DATA SET 113A-L1B

DESCRIPTION AND OPERATION

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1. GENERAL

1.01 This section describes the physical and functional characteristics of data set (DS) 113A-L1B. Information concerning the Bell System- or customer-provided equipment (CPE) is not included in this section.

1.02 When this section is reissued, the reason for reissue will be contained in this paragraph.

1.03 DS 113A-L1B requires a 565HK or 2565HK telephone set with internal wiring changes (see Fig. 1). The telephone must be ordered separately. DS 113A-L1B is an originate-only, low-speed (up to 300 baud), full-duplex (FDX), frequency-shift-keyed (FSK), serial data set that transmits in the f_1 frequency band and receives in the f_2 frequency band, as shown in Table A. It is designed for use with Bell System- or customer-provided data terminals to provide Dataphone® service over the switched network.

1.04 DS 113A-L1B is compatible with all data sets 103-type, 113B, and 113D. It is intended as a replacement for the older DS 113A-type and maintains the same capabilities.

1.05 Calls must be originated and answered manually. The data set/CPE interface circuitry is similar in many respects to the Electronic Industries Association (EIA) standard RS-232-C. The data and control interface leads are listed in Table B along with their on/off or mark/space potentials.

Fig. 1—DS113A-L1B and 565HK Telephone

TABLE A

TRANSMIT AND RECEIVE FREQUENCIES

BAND	FREQ	DATA SIGNAL
f_1 (Transmit)	1270 Hz	Mark
	1070 Hz	Space
f_2 (Receive)	2225 Hz	Mark
	2025 Hz	Space

2. PHYSICAL DESCRIPTION

A. DS 113A-L1B

2.01 DS 113A-L1B consists of a single printed circuit pack; an extruded aluminum housing with plastic faceplates, a 2012B transformer, a D4-BT cord; and an M13F cord.

B. Circuit Pack

2.02 The circuit pack (Fig. 2) is 10.26 inches long, 5.5 inches wide, and 1.5 inches high. The assembly weighs approximately 2 pounds.

2.03 One push-to-operate, push-to-release button, labeled TM, is accessible through the faceplate.

2.04 Connections to the circuit pack from the associated 565HK or 2565HK telephone set are made via an M13F cord to a 25-pin plug on the rear of the circuit pack. Connections to the CPE are made via a customer-provided cord to a 25-pin connector, also on the circuit pack.

C. Housing

2.05 Externally the housing is similar in appearance to the 47-type data mounting. The housing assembly consists of an aluminum extrusion which provides card guides for mounting the data card, and front and rear covers. No interface assembly or electrical connections are provided. All connectors are mounted directly on the circuit pack. The circuit pack is held in position by the latching mechanism shown in Fig. 3.

> ***Note:*** The circuit pack should be installed and removed from the rear of the data mounting.

2.06 The removable front and rear covers are molded plastic with reverse sides painted black. The customer EIA interface connector and the data set telephone interface plug are accessible through a cutout in the rear cover.

2.07 The top surface of the aluminum housing is depressed to allow nesting of several housings, or for nesting of a telephone as shown in Fig. 1.

2.08 The housing with data set installed measures 5.75 inches wide, 10.9 inches long and 2.2 inches high. It weighs approximately 4 pounds. The transformer weighs 5.5 ounces. The data set is powered by low voltage alternating current supplied by a 2012B transformer. The transformer plugs directly into either a standard 117-Vac 3-wire ground outlet or a 117-Vac 2-wire ungrounded outlet. Eighteen volts ac is provided on two screw terminals at the transformer. This is brought to two screw terminals on the data set via a D4-BT cord. The remainder of the power supply is integrated with the data set circuit pack.

2.09 No grounding connection is provided between the circuit pack and the extruded aluminum housing. This allows the housing to float and an ungrounded 2012B transformer to be used to power the data set.

TABLE B

CUSTOMER INTERFACE LEADS

LEAD	DESIG	CONN PIN ASSIGNMENT	MARK OR OFF	SPACE OR ON
Transmitted Data*	BA	2	Neg	Pos
Receive Data†	BB	3	Neg	Pos
Request to Send‡	CA	4	Neg	Pos
Clear to Send§	CB	5	Same as CA	Same as CA
Data Set Ready†	CC	6	Open Circuit or No Voltage	Pos
Data Terminal Ready*	CD	20	Neg	Pos
Signal Ground	AB	7	—	—

* Sensitivity of termination: 3 volts minimum

† Voltage of drivers: 5 to 15 volts when terminated
25 volts maximum when not terminated.

‡ CA and CB leads are tied together.

§ CD is an optional lead with DS 113A-LIB.

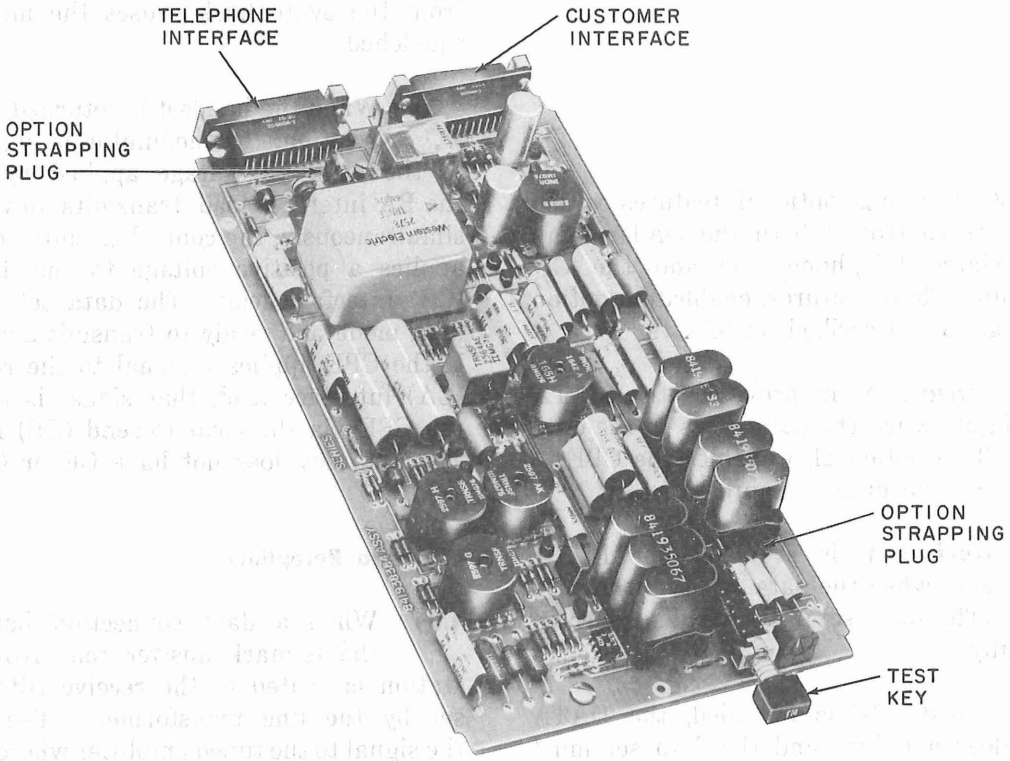

Fig. 2—Circuit Pack Removed From Housing

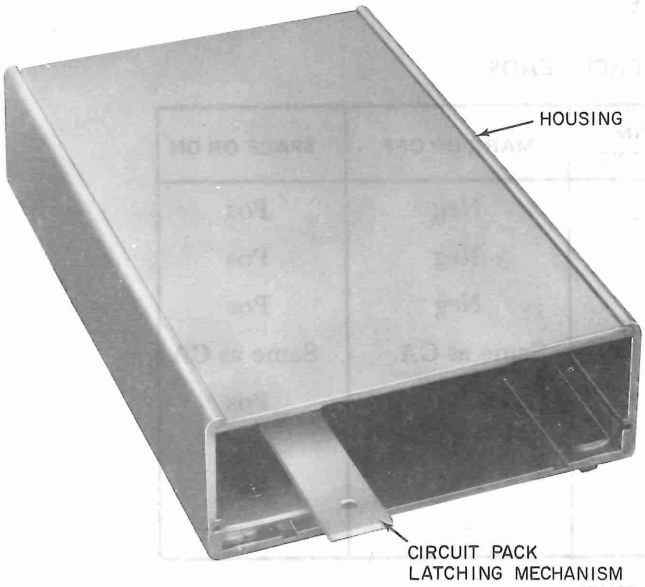

Fig. 3—Housing

2.10 The single pushbutton (TM) of the data set extends through a cutout in the front cover and is accessible through the faceplate.

3. OPTIONS

3.01 DS 113A-L1B has optional features which affect the control of both the DATA lamp (in the associated telephone set) and the CD interface circuit. These features, enabled by option strapping plugs, are described as follows:

- When ***option X*** is provided, the DATA lamp lights when the data set is in the data mode. This option also enables the CPE to disconnect the data set automatically.

- When ***option V*** is provided, the DATA lamp lights when the data set is in the data mode. The data set must be disconnected manually.

- When ***option W*** is provided, the DATA lamp does not light and the data set must be disconnected manually.

4. FUNCTIONAL DESCRIPTION

A. General

4.01 DS 113A-L1B is an originate-only set capable of transmitting and receiving low-speed full-duplex data over the switched telephone network. Refer to Fig. 4 for a simplified functional block diagram of the data set.

B. Operating Sequence

4.02 To originate a call, lift the associated telephone handset and operate the line key. When dial tone is received, dial the number of the station being called. When the CPE is turned on, it is required to present a negative (mark) voltage on the transmitting data (BA) interface lead. Also, the CPE is required to present a positive (ON) voltage on the data terminal ready (CD) interface lead when option X is provided in the data set. This ON voltage must be maintained for the duration of the data call. An OFF voltage will cause the data set to disconnect. The data set is placed in the data mode by momentarily operating the DATA button. Removing the handset from the switchhook causes the modulator to be squelched.

4.03 When the handset is returned to the on-hook position, the modulator is enabled, and due to the negative voltage applied by the CPE on the BA interface lead, transmits an f_1 mark signal; simultaneously, the control circuitry of the data set applies a positive voltage to the data set ready (CC) interface lead. The data set is now in the data mode and ready to transmit and receive data. If the CPE applies a signal to the request-to-send (CA) interface lead, that signal is looped back to the CPE via the clear-to-send (CB) interface lead. The data set does not have CE or CF leads.

C. Data Reception

4.04 When a data connection has been made, the f_2 mark answer tone from the distant station is routed to the receive filter of the data set by the line transformer. The filter directs the signal to the tuned amplifier where it is amplified and fed to the locked oscillator.

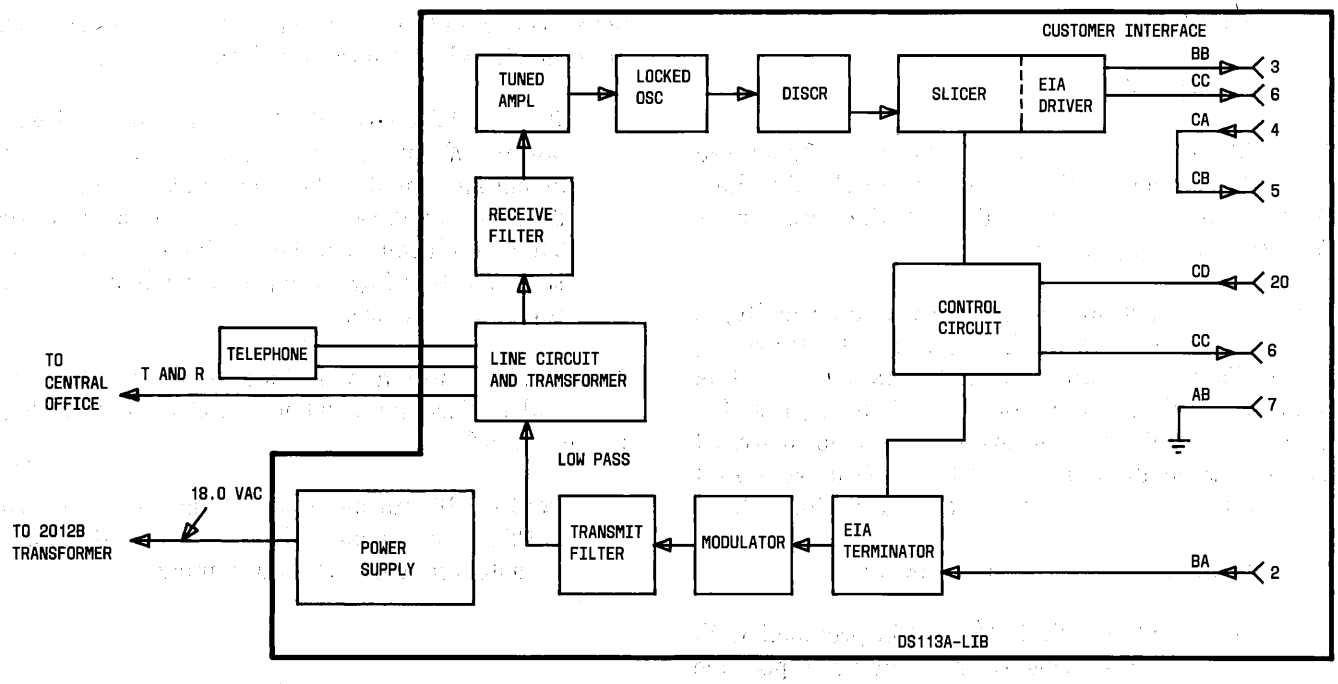

Fig. 4—Block Diagram of DS113A-L1B

4.05 The locked oscillator locks onto the frequency of the signal that is applied to its input and oscillates at the same frequency. The output of the locked oscillator is fed to the discriminator stage, and to the slicer of the EIA output stage.

4.06 The discriminator circuit converts the locked oscillator output to an amplitude modulated (AM) baseband signal which is applied to the slicer. The slicer then acts as a polarity detector for the discriminator and presents a positive or negative voltage to the received data (BB) interface lead, depending upon the output of the discriminator.

4.07 DS 113A-L1B handles the reception of a spacing signal in the same manner as it did the reception of the f_2 mark signal (4.04 through 4.06). When an f_2 space signal is presented to the locked oscillator, it causes the locked oscillator to oscillate at the f_2 space frequency. The discriminator converts the f_2 space frequency into the AM baseband signal, which the slicer converts into a negative voltage to drive the BB interface lead.

D. Data Transmission

4.08 The data to be transmitted is presented by the CPE on the BA interface lead. This causes the EIA input circuit associated with the BA lead to shift the output frequency of the modulator in accordance with the polarity of the applied voltage. The modulator output is fed into the transmit filter and then transformer-coupled to the telephone line.

E. Test Mode

4.09 When the data set has been placed in the test mode as described in 5.07 and 5.08, the following two events occur:

(a) The output of the receiver is connected to the input of the transmitter via the test mode switch.

(b) The BA, BB, CC, and CD leads are open circuits.

Note: The test mode works independently of the CD (data terminal ready) interface lead; therefore, it is not necessary to have the CPE turned on when testing.

5. OPERATION

A. Call Origination

5.01 To originate a call, lift the associated telephone handset and operate the line key. When dial tone is received, dial the number of the station being called.

5.02 If the distant end answers automatically, it responds with an f_2 mark signal. However, if the distant end answers in the talk mode, it is imperative that no action be taken at the DS 113A-L1B until the answering station is switched to the data mode and transmits the f_2 mark signal to disable all echo suppressors on the channel.

B. Talk Mode to Data Mode Transfer

> ***Note:*** When DS 113A-L1B is provided with option X, the CPE ***must*** provide a positive ON voltage to the data set via the CD interface lead before replacing the handset on-hook. Without this ON signal, the data set will disconnect from the telephone line when the handset is placed on-hook.

5.03 Momentarily operate the DATA key (with option V or X, DATA lamp lights), and then replace the handset on the switchhook. This must be done within 6 seconds of receiving the f_2 mark signal to ensure that the answering station abort timer does not automatically disconnect the call.

> ***Note:*** It is imperative that when in the data mode the handset not be taken off-hook, or the transmission will be interrupted and/or the call disconnected.

C. Data Mode to Talk Mode Transfer

5.04 To go to the talk mode from either the data or test mode, first lift the associated telephone handset from the switchhook and then operate the line key (with option V or X installed, the DATA lamp goes off). Failure to lift the handset before operating the line key will result in disconnection from the telephone line.

D. Call Disconnect

5.05 To disconnect a call manually, transfer from the data mode to the talk mode and then place the handset on-hook. The data set also disconnects when there is a loss of ac power.

> ***Note:*** When DS 113A-L1B is equipped with option W (no DATA lamp ~~indication~~), the attendant must take care not to leave the data set in data mode upon call completion. This condition can be avoided by ensuring that the line key is depressed when the data set is not in use.

5.06 When option X is provided, the data set also disconnects when the CD interface lead is turned ***off.***

> ***Note:*** If option V or X is provided, the DATA lamp goes off when the data set is transferred from the data mode.

E. Test Mode

5.07 A digital loop-back test is normally set up at the request of the data test center (DTC).

5.08 The call from the DTC is answered in the talk mode.

(1) When instructed by the DTC to enter the test mode, operate the TM key on the data set and wait for an f_2 mark signal from the DTC. Upon receipt of the f_2 mark, momentarily operate the DATA key (with option V or X installed, DATA lamp lights). Operation of the TM key opens the BA, BB, CC, and CD leads to the CPE, simulates internally the ***on*** condition of the CD lead and internally loops the receive data to the send data lead.

(2) Replace the handset on-hook. This removes the squelch from the modulator and the mark clamp from the receive data circuit, permitting the DTC to measure mark and space frequencies, levels, sensitivity, crossover frequency, and round-trip distortion.

(3) After a prearranged length of time with the DTC, transfer to the talk mode and release the TM key.

(4) After receiving the results of the test and the action to be taken from the DTC, replace the handset on-hook to disconnect the call.

6. REFERENCES

6.01 The following schematic drawings, circuit descriptions, and BSPs pertain to DS 113A-L1B.

NUMBER	TITLE
CD-&SD-1D281-01	Data System Station—Data Set 113A-L1B Type Transmitter-Receiver Circuit
590-101-108	Data Set 113A-Type—Reference Guide