

DATA SET 113A-TYPE

DESCRIPTION AND OPERATION

1. GENERAL

1.01 This section covers in general terms the physical and functional description as well as the operating procedures for Data Set 113A-type. Information concerning the Bell System or customer-provided data terminals is not included in this section.

1.02 This section is reissued to include information pertaining to options available with Data Sets 113A-L1/2 and 113A-L1A/2 that are not available with Data Sets 113A-L1 and 113A-L1A. Since this reissue is a general revision, arrows ordinarily used to indicate changes have been omitted.

1.03 Data Set 113A-L1 and 113A-L1A is a line-powered, low-speed (up to 300 bauds), full-duplex (FDX), frequency-shift-keyed (FSK), serial data set that always 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 DATA-PHONE® service over the direct distance dialing (DDD) network.

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

1.04 Data Sets 113A-L1/2 and 113A-L1A/2 are the same as described in 1.03 but may also provide additional features. When the data set is equipped with option V, a data lamp is provided and when it is equipped with option X, the data set is provided with both a data lamp and data-terminal-ready (CD) lead control. When the data set is equipped with option W, no additional features are provided.

1.05 Call origination and control with Data Set 113A-type can only be performed manually. The data terminal interface circuitry provided by the data set 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.

2. PHYSICAL DESCRIPTION

2.01 Data Set 113A-type (Fig. 1) is 3-3/4 inches high, 8-3/4 inches wide, 11-1/2 inches deep, and weighs approximately 8 pounds. It consists of an 11C (113A-L1) or 11G (113A-L1A) telephone apparatus unit, a key strip, an ER1 circuit pack, and a coded filter. The key strip, circuit pack, and filter are rigidly secured together by means of brackets. In addition, Data Set 113A-L1/2 (Fig. 2) and 113A-L1A/2 consists of an HH1 circuit pack, a lamp strip, and an external 2012B transformer. See Table C for the difference between separate list Data Sets 113A-type.

2.02 The key strip contains six keys of which only three are functional. The three functional keys are designated DATA (nonlocking, releasing), TALK/CLEAR (locking, releasing), and TEST (locking, releasing). The other three keys are locking-releasing keys; however, since they are not functional, they are blocked nonoperative.

2.03 The ER1 circuit pack contains the components necessary for the data set to perform the various modulator and demodulator functions. Fastened to this circuit pack via a bracket is the data terminal interface connector, which is readily accessible at the rear of the data set. Each individual section of the data set is tied together with hard-wire connections to form the complete data set.

2.04 The optional HH1 circuit pack provided in Data Set 113A-L1/2 and 113A-L1A/2 is secured to the filter brackets by four screws. It contains the components necessary for the optional data lamp and CD lead control.

TABLE B
INTERFACE LEAD POTENTIALS

LEAD	DESIG	OFF	ON	MARK	SPACE
Transmit Data	BA	—	—	-3V to -25V	+3V to +25V
Receive Data	BB	—	—	-5V to -15V	+5V to +15V
* Request to Send	CA	-3V to -25V	+3V to +25V	—	—
* Clear to Send	CB	-3V to -25V	+3V to +25V	—	—
Data Set Ready	CC	Open circuit or No Voltage	+5V to +15V	—	—
† Data Terminal Ready	CD	-3V to -25V	+3V to +25V	—	—

* CA and CB leads are tied together.

† CD is an optional lead with Data Sets 113A-L1/2 and 113A-L1A/2 equipped with option X.

TABLE C
DIFFERENCES IN DATA SETS 113A-TYPE

LIST NUMBER	DIAL	EQUIPMENT PROVIDED BY LIST NUMBERS	AVAILABLE OPTIONS
L1	Rotary	Basic Data Set	None
L1A	TOUCH-TONE	Basic Data Set	None
L1/2	Rotary	Basic data set plus HH1 circuit pack, lamp strip, external transformer 2012B	V*, X†, W‡
L1A/2	TOUCH-TONE	Basic data set plus HH1 circuit pack, lamp strip, external transformer 2012B	V*, X†, W‡

* Data lamp

† Data lamp and CD lead control.

‡ No added features

2.05 The optional lamp strip contains six lamp sockets but uses only one lamp, which is located in the DATA position. The other five positions are not used and, if desired, may be used for spare lamp and spare-ended lead storage.

2.06 The power required to operate Data Sets 113A-L1 and 113A-L1A is obtained from the telephone line; therefore, no other power supply is used. However, additional power is required for Data Sets 113A-L1/2 and 113A-L1A/2 when



Fig. 1—Data Set 113A-L1A

they are equipped with either option V or X. This additional power is obtained from a 105- to 130-volt ac power outlet and is coupled to the data set by a 2012B transformer.

3. FUNCTIONAL DESCRIPTION

A. General

3.01 Because a major portion of this data set is line-powered, it is necessary to have two reference grounds to provide proper isolation from the telephone line. One ground (designated G) (Fig. 3) provides a common reference point for the transmitter-receiver circuitry. The second ground (designated F) is presented by the customer, via interface lead AB, and provides a common reference point for the data terminal.

B. Operating Sequence (Fig. 3)

3.02 When the customer business machine is turned on, it is required to present a negative (MARK) voltage on the transmitted data (BA) interface lead. The data set is placed in the data mode by removing the handset from the switchhook and momentarily operating the DATA button. Removing the handset from the switchhook causes the modulator to be squelched.

3.03 When the handset is returned to the on-hook position, the modulator is enabled, and due to the negative voltage applied by the business machine 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.

3.04 When a data connection has been made, the f_2 mark answer tone from the distant station is routed to the cut-apart filter by the control circuitry. The filter directs the signal to the tuned amplifier where it is amplified and fed to the locked oscillator.

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

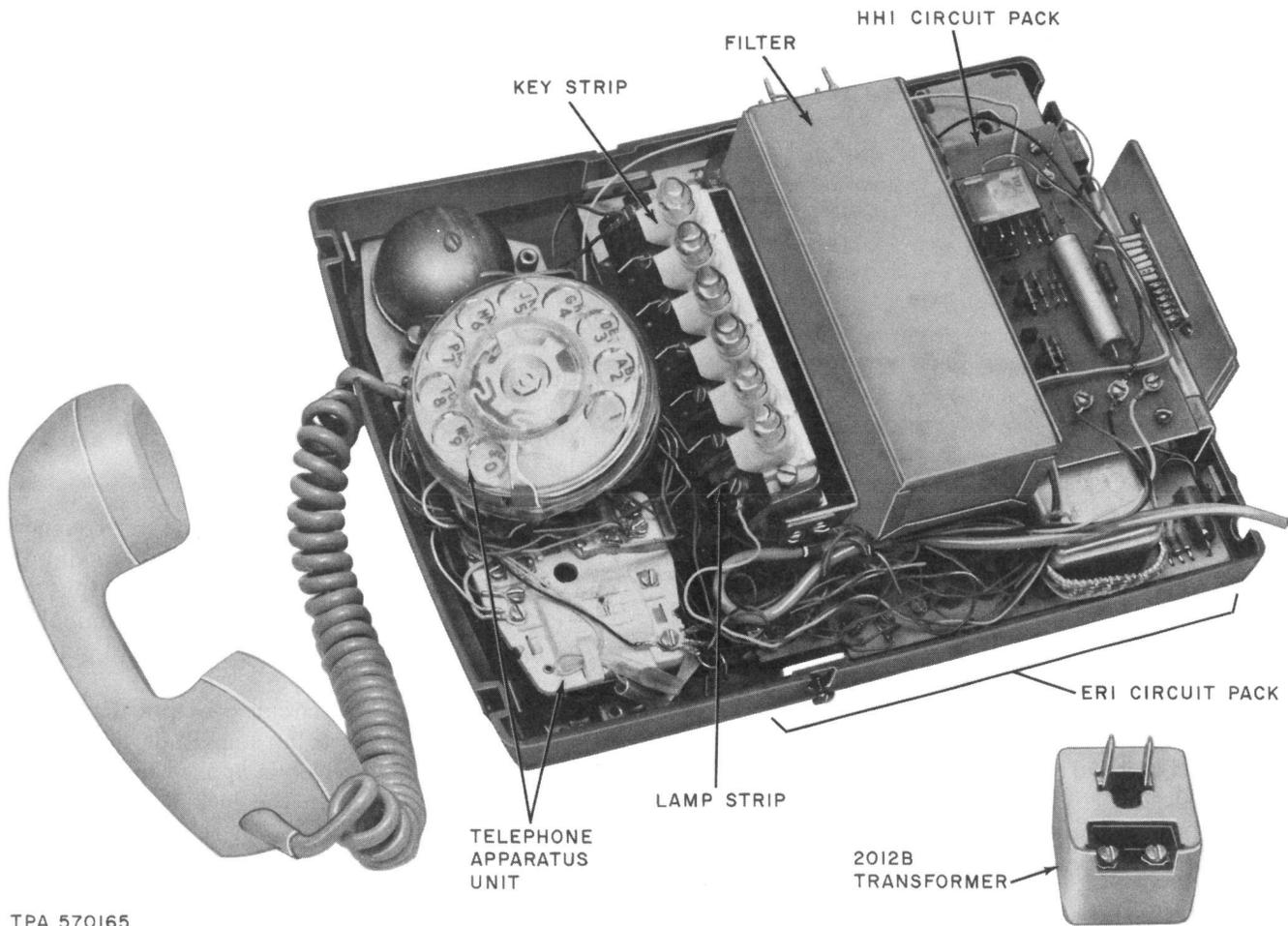
3.06 The discriminator circuit converts the locked oscillator output to an amplitude modulated (AM) baseband signal which is applied to the slicer. The voltage generated in the locked oscillator is also applied to the rectifier where it is converted into the positive and negative voltages required by 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.

B. Data Reception (Fig. 3)

3.07 Data Set 113A-type handles the reception of a marking signal in the same manner as it did the reception of the f_2 mark-answer signal of the handshaking sequence (3.02 through 3.06). When an f_2 space signal is presented to the locked oscillator, it will cause the locked oscillator to oscillate at the f_2 space frequency. The discriminator will convert the f_2 space frequency into the AM baseband signal which the slicer will convert into a negative voltage to drive the BB interface lead.

C. Data Transmission

3.08 The data to be transmitted is presented by the data terminal on the the BA interface lead. This causes the EIA input circuit associated with the BA lead, which was enabled when the



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Fig. 2—Data Set 113A-L1/2

handset was replaced on the switchhook, to shift the output frequency of the modulator in accordance with the polarity of the applied voltage. The modulator output is fed into the cut-apart filter where it is transformer-coupled to the telephone line.

D. Test Mode

3.09 When the data set has been placed in the test mode as described in 4.07 through 4.08, the following three events occur.

- (a) The output of the receiver is connected to the input of the transmitter via the control circuitry.
- (b) The BA lead is disconnected from the circuit.

Note: The BB lead remains connected to the receiver.

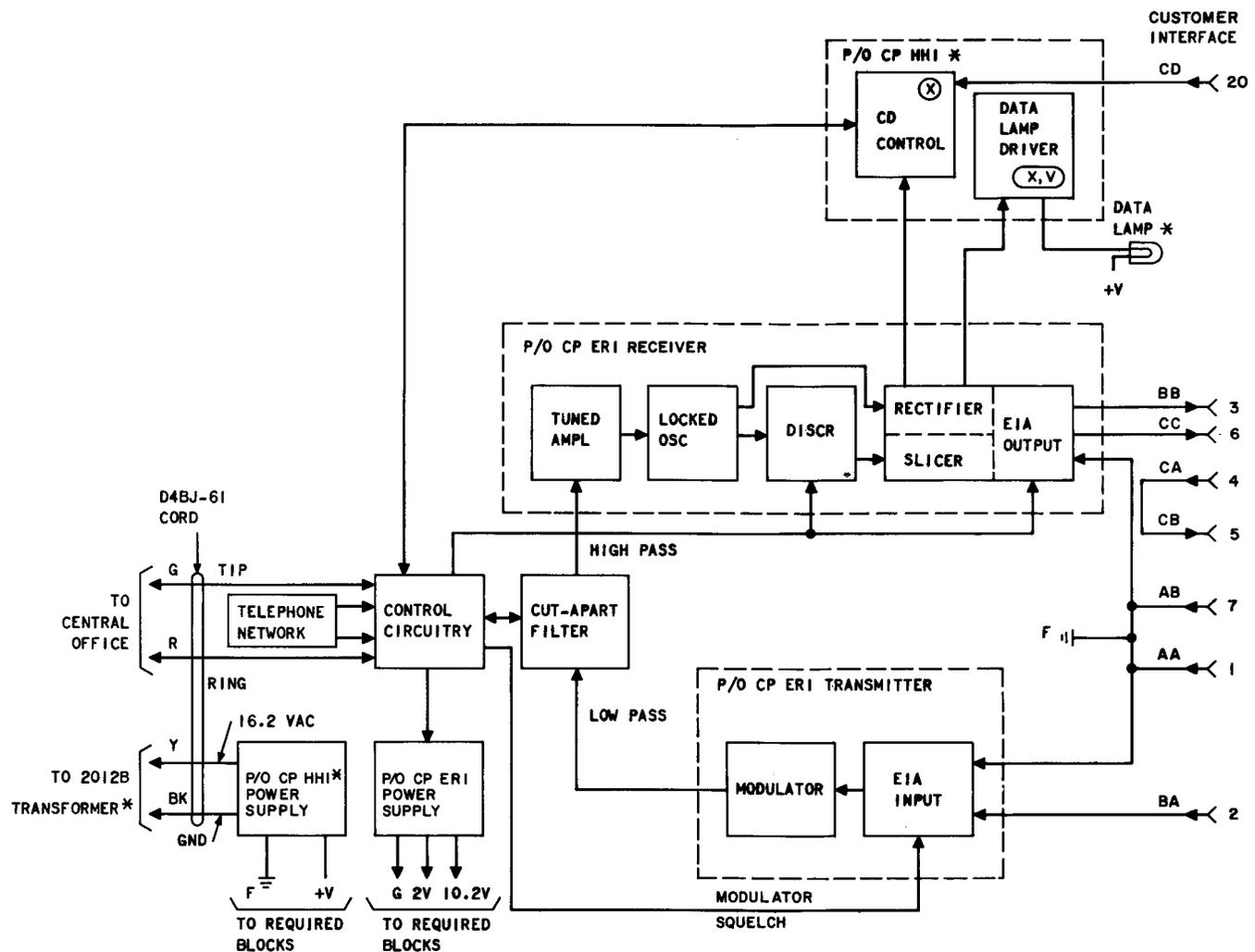
- (c) The CC lead is open-circuited.

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

4. OPERATION

A. Call Origination

4.01 To originate a call, lift the handset from the switchhook and operate the TALK/CLEAR key. When dial tone is received, dial the number of the station being called.



* THE HHI CIRCUIT PACK, DATA LAMP, AND 2012B TRANSFORMER ARE USED ONLY WHEN OPTION V OR X IS INSTALLED IN THE DATA SET 113A-L1/2 OR 113A-L1A/2.

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Fig. 3—Block Diagram of Data Set 113A-Type

B. Talk Mode to Data Mode Transfer

Note: When either Data Set 113A-L1/2 or 113A-L1A/2 is provided with option X, the business machine **must** provide a positive ON voltage to the data set via the CD interface lead before the data set goes into the data mode. Without this ON signal, the data set will disconnect from the telephone line instead of going into the data mode when the handset is placed on-hook.

4.02 If the distant end answers automatically, it will respond 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 Data Set 113A-type until the answering station is switched to the data mode and responds with the f_2 mark signal.

4.03 In either case, momentarily operate the DATA key first (with option V or X, DATA lamp lights) and then replace the handset on the switchhook. This must be done within 4 seconds

of receiving the f_2 mark signal to ensure that the answering station abort timer will not automatically disconnect the call. In addition, at least 0.3 seconds is required between operating the DATA key and placing the handset on-hook to allow for start-up transients within the data set to subside.

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 disconnected.

C. Data Mode to Talk Mode Transfer

4.04 If it is desired to go to the talk mode of operation (in response to a request from the answering station which is already in this mode) from either the data or test modes, first remove the handset from the switchhook and then operate the TALK/CLEAR key (with option V or X, DATA lamp extinguishes). Failure to place the station off-hook before operating the TALK/CLEAR key will result in disconnection from the telephone line.

D. Call Disconnect

4.05 To disconnect a call manually, it is only necessary to place the handset on-hook and operate the TALK/CLEAR key.

4.06 When option X is provided, the data set will also disconnect when the CD interface lead is turned off or when there is a loss of ac power.

Note: If option V or X is provided, the DATA lamp will extinguish when the data set is transferred from the data mode.

E. Test Mode

4.07 Should it become necessary to place Data Set 113A-type in the test mode, place a call as described in 4.01 to the serving central office and request a remote test. The central office will

call a data test center (DTC) which in turn calls the Data Set 113A-type requesting the remote test.

4.08 The call from the DTC is answered in the talk mode. When instructed by the DTC to enter the test mode, await an f_2 mark signal from the DTC. Upon receipt of the f_2 mark, first momentarily operate the DATA key (with either option V or X, DATA lamp lights) and then operate the TEST key. Next, replace the handset on-hook.

4.09 After a prearranged length of time, place the handset off-hook and operate the TALK/CLEAR key (with either option V or X, DATA lamp extinguishes). Failure to go off-hook before operating the TALK/CLEAR key will result in a disconnection from the telephone line. After receiving the results of the test and the action to be taken from the DTC, it will only be necessary to replace the handset on-hook to disconnect the call.

Note: When the data set is either a 113A-L1(A) or 113A-L1(A)/2 equipped with option W, the attendant must take care not to leave the data set in the data mode upon call completion, or to place the data set in data mode accidentally by going off-hook, pressing the DATA key, and replacing the handset on-hook. These conditions can be avoided by ensuring that the TALK/CLEAR key is depressed when the data set is not in use.

5. REFERENCES

5.01 The following schematic drawings, circuit descriptions, and BSPs pertain to Data Set 113A-type.

CD-&SD-1D167-01	Data System Station—Data Set 113A-Type — Transmitter-Receiver Circuit
590-001-108	Data Set 113A-Type—Reference Guide