DATA SET 109A-TYPE MULTIPLE PRIVATE LINE STATION USING DATA AUXILIARY SET 820E2 AND KS-20018 CABINET INSTALLATION AND CONNECTIONS

CONTENTS PAGE

1. GENERAL

1.01 This section covers the installation and connections of Data Set 109A-type Multiple Private Line Station using Data Auxiliary Set (DAS) 820E2 and KS-20018 Cabinet. For the purpose of this section, the KS-20018 type Cabinet equipped with Data Set 109A-type mounted in DAS 820E2 (Fig. 1) is referred to as a data station.

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 The data station can be installed in any location (depending on the type of cabinet used) that is convenient for the customer's use and within the maximum length of the interface cord.

1.05 A maximum of three data circuits can be mounted on DAS 820E2.

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

1.06 The KS-20018 type Cabinet mounts DASs 820E2 in the following manner.

(a) KS-20018 L1 (Fig. 4) mounts one DAS 820E2 (three data circuits).

(b) KS-20018 L2 (Fig. 5) mounts two DASs 820E2 (six data circuits).

(c) KS-20018 L3 (Fig. 5) mounts three DASs 820E2 (nine data circuits).

(d) KS-20018 L4 (Fig. 5) mounts four DASs 820E2 (12 data circuits).

Note: For the purpose of this section, any reference to a cabinet pertains to Cabinets KS-20018 L1 through L4.

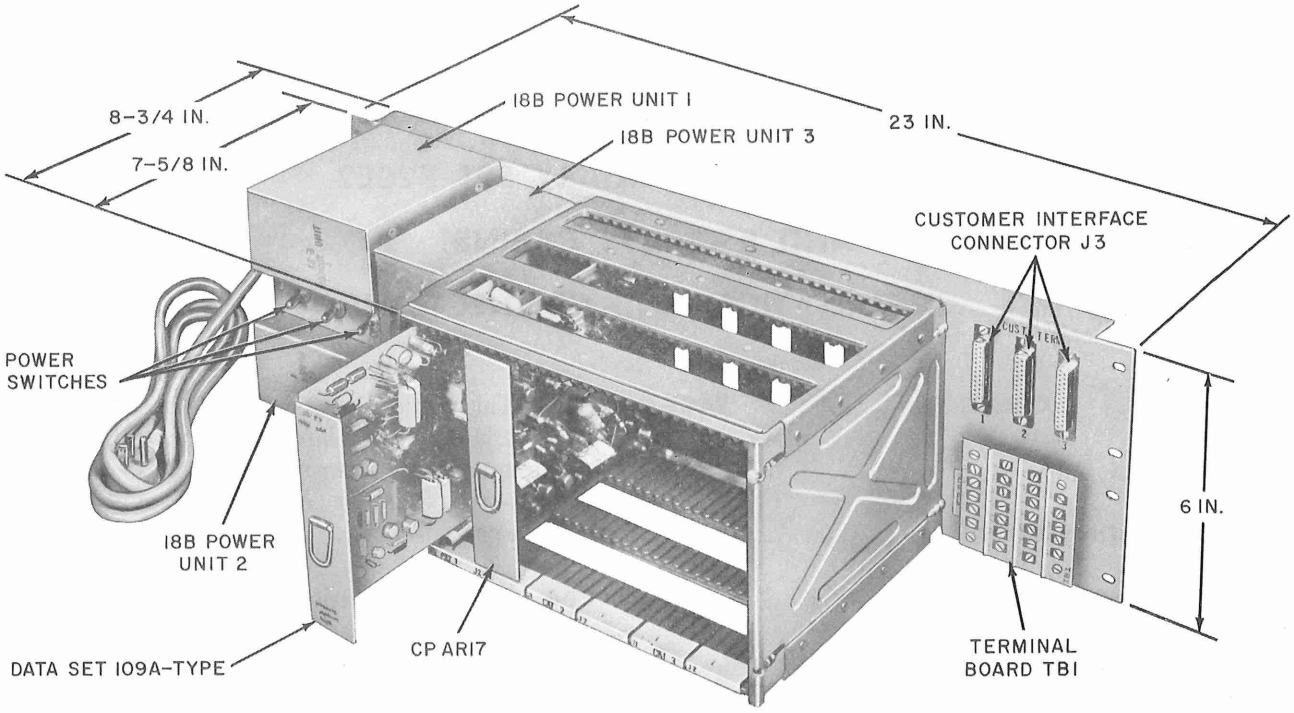
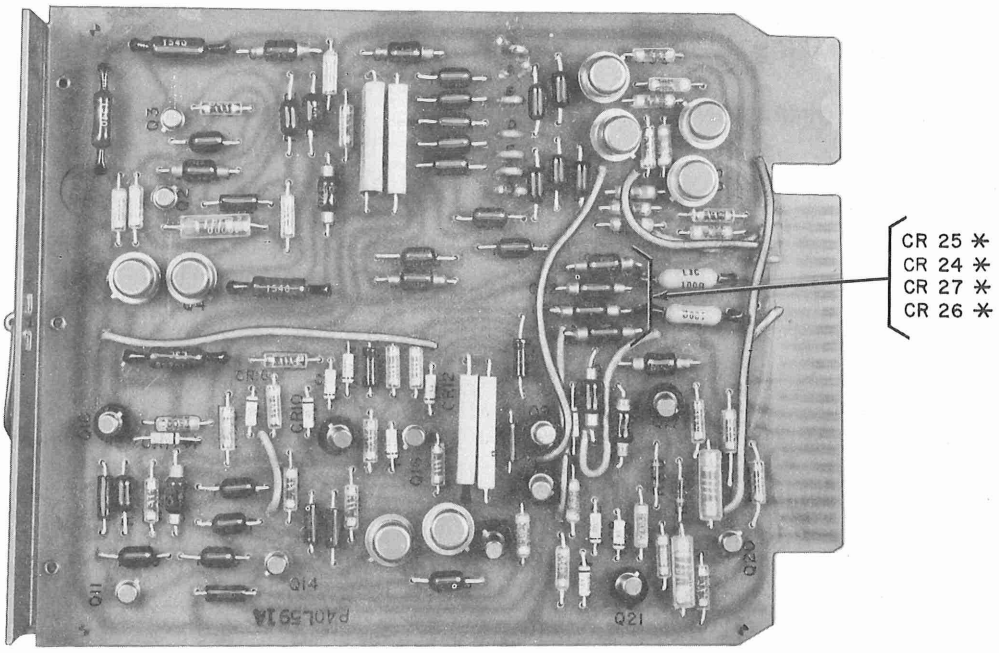


Fig. 1—Data Auxiliary Set 820E2 With Data Set 109A-Type Mounted (Extended), Front View



* THESE COMPONENTS ARE USED FOR LIGHTNING PROTECTION AND ARE ONLY PROVIDED ON DATA SET I09A1.

Fig. 2—Data Set 109A1

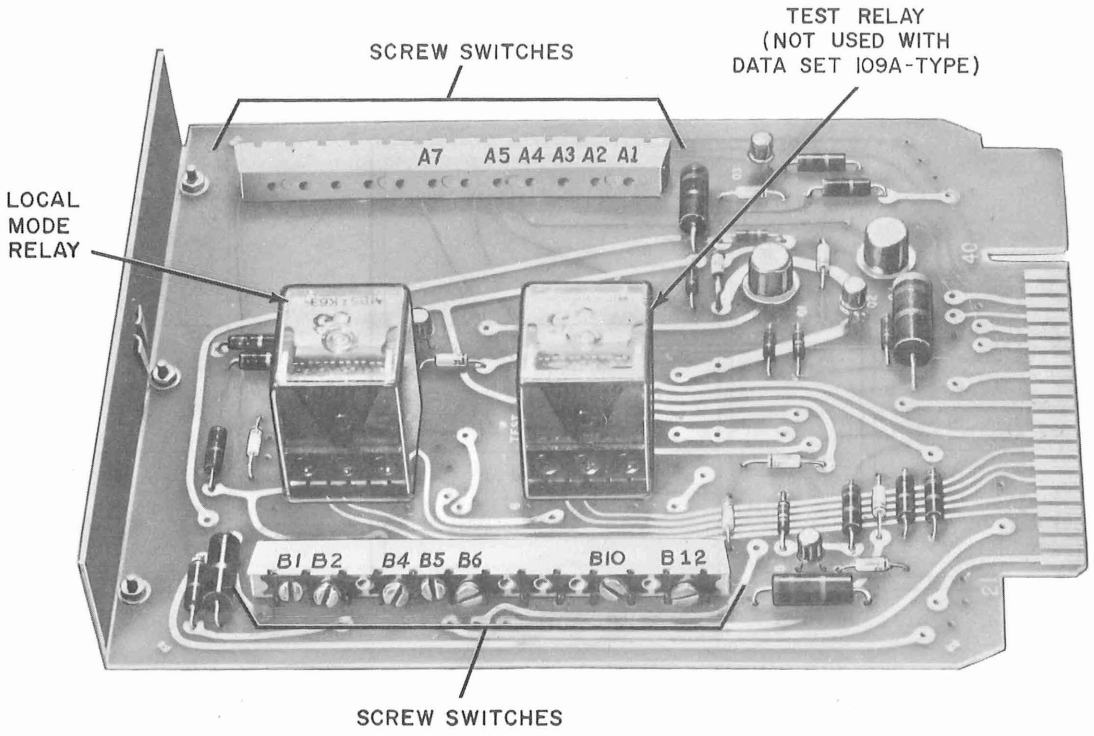


Fig. 3—Circuit Pack AR17

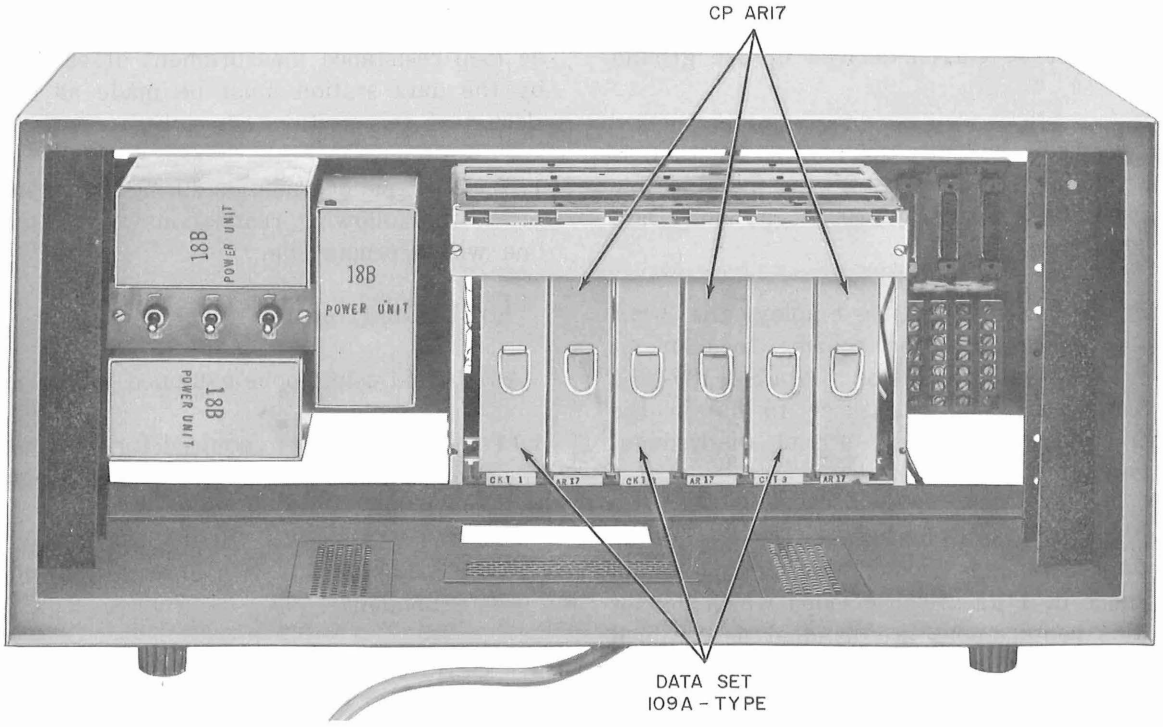


Fig. 4—KS-20018 L1 Cabinet Equipped With Data Auxiliary Set 820E2, Front View

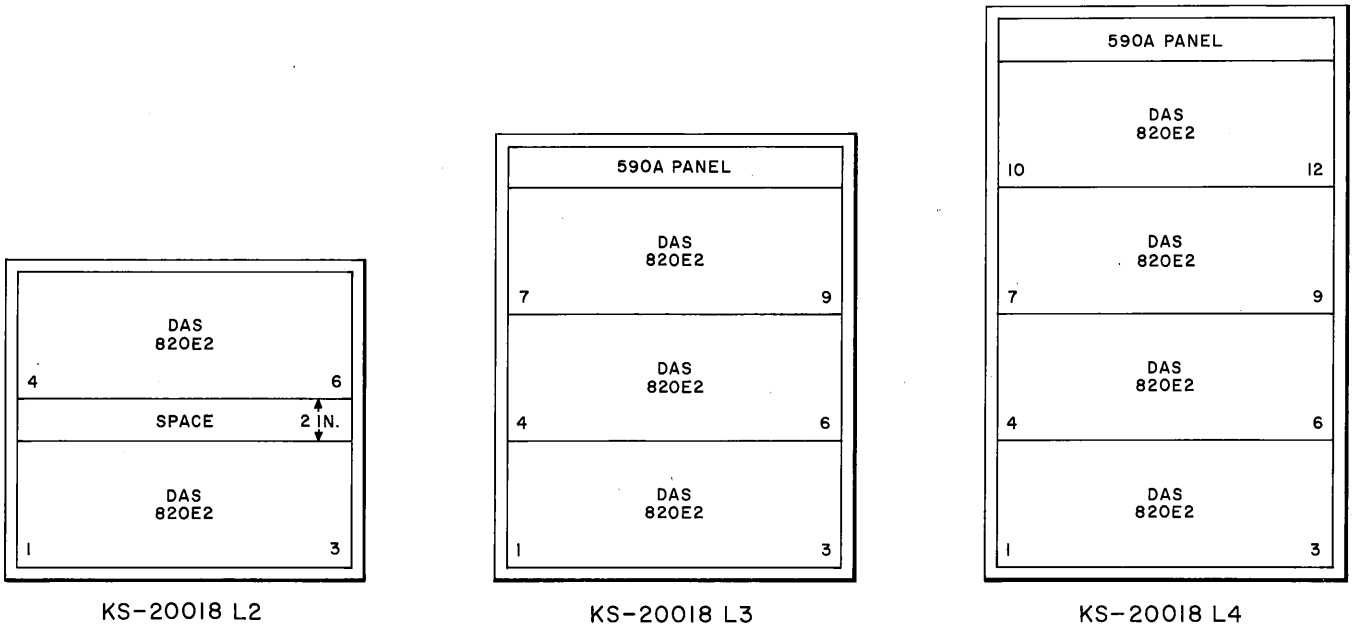


Fig. 5—KS-20018 L2 Through L4 Cabinets Mounting Arrangements, Front View

1.07 The data circuit 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 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.

1.08 The 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 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.

1.09 If the numerical value of the dc loop resistance for the transmission loop is not provided, a dc loop resistance measurement of each loop used by the data station must be made as outlined in Part 4 of this section.

1.10 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.

1.11 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 Using Data Auxiliary Set 820E2 and KS-20018 Cabinet, Maintenance (591-024-302).

(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 591-024-302.

(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 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 size 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 the 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 PROCEDURES

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 cabinet shall be installed in conformance with the existing sections covering the installation of multiple data set installation. See the section entitled Data Sets—Multiple Installation Information (590-010-201).

To avoid possible damage to the electrical components of the data station, do not connect the power to DAS 820E2 until directed to do so as outlined in this section.

3.03 After positioning the cabinet, remove the front and rear covers (Fig. 6) of the cabinet as outlined in Section 591-024-302. Then remove the front and rear access port covers (Fig. 6) by pulling them straight up.

3.04 Mount DAS 820E2 in the cabinet with the screws provided. Refer to Fig. 4 or 5 for the mounting arrangements in the different types of cabinets.

3.05 When more than one DAS 820E2 is mounted in a cabinet, strap terminal 1 of TB 1 (Fig. 1) on the first DAS 820E2 to terminal 1 of TB 1 on each of the other DASs 820E2 in the cabinet.

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

3.07 Insert Data Sets 109A-type into the proper mounting positions of DAS 820E2 (Fig. 1).

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.

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

To prevent possible damage to the electrical components of the data station, ensure that all power switches on the DASs 820E2 are in the OFF position before connecting power to the data station.

3.08 Connect the ac power to DAS 820E2 in the following manner.

(a) If either a KS-20018 L1 or L2 Cabinet is used, the ac power cord of DAS 820E2 (Fig. 1) must be run out the rear access port (Fig. 6) of the cabinet and connected to an ac wall receptacle provided by the customer.

(b) If either KS-20018 L3 or L4 Cabinet is used, power is provided in the following manner.

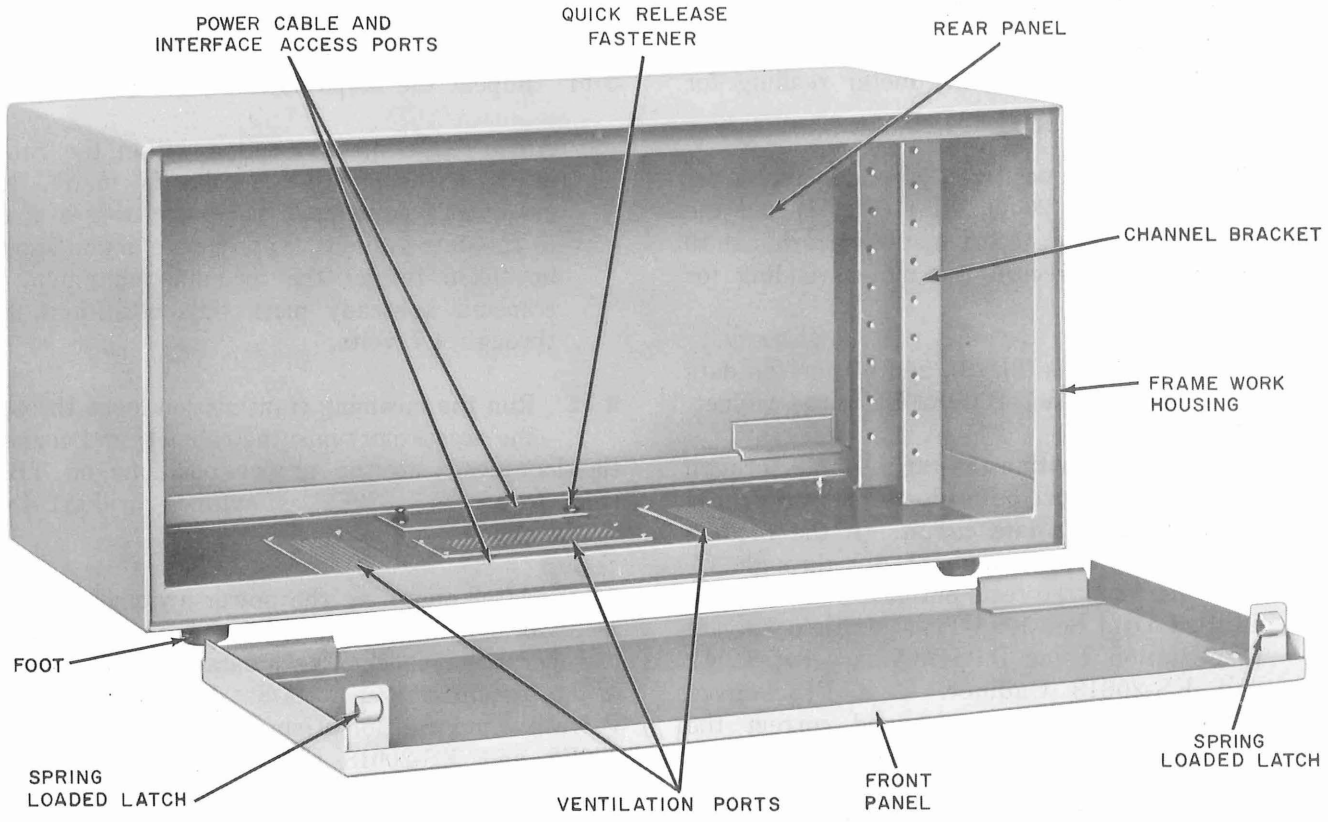


Fig. 6—KS-20018 L1 Cabinet, Front View

(1) Mount a 590A panel (Fig. 7) in the top of the cabinet (Fig. 5).

(2) Connect the KS-14532 L16 power cable (shipped with the 590A panel) to the single inlet on the 590A panel, then run the cable out of the cabinet through the rear access port. Connect the cable to the ac wall receptacle provided by the customer.

(3) Connect the ac power cord of each DAS 820E2 to an outlet on the 590A panel.

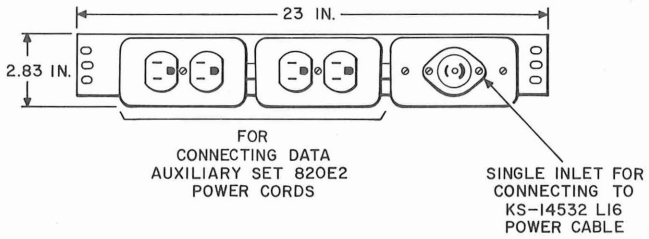


Fig. 7—590A Panel, Front View

3.09 Perform the following steps to check the operation of each data circuit in the data station.

(a) Operate all power switches on the DASs 820E2 in the cabinet to the ON position.

(b) 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.

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

(2) 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.

(3) 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.

(4) 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.

(5) Repeat Steps (2), (3), and (4) for the data circuits on each DAS 820E2 in the cabinet.

(6) 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.

(c) 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.

3.10 Run the interface connection cords through the access port into the cabinet, connect them to the proper interface connector J3 (Fig. 1) on DAS 820E2. The interface connection cords are provided by the customer and 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: It is recommended that the interface cords and the incoming transmission loops (telephone lines) be run through the front access port, while the power cords should be run through the rear access port.

3.11 Repeat the steps outlined in 3.09.

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 through 4.7 volts.

3.12 Run the incoming transmission loops through the access port into the cabinet, and connect the loop leads to the proper positions on TB 1 (Fig. 1) of DAS 820E2 as outlined in Part 4 of this section.

3.13 After operating the power switches (Fig. 1) of DAS 820E2 to the ON position, perform the operational check of each data circuit as 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).

3.14 After successfully completing the operational tests, replace the backplate of DAS 820E2 and the front and rear covers of the cabinet as outlined in Section 591-024-302 to complete the installation of the data station.

4. TIP AND RING LEAD CONNECTION OF INCOMING TRANSMISSION LOOP

4.01 The incoming transmission loop connects to TB 1 (Fig. 1) on 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 will be connected.

TABLE B

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

4.02 Because each incoming transmission loop is connected in the same manner, the following description covers the connection of one loop only.

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

4.03 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 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 approximately 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 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 up by using the test procedures outlined in 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

4.04 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.

4.05 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. 8). 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. 8). 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. (Refer to 3.13.)

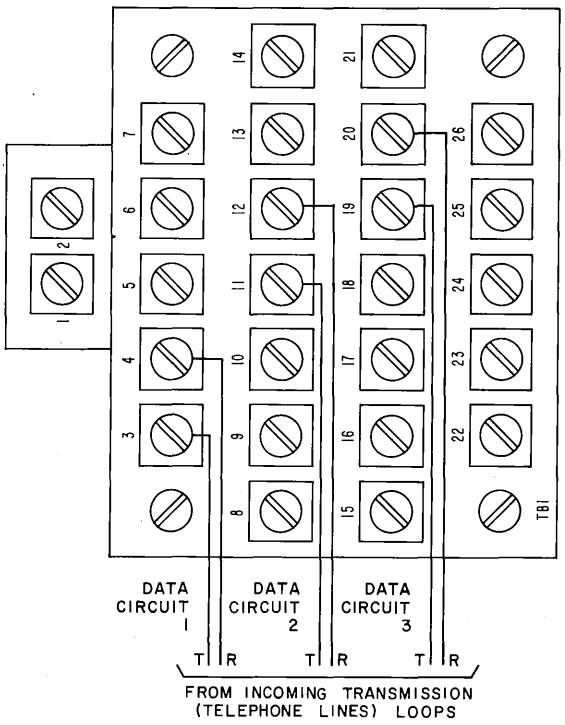


Fig. 8—Telephone Line Connection Diagram for Station-to-Hub Operation or Station-to-Station Operation When No Voltage Present on Incoming Transmission Loop

VOLTAGE PRESENT ON INCOMING TRANSMISSION LOOP

4.06 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 4.07.

(2) If the distant station is equipped with a floating ground, proceed to 4.08 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, but 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.***

4.07 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 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.

4.08 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 C 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 D to determine if the loop resistance is acceptable or not as indicated by the current reading.

4.09 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

4.10 If the dc resistance of the incoming transmission loop is between 1800 and 2500 ohms [see 4.08 (c) (2)] and the maximum capacitance of the loop does not exceed 1 μF, the loop is acceptable. Connect the loop leads (tip and ring) to TB 1 of DAS 820E2 as shown in Fig. 8, 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).

4.11 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. 8, 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

4.12 If the dc resistance of the incoming transmission loop is between 1500 and 2500 ohms [see 4.08 (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. 9.

TABLE C

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 Reqd (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 D

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.

(b) Connect the tip (-) lead of the loop to terminal 4 (or 12, or 20) of TB 1 as shown in Fig. 9.

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

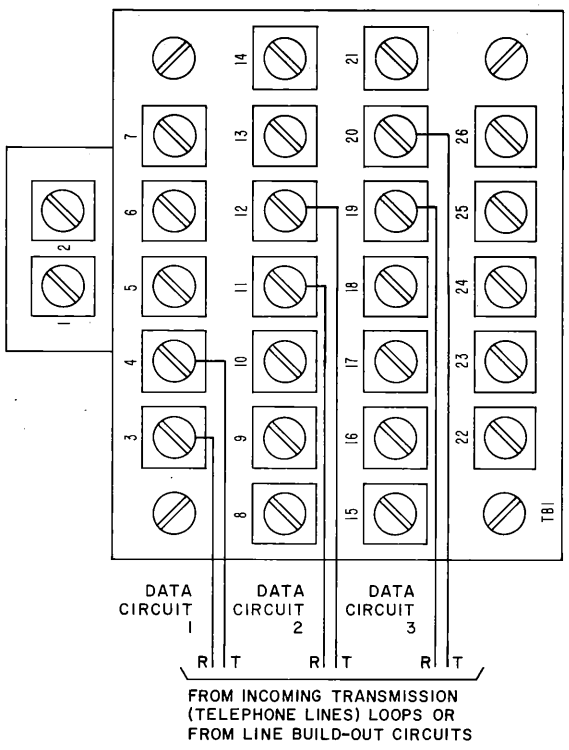


Fig. 9—Telephone Line Connection Diagram for Station-to-Station Operation When Voltage is Present on Incoming Transmission Loop

4.13 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.

(a) The 13A1 Data Unit must be located external to the data station.

(1) A 13A1 Data Unit provides resistance to build out only one transmission loop.

(2) The location and mounting procedures for the 13A1 Data Unit must be provided by the local telephone company engineering group.

(b) The J70165D-1 Line Adjusting Resistor Unit can be mounted in the cabinet of the data station.

(1) The J70165D-1 L1 provides the mounting panel and resistors for building out eight transmission loops. The mounting panel provides space to mount two L2s (each L2 provides eight build-out circuits) for a total of 24 build-out circuits in a fully equipped J70165D-1 Line Adjusting Resistor Unit.

(2) A resistor unit can be mounted in a KS-20018 L1 Cabinet without reducing the maximum capacity of the cabinet.

(3) When a resistor unit is mounted in either a KS-20018 L2, L3, or L4 Cabinet, the maximum capacity of the cabinet is reduced by three data circuits (one fully equipped DAS 820E2) as shown in Fig. 10.

Note: It is suggested that the 13A1 Data Unit be used unless eight or more transmission loops must be built out.

4.14 When the dc resistance of the incoming transmission loop must be built out, connect the loop leads (tip and ring) to the line build-out unit and to TB 1 of DAS 820E2 as follows.

(a) Connect the tip (+) and ring (-) leads of the loop to the line build-out unit as follows.

(1) If the 13A1 Data Unit is used, connect the loop leads according to Table C [see 4.08 (c) (1)] and as shown in Fig. 11.

(2) If the J70165D-1 is used, connect the loop leads as shown in Fig. 12.

(b) Connect the line build-out unit to DAS 820E2 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 line build-out unit as follows.

- If the 13A1 Data Unit is used, connect leads of the wire according to Table C and as shown in Fig. 11.

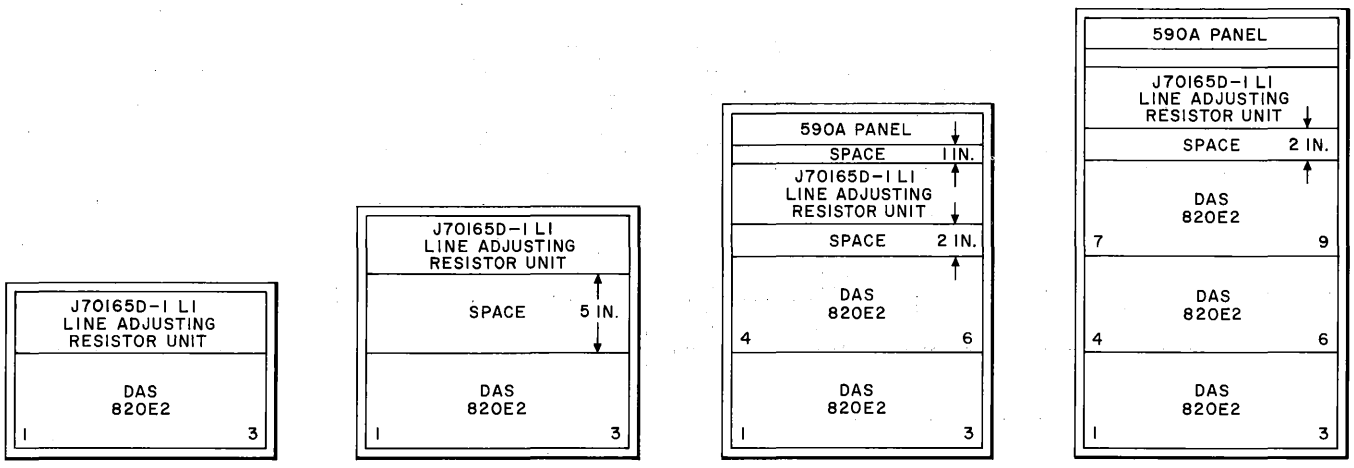


Fig. 10—KS-20018 Cabinet Mounting Arrangement With J70165D-1 Line Adjusting Resistor Unit

- If the J70165D-1 is used, connect the leads of the wire as shown in Fig. 12.

(3) Measure the voltage across the leads of the wire from the line build-out unit as follows.

Note: This measurement must be made to ensure that no opens exist in the line build-out unit.

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

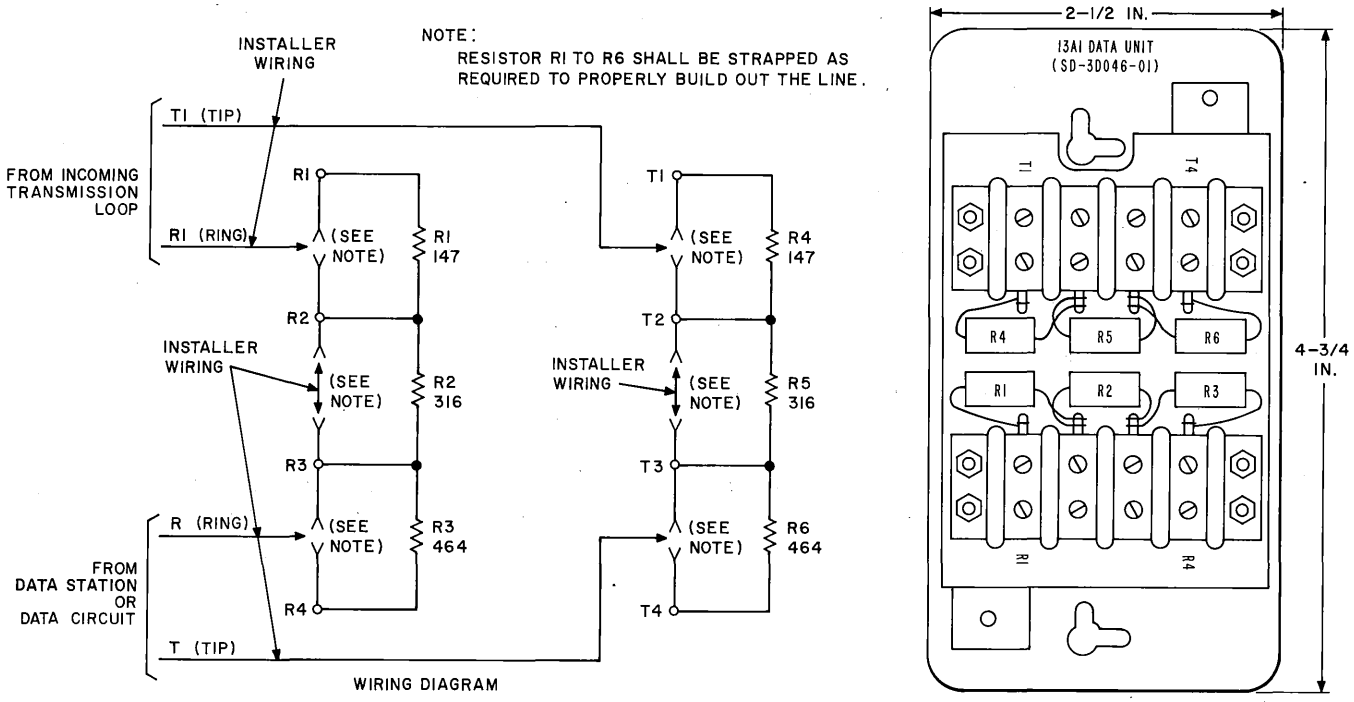
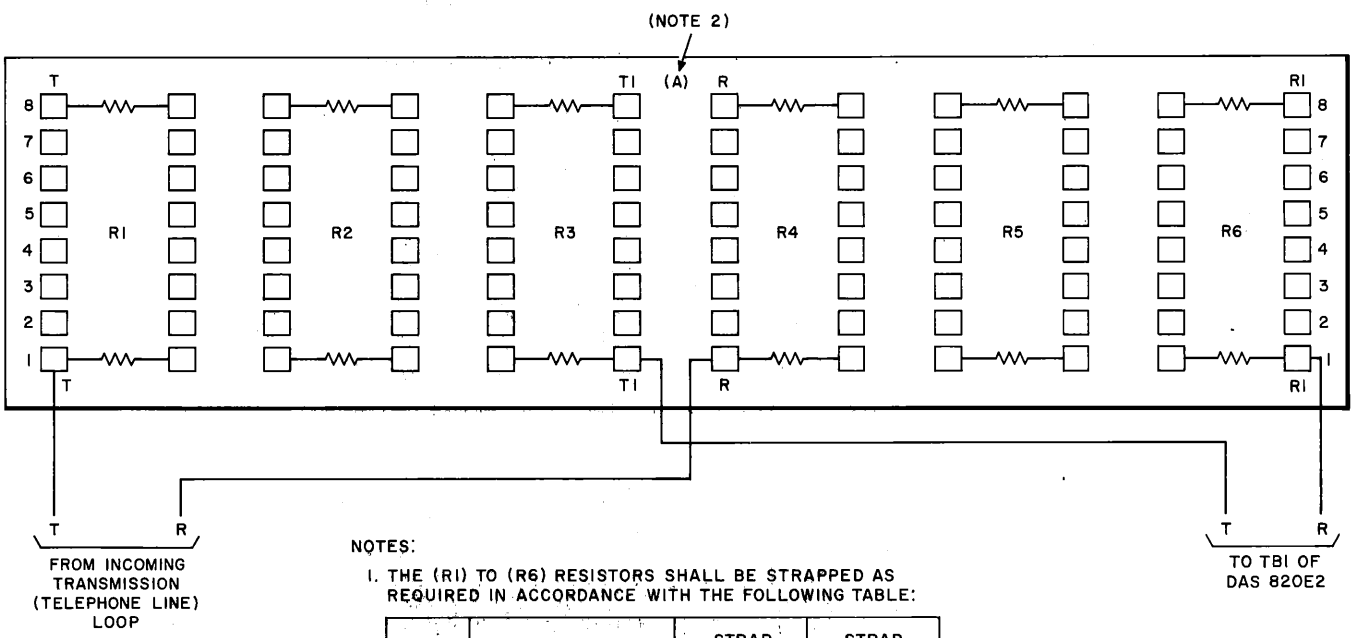


Fig. 11—13A1 Data Unit and Wiring Diagram



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

- 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 line build-out unit.

Note: A reading out of the range indicates a defective 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. 9.

- Connect the ring (R) lead of the wire to terminal 3 (or 11, or 19) of TB 1 as shown in Fig. 9. (Refer to 3.13.)