DATA SET 103G-TYPE

DESCRIPTION AND OPERATION

1. GENERAL

1.01 This section covers the physical description and functional operation of Data Set 103G-type used for DATA-PHONE® service. Information concerning the customer-provided equipment (business machine) is not included in this section.

1.02 This section is reissued to provide information on the Data Sets 103G5 and 103G6 which use the Data Set 103E6. Coverage of the Data Sets 103G1 and 103G4, which uses the Data Set 103E5, is retained to provide information for the equipment which is still in service. Since this reissue covers a general revision and extensive changes have been made throughout the section, change arrows have been omitted.

1.03 The Data Set 103G-type interface signals conform to Electronic Industries Association (EIA) Standards. The Data Sets 103G1 and 103G4 conform to EIA standard RS-232-B. The Data Sets 103G2, 103G3, 103G5, and 103G6 conform to EIA standard RS-232-C except when the associated Data Set 103E6 is equipped with the ZD option which makes the Data Set 103G5 and 103G6 conform to EIA standard RS-232-B.

1.04 The Data Sets 103G2, 103G3, 103G5, and 103G6 use the Data Set 103E6 which allows operation with Unigauge facilities, operation with higher receive signal levels, and provides for changes in the CC (Data Set Ready) lead operation. For additional information on the Data Set 103E6, refer to the practice entitled Data Set 103E-Type—Identification (591-025-100). Refer to CD- and SD-1D096-01 for additional information on the Data Sets 103G5 and 103G6.

1.05 Data Set 103G-type is designed to be compatible with Data Auxiliary Set 801A-type (rotary dialing) and Data Auxiliary Set 801C-type (TOUCH-TONE® dialing). When Data Auxiliary Set 801A-type is to be used, refer to the section entitled Data Auxiliary Set 801A-Type for Automatic Calling, Identification and Operation (598-010-101) or the section entitled Data Auxiliary Set 801C-Type for Automatic Calling, Identification and Operation (598-012-101) for information concerning the data auxiliary sets.

2. DESCRIPTION

2.01 Data Set 103G-type (Fig. 1) is a full-duplex serial data set capable of operating at speeds up to 300 bauds and provides DATA-PHONE service using the switched voice message network (DDD).

2.02 Data Set 103G-type is available with different types of dialing features. The types of data sets and dialing features provided are shown in Table A.

2.03 Data Sets 103G1 through G6 have the same housing which measures approximately 15-1/2 inches long, 9 inches wide, 5-1/2 inches high, and depending on the type, weighs approximately 16 pounds.
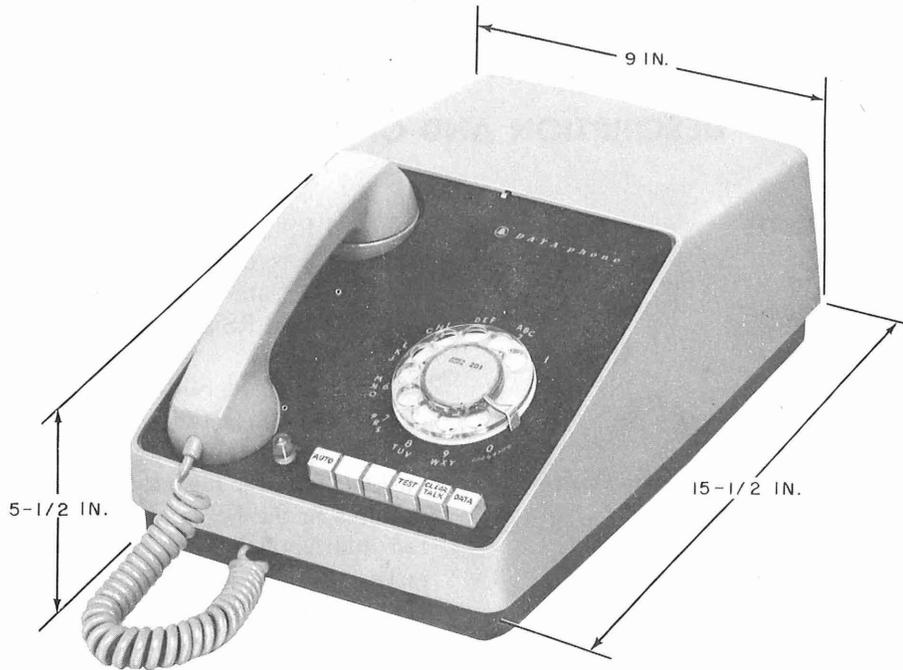
Fig. 1—Data Set 103G-Type—Front View

TABLE A

DATA SET 103G-TYPES

DATA SET	TYPE OF DIAL	EQUIPPED WITH CARD DIALER
103G1	Rotary	No
103G2	TOUCH-TONE	No
103G3	Rotary	*Yes
103G4	TOUCH-TONE	Yes
103G5	Rotary	No
103G6	TOUCH-TONE	Yes

* A 2075A Transformer will be required to supply the necessary power for operating the 41A or 41B dial.

2.04 Data Sets 103G1 and 103G4 are composed of an integrated telephone set, control keys, monitor amplifier with loudspeaker, Data Set 103E5 (the data set electronics chassis), 25A or 49A power unit, D10P-61 mounting cord (5 feet, 3 inches long), and a 3-wire power cord (Fig. 2). The Data Sets 103G2, 103G3, 103G5, and 103G6 use Data Set 103E6 and otherwise are identical to the Data Sets 103G1 and 103G4.

2.05 The data set control keys are shown in Fig. 3, and the function of each is explained in Table B.

2.06 The Data Set 103G-type electronics chassis (Data Sets 103E5 and 103E6) contains three plug-in circuit packs (CPs), a relay board assembly, and a filter assembly. The CP designations and

codes are shown in Table C. The location of these CPs is shown in Fig. 4.

3. FUNCTIONAL OPERATION

3.01 Data Set 103G-type is designed to transmit in one of two frequency bands and receive in the other frequency band. The proper filter (Fig. 5), transmitting band, and receiving frequency band are selected by the method of establishing the telephone connection. When the data set originates the call, the transmitting frequency band is designated f_1. The *normal* frequencies of this f_1 band are 1270 Hz for a mark and 1070 Hz for a space. The receiving frequencies are designated f_2, and are 2225 Hz for a mark and 2025 Hz for a space.

3.02 When Data Set 103G-type answers an incoming call, the transmit frequency is the f_2 band, and f_1 band is received. Table D summarizes the data set transmit and receive frequencies by mode of operation.

3.03 The following functional description of data set operation refers to the functional block diagram (Fig. 5).

A. *Establishing a Telephone Connection*

3.04 The telephone set of the data set functions in the regular telephone manner with the handset removed from the switch hook. "Hands-free" calls may be *originated* by operating the DATA key with the handset on-hook. When "hands-free" calls are originated, all supervisory tones (dial tone, busy tone, etc) will be heard in the monitor loudspeaker. If the called party answers the call in the data mode, the data sets will "handshake" and go directly into the data mode. If the called party answers the call in the talk mode, voice communications may be established by lifting the handset and operating the CLEAR-TALK key.

> *Note:* Prior to originating a "hands-free" call, transferring to the data mode, or answering an incoming call directly in the data mode, the business machine is required to condition the data terminal ready (CD) lead with a positive (on) voltage. This positive voltage indicates that the business machine is available to receive or transmit data. The CD lead *must* remain on for the duration of the call. If the business machine turns the CD lead off

(by removing the positive voltage and applying a negative voltage), the data set will originate a disconnect sequence for an established connection; or, if handshake sequence has not been completed, the data set will go on-hook immediately.

B. *Handshaking Operation*

3.05 When the DATA key is operated at the answering station (by mutual agreement on an established voice connection or by the called station answering the incoming call directly in the data mode), the connection circuits connect the line circuit to the telephone line. The line circuit maintains an off-hook condition after the data set is placed in the data mode. The proper filter arrangement has been selected by the connection circuits.

3.06 The quiet interval timer operates to disable the modulator for approximately 1.2 seconds (this allows the off-hook signal to be transmitted from the called station to the originating central office). At the end of 1.2 seconds, the modulator generates f_2 mark (2225 Hz). The f_2 mark passes to the F1 and F2 attenuator for power level adjustment. The output path of F1 and F2 attenuator is connected to the high-pass filter via the B path. The F1 attenuator, A path, and low-pass filter are used by the originating data station. The output of the filter connects to the telephone line via the line circuit.

3.07 The originating data station (with the DATA key operated by mutual voice agreement or operating DATA key when f_2 mark tone is heard) passes the f_2 mark through the line circuit, high-pass filter, and connection circuits to the limiter. The output of the limiter is connected to the discriminator.

3.08 The DISCR converts the f_2 mark frequency to a dc voltage signal. The carrier detector measures the power level of f_2 mark and checks for the proper output voltage of the DISCR. The DISCR output connects to the slicer. The carrier detector signal is timed for 0.5 second by the mark timer. If the dc signal is valid, the mark timer conditions the receive space timer to control the connection circuits to start the handshake status timer and disable the telephone set. At the same time, the originating modulator generates f_1 mark (1270 Hz), and passes f_1 mark through F1 and F2
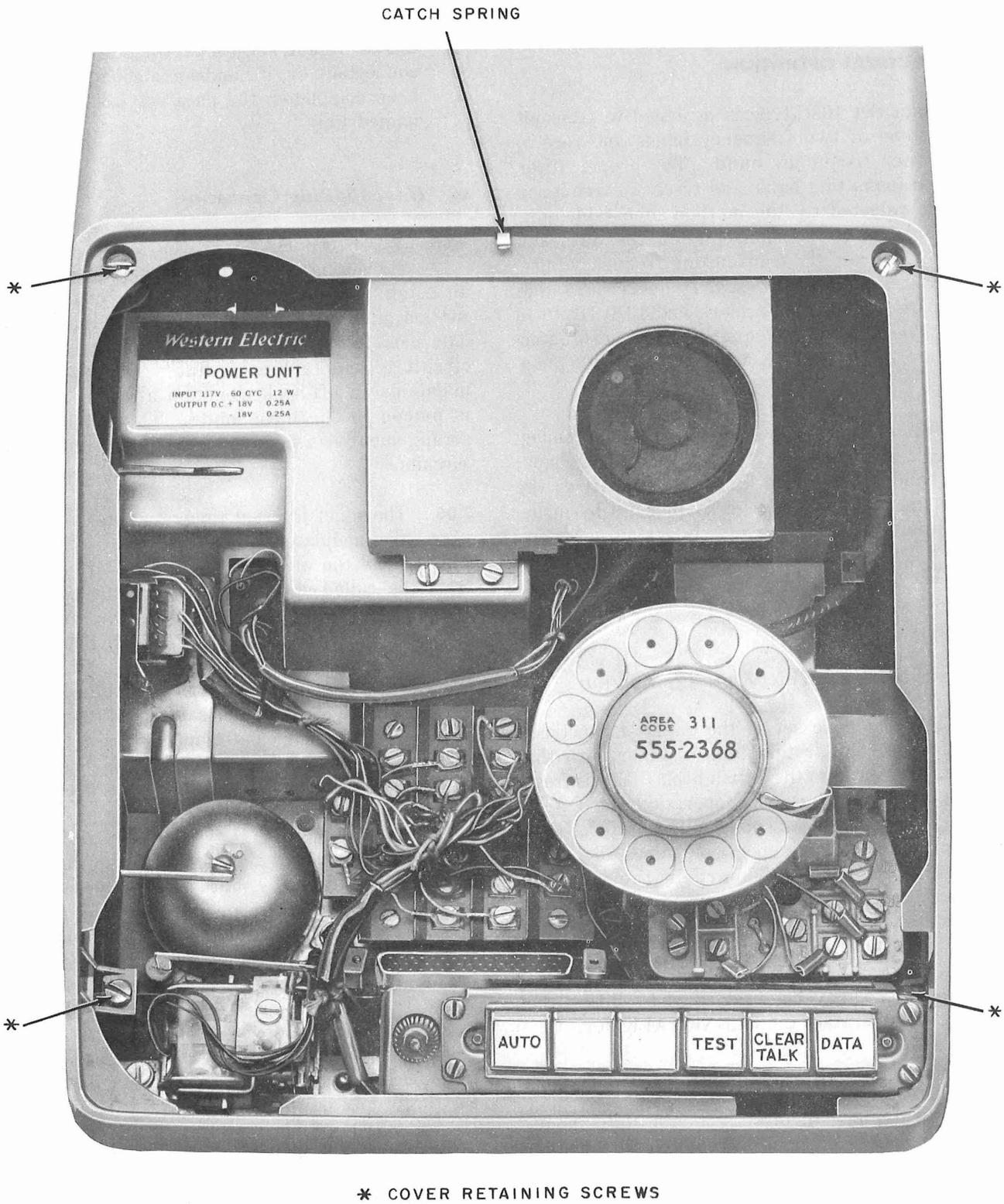
CATCH SPRING

Western Electric

POWER UNIT

INPUT 117V 60 CYC 12 W
OUTPUT D.C.+ 18V 0.25A
        - 18V 0.25A

AREA CODE 311
555-2368

AUTO | | | TEST | CLEAR TALK | DATA

* COVER RETAINING SCREWS

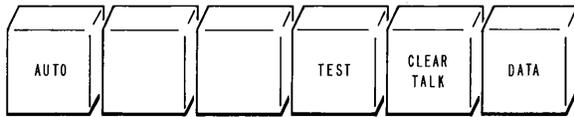Fig. 2—Data Set 103G-Type—Top View with Cover Removed

Fig. 3—Data Set 103G-Type—Control Keys and Lamps

attenuator, F1 attenuator, A path, low-pass filter to the telephone line via the line circuit.

Note: If the originating data station established the call on a "hands-free" basis, the monitor amplifier will be disabled at this time.

TABLE B

DATA SET 103G — KEY DESIGNATIONS

| KEY DESIG	EQUIPPED WITH LAMP	KEY TYPE	FUNCTION
AUTO	Yes (52A)	Push to operate Push to release Nonreleasing	Key — conditions data set to answer incoming calls automatically. Lamp — lights when key is operated.
TEST	Yes (52A)	Nonlocking Nonreleasing	Key — conditions data set for remote tests by 904-type Data Test Center. Lamp — lights when data set is conditioned for test mode.
CLEAR TALK	Yes (52A)	Nonlocking Releasing	Key — conditions data set for voice communications when set is in data mode; causes data set to disconnect and go on-hook. Lamp — lights while the data set sends 3 seconds of space during disconnect sequence.
DATA	Yes (52A)	Nonlocking Nonreleasing	Key — conditions data set for data mode; conditions data set for "hands-free" dialing when originating a call directly in data mode; conditions data set for manual answer of incoming call directly in data mode. Lamp — lights when key is operated.

TABLE C

CIRCUIT PACK DESIGNATION

DESIG	DATA SET 103E5	DATA SET 103E6
Line Circuit	CJ9 or CJ14	CJ14
Timers	CJ10	CJ10
Filters	768B	768B
Modem	CJ11 or CJ15	CJ15
Relays	BN3 or BN4	BN4
*Monitor Amplifier	BW2 or BW3	BW2 or BW3

* For information only, this CP is part of the telephone set apparatus for Data Set 103G-type.

3.09 The handshake status timer will operate in 0.3 second and connect the transmitted data (BA) lead to the business machine via the connection circuits.

3.10 The called data station receives f_1 mark which passes through the line circuit, low-pass filter, connection circuits, limiter, discriminator, and to the carrier detector. The carrier detector, after 0.1 second, conditions the data set to transmit and receive data by use of the connect switch and the connection circuits. The f_1 mark also passes from the limiter to the discriminator, through the slicer, and to the business machine over the received data (BB) lead.
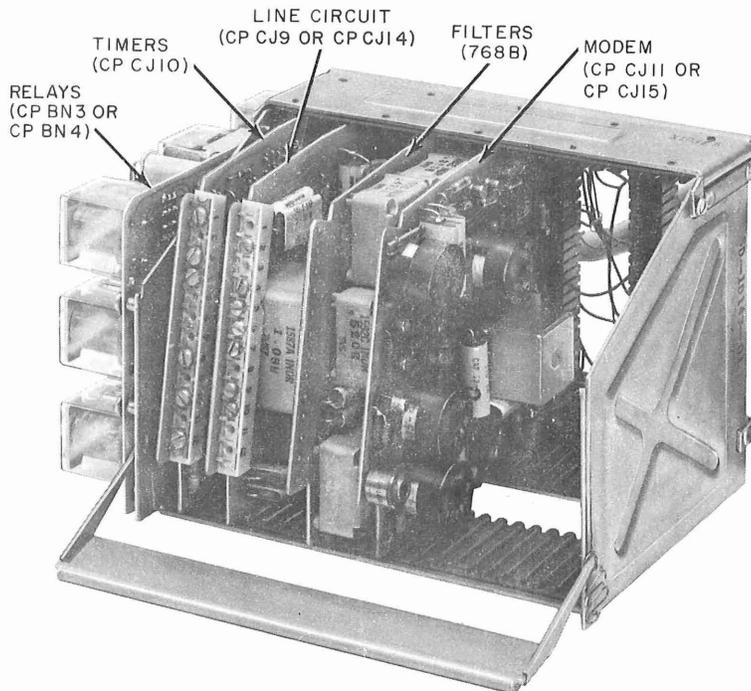
Fig. 4—Data Sets 103E5 and 103E6—Circuit Pack Locations

C. *Automatic Answer*

3.11 The data station is conditioned for automatic answering by the following:

● AUTO key operated and lead CD on (M option required for Data Sets 103G1 and 103G4 containing CP CJ9).

● AUTO key operated, lead CD on, and answer control (CM) lead on (without M option). This method of answering can be provided only by Data Sets 103G1 and G4 (which contain CP CJ9) since the Data Sets 103G5 and 103G6 do not provide a CM lead for answer control. The incoming ringing voltage will cause the ring detector to operate the

TABLE D

DATA SET 103G-TYPE FREQUENCIES

MODE	FREQ BAND		NORMAL FREQ	
			MARK	SPACE
Originate	TRMT	f_1	1270	1070
	RCV	f_2	2225	2025
Answer	TRMT	f_2	2225	2025
	RCV	f_1	1270	1070

connection circuits and connect the data station directly in the data mode. The connection circuits will function in the same manner as the attendant operating the DATA key. An exception is an additional timing cycle (24 seconds) by the handshake status timer. The 24-second timing interval starts when ringing is tripped. The handshake status timer will disconnect the data set from the telephone line if f1 mark is not received before the handshake status timer operates. Receipt of f1 during the timing cycle will stop the handshake status timer.

D. *Data Operation*

3.12 At the completion of the handshaking sequence, the transmitted data (BA) lead from the business machine is connected to the data set modulator via the connection circuits. The business machine may transmit data by applying a negative (mark) or positive (space) voltage in excess of 5 volts to the BA lead. This voltage (− or +) will cause the modulator to generate the appropriate voice frequency for transmission to the distant data station.

3.13 The received data (BB) lead delivers data to the business machine on the same voltage basis (ie, a voltage more negative than −5 volts for a mark, and more than +5 volts for a space).

3.14 At the end of data transmission, the business machine may disconnect the data station by removing the on (positive voltage) signal on lead CD and applying an off (negative voltage) signal

to lead CD for at least 50 msec. This off signal causes the data terminal ready driver to condition the connection circuits to start the send space timer, and to apply a space voltage to the BA lead.

- If T option is provided, the send space timer allows the space frequency to be transmitted to the distant data station for 3 seconds. The data set will disconnect at the end of the 3 seconds and go on-hook.

- If T option is *not* provided, the send space timer is disabled and the data set will immediately disconnect and go on-hook.

3.15 If the incoming data line power level decreases below −57 dBm, the carrier detector starts the mark timer via the connection circuits if loss of carrier (S) option is provided. The mark timer, when operated, overrides the CD lead from the business machine and initiates a 3-second space disconnect sequence independent of the T option covered in 3.14.

3.16 The answer timer is used when the data set receives an incoming call. The answer timer ensures that the data set will be conditioned to *answer* incoming calls in the proper mode for up to 4 (but not to exceed 8) seconds after the ring detector returns to the off condition.

4. ORDERING CIRCUIT PACKS

**4.01** Replacement circuit packs are ordered from the distributing house as follows:

(Quantity) ea., Description, (CP-Code).

Note: CP codes are shown in the table associated with 2.06.

Example: 5 ea., Timer, CP CJ10

5. HANDSET CHANGE FOR ACU OPERATION

5.01 Where Data Auxiliary Set 801-type ACU, requiring a ground-start line, is used with Data Set 103G, the handset of 103G must be replaced with the G5KR-61 handset. This change is covered in the section entitled Data Set 103G-Type, Installation and Connections (591-026-200).

CUSTOMER
INTERFACE
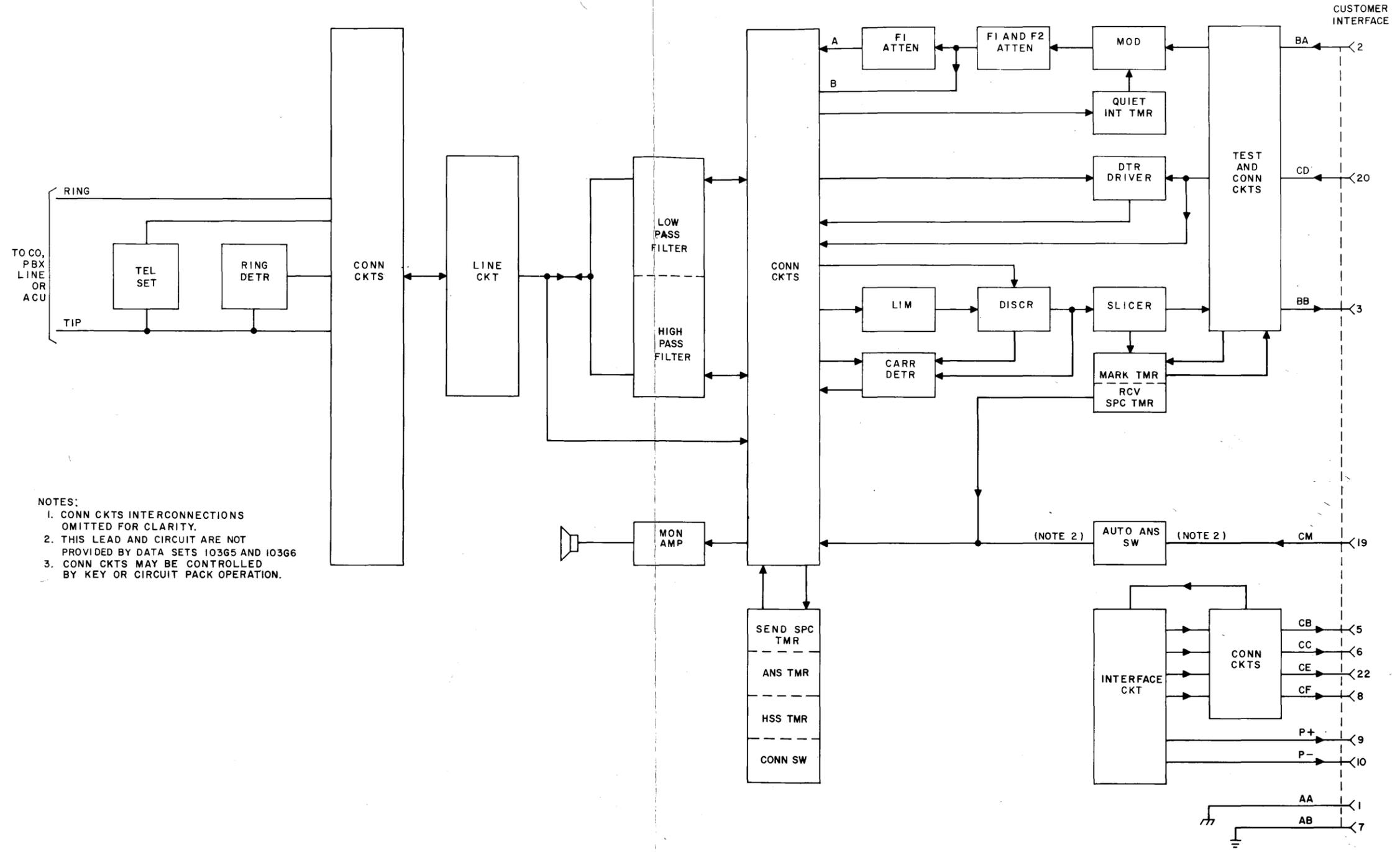
NOTES:
1. CONN CKTS INTERCONNECTIONS OMITTED FOR CLARITY.
2. THIS LEAD AND CIRCUIT ARE NOT PROVIDED BY DATA SETS 103G5 AND 103G6
3. CONN CKTS MAY BE CONTROLLED BY KEY OR CIRCUIT PACK OPERATION.

Fig. 5—Data Set 103G-Type—Functional Block Diagram