

DATA SET 103A-TYPE

DESCRIPTION AND OPERATION

1. GENERAL	1
2. PHYSICAL DESCRIPTION	1
3. FUNCTIONAL DESCRIPTION	4
A. Attended Station Operation—Data Sets 103A1 and 103A2	4
B. Automatic Answer Operation (Data Sets 103A1 and 103A2 Only)	7
C. Attended Station Operation—Data Sets 103A2 Modified for Originate-Only Service	7
D. Data Set 103A-Type Options	7
E. Modified Data Set 103A2 Options	9
4. OPERATION	10

1. GENERAL

1.01 This section covers in general terms the physical and functional descriptions as well as the operating procedures for data set 103A-type and the modified data set 103A2 which provides originate-only service.

1.02 This section is reissued to include physical and functional descriptions and operating procedures for the modified data set 103A2. Since this issue is a general revision, arrows ordinarily used to indicate changes have been omitted.

1.03 Data set 103A-type is a general purpose, full-duplex (FDX), frequency-shift-keyed (FSK), serial set that conforms to Electronic Industries Association (EIA) Specification RS-232-A. The data set is used to provide low-speed DATA-PHONE® service at rates up to 300 bauds over the direct distance dialing (DDD) telephone network.

1.04 A data auxiliary set (DAS) 804B1 (Fig. 1) or 567PB-61 telephone set (MD) (Fig. 2) is required for external control of the data set and for establishing the data set transmission path.

2. PHYSICAL DESCRIPTION

2.01 Data set 103A-type consists of four circuit packs, eleven relays (see Fig. 3), and a power supply, all enclosed in a two-tone gray plastic case. Mounted on the rear of the data set is a KS-19087-List 2 twenty-five pin connector (designated CUST EQUIP) for connection to the business machine.

2.02 The data set comes equipped with a 35-conductor, 5-1/2 foot D35C-61 cord which is used to connect the DAS 804B1 to the KS-19088-List 2 connector (designated TEL LINE) on the rear of the data set (Fig. 4). In addition, data set 103A-type comes equipped with a 3-conductor, 10-foot KS-14532-List 15 power cord.

2.03 A block diagram of data set 103A-type is shown in Fig. 5. It illustrates the five basic component sections of the data set:

- Modulator—data transmitter
- Demodulator—data receiver
- Control—logic and timing circuitry
- Line Circuit—impedance-matching transformer and ring detector
- Power Supply—rectifier.

2.04 When data set 103A2 is to be modified and used to provide originate-only service, an F44542 connecting cord is required. An M25A cord can be modified as described in the BSP entitled Data Set 103A-Type—Installation and Connections (591-014-200) and can be used in place of the F44542 cord.

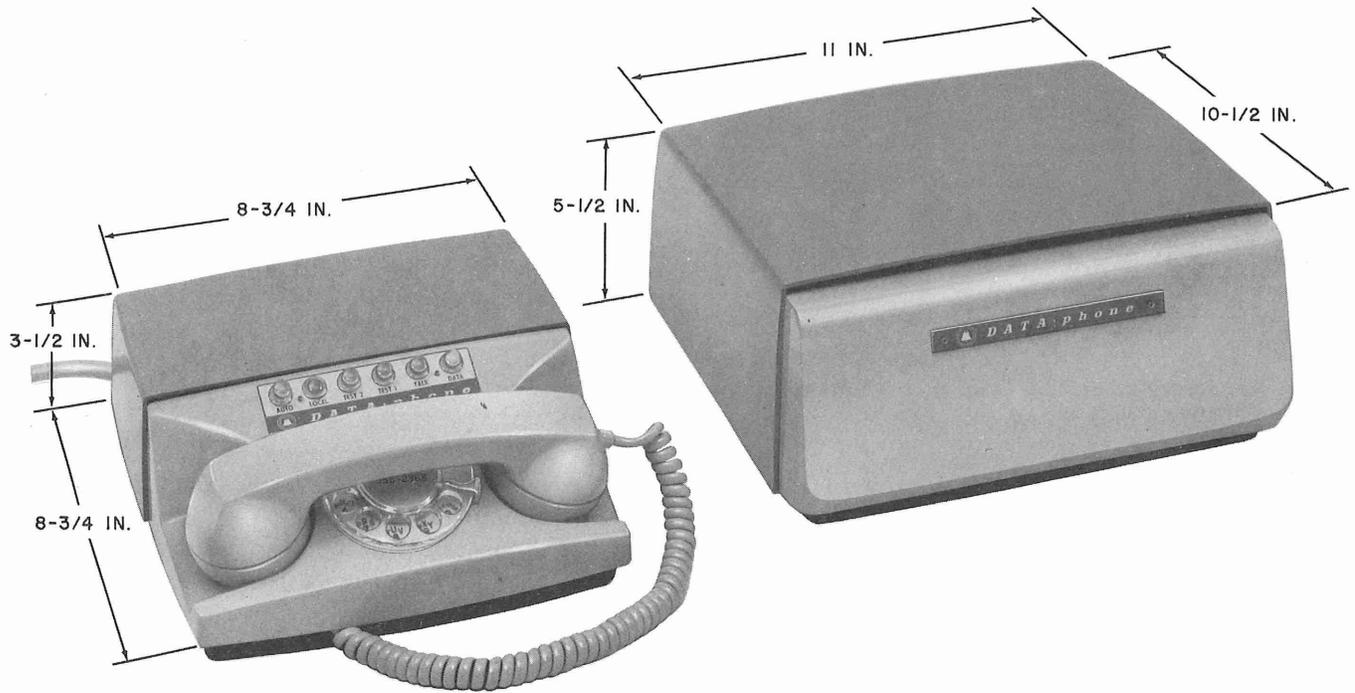


Fig. 1—Data Set 103A-Type and Data Auxiliary Set 804B1

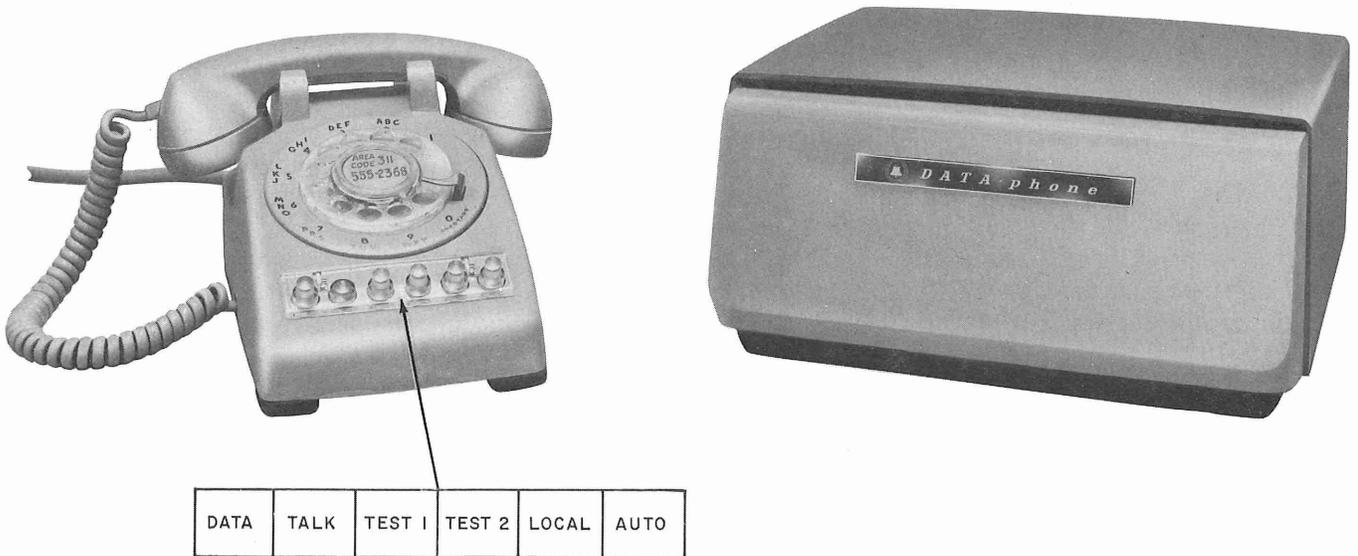


Fig. 2—Data Set 103A-Type and 567PB-61 Telephone Set (MD)

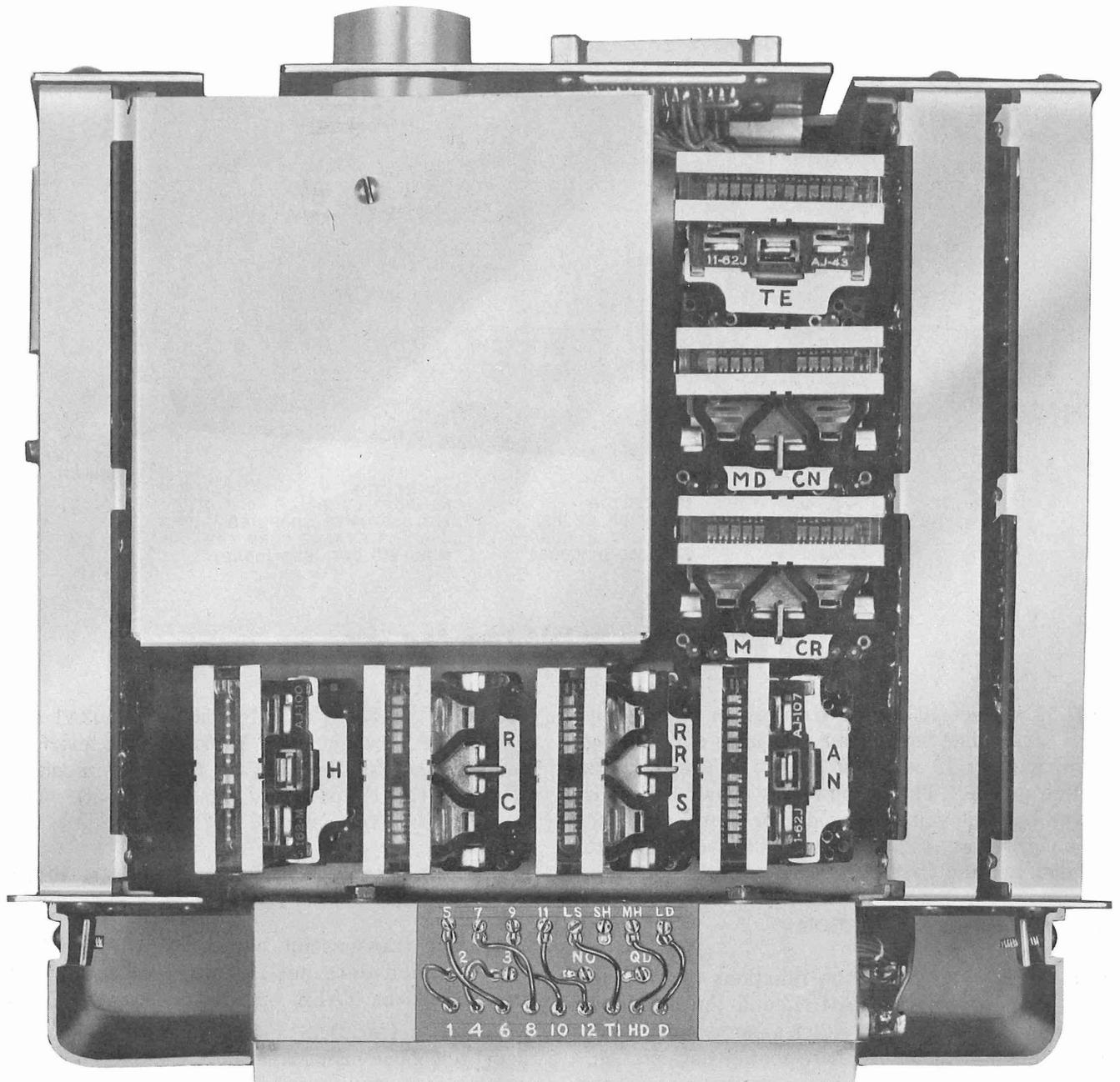


Fig. 3—Data Set 103A—Top View—Cover Removed

2.05 A block diagram of the modified data set 103A2 is shown in Fig. 6. It illustrates the five basic component sections of the data set which are the same as described in 2.03.

2.06 The DAS 804B1 contains a six-button 589AG key, handset, and an 11A or 11C telephone

apparatus unit, all housed in a two-tone gray plastic cover. For more detailed information on the DAS 804B1, refer to the BSP entitled Data Auxiliary Set 804B1 for Line Control—Identification and Connections (598-031-100).

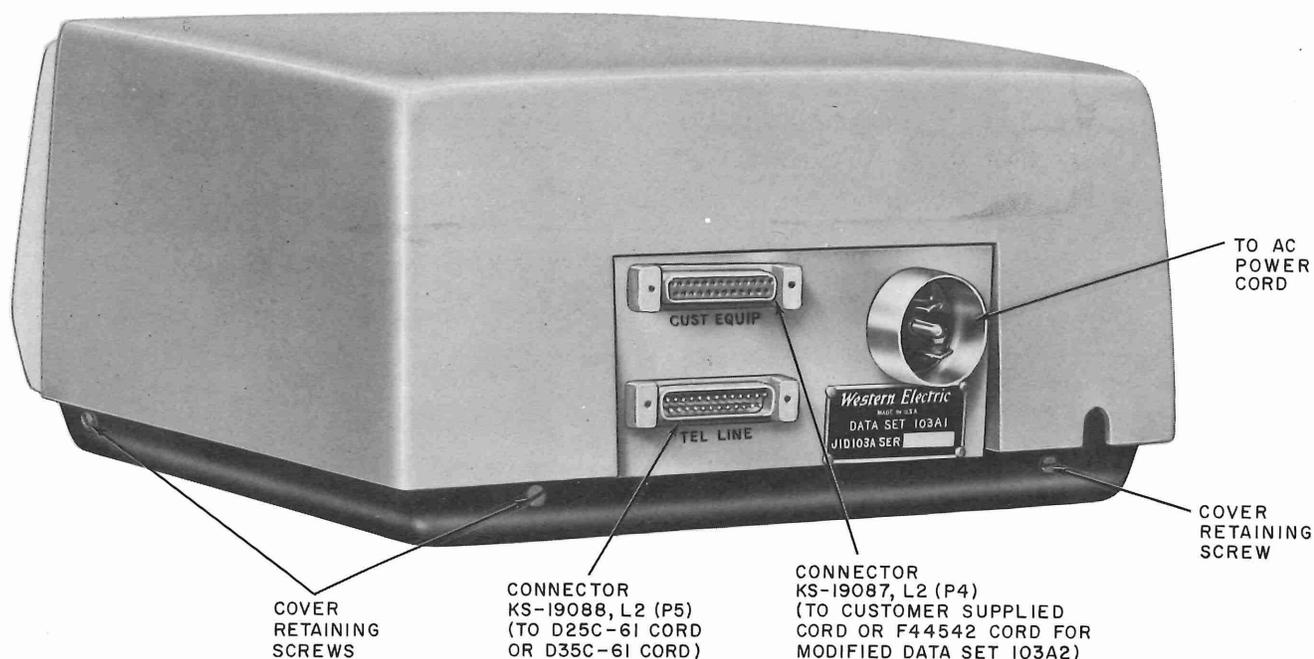


Fig. 4—Data Set 103A-Type—Rear View

2.07 Data set 103A-type requires an individually fused line power source capable of providing approximately 15 watts of 105- to 130-volt, 60 Hz ac line power. The ac power is converted to dc power by a 20-volt semiconductor rectifier circuit which provides +20V dc and -20V dc for both the data set and the DAS 804B1.

3. FUNCTIONAL DESCRIPTION

3.01 This part covers the functions of data set 103A-type, DAS 804B1, and the 567PB-61 telephone set when used either as an originate-only data station or as an originate-answer data station.

3.02 Data sets 103A1 and 103A2 are designed to transmit in one of two frequency bands and receive in the other frequency band. The transmitting frequency band and receiving frequency band used by these data sets are determined automatically during the establishment of the connection and are shown in Table A.

3.03 Data sets 103A2 modified for originate-only service always operate in the originate mode and therefore, transmit and receive the frequencies for the originate mode of data set 103A2 as shown in Table A.

3.04 The interface leads for data sets 103A1 and 103A2 are shown in Table B. The interface leads for the modified data set 103A2 are modified by using the F44542 cord (or equivalent). The leads are shown in Table C.

A. Attended Station Operation—Data Sets 103A1 and 103A2

3.05 The transmission path for the originating station data set is established by first depressing the TALK button on the associated telephone set or DAS and placing the call in the usual telephone manner.

3.06 At the answering station, ringing current will cause the bell to ring and operate circuitry in the data set to signal the business machine that there is an incoming call. It also prepares the data set for the answering mode. After at least one complete ringing cycle, the attendant at the answering station should depress the TALK button and lift the handset to trip ringing and place the data set in the answer mode. If the voice communication option is provided, the attendant may remain in the talk mode to conduct voice communication or go to the data mode by depressing the DATA button.

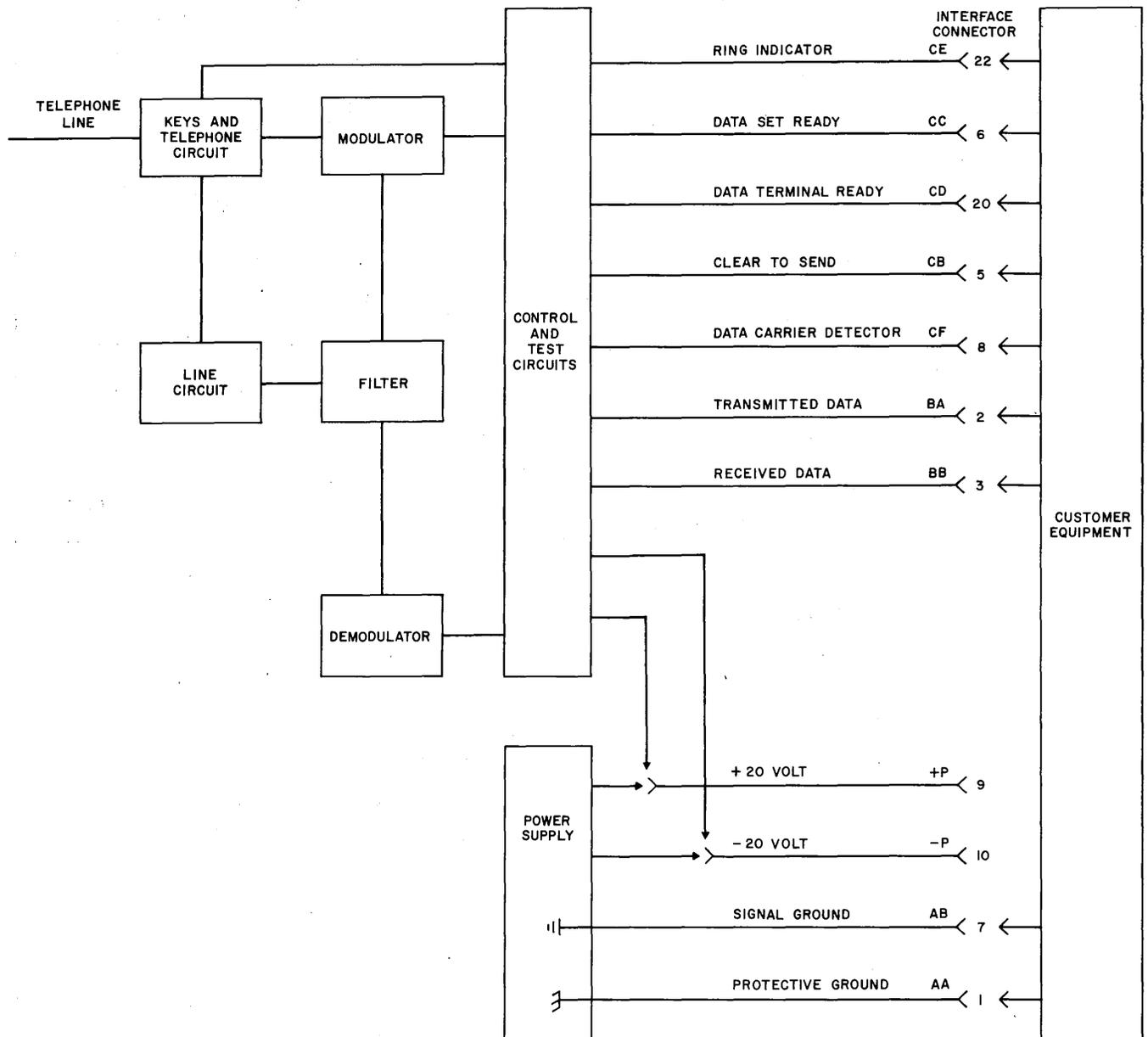


Fig. 5—Data Sets 103A1 and 103A2—Block Diagram

3.07 When the answering station DATA button is depressed and released, the TALK button is automatically released and a timing interval of 1-1/2 seconds is initiated. This timing interval is the single-frequency (SF) guard interval. The purpose of this guard interval is to insure the receipt of an off-hook signal by the originating

(serving) office from the answering station.

3.08 At the end of the 1-1/2 second SF guard interval, the answering station will transmit an f_2 mark tone to disable echo suppressors on toll trunks. Echo suppressors will remain disabled as long as any tones are being transmitted.

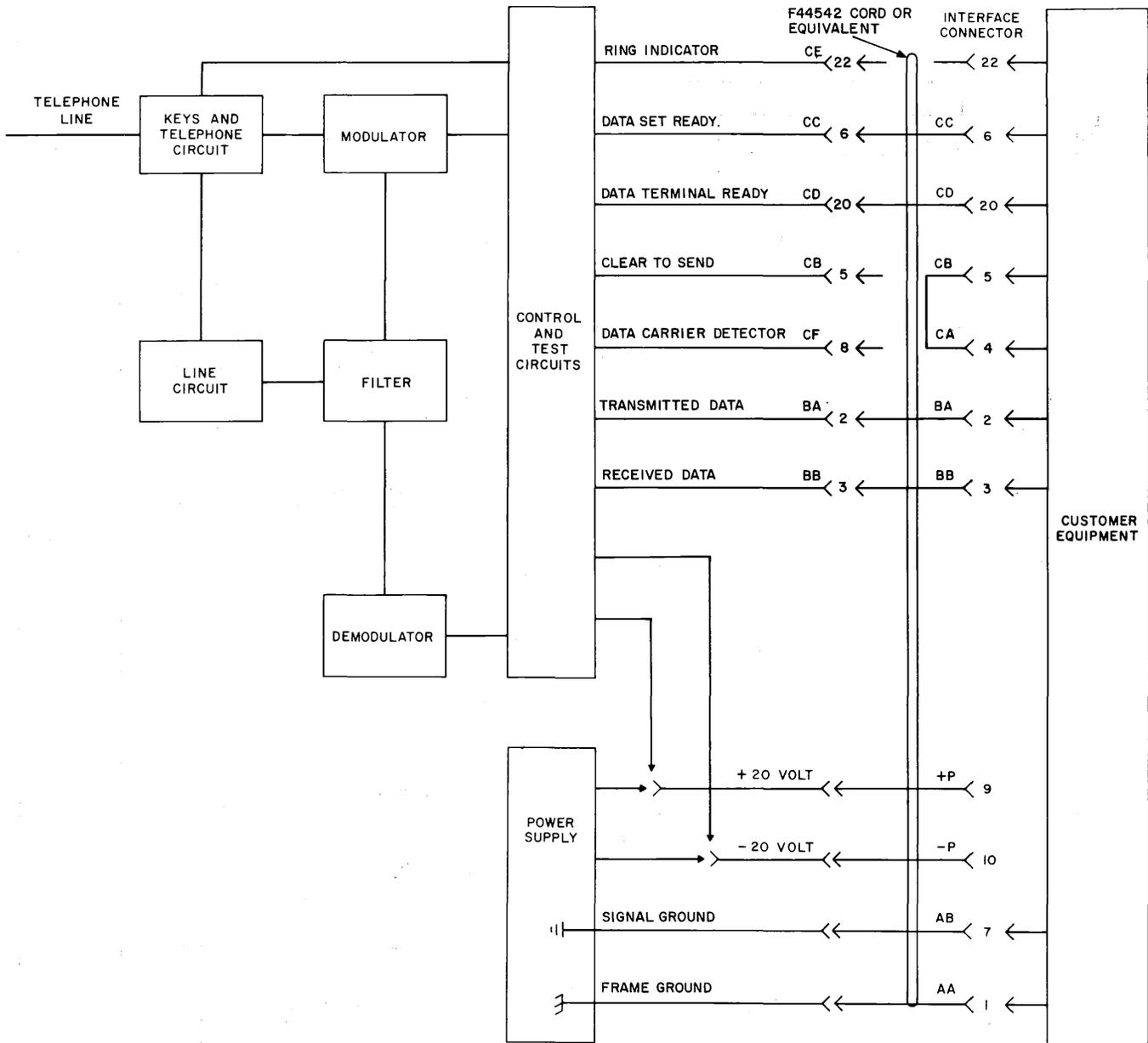


Fig. 6—Modified Data Set 103A2—Block Diagram

3.09 When the originating station attendant hears this f_2 mark tone, the attendant should depress the DATA button until the DATA lamp lights. When the DATA lamp lights, the DATA button should be released. Release of the DATA button causes the following to occur in the sequence listed:

- (1) TALK button releases
- (2) Starts a 1-1/2 second timing interval

- (3) Transmits f_1 mark tone to answering station
- (4) Signals business machine at originate end, over the clear to send (CB) interface lead, that data transmissions can begin.

3.10 Upon receipt of f_1 mark tone at the answering station, the station signals its business machine over the CB interface lead that data transmission can now begin.

B. Automatic Answer Operation (Data Sets 103A1 and 103A2 Only)

Calls may be answered automatically when either of the following options are provided:

- (1) AUTO button is depressed (alternate automatic or manual answering option).
- (2) Strapping option is connected to provide permanent automatic answering on all incoming calls (permanent automatic answering option). Use of this option bypasses the AUTO button.

3.11 With the set arranged for automatic answer, ringing current will cause the bell in the telephone set to ring and a relay in the data set to operate. Operation of this relay trips ringing and causes the data set to change to the off-hook condition, provided an ON condition is present on the CD lead. Under these conditions, the line control circuit will initiate the 1-1/2 second SF guard interval. From this point, the call will progress as previously described in 3.09 and 3.10.

C. Attended Station Operation—Data Sets 103A2 Modified for Originate-Only Service

3.12 Data set 103A2 can be modified to simulate the service provided by data set 113A-type. In this case, the data set always operates in the originate mode and functions as described in 3.13 through 3.18.

3.13 The telephone portion of the modified data set still functions in the regular telephone manner with the handset removed from the switchhook. The telephone connection is established by lifting the handset from the switchhook, operating the TALK-CLEAR button, and dialing the number of the station being called.

3.14 If the answering station answers the call in the talk mode, voice communications will be established. If the answering station answers in the data mode (ie, automatic answer operation), operation of the DATA button at the originating station will cause the data sets to "handshake" and go directly into the data mode provided the business machine is presenting a negative (*mark*) voltage on the transmitted data (BA) interface lead and a positive voltage on the data-terminal-ready (CD) interface lead when the CD lead is provided.

Note: The modified data set 103A2 is ready to send data when the DATA button is operated. Therefore, the business machine must maintain a negative voltage on the BA lead until the handshaking sequence is completed.

3.15 In either case, the answering station, when placed in the data mode, transmits f_2 mark (2225 Hz) to the originating station. When the DATA button is operated by mutual voice agreement, or operating the DATA button when the f_2 mark answer tone is heard, the originate station transmits f_1 mark back to the answering station. The handshake sequence is complete when the answering station receives and processes f_1 mark tone. The data sets are now ready to transmit and receive data.

3.16 When a data signal is transmitted from the answering station to the modified data set 103A2, the signal passes through the telephone circuit, line circuit, filter, and on to the demodulator.

3.17 The demodulator consists of a buffer-amplifier, locked-oscillator type of amplifier limiter, discriminator, slicer, and the carrier detector.

3.18 When no signal is presented to the amplifier limiter, it generates a constant amplitude signal of 2125 Hz. When the mark or space signal is presented to the amplifier limiter, it will generate a signal of the same frequency which is then applied to the discriminator.

3.19 When a mark or space frequency is applied to the discriminator, it generates a negative or positive voltage, respectively. These voltage signals are applied to the slicer and the carrier detector. The carrier detector determines whether the signal is a legitimate data signal or noise. If it determines that the signal is a data signal, then the carrier detector signals the slicer which releases the proper voltage signal to the business machine via the received data (BB) interface lead.

D. Data Set 103A-Type Options

(a) **Mark Hold**—With this option installed in the data set, the slicer will be clamped in the marking condition during absence of carrier.

(b) **Space Hold**—With this option installed in the data set, the slicer will be clamped in the spacing condition during the absence of carrier.

TABLE A
DATA SET 103A-TYPE FREQUENCIES

STATION MODE	FREQUENCY BAND	103A1 FREQUENCIES		103A2 FREQUENCIES	
		MARK	SPACE	MARK	SPACE
Originate	TRMT f_1	1070	1270	1270	1070
	RCV f_2	2025	2225	2225	2025
Answer	TRMT f_2	2025	2225	2225	2025
	RCV f_1	1070	1270	1270	1070

TABLE B
DATA SETS 103A1 AND 103A2 INTERFACE LEAD DESIGNATIONS

PIN NO.	LEAD AND FUNCTION	DESIGNATION
1	PROTECTIVE GROUND — Common to signal and ac power service ground	AA
2	TRANSMITTED DATA — Customer data presented to data set	BA
3	RECEIVED DATA — Data output presented to business machine	BB
5	CLEAR TO SEND — Signals business machine that data may be transmitted	CB
6	DATA SET READY — Signals business machine when data set is in the data mode	CC
7	SIGNAL GROUND — Common to frame ground and ac power service ground	AB
8	DATA CARRIER DETECTOR — Signals business machine that data carrier is being received	CF
9	+POWER — Positive voltage for test purposes only	+P
10	-POWER — Negative voltage for test purposes only	-P
20	DATA TERMINAL READY — Business machine applies an ON condition for auto. answer and an OFF condition to disconnect data set from the line. This lead must be ON to enable the data set to be placed off-hook.	CD
22	RING INDICATOR — Indicates presence of ringing current to business machine on incoming calls	CE

TABLE C
MODIFIED DATA SET 103A2 INTERFACE LEAD DESIGNATIONS

PIN NO.	LEAD AND FUNCTION	DESIG
1	Protective Ground — Common to signal and ac power service grounds	AA
2	Transmitted Data — Customer data presented to data set	BA
3	Received Data — Data output presented to business machine	BB
4	Request to Send — Connected to CB at the data terminal equipment end	CA
5	Clear to Send — Connected to CA at the data terminal equipment end	CB
6	Data Set Ready — Signals business machine when data set is in the data mode	CC
7	Signal Ground — Common to frame ground and ac power service ground	AB
9	+ Power — Positive voltage for test purposes only	+P
10	— Power — Negative voltage for test purposes only	—P
20	Data Terminal Ready — Customer control of data mode (optional)	CD

(c) **Responds to Disconnect Option**—With this option installed in the data set, the data set will disconnect and go on-hook upon receiving 1-1/2 seconds of continuous spacing signal from the distant station.

(d) **Does Not Respond to Disconnect Option**—With this option installed in the data set, the data set will not disconnect upon reception of a spacing signal of any duration.

(e) **Initiates Disconnect**—With this option installed in the data set, the business machine may initiate a disconnect sequence by turning off the data-terminal-ready (CD) interface lead which causes the data set to transmit three seconds of spacing signal to the distant station.

(f) **Does Not Initiate Disconnect**—With this option installed in the data set, the data set will not transmit any spacing signal to the distant station when the business machine turns off the CD interface lead.

Note: Options described in (g), (h), and (i) are provided in either the DAS 804B1 or 567PB-61 key telephone set.

(g) **Alternate Automatic or Manual Answering Option**—With this option (wiring option W) installed, the data set can either automatically or manually answer any incoming call.

(h) **Manual Answering Option**—With this option installed, all incoming calls must be answered manually.

(i) **Permanent Automatic Answer Option**—With this option installed, manual control of the data set is not possible and all calls will be automatically answered.

E. Modified Data Set 103A2 Options

(a) **W Option**—With this option installed in the modified data set 103A2 there is no visual indication provided when the data set is in the *data* mode and the test lamp lights when the data set is in the *test* mode. The data set will only disconnect when the TALK/CLEAR button is operated.

(b) **V Option**—With this option installed in the modified data set 103A2, the data lamp lights when the data set enters the *data* mode and

SECTION 591-014-100

the test lamp lights when the data set enters the *test* mode. The lamps extinguish when the data set goes on-hook or reverts to the talk mode. In addition, the data set will only disconnect when the TALK/CLEAR button is operated.

(c) **X Option**—With this option installed in the modified data set 103A2, the data lamp lights when the data set enters the *data* mode and the test lamp lights when the data set enters the *test* mode. The lamps extinguish when the data set goes on-hook or reverts to the talk mode. In addition, the data set will only go into the data mode when the customer business machine is turned on and is supplying a positive voltage on the data-terminal-ready (CD) lead. Because of CD lead control, a data call may be disconnected when the customer turns off the business machine or whenever the data set loses power.

4. OPERATION

Note: Designations shown in parentheses are the designations to be used when the data set to be operated is a modified data set 103A2. See Table D (103A1 and 103A2) or Table E (modified data set 103A2) for a list of key designations.

Call Origination

4.01 In order to originate a call, first lift the handset and then operate the TALK (TALK/CLEAR) button. When dial tone is received, dial the number of the station being called.

Talk Mode to Data Mode Transfer

4.02 The called station may answer in either of two different ways. They may answer manually in the talk mode or they may answer automatically and go directly into the data mode. In either case, when it is desired to go into the

**TABLE D
DATA SETS 103A1 AND 103A2 KEY DESIGNATIONS**

KEY DESIGNATION	KEY NUMBER		FUNCTION	ILLUMINATED KEY
	DAS 804B1	567PB-61 TEL SET		
AUTO	1	6	A locking key used to provide automatic answer of incoming calls	Yes
LOCAL	2	5	A locking key used to connect send and receive leads together and disconnect data set. This permits local operation and test of business machine	No
TEST 2	3	4	Nonlocking key used to test data set under the direction of data test center	No
TEST 1	4	3	Nonlocking key used to test data set under the direction of data test center	Yes
TALK	5	2	Locking key used to connect telephone set to data line	No
DATA	6	1	Nonlocking key used to shift from talk to data mode (also takes data set out of test mode if connected in error)	Yes

TABLE E
MODIFIED DATA AUXILIARY SET 804B1 KEY DESIGNATIONS

KEY DESIGNATION	KEY NUMBER DAS 804B1	FUNCTION	ILLUMINATED KEY
—	1	Not in use	No
—	2	Not in use	No
—	3	Not in use	No
TEST	4	Nonlocking key used to place data set in test mode under the direction of the DTC	Yes
TALK/CLEAR	5	Locking key used to provide manual disconnect from the data mode and to connect telephone to the telephone line when handset is off-hook	No
DATA	6	Nonlocking key used to shift from the talk mode to the data mode	See Note

Note: The key is illuminated for the modified data set 103A2 equipped with option X and is *not* illuminated for the modified data set 103A2 equipped with options V or W.

data mode, operate the DATA button and replace the handset on the switchhook.

Call Disconnect (Data Sets 103A1 and 103A2)

4.03 When it is desired to terminate a data call with either of these data sets, the attendant at the station turns off the business machine or lifts the handset, operates the TALK key, and replaces the handset on-hook.

Call Disconnect (Modified Data Sets 103A2)

4.04 When it is desired to terminate a data call with a modified data set 103A2 without CD lead control (option W or V), operate the TALK/CLEAR button.

4.05 A data call may be terminated when using modified data set 103A2 with CD lead control (option X) by either operating the TALK/CLEAR button or by turning off the customer business machine.

Test Mode

4.06 Should it become necessary to remote test data set 103A1, 103A2, or a modified data set 103A2, 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 103A-type requesting the remote test.

4.07 The call from the DTC is answered in the talk mode. When instructed by the DTC, the attendant places the data set in the test mode by operating the TEST 1 (TEST) button. The data set is now under the control of the DTC and will be released from the test mode upon completion of the test. To manually release the data set from the test mode, transfer it to the data mode by operating and releasing the DATA key and then disconnect it as described in 4.03 (data sets 103A1 or 103A2) or 4.04 (modified data set 103A2).