DATA SET 109B-TYPE

MAINTENANCE PROCEDURES

1. GENERAL

1.01 This section provides information on the maintenance requirements, maintenance procedures, and the scope of maintenance required for Data Set 109B-type and the associated Data Auxiliary Set 811C.

1.02 This section is reissued to incorporate minor changes to the text and figures.

1.03 Data Set 109B-type (Fig. 1) and associated Data Auxiliary Set (DAS) 811C (Fig. 2) are located at a type 2 hub circuit of a No. 2 or 9B Serviceboard or the Long Lines DOTC (Data Observing Test Center). These sets, in conjunction with a Data Set 109-type located at an outlying station, provide low-speed, half-duplex dc data transmission on 2-wire metallic private line facilities at speeds up to 150 bauds.

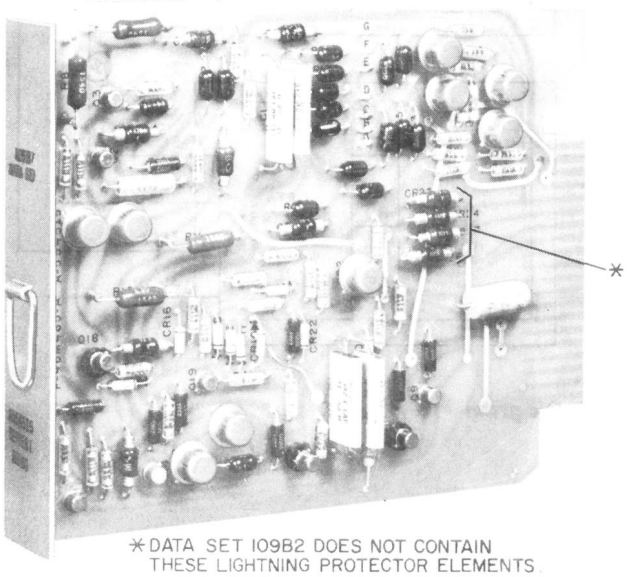


Fig. 1—Data Set 109B-Type

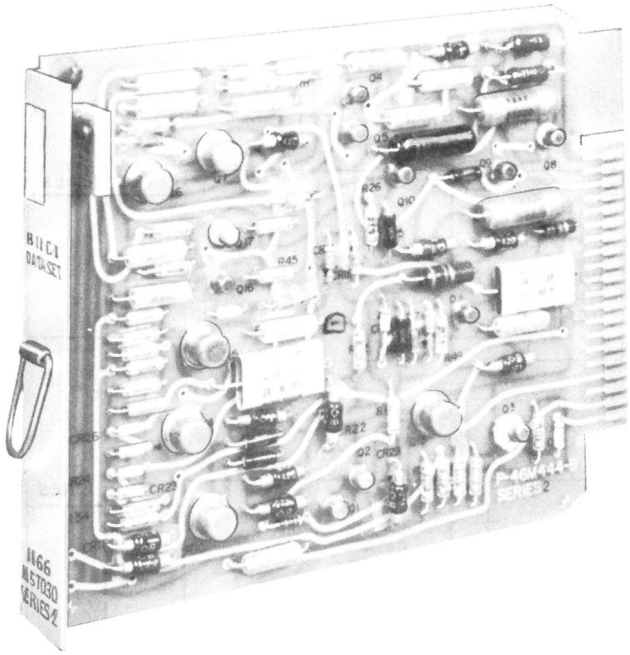


Fig. 2—Data Auxiliary Set 811C

1.04 A typical system block diagram is shown by Fig. 3.

1.05 Data Set 109B-type and DAS 811C are mounted in a J70165A1 mounting panel (Fig. 4), which provides the necessary fuses and central office connections. The associated J70165D panel mounting is provided in adjusting the loop resistance to a nominal 2000 ohms. Data Set 109B-type and DAS 811C do not require routine maintenance, therefore, service is maintained by patching in spare units and replacing the defective unit.

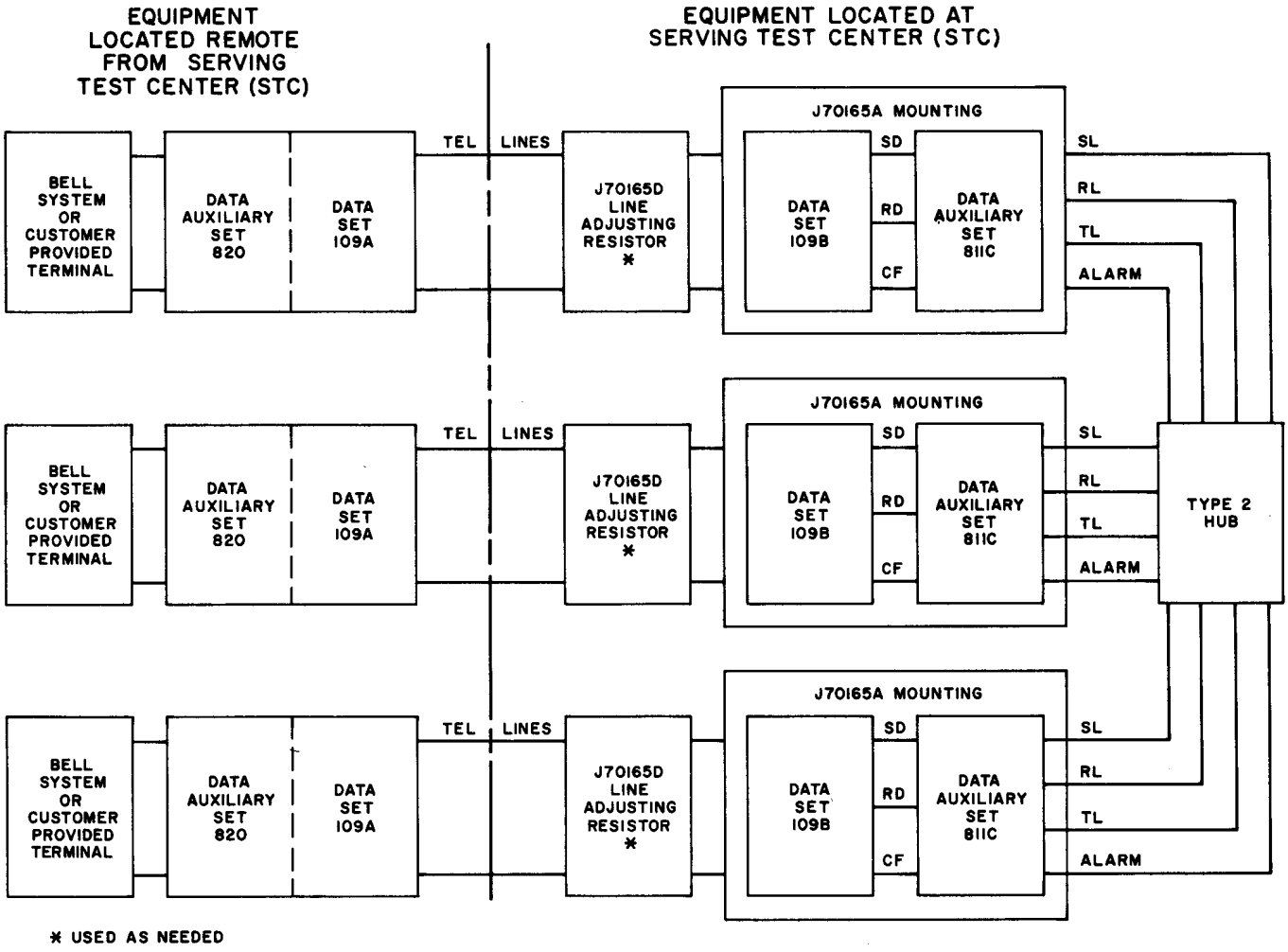


Fig. 3—System Block Diagram

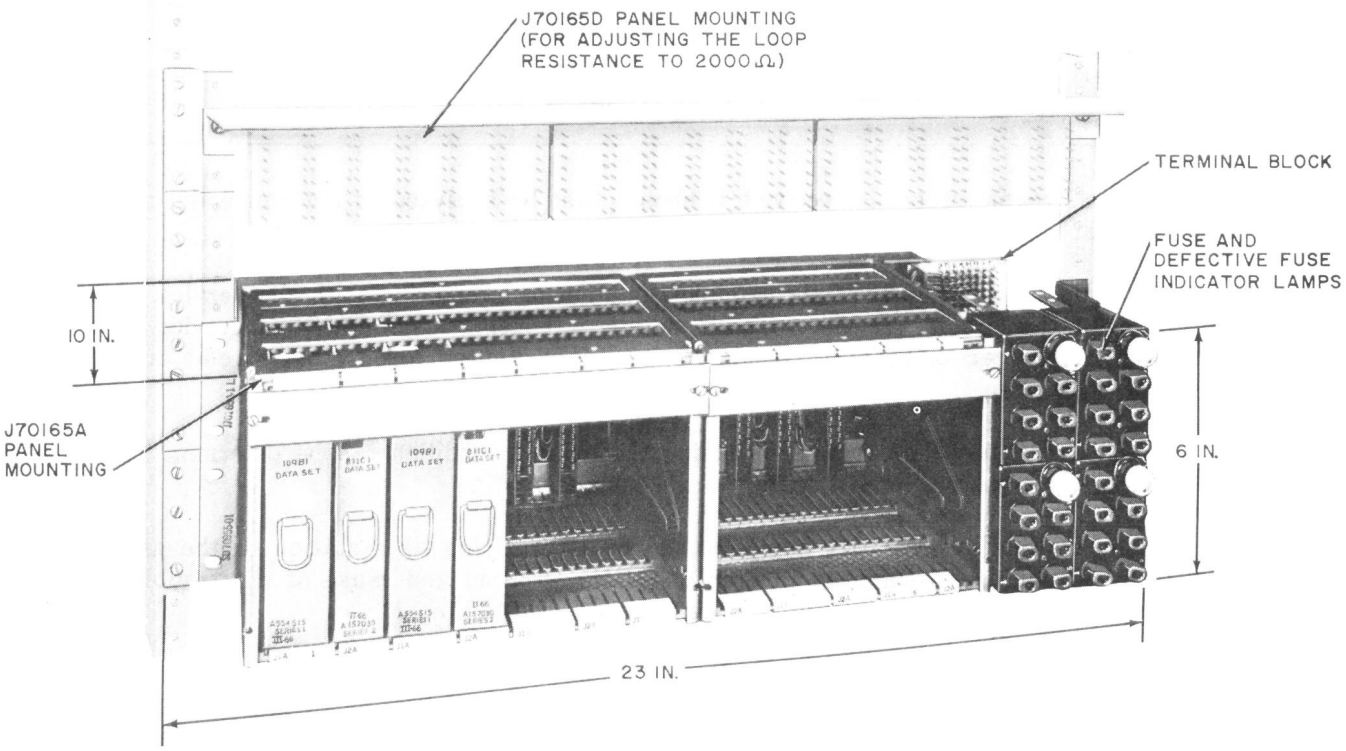


Fig. 4—Data Set 109B-Type and Data Auxiliary Set 811C Installed in a J70165A Panel

1.06 Data sets and data auxiliary sets that are defective should be carefully packed (in original type cartons, if available) to protect them in transit and returned to the distributing house. A tag describing the nature of trouble as completely as possible should be attached to the defective unit.

1.07 Part 3 of this section contains information on the replacement of defective units.

2. TROUBLE LOCATING PROCEDURE

2.01 Figure 5 is a flow chart outlining a procedure used in locating and eliminating a trouble condition.

2.02 The procedure follows the "test before dispatch" philosophy of trouble clearing, and will aid a craft employee in isolating the malfunction to the equipment at the hub, line, or at the remote station. For information on the system tests requirements and procedures used in locating and clearing trouble, refer to the applicable telegraph serviceboard or testboard practice. Details on clearing a trouble condition at a remote station are contained in the practice entitled Data Set 109A-Type Single Private Line Station Using Data Auxiliary Set 820D-Type—Maintenance (591-024-301). For multiple private line stations, refer to the applicable maintenance sections for the type of station being tested.

2.03 The following step-procedure can be used in conjunction with Fig. 5 as a guide or sequence to be performed for isolation of a trouble condition. The blocks of Fig. 5 are numbered in order to facilitate the use of this figure in conjunction with the step-procedure. These numbers are for reference only and do not indicate the order of testing or sequence that will be followed in clearing the trouble condition. In order to pinpoint a trouble condition it may not be ncessary to perform all the steps, since this procedure is designed to eliminate repetitive testing of the operative parts of the system.

2.04 ***Test Procedure:***

STEP	PROCEDURE
1	When a trouble report is received, it should first be analyzed to determine the nature or cause of the trouble.
2	It should be determined if the trouble condition is interfering with the service on other parts of the circuit. If the trouble condition is causing a disruption of service on other circuits, proceed to Step 3. When the trouble is limited to only one circuit or station, proceed to Step 4.
3	If the circuit, leg, or equipment causing the trouble condition can be determined, remove it in order to restore limited service to the customer.
4	If the trouble is obviously being caused by an outlying data station or the associated terminal equipment, proceed to Step 5. If the location and cause of the trouble cannot be determined from an analysis of the report, proceed to Step 7.
5	When an outlying station is in trouble, a craft employee must be dispatched to the station.
6	Take the necessary steps to isolate and clear the outlying station trouble. ▶If the terminal is a Bell System teletypewriter,◀ refer to the applicable Field Maintenance Practices (FMPs) and the applicable BSPs for information on clearing the trouble at the data station. ▶If the terminal is a customer-provided teletypewriter, refer the trouble to the customer.◀ After taking the necessary corrective action, proceed to Step 26 and perform the indicated steps to verify that the trouble has been cleared.
7	Remove or disconnect the lines at Data Set 109B-type and measure the incoming voltage from the outlying data station by connecting a meter to the facilities position line and equipment jack, using an appropriate patch cord to break the hub circuit and connect the meter to the tip and ring of the line. The outlying station must be correctly polled and sending a mark when the voltage is measured, or a valid test cannot be made. ***Note:*** In order to obtain a reading of the incoming voltage, the leads of the meter may have to be reversed to obtain the correct polarity.
8	With the meter connected across the incoming line, the indicated voltage should be between 3.2 volts and 4.7 volts. A −10 to −12 volt reading indicates that the outlying station is sending a space. When this condition is encountered, the outlying station must be placed in a marking condition and the voltage across the incoming line remeasured. The indicated voltage should now be between 3.2 and 4.7 volts. When the voltage is within these specified limits, proceed to Step 9. If the voltage is not between 3.2 and 4.7 volts, proceed to Step 21.
9	After completing Step 8 and thereby verifying that the line and outlying data station are operative, it can be concluded that the trouble condition has either come clear or that the trouble is at the hub.

STEP	PROCEDURE
10	Perform the test indicated by Table A and the associated Fig. 6. This table indicates the correct status of each lead for the combined Data Set 109B-type and Data Auxiliary Set 811C. All the tests must be made and conditions given in Table A must be met for the data set to be considered acceptable.
11	The status of the leads of the data set and data auxiliary set shall be checked against Table A to determine if the data set and data auxiliary set are operating properly. The voltages given by Table A are nominal values and the actual measured voltages will vary slightly from these values; however, it can be determined that the data set and data auxiliary set are operating properly or improperly by comparing the measured signals with Table A.
12	Successful completion of the test requirements given in Steps 8 and 11 indicates that the data system is operating properly. When this is the case, the trouble condition may have come clear. Proceed to Step 26 and perform an operational test of the system to verify that the trouble condition has been cleared.
13	When an unacceptable condition is encountered during the test of the data set and data auxiliary set, the following substitution procedure should be followed. Substitute a known good Data Set 109B-type in the hub mounting. After making this substitution, the hub is retested in accordance with Table A to determine if the trouble condition has been eliminated. Proceed to Step 14.
14	If the nominal voltages indicated by Table A are obtained when the data set and data auxiliary set are retested, the trouble conditon has been cleared by this substitution. An operational test of the system should be performed to verify that the trouble condition has been eliminated (Step 26). If the test indicates that the trouble condition was not cleared by substitution of the Data Set 109B-type, proceed to Step 15.
15	A known good Data Auxiliary Set 811C is now substituted in the hub and the Table A test is repeated to determine if the trouble condition is corrected by the substitution.
16	If the nominal voltages indicated by Table A are obtained when the data set and data auxiliary set are retested, the trouble condition has been eliminated (Step 26). If the test indicates that the trouble condition was not cleared by substitution of the Data Auxiliary Set 811C, proceed to Step 17. ***Note:*** After a trouble condition has been cleared by substitution of DAS 811C, the original Data Set 109B can be reinstalled in the hub and the hub retested to determine if this unit is operative or if it is also defective.
17	When the preceding substitution procedures do not clear the trouble condition or there is no voltage or output, a check of the hub fuse circuits, hub power supply, and wiring must be made.
18	When a blown fuse, damaged wiring, or loss of power is causing the trouble condition, proceed to Step 19. When there is power available to the hub and no visible damage to the wiring, proceed to Step 20.

STEP	PROCEDURE
19	Take the necessary corrective action to restore power to the hub and repair any defective wiring. Proceed to Step 26 and perform the specified operational system test to verify that the trouble condition has been cleared.
20	In order to clear the trouble condition, request help through proper lines of authority. After obtaining the necessary assistance in clearing the trouble condition, proceed to Step 26 and verify operation of the system by performing the tests indicated.
21	When no output is received from the outlying station or an unacceptable voltage level is received, the trouble may be caused either by the loop facilities or by a malfunction of the outlying station. ***Note:*** In order to perform the following tests, a telephone company employee must be dispatched to the outlying station.
22	◗A check should be made of the loop facilities to determine if the loop is acceptable. The loop resistance should meet the requirements outlined in Section 314-410-500.◖ ***Note:*** In order to measure the loop resistance, a telephone company craft employee must be dispatched to the outlying station to connect the loop leads together for the resistance measurement. When the leads are removed from the station, each lead must be labeled or identified with a tag so they can be reconnected to the same terminals.
23	When a check of the loop indicates that the loop is acceptable, proceed to Step 25 and perform the required test to determine if the outlying station is causing the trouble condition. When the loop is unacceptable, proceed to Step 24.
24	Make the necessary repairs or replace the defective loop. In order to restore service to the customer, another line that meets the requirements for this service can be patched in. If resistance of the loop is less than 2000 ohms, it should be "built out" to approximately 2000 ohms, using the J70165D resistor panel (see Fig. 4) as required. When the resistance is more than 2000 ohms, no "build out" is required. After repairing or replacing the loop, proceed to Step 26 and perform an operational test of the system to verify that the trouble has been cleared.
25	When the outlying station is suspected of being in trouble, it must be tested to locate the trouble condition. For information on locating and clearing a trouble condition at an outlying station, refer to the practice entitled Data Set 109A-Type Single Private Line Station Using Data Auxiliary Set 820D-Type—Maintenance Procedures (591-024-301). After clearing the trouble or verifying that the station and associated equipment is operative, proceed to the following step.
26	Perform an operational test of the system by using the outlying station to both send and receive data. If the trouble condition has been cleared by the previous steps, the system should operate properly. If the trouble condition still exists, request help through proper lines of authority to aid in clearing the trouble.
27	After verification that the system operates properly, the station can be returned to service and the trouble ticket closed out.

3. DATA SET AND DATA AUXILIARY SET REPLACEMENT PROCEDURES

THINK ***Before attempting to replace a data set or data auxiliary set, make sure that the power has been disconnected.***

3.01 Data Set 109B-type is mounted in J1A slots of a J70165A mounting and connecting panel. The J70165A mounting and connecting panel is shown in Fig. 4.

3.02 Replacement of Data Set 109B-type or DAS 811C is accomplished as follows:

(a) Remove the fuses for the +24V, −24V, −48V, and −130V power. These fuses are located on the mounting panel (see Fig. 4).

(b) Remove the retaining screws that hold the card retaining bar.

(c) Remove the data set by grasping the pull ring on the data set card and pulling the card straight out of the mounting panel.

(d) When replacing a data set, make sure that the card is correctly positioned to engage the connector at the back of the panel. Excessive force should not be required to install the data set; however, the data set should be seated firmly in the mounting panel connector.

(e) Replace the card retaining bar and fuses to complete the installation of the data set.

4. REFERENCES

4.01 For additional information on the equipment associated with the data set, refer to the following items:

(a) SD-70944-01 (Data Systems Central Office Data Set 109B-Type)

(b) CD-70944-01 (Data Systems Central Office Data Set 109B-Type)

(c) SD-70963-01 (Data Auxiliary Set 811C, Schematic Diagram)

(d) CD-70963-01 (Data Auxiliary Set 811C, Circuit Description)

(e) SD-70955-01 (Connecting Circuit for Data Sets 108B, 109B, 110B, and Data Auxiliary Set 811C in Central Office, Schematic Diagram)

(f) CD-70955-01 (Connecting Circuit for Data Sets 108B, 109B, 110B, and Data Auxiliary Set 811C in Central Office, Circuit Description)

(g) J70165 (Mounting and Connecting Units for Central Office Data Sets, Data Systems)

(h) Section 314-421-100 (Data Auxiliary Set 811C, Description).

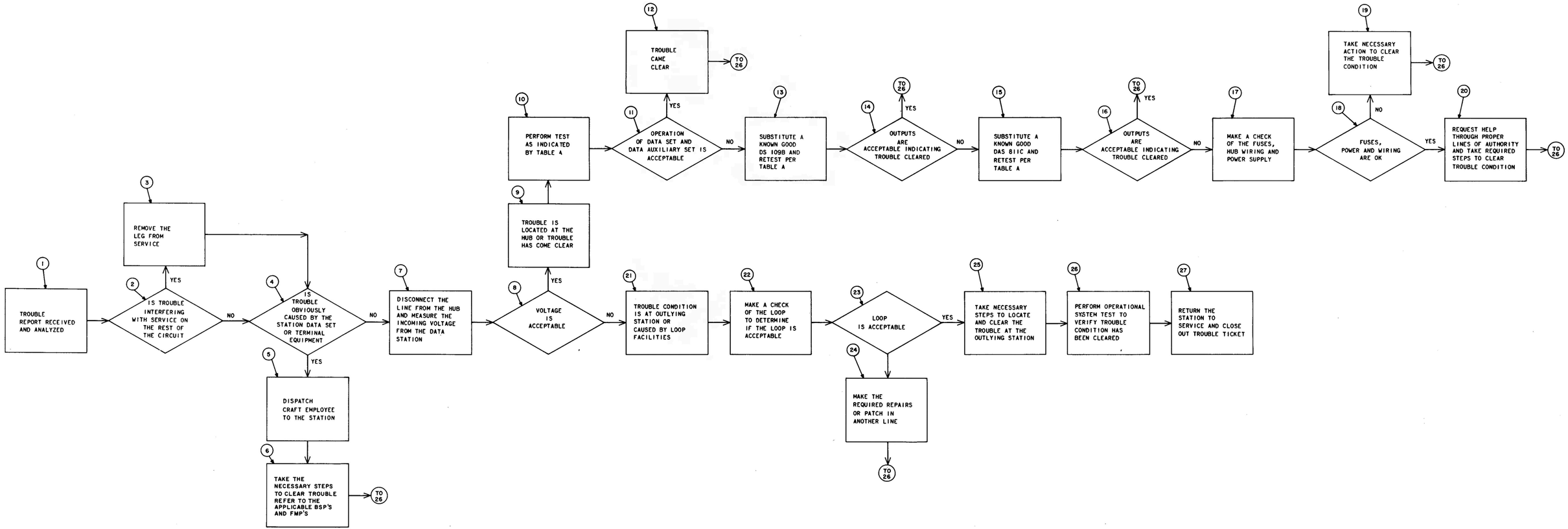


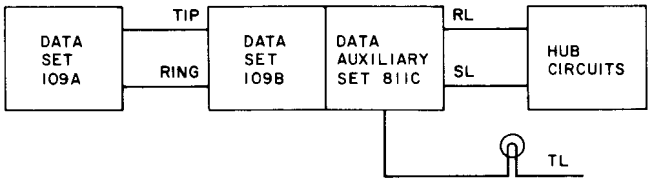
Fig. 5—Trouble Locating Procedures—Block Diagram

TABLE A

CONDITION	TIP-RING		TL LAMP	RL LEAD	SL LEAD
	VOLTAGE	CURRENT			
Idle mode	+4V	+3 mA	OFF	+60V	+60V
Space applied to Data Set 109B-type	+4V	−3 mA	ON	−30V	−30V
Mark applied to Data Set 109B-type	+4V	+3 mA	OFF	+60V	+60V
Space applied to the hub	−12V	−3 mA	OFF	−30V	−30V
Mark applied to hub with the loop open	+4V	0	ON	+60V Note 1	+60V Note 1

Note 1: If the screw switch S2 is closed for this step, the voltage on the RL lead and the SL lead is −30V.

Note 2: The tip to ring voltage is taken from pin 16 with respect to pin 15 to obtain the proper polarity. Loop current reference assumes that the current is leaving pin 16.



NOTE:
FOR HDX OPERATION, SCREW SWITCHES ON DAS 811C ARE SET AS FOLLOWS:

S1 CLOSED, S2 OPEN.

Fig. 6—System Testing Block Diagram