

**DATA SET 109E-TYPE**  
**SINGLE PRIVATE LINE STATION**  
**USING DATA AUXILIARY SET 820D-TYPE**  
**DESCRIPTION**

**1. GENERAL**

**1.01** This section covers the physical and functional description of Data Set 109E-type Single Private Line Station using Data Auxiliary Set (DAS) 820D-type. Information pertaining to Data Set 109E-type is found in the section entitled Data Set 109E-Type—Description (591-036-100). For purposes of this section, a data station is comprised of DAS 820D-type equipped with Data Set 109E-type and the AR17 circuit pack.

**1.02** The data station uses a tri-level current dc baseband transmission scheme. It operates over 2-wire metallic private line (PL) facilities at speeds up to 150 bauds. The data station is capable of operation in both the half-duplex (HDX) and full-duplex (FDX) modes.

**1.03** In the HDX mode the data station will operate with any Data Set 109-type. In the FDX mode, it will operate with Data Sets 109E-type, 109F-type, 109G-type (in the type-2 or type-3 hub), and 109H-type. The mode of operation (HDX or FDX) is governed by the remote station (or hub) and the terminal equipment.

**1.04** The data station can operate with a Data Set 109-type (Refer to 1.03) in station-to-station or station-to-hub arrangements. The data station is used with terminal equipment consisting of either a Bell System-provided teletypewriter (TTY) or a customer-provided terminal (CPT) which conforms to Electronic Industries Association (EIA) Standard RS-232-B.

**1.05** When used with DAS 820D-L1, the data station can be positioned on any surface (desk, table, etc) convenient to the customer and within range of the customer-provided interface cord (connected to the data terminal). When used with DAS 820D-L1A, the data station will mount in the kneewell of a 35- or 37-type TTY.

**2. PHYSICAL DESCRIPTION**

**2.01** The complete single PL station consists of DAS 820D-type, Data Set 109E-type, and AR16 or AR17 circuit pack.

**2.02** The data station assembled is approximately 11 inches wide, 11 inches deep, and 5-1/2 inches high.

**Data Auxiliary Set 820D-Type**

**2.03** DAS 820D-type consists basically of a dark gray plastic base which contains an 18A power unit and a 61A apparatus mounting. The 61A apparatus mounting provides for the mounting of the AR17 circuit pack and Data Set 109E-type. (The data set and circuit pack must be ordered separately.)

*Note:* Early models of the DAS 820D-type (DAS 820D1 and DAS 820D2) were equipped with the AR16 circuit pack. These models are rated MD. Information pertaining to later models of the DAS and AR17 circuit pack also apply to these earlier models (DAS 820D1, DAS 820D2, and AR16 circuit pack).

**2.04** DAS 820D-type is available in two models (DAS 820D-L1 and DAS 820D-L1A). Both models provide connections to the terminal equipment via a 25-pin connector J3. Connections for the transmission loop and external TEST key and lamp are provided by a 26-screw terminal board (TB 1). Differences in the models of the DAS are outlined in Table A.

**2.05** Models of DAS 820D-type provide the standard bipolar voltage interface (Table B) that conforms to EIA Standard RS-232-B. There is also a neutral current interface option (Table C) which must be used for connection to Bell System TTYs operating at 150 bauds or less or to any CPT

**SECTION 591-036-102**

operating at 75 bauds or less. The terminal equipment must provide a 680-ohm **resistive** impedance in the receiver for 20-mA operation and a contact closure in the transmitter, both isolated from ground. Current for the send and receive circuits is furnished by DAS 820D-L1 or -L1A.

**2.06** The 18A power unit of DAS 820D-type requires 0.15 amperes of a 60-Hz supply which may range from 105 to 129 volts. The power unit supplies +22 to +26 volts dc and -22 to -26 volts dc at 150 mA, each to all parts of the unit.

**2.07** Power is supplied to the 18A power unit of DAS 820D-L1 via the ac power cord (KS-14532-L16) (Fig. 1) by a customer-provided wall receptacle which meets the requirements outlined in 2.06 and is not under the control of a switch. In DAS 820D-L1A the power is supplied via the M3AY cord by the TTY in which the DAS is mounted.

**2.08** In DAS 820D-L1 the connection between connector J3 (Fig. 1), the data station, and the data terminal is made via a customer-supplied interface cord which must not exceed 50 feet in length. In the DAS 820D-L1A the connection to the TTY is made via TP-327470 cable assembly which must be ordered separately.

**2.09** The AR17 circuit pack consists of a single printed wiring board which measures 7 inches (length) by 5-1/2 inches (width) (Fig. 2). The AR17 circuit pack is equipped with screw switches which are used to provide the options. See Section

591-036-202 for more information pertaining to data station options.

**Data Set 109E-Type**

**2.10** Data Set 109E-type (Fig. 3) is a single plug-in printed circuit board that is approximately 5-1/2 inches wide, 7 inches long, and 1/2 inch thick. Screw switches on the data set provide line pad and option adjustments.

**2.11** Power requirements for Data Set 109E-type are at a maximum of 2.6 watts of +22 to +26 volts dc at 110 mA and 2.3 watts of -22 to -26 volts dc at 95 mA—a total of 4.9 watts per data set.

**3. FUNCTIONAL DESCRIPTION**

**3.01** The single PL data station provides station-to-station or station-to-hub connections between line facilities and CPTs or TTYs.

**Data Auxiliary Set 820D-Type**

**3.02** The basic function of DAS 820D-type is to provide a space for mounting the Data Set 109E-type and AR17 circuit pack. Also provided are terminals for connecting the tip and ring leads of the transmission loop, remote TEST keys and lamps, and external power connections.

**3.03** All EIA interface mark and space signals (positive and negative voltages, respectively) conform to specifications described in EIA Standard RS-232-B. Current interface mark and space signals (closed and open contacts, respectively, on the

**TABLE A**  
**MODELS OF DAS 820D-TYPE**

MODEL	TERMINAL EQUIPMENT	POWER CORD	PHYSICAL DESCRIPTION
DAS 820D-L1	CPT	KS-14532-L16	Supplied w/gray housing
DAS 820D-L1A	TTY	M3AY w/one spade-tipped end and one Hubbell 7593 connector end	Not supplied w/gray housing

**TABLE B**  
**EIA INTERFACE LEAD DESCRIPTION FOR CONNECTOR (J3)**

PIN NUMBER	LEAD DESIGNATION	LEAD DESCRIPTION
1	AA	<i>Protective Ground</i>
2	BA	<i>Transmitted Data</i> — Data transmitted to the remote station.
3	BB	<i>Received Data</i> — Data received from remote station.
4	CA	<i>Request to Send</i> — Signal to data set from the data terminal which signifies a request to transmit. Signal is looped back to local station on CB lead for a clear-to-send indication.
5	CB	<i>Clear to Send</i> — Signal to the terminal equipment signifies that data can be transmitted.
6	CC	<i>Data Set Ready</i> — This signal (from the station) is “OFF” when the station is in the local or test mode and is “ON” otherwise.
7	AB	<i>Signal Ground</i>
8	RS	<i>Received Line Signal Detector</i> — Signal to the local station when the data set detects current failure on the transmission loop.
9	+P	(Non-EIA) +24 volt power
10	-P	(Non-EIA) -24 volt power
12	CX	(Non-EIA) <i>Local Mode Control</i> — Signal applied to the data set by the terminal equipment which causes the data station to be placed in the local mode.

**TABLE C**  
**CURRENT INTERFACE LEAD DESCRIPTION FOR CONNECTOR (J3)**

PIN NO.	LEAD DESCRIPTION
2 10	<i>Transmit</i> — Data is sent by the data terminal via the transmit loop which consists of a path from pin 2 through the send contact of the TTY and back to pin 10.
3 10	<i>Receive</i> — Data is received from the remote station via the receive loop which consists of a path from pin 3 through the selector magnetic driver (SMD) and back to pin 10.
8 9	<i>Carrier Detector</i> — The carrier detector loop is a loop from pin 8 through the alarm circuits of the TTY, which must have an input impedance greater than 2000 ohms, and back through a lead to pin 9. Loss of current on the transmission loop will produce an open on pin 8 to the TTY. In normal operation a short to ground appears on pin 8 of the TTY.
12 9	<i>Local Mode Control</i> — A signal from the TTY operates the local relay on AR17 circuit pack. Closing the local mode contact in the TTY will form a loop from pin 12 through the local mode contact in the TTY and back through a lead to pin 9. Closing the local mode contact in the TTY puts the station in the local mode.

TTY) are converted into EIA signals (per EIA Standard RS-232-B).

#### **AR17 Circuit Pack**

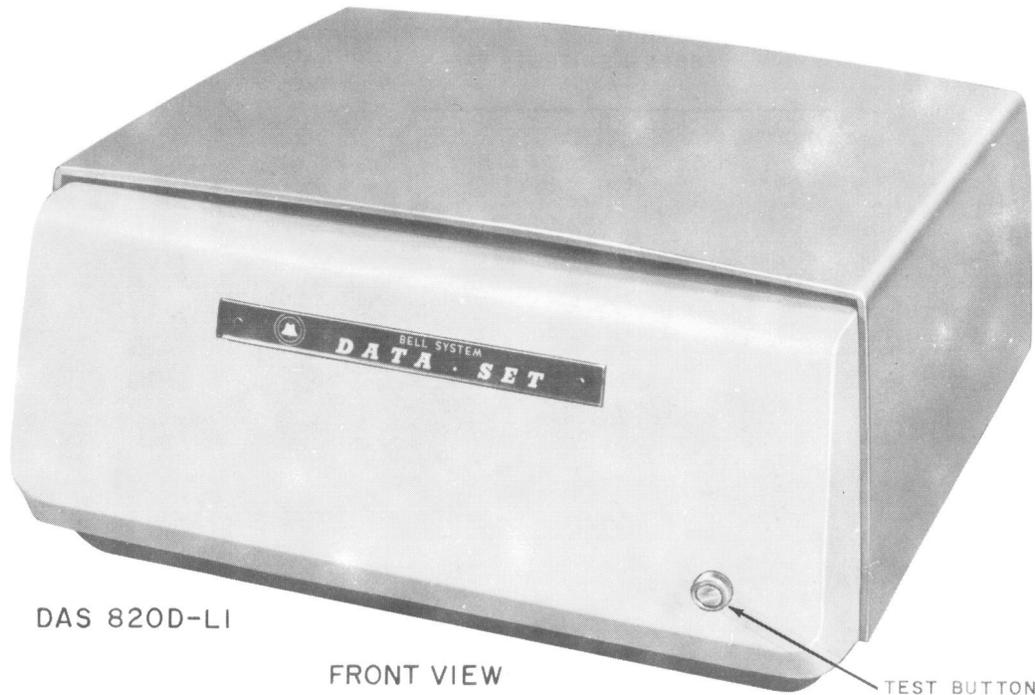
**3.04** AR17 circuit pack provides current or EIA interface options between the terminal equipment and Data Set 109E-type. Also provided by the circuit pack are the TEST and LOCAL relays and relay contacts. These relays provide loop-back capabilities to the remote station and terminal equipment, respectively. Options provided by AR17 circuit pack are described in Section 591-036-202.

**3.05** The functional description of the AR17 circuit pack is covered under two major functions which are local mode and test mode.

#### **LOCAL MODE**

**3.06** The local mode of operation allows the terminal equipment to be isolated from the data set. An ON condition on the CX lead of the AR17 circuit pack energizes the local mode relay. Contacts of the local relay cause the following.

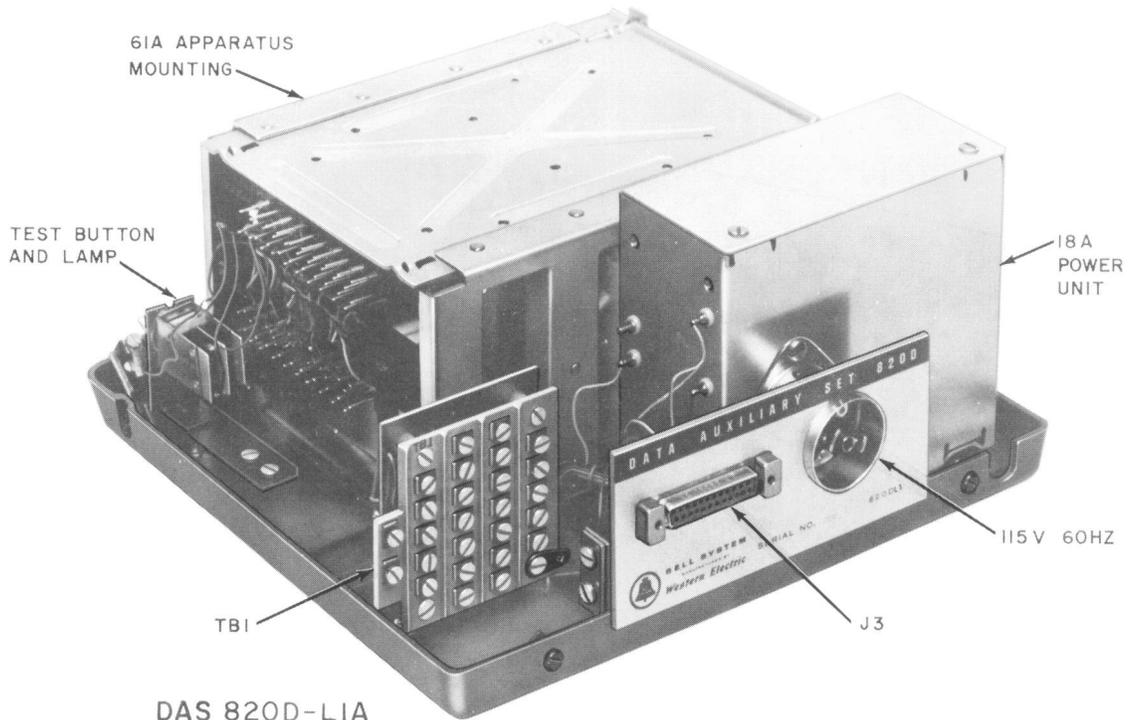
- (a) The transmit lead is connected to the receive lead of the data terminal and signals from the data set are blocked.
- (b) The transmit lead of the data set is clamped marking.
- (c) The data-set-ready lead is in an OFF condition.



DAS 820D-LI

FRONT VIEW

TEST BUTTON AND LAMP



DAS 820D-LIA

REAR VIEW

Fig. 1—Data Auxiliary Set 820D-Type

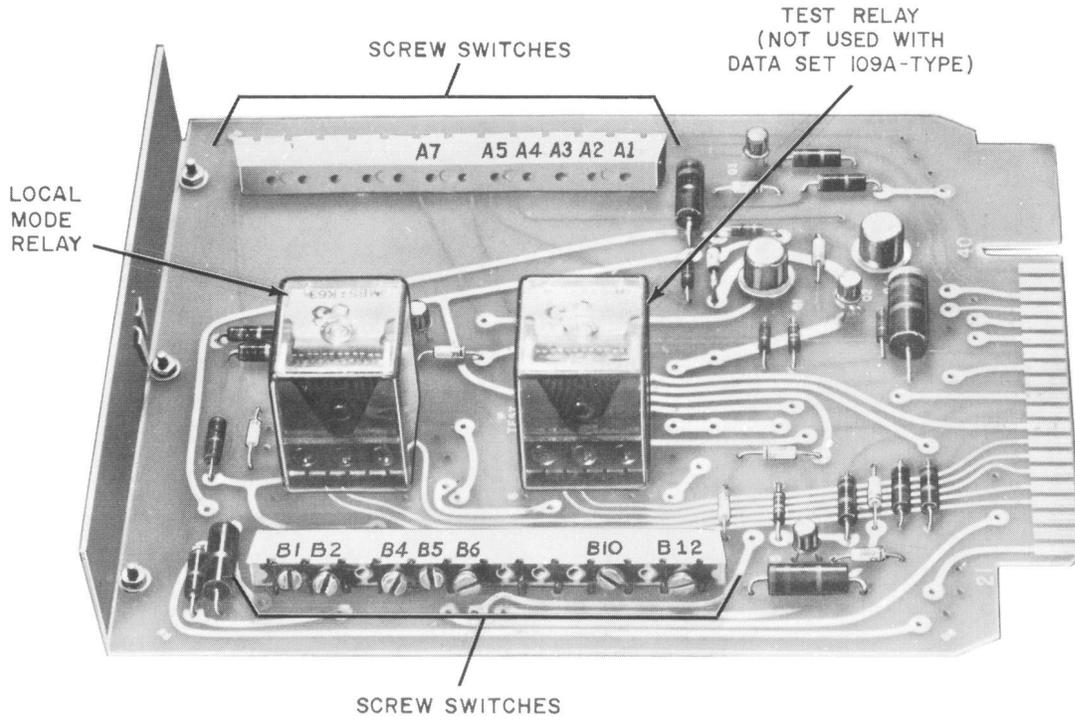


Fig. 2—AR17 Circuit Pack

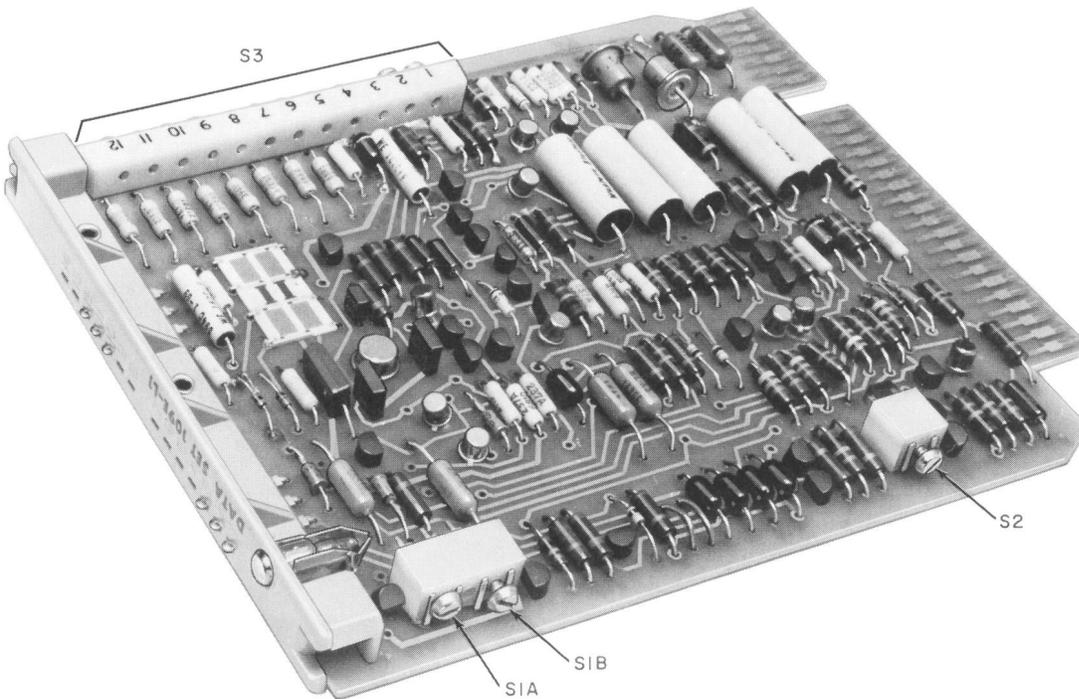


Fig. 3—Data Set 109E-L1

**TEST MODE**

**3.07** The purpose of the test mode is to provide for a loop-around test of incoming data (FDX) or to provide space signal (HDX). In FDX operation, signals on the receive lead are retransmitted over the transmit lead of the data set. In HDX operation, a continuous space is sent over the transmit lead. Additional contacts cause a TEST lamp on the DAS to light; an OFF indication on the data-set-ready lead (CC) is then applied to the data terminal. Connections for an external TEST key and TEST lamp are provided on TB 1 of the DAS.

**Data Set 109E-Type**

**3.08** Data Set 109E-type accepts EIA signals from the BA lead and converts them to low-current loop signals. Loop current signals from the remote set are converted to EIA signals, which are applied to the BB lead. More detailed information pertaining to the data set options and line pad adjustments may be found in Section 591-036-100.

**3.09** The functional description of the data set is covered in three major functions which are transmitting data, receiving data, and current detection.

**TRANSMITTING DATA**

**3.10** Data from the local terminal is applied through the AR17 circuit pack to the BA lead of the Data Set 109E-type. The signal is passed through the transmit driver to the transmitter. The signal is also applied to the mark-space detector to logically separate received data from transmitted data. The transmitter applies data to the metallic loop through the monitor bridge and the line pads. The line pads are adjusted during installation. Refer to Section 591-036-202.

**RECEIVING DATA**

**3.11** Data received from the metallic loop is detected in the monitor bridge and applied to the monitor amplifier. The signal is then applied to the mark-space detector which separates the received data from the transmitted data. The receive signal is passed through a low-pass filter,

then to the receive driver, and finally to the BB lead of the AR17 circuit pack.

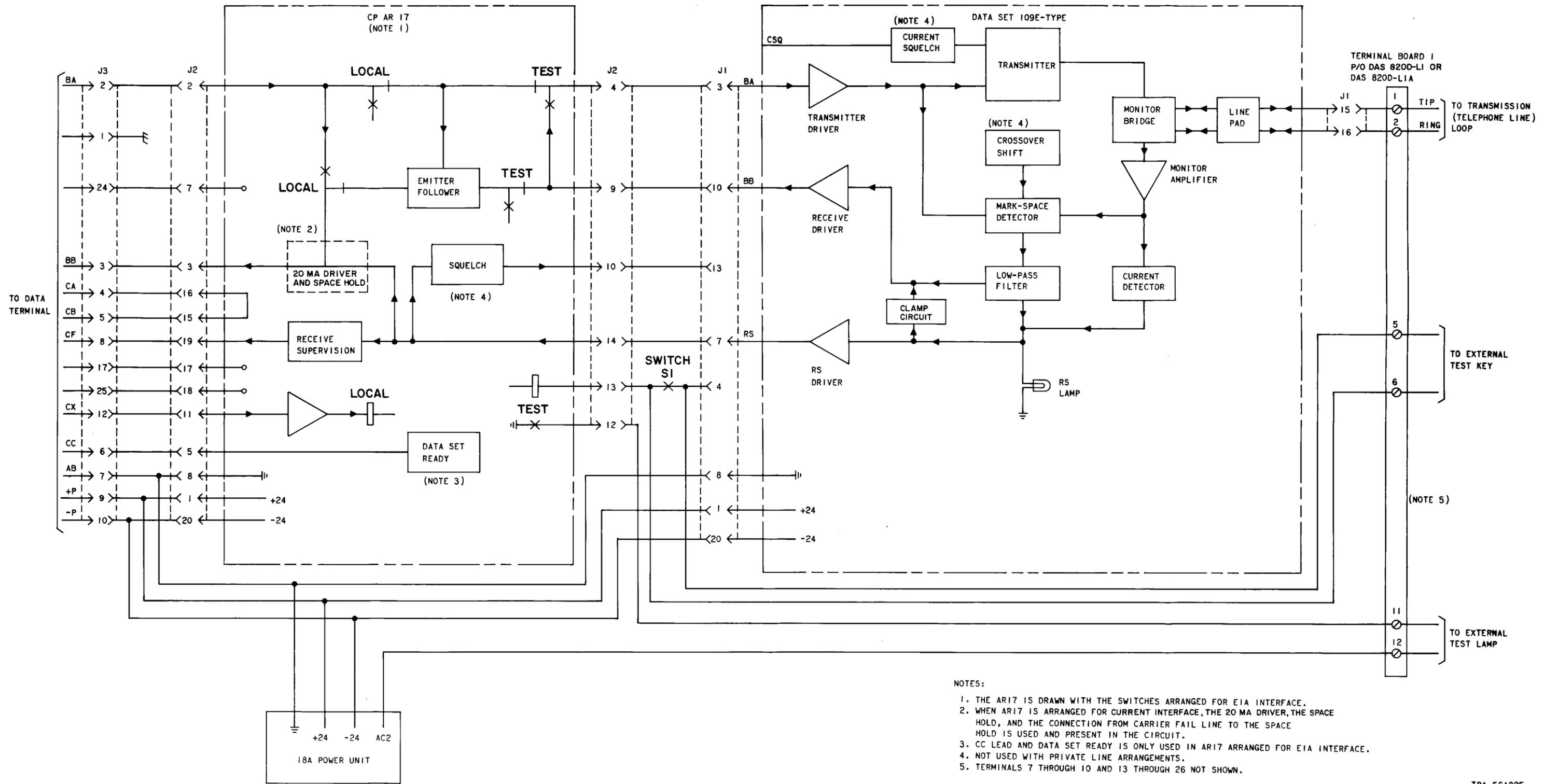
**CURRENT DETECTION**

**3.12** The output of the monitor amplifier is also applied to the current detector. When the loop current falls within the band of +0.8 to -1.3 mA for a minimum of 15 msec, a loss of current condition is detected. An RS lamp is then lighted and the RS lead of the AR17 circuit pack is switched from ON to OFF.

**4. REFERENCES**

**4.01** The following Bell System Practices (BSPs) contain information pertaining to the Data Set 109E single PL station.

SECTION	TITLE
598-058-100	Data Auxiliary Set 820D-Type—Identification
591-036-100	Data Set 109E-Type-Description
591-036-202	Data Set 109E-Type—Single Private Line Station—Using Data Auxiliary Set 820D-Type—Installation
591-036-302	Data Set 109E-Type—Single Private Line Station—Using Data Auxiliary Set 820D-Type—Maintenance
591-036-502	Data Set 109E-Type—Single Private Line Station—Using Data Auxiliary Set 820D-Type—Test Procedures.
<b>4.02</b>	The following schematic diagrams and circuit descriptions contain information pertaining to Data Set 109E-type single PL station.
SD & CD-1D198-01	Data Set 109E-L1
SD & CD-3D031-01	Data Systems Station—Data Auxiliary Sets 820D- and 820E-Type.



- NOTES:
1. THE AR17 IS DRAWN WITH THE SWITCHES ARRANGED FOR EIA INTERFACE.
  2. WHEN AR17 IS ARRANGED FOR CURRENT INTERFACE, THE 20 MA DRIVER, THE SPACE HOLD, AND THE CONNECTION FROM CARRIER FAIL LINE TO THE SPACE HOLD IS USED AND PRESENT IN THE CIRCUIT.
  3. CC LEAD AND DATA SET READY IS ONLY USED IN AR17 ARRANGED FOR EIA INTERFACE.
  4. NOT USED WITH PRIVATE LINE ARRANGEMENTS.
  5. TERMINALS 7 THROUGH 10 AND 13 THROUGH 26 NOT SHOWN.

Fig. 4—Data Set 109E-Type—Single PL Station Using Data Auxiliary Set 820D-Type Simplified Block Diagram

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