DATA SET 113AR-L1B

DESCRIPTION AND OPERATION

CONTENTS PAGE

1. GENERAL

1.01 This section describes the physical and functional characteristics of data set (DS) 113AR-L1B (Fig. 1). Information concerning the Bell System- or customer-provided data terminals 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 Data set 113AR-L1B is the registered replacement for the older DS 113A-type and maintains the same capabilities. Data set 113AR-L1B meets the requirements of the FCC Registration Program and is compatible with all DSs 103-type, 113B, 113D, and 113DR. Data set 113AR-L1B is also compatible with DSs 212A and 212AR when operating in the low-speed mode. The registration number for DS 113AR-L1B is AS593M-62999-MD-E.

1.04 General information concerning registered data sets and arrangements follows.

- Registered versions of data sets are coded with an "R" in the data set code.
- All Bell System switched network data sets not coded with an "R" in the data set code are grandfathered.
- Grandfathered DS 113A may be connected in registered arrangements provided the interface with the network is made with the appropriate jack and cord as shown in the connection diagram in Section 591-048-200.
- Data set 113AR may be connected in grandfathered arrangements provided the interface with the network is made with

Fig. 1—DS 113AR-L1B and 2565HKM Telephone Set

the appropriate cords as shown in the connection diagram in Section 591-048-200.

- Connections to the telephone lines must be made with the proper cords to the voice or data jack as shown in the connection diagram in Section 591-048-200.

1.05 Data set 113AR-L1B requires a 565HKM or 2565HKM telephone set that must be ordered separately. Data set 113AR-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 f1 frequency band and receives in the f2 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.

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

2. PHYSICAL DESCRIPTION

A. DS 113AR-L1B

2.01 Data set 113AR-L1B consists of a single printed circuit pack, an extruded aluminum housing with front and rear plastic covers, a 2012D transformer, a D4BT cord, and an M4AS cord.

B. Circuit Pack

2.02 The printed circuit pack (Fig. 2) is 10.26 inches long, 5.5 inches wide, and 1.5 inches high. The circuit pack 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 associated 565HKM or 2565HKM telephone set are made via a cord connected to the circuit pack. Connection to tip and ring is made via the M4AS cord which is

TABLE A

TRANSMIT AND RECEIVE FREQUENCIES

BAND	FREQ	DATA SIGNAL
f1 (Transmit)	1270 Hz 1070 Hz	Mark Space
f2 (Receive)	2225 Hz 2025 Hz	Mark Space

TABLE B

CUSTOMER INTERFACE

LEAD	DESIG	CONN PIN ASSIGNMENT	MARK OR OFF	SPACE OR ON
Transmitted Data	BA	2	Neg	Pos
Received 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	—	—

* CA and CB leads are tied together.

† CD is required for option X only.

connected to the RT and RR terminals of the telephone set. Connections to the customer-provided equipment (CPE) are made via a customer-provided cord to a 25-pin connector, also on the rear of the circuit pack.

C. Housing

2.05 Externally the housing is similar in appearance to the 47-type data mounting. The housing consists of an aluminum extrusion that provides guides for mounting the circuit pack, 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 housing.

2.06 The removable front and rear covers are molded plastic with reverse sides painted black. The customer EIA interface connector is 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 set as shown in Fig. 1.

2.08 The housing with circuit pack installed measures 5.75 inches wide, 10.9 inches long, and 2.2 inches high. It weighs approximately 4 pounds. The 2012D transformer weighs 5.5 ounces. The data set is powered by low voltage alternating current supplied by the 2012D transformer. The transformer plugs directly into either a standard 117-Vac 3-wire grounded 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 D4BT 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 2012D transformer to be used to power the data set.

3. OPTIONS

3.01 Data set 113AR-L1B has options that affect the control of the DATA lamp in the associated telephone set and the CD interface circuit. The options are enabled by plug-in straps on the circuit pack. The options are summarized in Table C and described as follows.

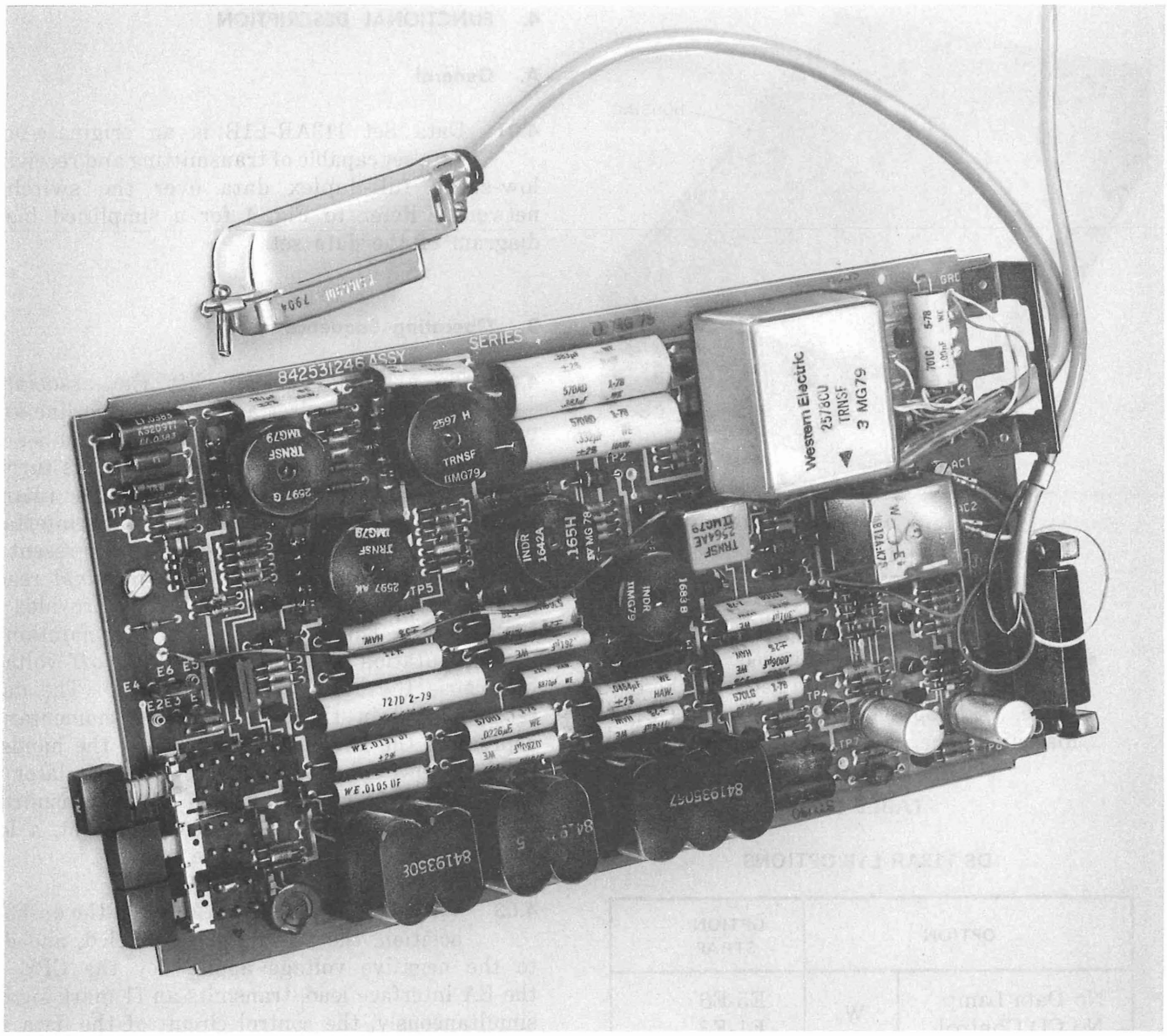

Fig. 2—DS 113AR-L1B Circuit Pack

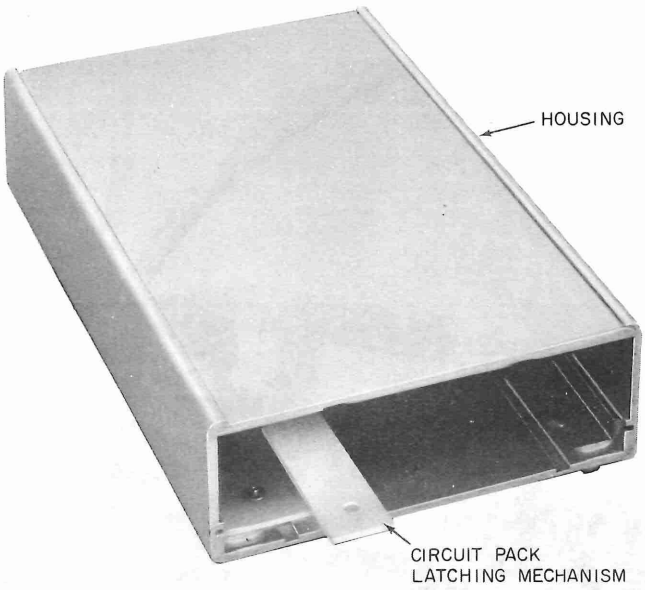

Fig. 3—Housing

- 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.

TABLE C

DS 113AR-L1B OPTIONS

OPTION		OPTION STRAP
No Data Lamp No CD Control	W	E5-E6 E1-E3
Data Lamp No CD Control	V	E4-E6 E1-E3
Data Lamp CD Control	X	E4-E6 E2-E3

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

B. Operating Sequence

4.02 To originate a call, lift the associated telephone handset and depress 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 transmitted 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 depressing the DATA key. Removing the handset from the switchhook will cause the modulator to be squelched if a mark is present at the transmitted (BA) interface lead. If a space is present, a low level tone will be heard in the handset.

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 f1 mark signal; simultaneously, the control circuit 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 f2 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 then fed to the locked oscillator.

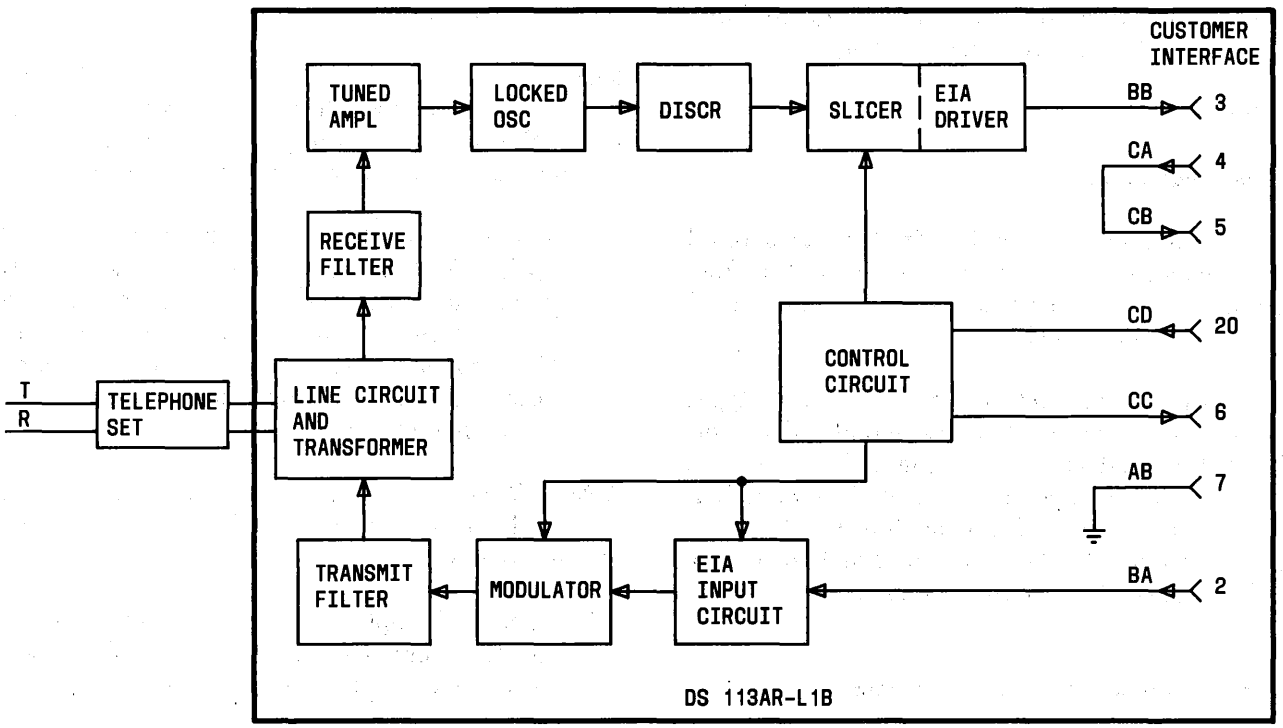

Fig. 4—Simplified Block Diagram of DS 113AR-L1B

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 then to the slicer of the EIA output stage.

4.06 The discriminator converts the locked oscillator output into an amplitude modulated (AM) baseband signal that is applied to the slicer. The slicer acts as a polarity detector for the discriminator and presents a negative voltage to the received data (BB) interface lead.

4.07 Data set 113AR-L1B handles the reception of a spacing signal in the same manner as it did the reception of the f2 mark signal (paragraphs 4.04 through 4.06). When an f2 space signal is presented to the locked oscillator, it causes the locked oscillator to oscillate at the f2 space frequency. The discriminator converts the f2 space frequency into the AM baseband signal, which the slicer converts into a positive voltage to drive the received data (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 paragraphs 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 reponds with an f2 mark signal. However, if the distant end answers in the talk mode, it is imperative that no action be taken at DS 113AR-L1B until the answering station is switched to the data mode and transmits the f2 mark signal to disable all echo suppressors on the channel.

B. Talk Mode to Data Mode Transfer

Note: When DS 113AR-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 depress the DATA key on the telephone (with option V or X installed, the DATA lamp lights), and then replace the handset on the switchhook. This must be done within 6 seconds of receiving the f2 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 on telephone (with option V or X installed, the DATA lamp goes off). Failure to lift the handset before depressing 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 113AR-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 loopback 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 button on the data set and wait for an f2 mark signal from the DTC. Upon receipt of the f2 mark, first momentarily depress the DATA key on the data set (with option V or X installed, the DATA lamp lights). Operation of the TM button 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 button.

(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 BSPs provide additional information:

SECTION	TITLE
591-048-200	Data Set 113AR-L1B—Installation and Connections
591-048-500	Data Set 113AR-L1B—Test Procedure