DATA SET 109C-TYPE
USED IN
10-TYPE DATA LINE CONCENTRATOR SYSTEM (DATREX*)
DESCRIPTION AND OPERATION

1. GENERAL

1.01 This section covers the physical and functional description and operating procedures for Data Set 109C-L1 and Data Set 109C-L1/2 when used in data line concentrator applications.

* Service mark of the Bell System.

1.02 Data Set 109C-type (Fig. 1) is a low-speed (up to 300 bauds), half-duplex, serial transmission, ungrounded dc (baseband) data set. It is specifically designed to mount within a suitably configured model 33 or 35 teletypewriter (TTY). The data set requires approximately 3 watts peak power of filtered +24 volts dc which is normally supplied by the TTY call control unit.

1.03 Data Set 109C-type is installed within a model 33 or 35 TTY directly in front of the call control unit, under the bezel on the right-hand side. The data set provides an interface between the send contacts and selector magnet driver of the model 33 or 35 TTY and a metallic loop.

1.04 Data Set 109C-type is limited to use on a 2-wire metallic loop. The transmission loop used by the data set cannot be equipped with anything that will break the dc path of the loop. The loop cannot be carrier derived, and ground return cannot be used.

1.05 Data Set 109C-type operates in ambient temperatures ranging from 40° to 120° F, and in relative humidity up to 95 percent.

1.06 The schematic drawing and circuit description covering Data Set 109C-type are SD- and CD-1D164-01.

2. PHYSICAL DESCRIPTION

2.01 Data Set 109C-L1 (Fig. 1) consists of a metal bracket, a 635T2 key, and an EU1 circuit pack.

(a) The 635T2 key is made up of six buttons, each equipped with a lamp and a designation card, and is attached to the bracket by means of a retainer.

(b) The EU1 printed circuit pack is attached to the baseplate with four screws.

(c) Interconnections to the circuit packs, the 635T2 key, teletypewriter, metallic loop, and dc power are made through the screw terminals at the rear of the card.

2.02 Data Set 109C-L1/2 consists of a Data Set 109C-L1 and an ET1 circuit pack mounted on the EU1 circuit pack. The ET1 circuit pack is mounted by means of standoffs which snap into holes provided in the EU1 circuit pack. Interconnections to the ET1 circuit pack are made through screw terminals and spade-tipped leads on the rear of the ET1 circuit pack.

2.03 Data Set 109C-type is approximately 7.38 inches long, 3.75 inches high, and 4.25 inches wide. It weighs approximately 1 pound 6 ounces.

3. FUNCTIONAL DESCRIPTION

3.01 Data Set 109C-type is a dc (baseband) half-duplex (HDX) data set designed to operate over a metallic loop up to 2000 ohms resistance and up to 1 microfarad capacity. Polar dc loop current of 3 mA is used to communicate over a 2-wire metallic loop with any other Data Set 109-type.

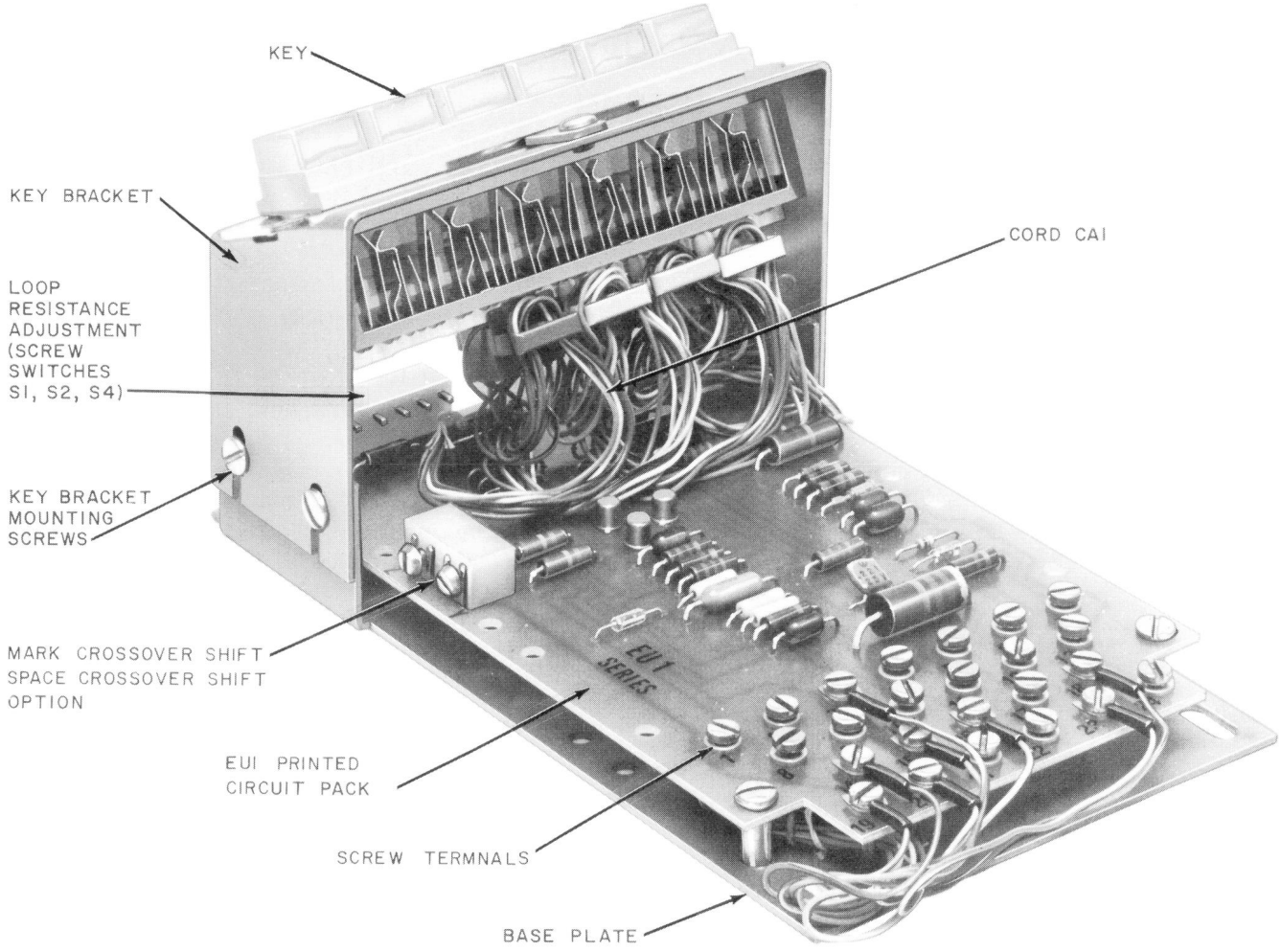

Fig. 1—Data Set 109C-1

3.02 Data Set 109C-L1 includes an EU1 circuit pack which functionally consists of a transmitter, a receiver, and a built-in line pad. See Fig. 2.

3.03 The transmitter is keyed by the send contacts in the TTY. When the send contacts are closed, the transmitter sends a marking voltage (+4.3 volts); when the send contacts are open, the transmitter sends a spacing voltage (−12.9 volts). These signal voltages are applied to the loop through a line pad.

3.04 The receiver consists of a differential amplifier and a selector magnet driver (SMD) coupling circuit. The input to the differential amplifier is derived from a resistor in series with the metallic loop. See Fig. 3. Voltage across the resistor is proportional to the loop current signals. When the differential amplifier detects a marking current on the metallic loop, the SMD coupling circuit is driven into saturation. When the differential amplifier detects a spacing current on the loop, the SMD coupling circuit is cut off. These two states of the SMD coupling circuit cause the teletypewriter to receive a mark or a space.

3.05 External to the EU1 circuit pack but interconnected to it is a 635T2 key, which provides a switching control for selecting the mode operation. Connections between the key and circuit pack are made via a spade-ended cord and screw terminals located on the rear of the circuit pack. The key is equipped with a cord (CA1) which plugs

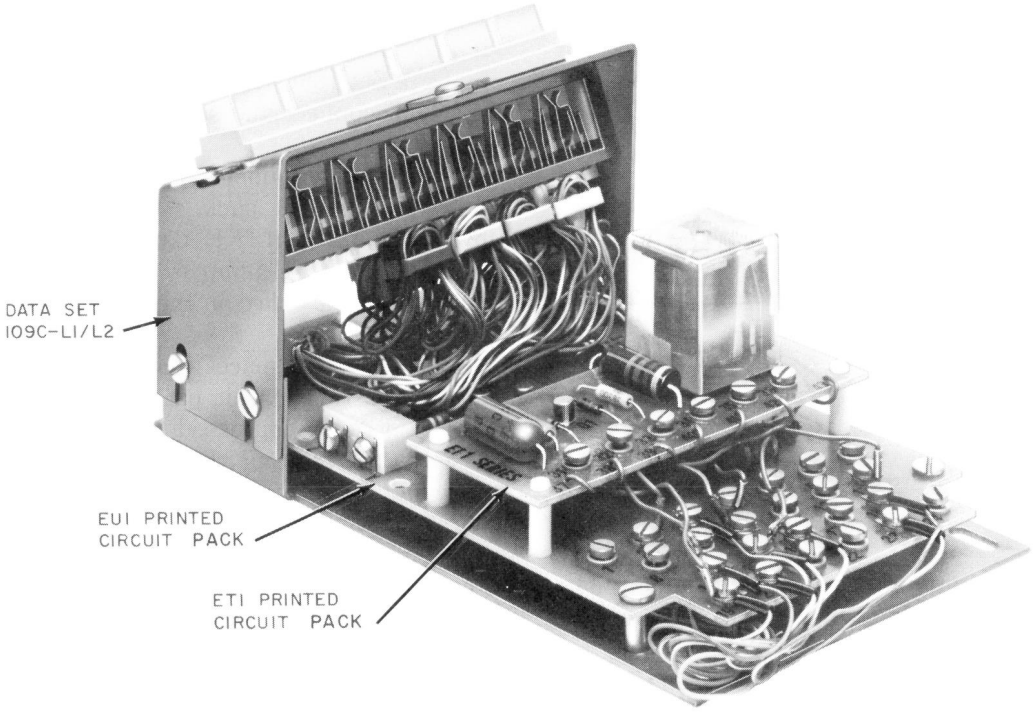

Fig. 2—Data Set 109C-L1/2

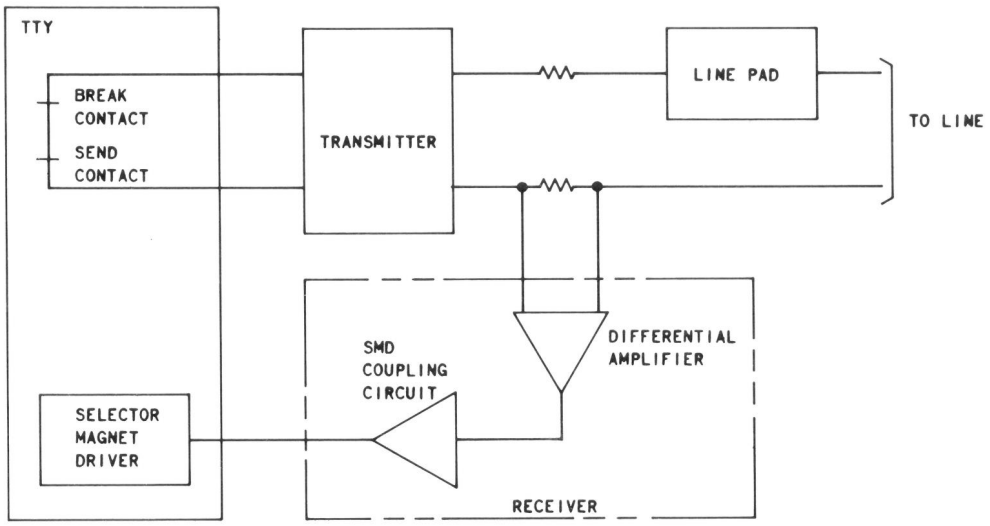

Fig. 3—Block Diagram of Data Set 109C-L1

into the key at one end. The free end is terminated with spade lugs which permit the installer to rearrange connections to the circuit pack for different required features. Key designations are shown in Fig. 4.

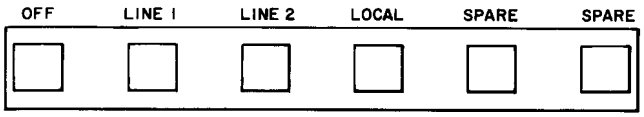

Fig. 4—Data Set 109C-L1 Key Arrangement

3.06 Mark Crossover Shift, Space Crossover Shift:

(a) Strapping option Y causes the incoming data lead to be marking when the loop is opened.

(b) Strapping option Z causes the incoming data lead to be spacing when the loop is open with LINE 1 or LINE 2 button depressed. When the data set is off, the incoming data lead is marking. Switching the logic of this feature prevents hits when the data set is turned off.

3.07 A resistor pad arrangement is built into the data set EU1 circuit pack, allowing resistance to be added to the metallic loop. By opening or closing various screw switch combinations, the line can be built out to a nominal value of 2000 ohms, in 8 steps of approximately 270 ohms each. See Fig. 1 and Table A.

3.08 Data Set 109C-L1/2 includes Data Set 109C-L1 and a snap-on circuit pack ET1. Functionally, it provides two additional features not provided by Data Set 109C-L1. These are end of transmission (EOT) disconnect and send-space timer (SST).

3.09 EOT disconnect is a feature of the optional ET1 circuit pack. When an EOT is detected by the TTY, the LINE 1 or LINE 2 lamp remains lighted, the OFF lamp is lighted, and the loop is opened via the relay on the ET1 circuit pack.

3.10 The send-space timer is another feature of the ET1 circuit pack. When the break key on the TTY is depressed and held, a delay circuit is activated limiting the length of the transmitted spacing signal to approximately 500 ms.

Note: The key must be held down in excess of 500 ms to ensure proper operation of the SST circuit.

4. OPERATION

4.01 When used for data line concentrator (DATREX) service, Data Set 109C-type is arranged as shown in the simplified block diagram (Fig. 5). Table B lists the key and lamp positions, designations, and functions for this application.

4.02 ***OFF:*** When the OFF button is depressed, the data set is disconnected from the metallic loop, and the interface lead to the motor control relay is opened.

TABLE A

LINE PAD RESISTANCE VALUES

PAD RESISTANCE	SCREW SWITCH POSITION		
	S4	S2	S1
0	CLOSE	CLOSE	CLOSE
270	CLOSE	CLOSE	OPEN
510	CLOSE	OPEN	CLOSE
780	CLOSE	OPEN	OPEN
1100	OPEN	CLOSE	CLOSE
1370	OPEN	CLOSE	OPEN
1610	OPEN	OPEN	CLOSE
1880	OPEN	OPEN	OPEN

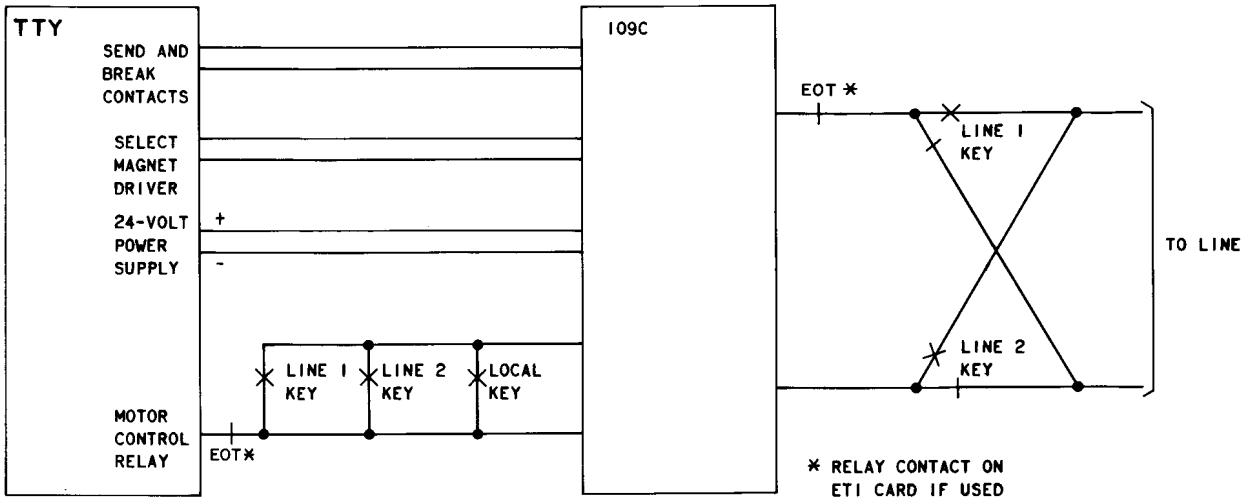

Fig. 5—Data Set 109C-L1 Dual Access Data Line Concentrator Service, Major Switching Functions

TABLE B

KEY FUNCTIONS "DATREX"

BUTTON POSITION	BUTTON DESIGNATION	FUNCTION
1	OFF*	The data set is disconnected from the loop. Motor control relay in TTY is released.
2	LINE 1†	The data set is connected to the loop.
3	LINE 2†	The data set is connected to the loop with the connections to tip and ring reversed. *Note:* Operation of this button obtains dual access. For single access, this button is permanently blocked mechanically.
4	LOCAL†	The data set is disconnected from the line and terminated in a dummy line circuit to derive local copy.
5	SPARE	
6	SPARE	

* If Data Set 109C-type is equipped with an ET1 circuit pack and EOT is received, the OFF lamp is lighted, LINE 1 or LINE 2 lamp remains lighted, the loop is opened via relay contacts on the ET1 circuit pack, and the TTY motor is switched off via the interface lead to the motor control relay. Before another call may be placed, the OFF button must be depressed. Depressing the OFF button extinguishes both lamps and releases EOT relay on ET1 circuit pack.

† Operating button LINE 1, LINE 2, or LOCAL lights a lamp under the depressed button and closes a contact which will permit the TTY motor control relay to be turned on via interface lead.

To Place A Call

4.03 ***LINE 1:*** When the LINE 1 button is depressed, the data set is connected to the metallic loop, the LINE 1 lamp is lighted, and the TTY motor control relay is operated via the interface lead to the TTY. The data set applies a marking voltage of approximately +4 volts to the metallic loop. The line scanner of the data line concentrator recognizes the +4 volts as a request for service to trunk group A, and connects the line to an available trunk which terminates in a Data Set 109D-type. When the metallic line between the data sets is completed, exchange of data can begin. If there is no idle trunk available, the scanner seizes the first line requesting service and stops while waiting for the next idle trunk. The concentrator is equipped with a camp-on generator which sends a short spacing signal to all stations requesting service and unable to connect during the all-trunks-busy condition. This camp-on signal can be recognized as a momentary click when the TTY selects a delete character.

4.04 ***LINE 2 (Used in dual access only):*** When the LINE 2 button is depressed, the LINE 2 lamp is lighted, the motor control relay is operated via the interface lead to the TTY, and the data set is connected to the metallic loop with the connection to tip and ring reversed. The concentrator senses this reversal of polarity, and proceeds as described for LINE 1, except the data set is connected to trunk group B.

> ***Note:*** If a single-access concentrator is used, the LINE 2 button is blocked.

Local Mode

4.05 ***LOCAL:*** When this button is depressed, the data set is disconnected from the metallic loop and connected to a dummy line circuit, the motor control relay is operated via the interface lead to the TTY, and the LOCAL lamp is lighted. The receiver detects current in the normal manner and drives the selector magnet driver, causing local copy to be printed.

4.06 ***EOT Option:*** When an EOT character is detected by the local TTY station equipped with the optional ET1 circuit pack, the following conditions exist.

(a) The LINE 1 or LINE 2 lamp (whichever is the case) remains lighted.

(b) The OFF lamp is lighted.

(c) The metallic loop is opened via the relay on the ET1 circuit pack.

(d) The TTY motor is turned off via the interface lead to the motor control relay.

In order to place another call, it is necessary to depress the OFF button (this extinguishes both lamps) and then depress the desired LINE 1 or LINE 2 button again.