

DATA SET 108B
DESCRIPTION

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1. GENERAL

1.01 This section gives a physical and functional description of the data set 108B which is used on private line telegraph loops at speeds up to 150 bauds. This includes information on the way the data set operates and the relationship of the data set to the other components of the system.

1.02 This section is reissued to:

- (a) Include information pertaining to the data set 108B, series 7
- (b) Add this notice that the J70165A-1 mounting has been rated manufacture discontinued (MD)
- (c) Add this notice that the data set 108B and data auxiliary set (DAS) 811C have been rated for additions and maintenance (A&M).

Note: Since the J70165A-1 mounting is rated MD, data set 108-type hub installations requiring new mounting space *must* use data sets 108D, 108E, DAS 811K, and J70165G mounting. Where spare positions are available in existing J70165A-1 mountings, they can be field modified per drawing SD-70955-01, Issue 12B, to mount data sets 108D or 108E and DAS 811K.

1.03 Data set 108B is designed to work in conjunction with the DAS 811C at a No. 2, 9B, or DOTC serviceboard. Data set 108B and DAS 811C are housed in a J70165A-1 data mounting which is located in the central office, and, in

conjunction with the data set 108A or 108E located at the station, provide an ac-type loop transmission scheme.

1.04 The No. 2-type dc hub voltages, representing data received from other stations, are fed to the 108B by the 811C which provides the connections to the hub by converting the high-voltage hub signals to low-level signals which are compatible with the 108B. The 108B converts the dc signals to frequency-shifted signals for transmission over the local loop. Conversely, the incoming ac signals received from the local loop (data set 108A or 108E) are converted by the 108B to dc signals which are converted to hub voltages by the 811C. Refer to Fig. 1 for a block diagram showing the relationship of these units.

1.05 The data set 108B-type (Fig. 2 and 3) employs frequency shift modulation with a frequency shift of +100 Hz representing a mark and -100 Hz representing a space. The sending center frequency of the F1 channel is 1170 Hz, and the receiving center frequency of the F2 channel is 2125 Hz.

1.06 Since the ac signals occupy different frequency bands and are transmitted in different directions, the station (108A or 108E) and the 108B are connected by two separate one-way (F1 and F2) channels. This makes it possible to obtain full-duplex operation on either a 2- or 4-wire loop. Half-duplex operation is available when required. This is accomplished by strapping of the 811C (Fig. 4).

1.07 The sending transmission level for the data set is preset at -10 ±2 dBm for a 600-ohm loop 4-wire circuit, or -12 ±2.5 dBm for a 900-ohm loop 2-wire circuit. The data set will operate satisfactorily over voiceband loops and trunks which allow the incoming carrier frequency to arrive at a signal strength greater than -36 dBm at a 4-wire termination, or -34 dBm at a 2-wire termination.

1.08 A typical ac loop consists of a local loop section between the station data set and its

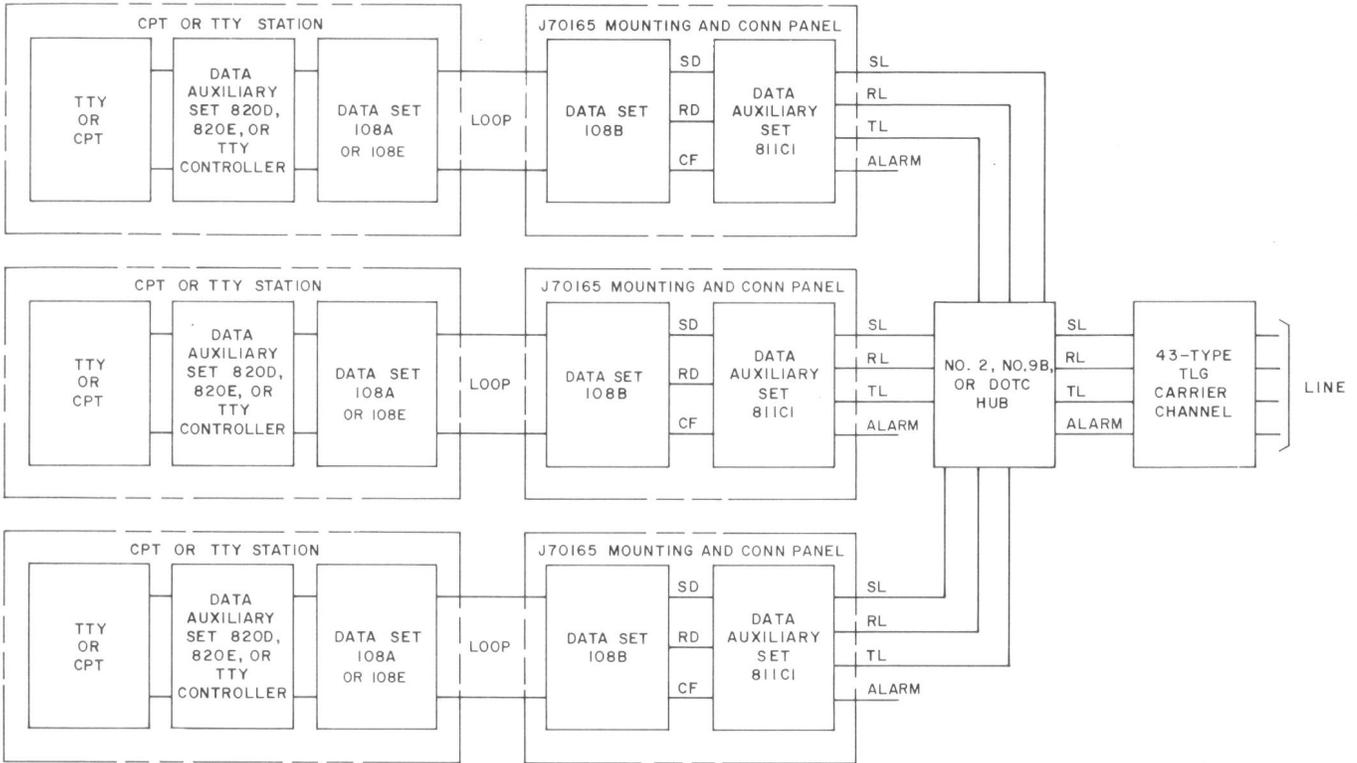


Fig. 1—System Block Diagram

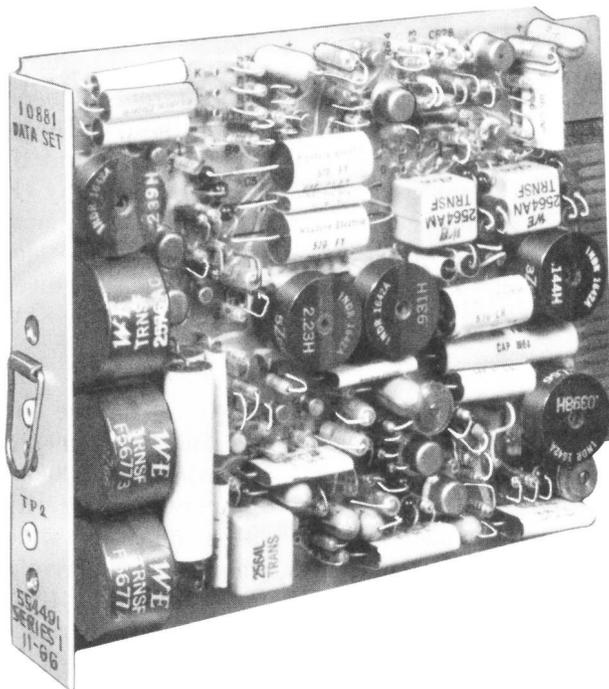


Fig. 2—Data Set 108B, Series 2

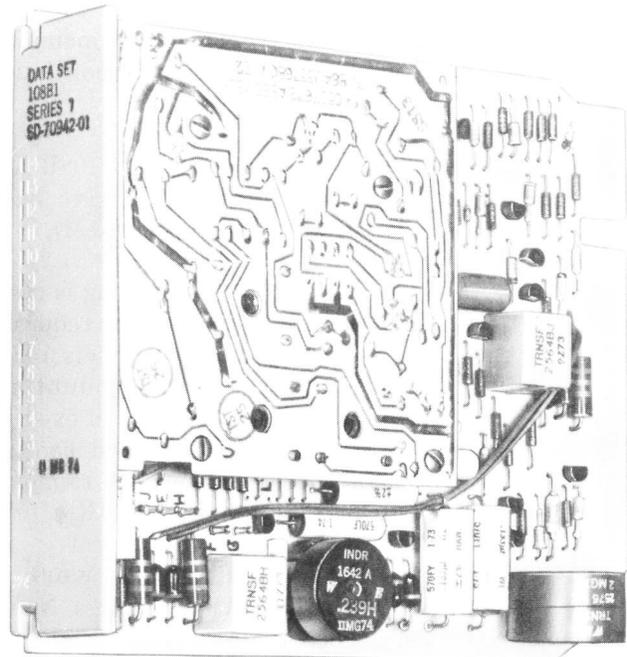


Fig. 3—Data Set 108B, Series 7

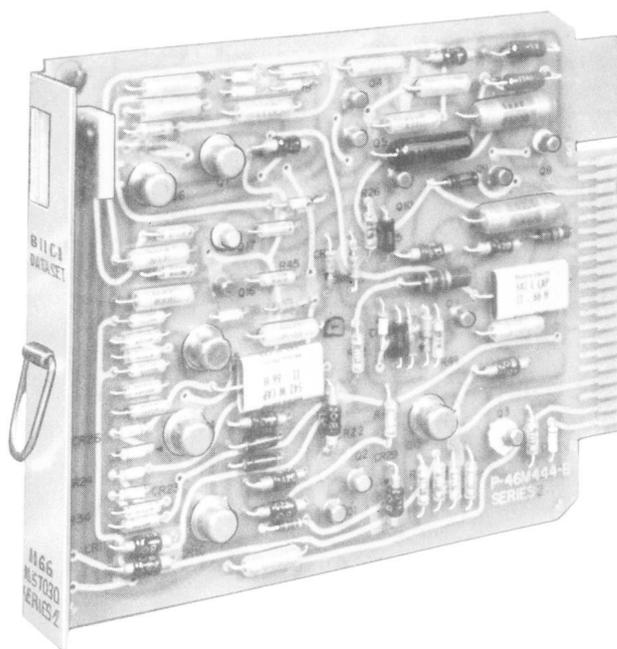


Fig. 4—Data Auxiliary Set 811C

local central office and a trunk section between the local central office and the hub point. The 1000-Hz loss for the loop section may be 0-dB minimum to 10-dB maximum. The 1000-Hz loss for the trunk section should be 4-dB nominal, 6-dB maximum design limit between voice-frequency cross-connecting points.

1.09 The data set 108B supplies the following signals to the 811C.

- (1) A mark condition is represented by a ground on the RD lead.
- (2) A space is represented by -24 volts on the RD lead.
- (3) Carrier received is represented by $+24$ volts on the CF lead.
- (4) Carrier fail or loss is represented by a small negative voltage on the CF lead.

1.10 The data set 108B receives the following signals from the 811C.

- (1) A $+24$ volts applied through an impedance on the SD lead represents a mark.
- (2) A ground applied to the SD lead represents a space.

1.11 The data set 108B includes two line transformers for 4-wire connections to paired 600-ohm facilities. A connection to a 2-wire facility can be made by strapping one of the line transformers to serve as a hybrid coil. Refer to 3.08 for information on the strapping required for 2- or 4-wire service.

1.12 The data set 108B is designed to operate satisfactorily within the environmental condition ranges specified below:

Ambient Temperature Range: 40 to 120°F

Relative Humidity Range: 20 to 95 percent.

1.13 The data set requires approximately five watts of filtered $+24$ and -24 Vdc power which is normally supplied by the central office battery.

2. PHYSICAL DESCRIPTION

2.01 The data set 108B, series 2, is a printed circuit board and is shown in Fig. 2. The data set 108B, series 7, consists of two printed circuit boards mounted in piggyback fashion and is shown in Fig. 3.

2.02 The DAS 811C is a printed circuit board and is shown by Fig. 4. Refer to the section entitled Data Auxiliary Set 811C—Description (312-801-100) for additional information on the 811C.

2.03 The data set 108B and DAS 811C are both inserted into adjacent slots in a J70165A-1 mounting panel which contains the necessary fuses and connectors. The J70165A-1 mounting panel is designed for 23-inch relay rack mounting and is shown by Fig. 5.

3. FUNCTIONAL DESCRIPTION

3.01 The data set 108B receives the ac signals from the data set 108A or 108E located at the station and converts these signals to low-level dc voltages which are supplied to the DAS 811C. The data set 108B receives dc voltages from the 811C and converts these voltages to ac signals for

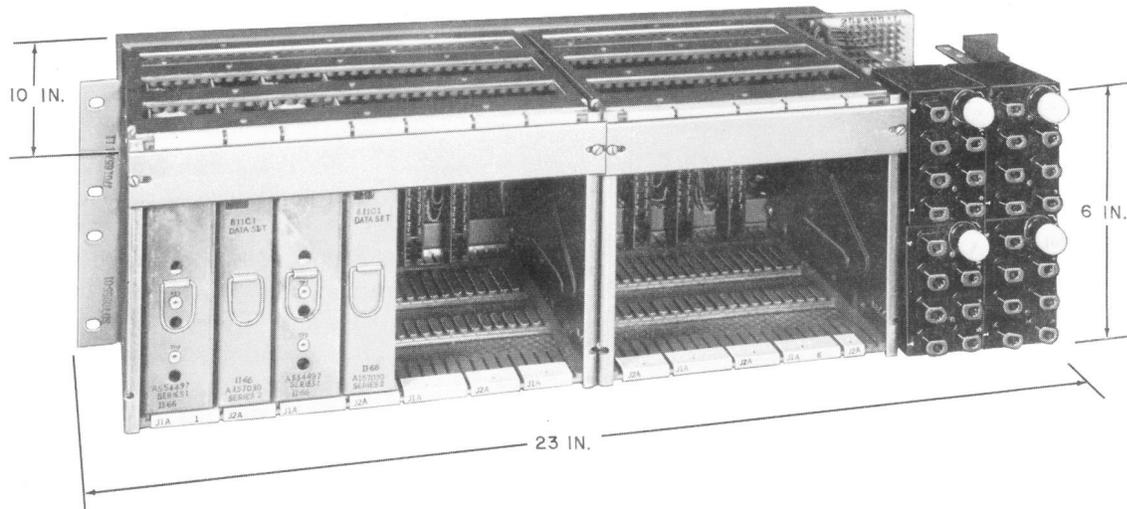


Fig. 5—J70165A-1 Mounting Panel (MD) for Data Set 108B and Data Auxiliary Set 811C

transmission to the data set 108A or 108E. Fig. 6 gives a functional block diagram of the data set 108B.

3.02 The data set 108B has an F1 and an F2 channel. The F1 channel is used to transmit from the hub toward the station. The F2 channel is used to receive data transmitted from the data station to the hub serviceboard.

3.03 The modulator circuit which transmits the F1 channel consists of a keyer, an oscillator, a sending buffer amplifier, and a line transformer.

3.04 The keyer receives a mark (positive voltage) or a space (ground) signal from the DAS 811C.

3.05 When a positive voltage (mark) is supplied to the keyer, a portion of an inductor is connected to the tank circuit of the oscillator which results in an oscillator output of 1270 Hz (mark). The application of a ground (space) to the keyer results in the connection of the full winding of the inductor to the tank circuit. This shifts the frequency to a 1070-Hz output for a space signal.

3.06 The output of the oscillator is fed to a sending low-pass filter. The filter attenuates the oscillator modulation products in the F2 receiving band, thereby reducing the balance requirements

of the hybrid coil used to obtain 2-wire operation of the data set.

3.07 The sending buffer amplifier is used to deliver a preset power level to drive the line. The amplifier isolates the line and provides a suitable termination for the low-pass filter.

3.08 The line transformer T1 can be strapped to provide for connection to either a nominal 600-ohm 4-wire line or a nominal 900-ohm 2-wire line. For strapping information, refer to Table A.

3.09 The demodulator circuit receiving the F2 channel consists of a receiving buffer amplifier, bandpass filter, limiter stage, discriminator, and a discriminator dc amplifier.

3.10 Depending on the mode of operation (2- or 4-wire), line transformer T3 (4-wire) or T1 (2-wire) may be connected to the receiving buffer amplifier. This amplifier isolates the telephone line from variations in impedance of the bandpass filter which follows this amplifier.

3.11 The receiving filter has a pass band of 2125 ± 150 Hz. This serves to reduce interference by attenuating out-of-band line noise.

3.12 The output of the receiving bandpass filter is connected to the first stage of a 2-stage

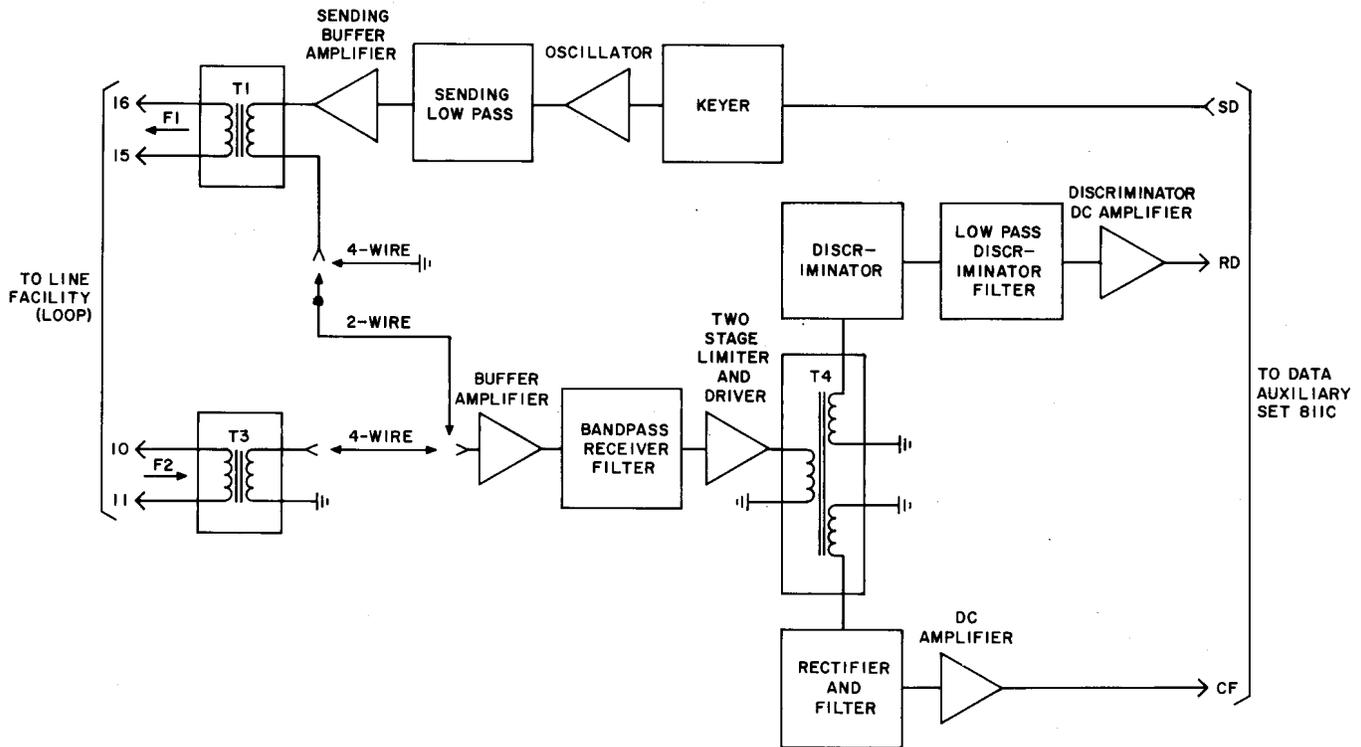


Fig. 6—Data Set 108B—Functional Block Diagram

◆TABLE A◆

2-WIRE/4-WIRE OPTIONS

OPTION	FEATURE	STRAP TERMINAL	CONNECT TERMINALS
Z	4-wire operation	G to H I to J	15 and 16 to send line 10 and 11 to receive line
X	2-wire operation for H88 (HC) cable	G to J F to H	15 and 16 to line
Y	2-wire operation for NL (HC) cable	G to J E to H	15 and 16 to line

limiter. The final output of the second stage of the limiter is connected to the primary winding of transformer T4.

3.13 Transformer T4 has two secondary windings. One of the secondary windings of the transformer is fed to a discriminator circuit. The function of the discriminator is to convert the carrier frequency variations of the limiter output

into dc voltage variations at the discriminator output. The positive or negative signal resulting from the discriminator is filtered to remove any ripples and applied to the discriminator dc amplifier.

3.14 The discriminator dc amplifier provides impedance matching and amplifies the output of the discriminator circuit. A positive signal, representing a mark from the discriminator, results

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in a ground being applied to the RD lead. A negative signal, representing a space from the discriminator, results in a -24 volt signal being applied to the RD lead.

3.15 A detection circuit is provided to signal loss of carrier. A secondary winding of transformer T4 supplies the ac signal to a rectifier filter. The resulting dc voltage is proportional to the limiter output. This signal is supplied to a transistor circuit which is biased so that loss of the signal results in a small negative voltage on the CF lead instead of the positive voltage which is present when the signal is above the predetermined minimum level. Due to the design of the circuit, a carrier fail indication is given approximately 150 ms after the carrier has actually failed or has been lost. This prevents the carrier fail alarm operation when the carrier is interrupted momentarily or momentarily falls below the predetermined acceptable level.

3.16 Hybrid strapping is predetermined by the loop impedance of the facility. Table B shows typical loop impedances and the appropriate strapping when the cable makeup is known. Optimum transhybrid balance for the two strap options is indicated in the STRAP CONNECTION column for

use if cable makeup is unknown and impedance measurements at 1170 Hz can be made.

4. REFERENCES

4.01 For additional information on data set 108B and the associated equipment, refer to the following items:

- (1) SD-70942-01 (Data Set 108B, Schematic Diagram)
- (2) CD-70942-01 (Data Set 108B, Circuit Description)
- (3) SD-70963-01 (Data Auxiliary Set 811C, Schematic Diagram)
- (4) CD-70963-01 (Data Auxiliary Set 811C, Circuit Description)
- (5) Bell System Practice 312-801-100, Data Auxiliary Set 811C, Description
- (6) SD-70955-01 (Data Systems Connecting Circuits for Data Sets 108B, 108D, 108E, 109B, 109G, and 110B and Data Auxiliary Sets 811C and 811K in Central Office, Schematic Diagram)

TABLE B

TYPICAL LOOP IMPEDANCE

TYPICAL LOOP FACILITY	TYPICAL LOOP IMPEDANCE MEASURED AT 1170 Hz	STRAP CONNECTION
26 NL (HC)	900	F-H
24 NL (HC)	700	E-H
22 NL (HC)	550	
19 NL (HC)	400	
16 NL (HC)	280	
26 H88 (HC)	1180	F-H
24 H88 (HC)	1080	
22 H88 (HC)	1060	
19 H88 (HC)	1030	
16 H88 (HC)	1130	

NL — Nonloaded (HC) — High Capacity

(7) CD-70955-01 (Data Systems Connecting Circuits for Data Sets 108B, 108D, 108E, 109B, 109G, and 110B and Data Auxiliary Sets 811C and 811K in Central Office, Circuit Description).

(8) Bell System Practices 807-017-150 [(J70165) Mounting and Connecting Unit—Central Office Data Sets].