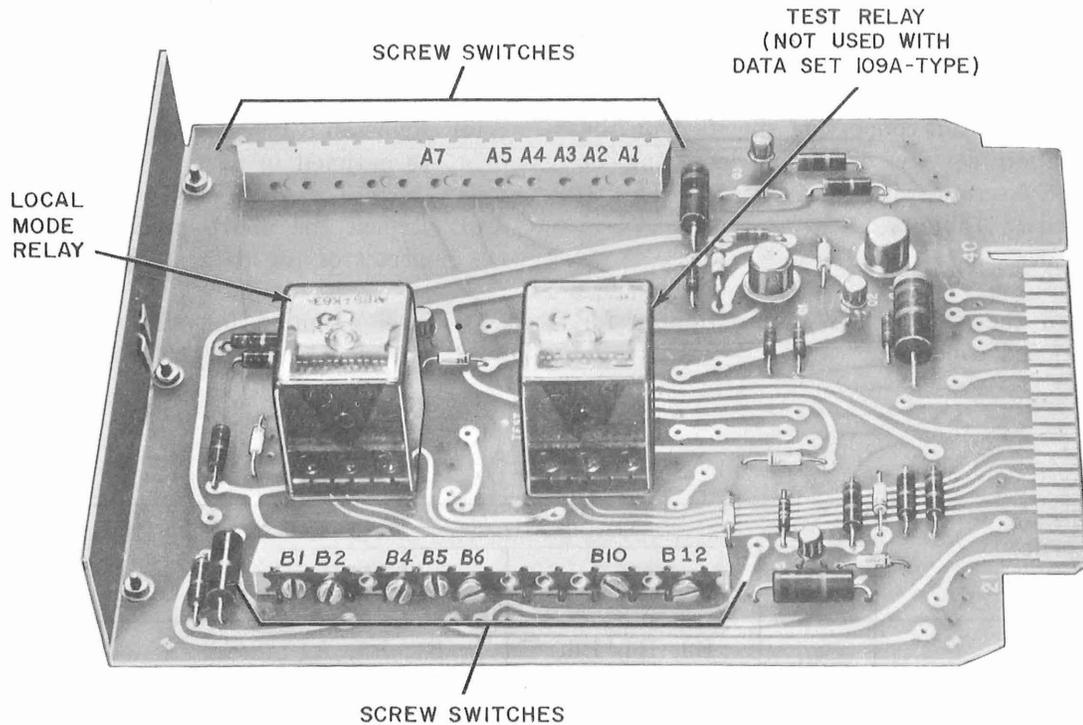


Fig. 3—Circuit Pack AR17

(b) In station-to-station operation, the design dc loop resistance required is 1800 ohms with a maximum capacitance of 1 μ F. Those loops which do not meet this requirement are handled as outlined in Part 5 of this section.

1.07 If the numerical value of the dc loop resistance for each transmission loop is not provided, a dc loop resistance measurement of each loop must be made as outlined in Part 5 of this section.

1.08 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.

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

1 - KS-14510 L5 volt-ohm-milliammeter, or equivalent.

2. OPTION CONNECTIONS

2.01 The option connections for the data circuit are made by opening or closing the screw switches on CP AR17 (Fig. 3). The option connections are normally made prior to the installation of the data station as specified on the installation service order. The option connections can be changed at any time, if necessary, to meet changes in the customer's operations.

Note: The installation service order should specify the options required for each data circuit of the data station unless all of the data circuits are to be arranged the same.



Care must be taken to avoid stripping the threads in the plastic strip of CP AR17 when tightening the screws to make option connections.

2.02 The procedure for connecting the option of each data circuit is as follows.

- (a) Remove the correct CP AR17 from DAS 820E2 as outlined in the section entitled Data Set 109A-Type Multiple Private Line Station

SECTION 591-024-203

Using Data Auxiliary Set 820E2 and KS-20093 Cabinet, Maintenance (591-024-308).

(b) Make the option connection specified on the installation service order by loosening or tightening the screw switches of CP AR17 (Fig. 3) 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 CP AR17 in DAS 820E2 (Fig. 1) as outlined in Section 591-024-303.

(d) Repeat the above procedure for each data circuit of the data station.

2.03 The X option for DAS 820E2 is the local option to tie the signal ground of DAS 820E2

TABLE A

OPTION FEATURE	CP AR17			QUANTITY
	OPT DESIG	SCREW OPEN	SCREW CLOSED	
EIA Interface	W	B2, B4, B6 A2, A4	B1, B5, A1 A3	Choose One
Current Interface (See Note)	V	B1, B5, A1 A3	B2, B4, B6 A2, A4	
Copy in Test Mode	T		B12	Not used with Data Set 109A-type
No Copy in Test Mode	S	B12		
Local Copy	R		B10	Choose One
No Local Copy	Q	B10		
Mark Hold on Carr Fail	N		A5	Choose One with Current Interface
Space Hold on Carr Fail	M	A5		
Carr Squelch on Carr Fail	K		A7	Not used with Data Set 109A-type
No Carr Squelch on Carr Fail	J	A7		

Note: 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.

to the chassis ground of the cabinet. The X option is provided in the following manner.

Note: It is suggested that the X option be installed in only one DAS 820E2 of a cabinet when the option is required.

(a) Connect one end of a sufficient sized wire to terminal 1 of Terminal Board (TB) 1 on DAS 820E2 (Fig. 1).

(b) Connect the other end of the wire to a convenient mounting screw which mounts DAS 820E2 to the chassis frame of the cabinet.

Note: This connection should be made in accordance with procedures of the local telephone company.

3. INSTALLATION INFORMATION

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

3.02 The KS-20093 L1 Cabinet (Fig. 4) is installed on the customer's premises in accordance with the section entitled Data Sets, Multiple Installation Information (590-010-201).

3.03 The installation of DAS 820E2 in the front section of the KS-20093 L1 Cabinet (Fig. 5) requires the use of KS-20130 L7-type adapter plates to reduce the width of the 25-inch frame to the required 23 inches for the data auxiliary set (Fig. 1). The adapter plates are available in several lengths to accommodate the various installation arrangements. The following listing identifies the codes and corresponding lengths for the KS-20130 L7-type adapter plates.

KS-20130 LIST	LENGTH IN INCHES
7A	68
7B	30
7C	18
7D	12
7E	10

KS-20130 LIST	LENGTH IN INCHES
7F	9
7G	8
7H	6
7J	3

3.04 When the cabinet is to be partially filled, the DASs 820E2 are mounted to equally distribute the weight and to add rigidity to the cabinet. For example, if eight DASs 820E2 are to be installed, the sets are mounted as follows.

(a) Mount the first three DASs 820E2 at the bottom front of the cabinet as shown in Fig. 6.

(b) Mount one DAS 820E2 at the top front of the cabinet (Fig. 6).

(c) Mount the other four DASs 820E2 in the rear of the cabinet as outlined above.

3.05 When the cabinet is to be completely filled (16 DASs 820E2), the basic configuration described in 3.04 should be installed first. The remaining DAS 820E2 must be installed as indicated in Fig. 7.

4. INSTALLATION PROCEDURES

4.01 The following procedure should be used to install equipment in the KS-20093 L1 Cabinet.

(a) Install the auxiliary equipment (KS-20129 L1 power strip and KS-20130 L7-type adapter plate) in the following manner.



To prevent possible damage to the electrical components in the cabinet, do not connect the KS-20129 L1 power strip to the customer-provided wall receptacle until directed to do so as outlined in this section.

(1) Install the KS-20129 L1 power strip as shown in Fig. 8. **Completely tighten all mounting screws.**

(2) Install the proper size KS-20130 L7-type adapter plate in the left front side of

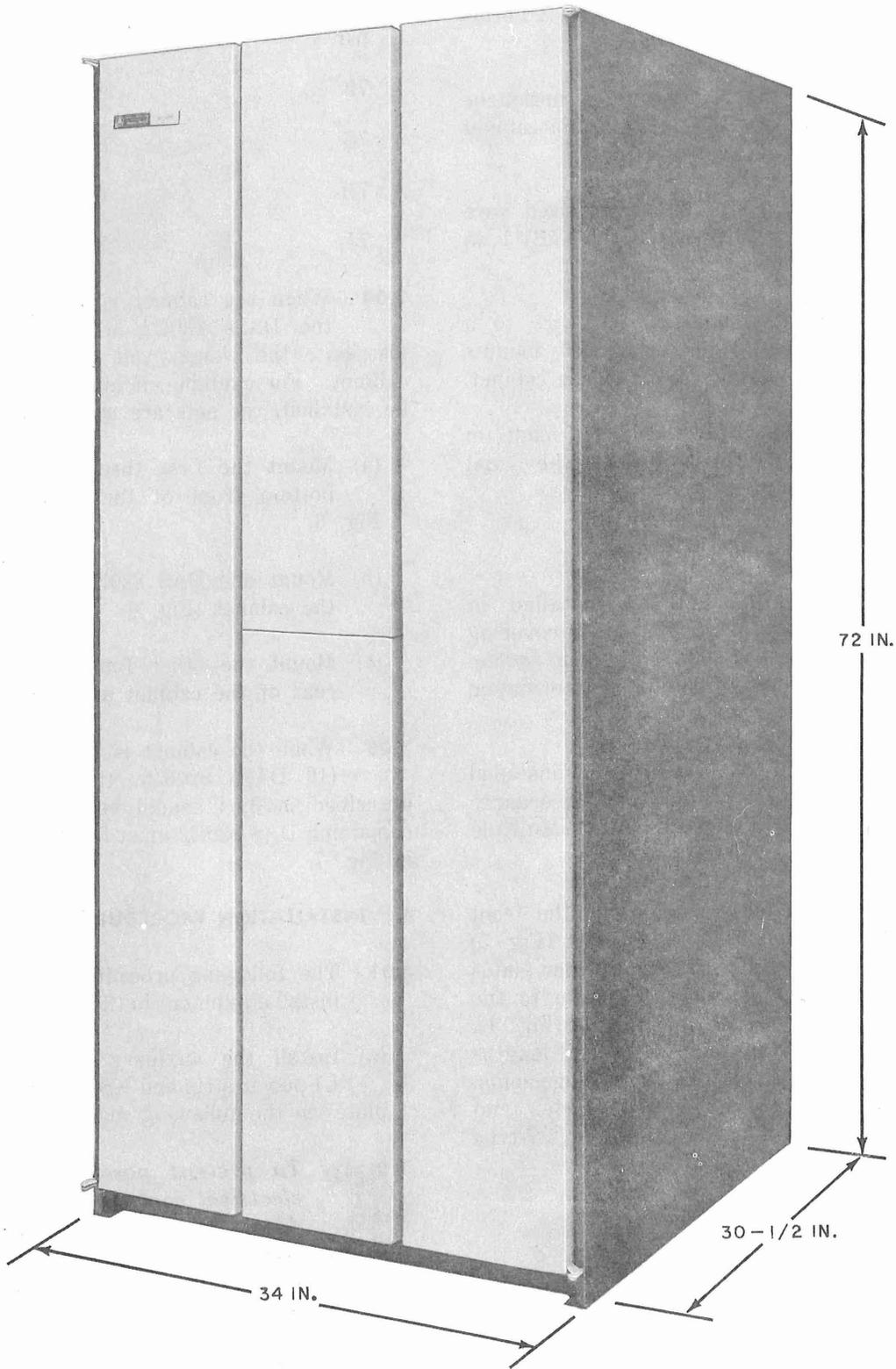


Fig. 4—KS-20093 Cabinet , Front View

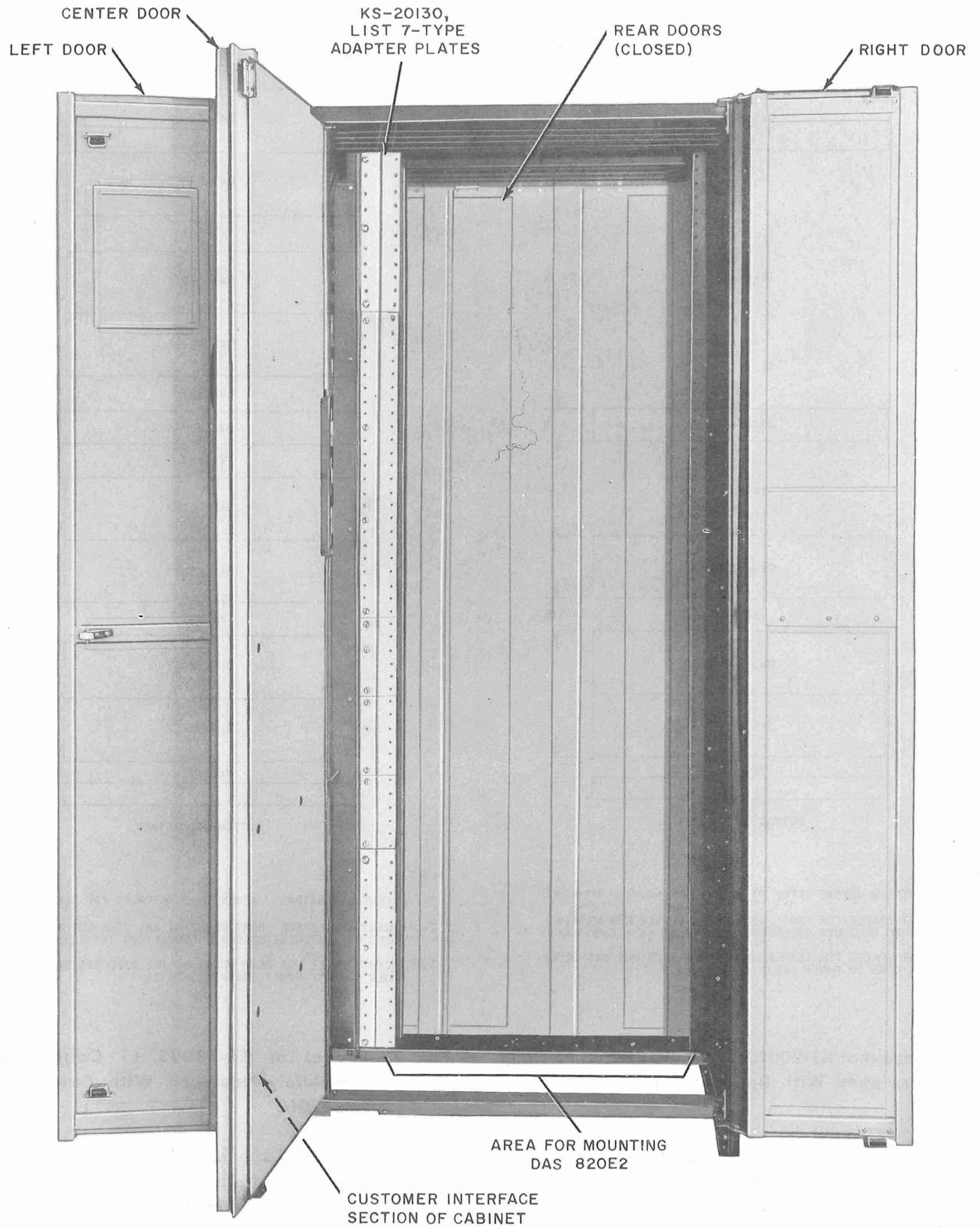
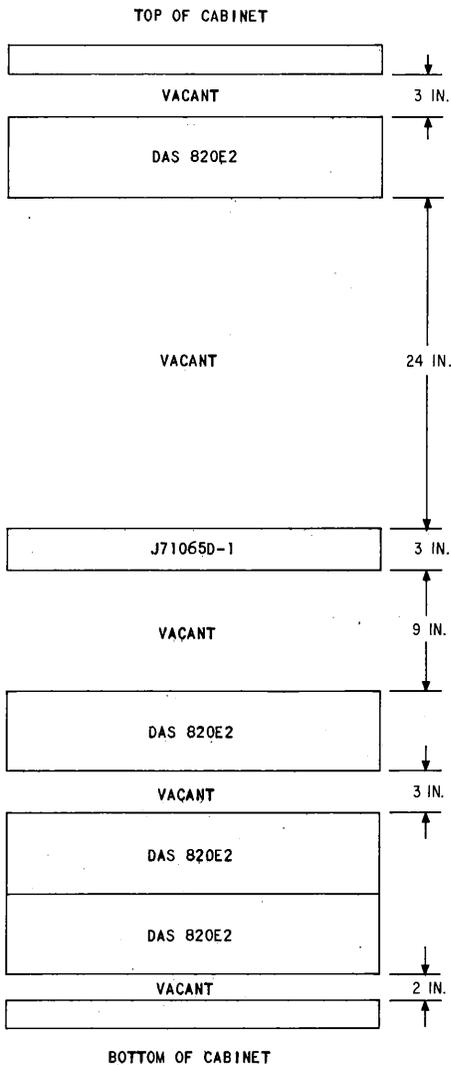


Fig. 5—KS-20093 L1 Cabinet (Front Doors Open) With KS-20130 L7-Type Adapter Plates Installed

SECTION 591-024-203



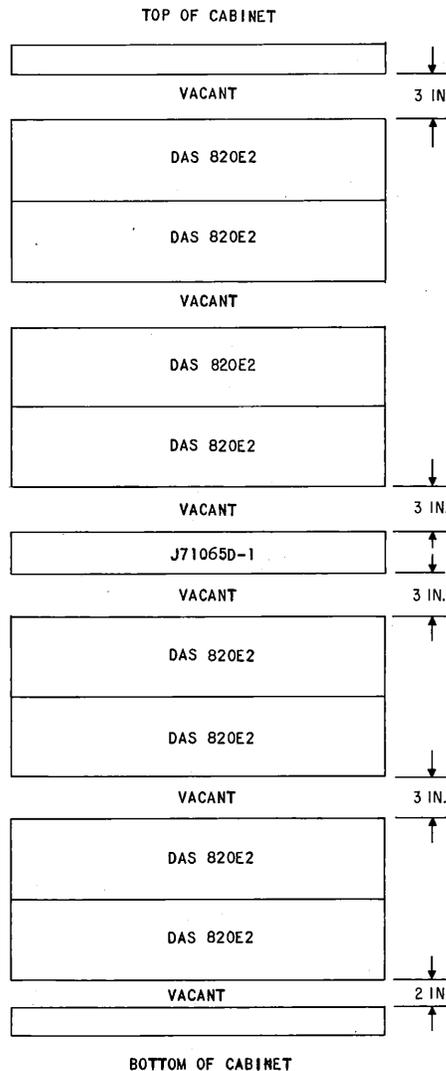
NOTES:

- 1: LAYOUT DIMENSIONS APPLY TO BOTH FRONT AND REAR MOUNTINGS.
- 2: VACANT SPACES FOR FRONT MOUNTING ARE USED FOR M25A-61 CORDS TO CUSTOMER INTERFACE CONNECTORS (KS-20130 L1A).
- 3: VACANT SPACES FOR REAR MOUNTING ARE USED FOR DAS 820E2 POWER CORD TO POWER STRIP (KS-20129).

Fig. 6—Layout of KS-20093 L1 Cabinet When Partially Equipped With Data Auxiliary Set 820E2

the cabinet (Fig. 5) for the installation of the DAS 820E2 in the front of the cabinet. **Completely tighten all mounting screws.** Refer to 3.03 of this section for the different types of adapter plates that are available.

Note: If the cabinet is to be completely



NOTES

1. LAYOUT DIMENSIONS. APPLY TO BOTH FRONT AND REAR MOUNTINGS.
2. VACANT SPACES FOR FRONT MOUNTING ARE USED FOR M25A-61 CORDS TO CUSTOMER INTERFACE CONNECTORS (KS-20130 L1A).
3. VACANT SPACES FOR REAR MOUNTING ARE USED FOR DAS 820E2 POWER CORD TO POWER STRIP (KS-20129).

Fig. 7—Layout of KS-20093 L1 Cabinet When Completely Equipped With Data Auxiliary Set 820E2

filled, install the KS-20130 L7A adapter plate.
 (b) Install the required DASs 820E2 in the cabinet in the following manner.

- (1) Install the first DAS 820E2 approximately 2 inches from the bottom front of the cabinet (Fig. 6) by using the eight No. 12-24

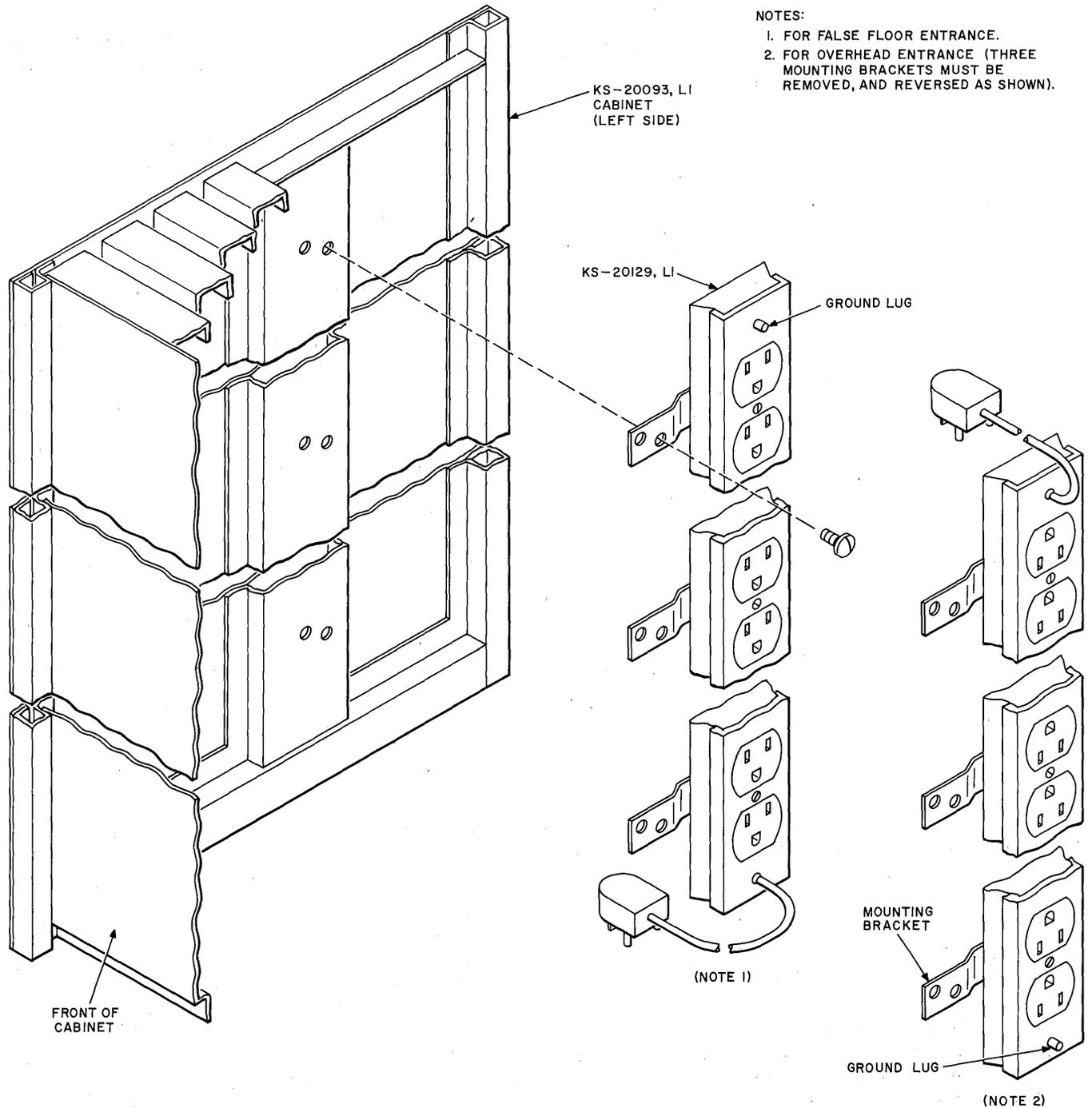


Fig. 8—Installation of KS-20129 L1 Power Strip on Left Side of Cabinet

BHM screws furnished with the unit. **Do not completely tighten the mounting screws.**

(2) Install the second DAS 820E2 approximately 3 inches from the top front of the cabinet (Fig. 6) by using the eight No. 12-24 BHM

screws. **Do not completely tighten the mounting screws.**

(3) Adjust the mounting bar in the rear of the cabinet to the 23-inch position.

SECTION 591-024-203

- (4) Install two DASs 820E2 in the rear of the cabinet as outlined in 4.01 (b) (1) and (2). **Do not completely tighten the mounting screws.**
 - (5) Close the front and rear doors of the cabinet. Align the top of the front and rear doors with the top edge of the cabinet by applying slight sideward pressure at the top. When the cabinet is aligned, open the doors and **completely tighten all of the mounting screws.**
 - (6) Install the remaining DASs 820E2 in the cabinet (Fig. 6 or 7) using the procedure outlined in 3.04 and 3.05. **Completely tighten the mounting screws.**
 - (7) To ensure the proper operation of the data circuits, the ground terminal of each DAS 820E2 installed in the cabinet must be connected together. Therefore, terminal 1 on TB 1 of each DAS 820E2 must be strapped to terminal 1 of the other DAS 820E2 installed in the cabinet.
- (c) Insert the Data Sets 109A-type into the proper mounting positions of DAS 820E2 (Fig. 1).

Note: Ensure that a good connection is made between the data set and DASs 820E2 by using sufficient force when pushing the data sets into position.

- (d) Install the options for each data circuit as specified on the installation service order and as outlined in Part 2 of this section.



To prevent possible interference with the interface signals, do not route the power cords from the DASs 820E2 through the same cutouts used by the M25A-61 cords. To prevent possible damage to the electrical components of the DASs 820E2, be sure that the power switches (Fig. 1) of the DASs 820E2 are in the OFF position.

- (e) Route the power cord of each DAS 820E2 through the cutouts of the cabinet and connect it to an outlet on the KS-20129 L1 power strip (Fig. 8). Connect the plug of the KS-20129 L1 power strip to the customer-provided ac receptacle.

- (f) Perform the following steps to check the operation of each data circuit in the data station.

- (1) Operate all power switches on the DASs 820E2 in the cabinet to the ON position.
- (2) Measure the voltage output of each data circuit in the cabinet as follows.

Note: This voltage measurement procedure describes the method for measuring the voltage outputs of a single DAS 820E2 (3 data circuits) but can be applied to all DASs 820E2 in the cabinet.

- Set the volt-ohm-milliammeter to 12 on the DC VOLTS scale.
- Connect the positive (+) lead of the meter to terminal 4 of TB 1 (Fig. 1) and the negative (-) lead of the meter to terminal 3 of TB 1 (Fig. 1), and record the meter reading for data circuit 1 of DAS 820E2.
- Connect the positive (+) lead of the meter to terminal 12 of TB 1 (Fig. 1) and the negative (-) lead of the meter to terminal 11 of TB 1, and record the meter reading for data circuit 2.
- Connect the positive (+) lead of the meter to terminal 20 of TB 1 (Fig. 1) and the negative (-) lead of the meter to terminal 19 of TB 1, and record the meter reading for data circuit 3.
- Repeat the above steps for the data circuits on each DAS 820E2 in the cabinet.
- A reading within the range of 3.9 through 4.7 volts must be made to indicate proper operation of the data circuit. 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 Multiple Private Line Station Using Data Auxiliary Set 820E2 and KS-20018 Cabinet, Test Procedures (591-024-502) to determine and correct the malfunction of the data circuit.

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.

- (3) Operate all power switches on the DASs 820E2 in the cabinet to the OFF position.



To prevent possible damage to the electrical components of the data station, ensure that the power switches on each DAS 820E2 in the cabinet are in the OFF position.

- (g) Install the KS-20130 L1A mounting plates as follows.

- (1) Install the KS-20130 L1A mounting plates in the customer interface section of the cabinet as shown in Fig. 9 using the screws provided. **Completely tighten the screws.**

Note: If the cabinet is completely filled with DASs 820E2, 12 KS-20130 L1A mounting plates must be installed beginning at the bottom of the cabinet and progressing upward. If the cabinet is partially filled with DASs 820E2, two KS-20130 L1A mounting plates must be mounted near the top of the cabinet while the other mounting plates are mounted from the bottom of the cabinet up.

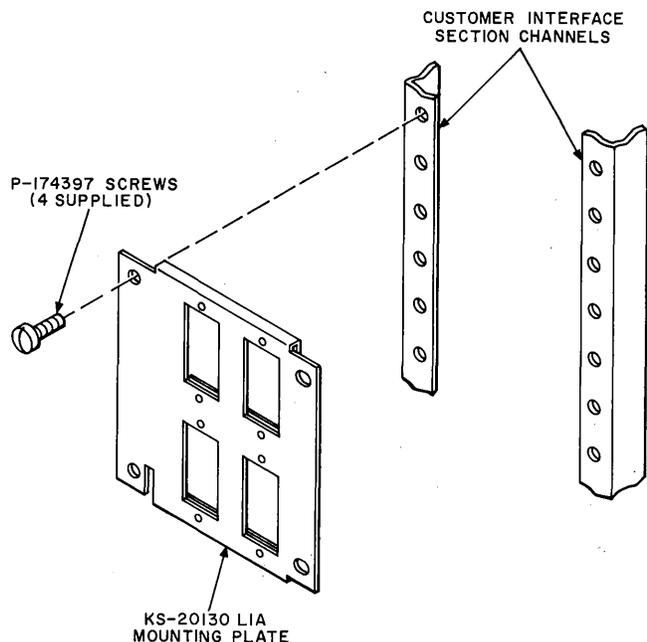


Fig. 9—Detail for Mounting KS-20130 L1A Mounting Plate in Customer's Interface Section of KS-20093 L1 Cabinet

- (2) Install a KS-20130 L1B mounting plate where a KS-20130 L1A mounting plate is not installed. The KS-20130 L1B is mounted with the screws provided and in the same manner as the KS-20130 L1A is mounted. **Completely tighten the screws.**

- (3) Connect three M25A-61 cords (male end) to the respective CUST TERM connectors (connectors J3) on each DAS 820E2 installed (Fig. 1). Route the cords through the vacant space as indicated in Fig. 7, through the cutout at the left of the cabinet, and connect the female end of each cord to the respective position on the KS-20130 L1A mounting plate as shown in Fig. 10.

Note: It is suggested that the cords from the DASs 820E2 mounted in the top (both front and back) of the cabinet be connected to the top six mounting positions of the KS-20130 L1A mounting plates. The cords from the next DASs 820E2 (units mounted both front and rear below the top mounted DASs 820E2) should be connected to the six positions on the mounting plates below where the previously connected cords are positioned on the mounting plates. This procedure should be followed to connect the cords from the other DASs 820E2 mounted in the cabinet.

- (4) Route the customer interface cords into the cabinet and connect each interface cord to the proper data circuit on the KS-20130 L1A mounting plate as shown in Fig. 11.

Note: It is suggested that each interface cord be tagged to show the data circuit to which the interface cord should be connected. The assignment of each data circuit should be stated in the installation service order.

- (5) Perform the steps outlined in 4.01 (f).

Note: If a meter reading within the range of 12.5 through 13.3 volts is made, the customer's terminal 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 through 4.7 volts.

- (h) Route the incoming transmission loops into the cabinet and connect them as outlined in Part 5 of this section.

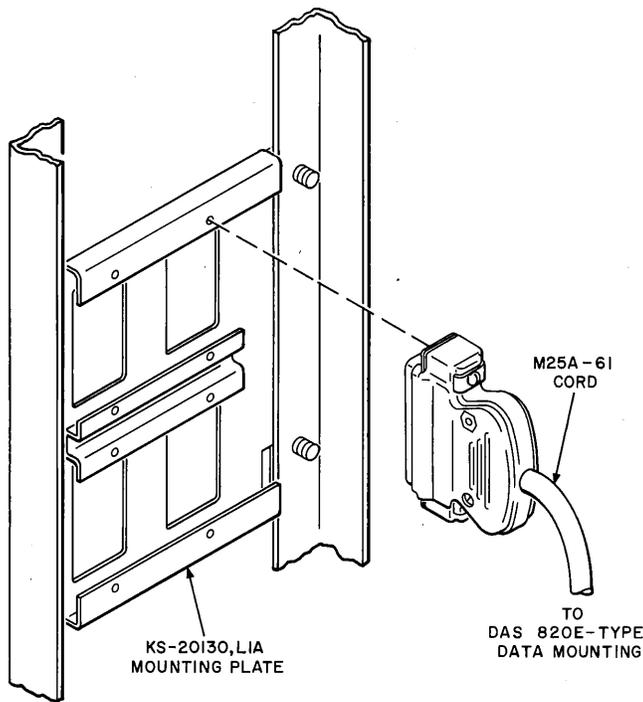


Fig. 10—Details for Mounting M25A-61 Cord in Customer's Interface Section of KS-20093 L1 Cabinet

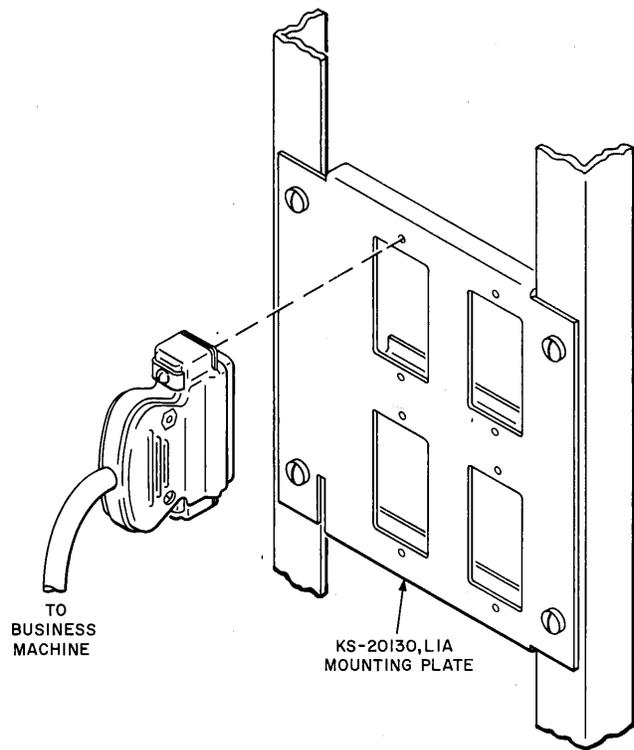


Fig. 11—Customer Interface Cord Attached to KS-20130 LIA Mounting Plate, Front View

(i) To complete the installation of the equipment in the cabinet, switch all of the power switches on the DASs 820E2 in the cabinet to the ON position.

4.02 Perform the operational test of each data circuit in the cabinet as outlined in Section 591-024-503. After successfully completing the operational tests, replace locking strip (card retaining bar) on each DAS 820E2, switch the power switches of the data circuits not being used to the OFF position, and close all doors of the cabinet to complete the installation of the data station.

5. TIP AND RING LEAD CONNECTION OF INCOMING TRANSMISSION LOOP

5.01 The incoming transmission loops connect to TB 1 (Fig. 1) on each DAS 820E2 as follows:

- (a) Data Circuit 1 Terminals 3 and 4
- (b) Data Circuit 2 Terminals 11 and 12
- (c) Data Circuit 3 Terminals 19 and 20.

Note: To ensure proper operation of the data station, care must be taken to ensure that each incoming transmission loop is connected to the proper data circuit. It is recommended that each incoming loop be tagged showing the data circuit to which it is to be connected.



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

5.02 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 within the range of 3.2 through 4.7 volts, which indicates voltage across the loop, or 0 volt, 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 within the range of 3.2 through 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 12 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 volt 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 up by using the test procedures outlined in 591-024-503, 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 from 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

5.03 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.

5.04 After verifying that the transmission loop is good, connect the leads of the incoming transmission loop to TB 1 of DAS 820E2 as follows.

- (a) Connect one lead of the loop to terminal 4 (or 12, or 20) of TB 1 (Fig. 12). This lead is now designated as the ring lead of the loop.
- (b) Connect the remaining lead of the loop to terminal 3 (or 11, or 19) of TB 1 (Fig. 12). This lead is now designated as the tip lead of the loop.

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.

VOLTAGE PRESENT ON INCOMING TRANSMISSION LOOP

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

- (a) 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 5.06.

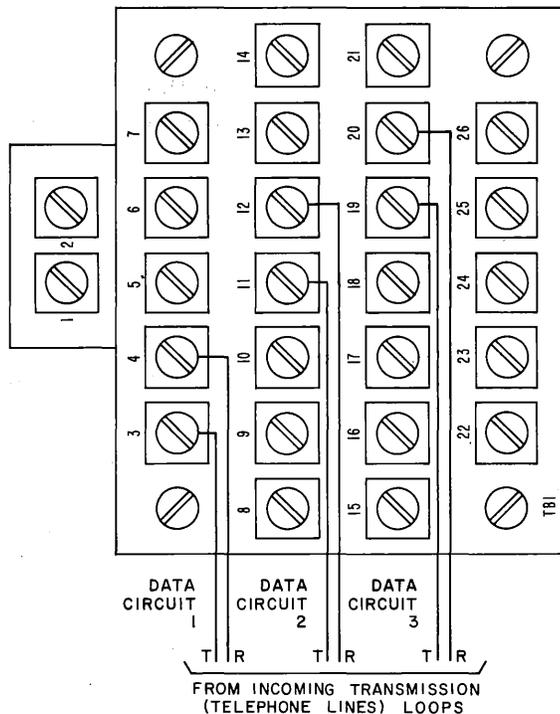


Fig. 12—Telephone Line Connection Diagram for Station-to-Hub Operation or Station-to-Station Operation When No Voltage Present on Incoming Transmission Loop

- (2) If the distant station is equipped with a floating ground, proceed to 5.07 for the connection of the loop leads.
- (b) Determine whether the local data station is grounded or equipped with a floating ground (see 2.03).
- (c) Determine whether the local station is to be arranged for station-to-hub operation or station-to-station operation.

Note: Station-to-hub operation is the distant station equipped with a Data Set 109B-type; station-to-station operation is the distant station equipped with a Data Set 109A-type. **The type of operation must be known before proceeding with the connection of the transmission loop leads.**

5.06 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 by performing the following steps 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 the 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 and below on the AC VOLTS scale, 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.

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

- (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 B 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 C to determine if the loop resistance is acceptable or not as indicated by the current reading.

5.08 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

5.09 If the dc resistance of the incoming transmission loop is between 1800 and 2500 ohms [see 5.07 (c) (2)] and the maximum capacitance of the loop does not exceed 1 μ F, the loop is

TABLE B
CURRENT ON TRANSMISSION LOOP
FOR STATION-TO-STATION OPERATION

METER READING RANGE	EQUIVALENT LOOP RESISTANCE RANGE	EQUIVALENT RESISTANCE REQUIRED	13A1 DATA UNIT					J70165D-1 LINE ADJUSTING RESISTOR UNIT	
			LEAD DESIGNATION				STRAP TERMINALS	STRAP RESISTOR IN TIP	STRAP RESISTOR IN RING
			T	R	T1	R1			
			CONNECT TO TERM.						
1.40-2.15 mA	2500-1500 Ω	Not Req'd (See note)	—	—	—	—		Unit not required	Unit not required
2.15-2.54 mA	1500-1200 Ω	294 Ω	T2	R2	T1	R1		R1, R3	R4, R6
2.54-3.08 mA	1200-900 Ω	632 Ω	T3	R3	T2	R2		R1, R2	R4, R5
3.08-3.92 mA	900-600 Ω	928 Ω	T4	R4	T3	R3		R2	R5
3.92-5.40 mA	600-300 Ω	1222 Ω	T4	R4	T1	R1	T2, T3, R2, R3	R1	R4
5.40-9.50 mA	300-0 Ω	1560 Ω	T4	R4	T2	R2		none	none

Note: When the meter reading is between 1.40-2.15 mA, the 13A1 Data Unit or J70165D-1 Line Adjusting Resistor Unit is not required.

TABLE C
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.

acceptable. Connect the loop leads (tip and ring) to TB 1 of DAS 820E2 as shown in Fig. 12, and complete the following steps.

- (a) Contact the hub location.
- (b) Request that the proper personnel at the hub location verify the dc resistance of the transmission loop as outlined in the section entitled Data Set 109B-Type, Installation (312-802-200).

5.10 If the dc resistance of the incoming transmission loop is below 1800 ohms, the loop is not acceptable; however, connect the loop leads (tip and ring) to TB 1 of DAS 820E2 as shown in Fig. 12, and perform the following steps.

- (a) Contact 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 (312-802-200).

Note: The additional resistance is provided by adjusting a circuit on the J70165D-1 Line Adjusting Resistor Unit at the hub.

STATION-TO-STATION OPERATION

5.11 If the dc resistance of the incoming transmission loop is between 1500 and 2500 ohms [see 5.07 (c) (1)] and the maximum capacitance

of the loop does not exceed 1 μF, the loop is acceptable, and a line build-out unit is not required. Connect the loop leads (tip and ring) to TB 1 of DAS 820E2 as follows.

- (a) Connect the ring (+) lead of the loop to terminal 3 (or 11, or 19) of TB 1 as shown in Fig. 13.
- (b) Connect the tip (-) lead of the loop to terminal 4 (or 12, or 20) of TB 1 as shown in Fig. 13.

Note: The above connection procedure for the loop leads *must be used* to ensure proper operation of the Data Set 109A-type when voltage is present across the leads of the transmission loop and a line build-out unit is not required.

5.12 If the dc resistance of the incoming transmission loop is less than 1500 ohms, the resistance of the loop must be built out to 1800 ohms by using either a 13A1 Data Unit or a circuit of the J70165D-1 Line Adjusting Resistor Unit.

Note: It is suggested that, if less than eight of the telephone lines to the data station require additional resistance, a 13A1 Data Unit should be used on each line to provide the additional resistance required. If eight or more of the lines to the data station require the additional resistance, a J70165D-1 Line Adjusting Resistor Unit should be used.

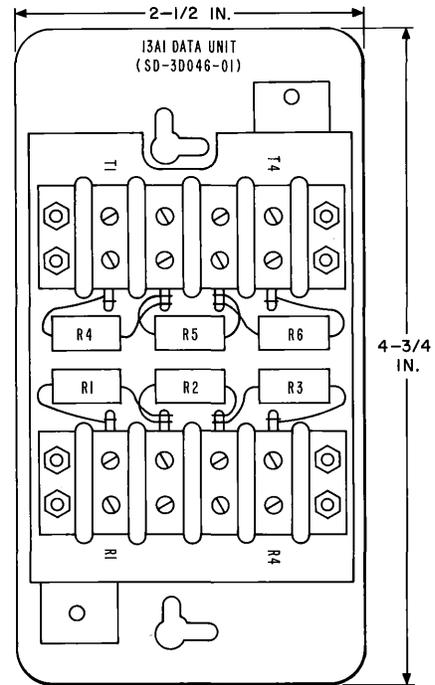
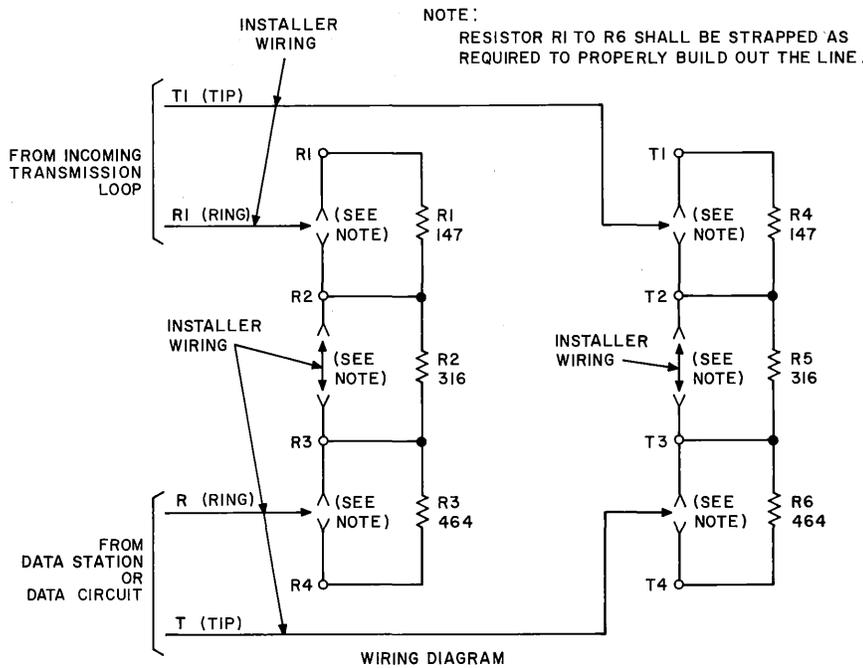


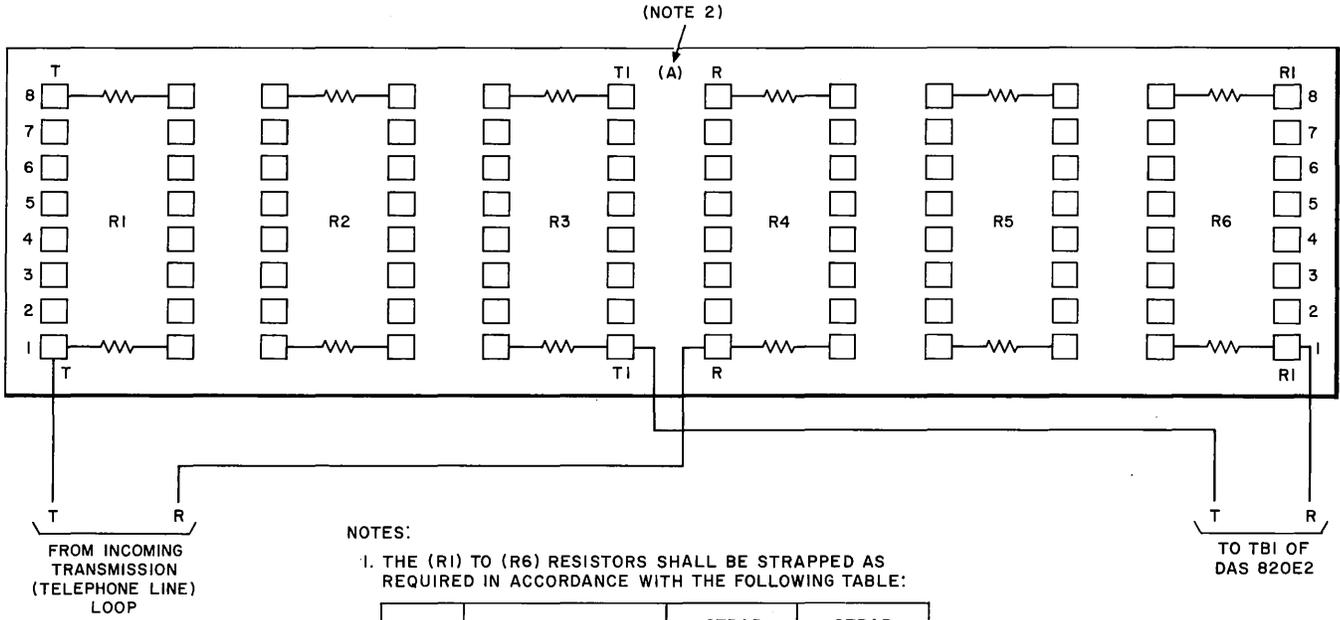
Fig. 14—13A1 Data Unit and Wiring Diagram

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 line build-out unit.

(4) Connect the tip and ring leads of the wire from the line build-out unit to TB 1 of DAS 820E2 as follows.

- Connect the tip (T) lead of the wire to terminal 4 (or 12, or 20) of TB 1 as shown in Fig. 13.
- Connect the ring (R) lead of the wire to terminal 3 (or 11, or 19) of TB 1 as shown in Fig. 13.



NOTES:

1. THE (R1) TO (R6) RESISTORS SHALL BE STRAPPED AS REQUIRED IN ACCORDANCE WITH THE FOLLOWING TABLE:

ITEM	MEASURED LOOP RESISTANCE	STRAP RESISTOR IN TIP	STRAP RESISTOR IN RING
1	ZERO TO 300Ω	NONE	NONE
2	300Ω TO 600Ω	R1	R4
3	600Ω TO 900Ω	R2	R5
4	900Ω TO 1200Ω	R1,R2	R4,R5
5	1200Ω TO 1500Ω	R1,R3	R4,R6
6	1500Ω TO 1800Ω	R2,R3	R5,R6

2. CIRCUIT 1-8 ARE ON (A) TERMINAL STRIP
 CIRCUIT 9-16 ARE ON (B) TERMINAL STRIP
 CIRCUIT 17-24 ARE ON (C) TERMINAL STRIP

Fig. 15—J70165D-1 Line Adjusting Resistor Unit, Connection Diagram