

DATA SET 103H-TYPE DESCRIPTION AND OPERATION

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1. GENERAL

1.01 This section covers in general terms the physical and functional description as well as the operating procedures for Data Set 103H-type. Information concerning the Bell System or customer provided data terminals is not included in this section.

1.02 This section is reissued to provide information on the Data Set 103H2 which incorporated Data Set 103E6 as the data modem. Information on the Data Set 103H1, which incorporates the

Data Set 103E5, is retained in this practice to provide coverage for equipment that is still in service. Since this is a general revision and extensive changes have been made throughout the practice, change arrows have been omitted.

1.03 Data Set 103H-type (Fig. 1) is a general purpose, full-duplex (FDX), frequency-shift-keyed (FSK) serial set designed for low-speed (up to 300 baud) data transmission. The interface conforms to Electronic Industries Association (EIA) Standards. When the Data Set 103H-type is equipped with Data Set 103E5 or 103E6 with ZD option, the 103H-type conforms to EIA standard RS-232-B. When the Data Set 103E6 is not equipped with ZD option, the Data Set 103H2 conforms to EIA standard RS-232-C.

1.04 The Data Set 103H-type is used to provide DATA-PHONE[®] service for Model 37-type teletypewriters (TTY) or customer provided terminals (CPT). To provide this service, Data Set 103H-type requires connection to one of the Data Auxiliary Sets (DAS) 804P5, 6, 7, or 8 (attendant set) which in turn requires connection to hand telephone set 223C-52. Facilities are also provided to connect an optional DAS 801A5, 801C3, or 801C4 automatic calling unit (ACU).

1.05 Call origination may be made manually, in the hands-free mode, or, when ACU is provided, automatically. For detailed operation of the Data Set 103H-type, refer to CD- and SD-1D121-01.

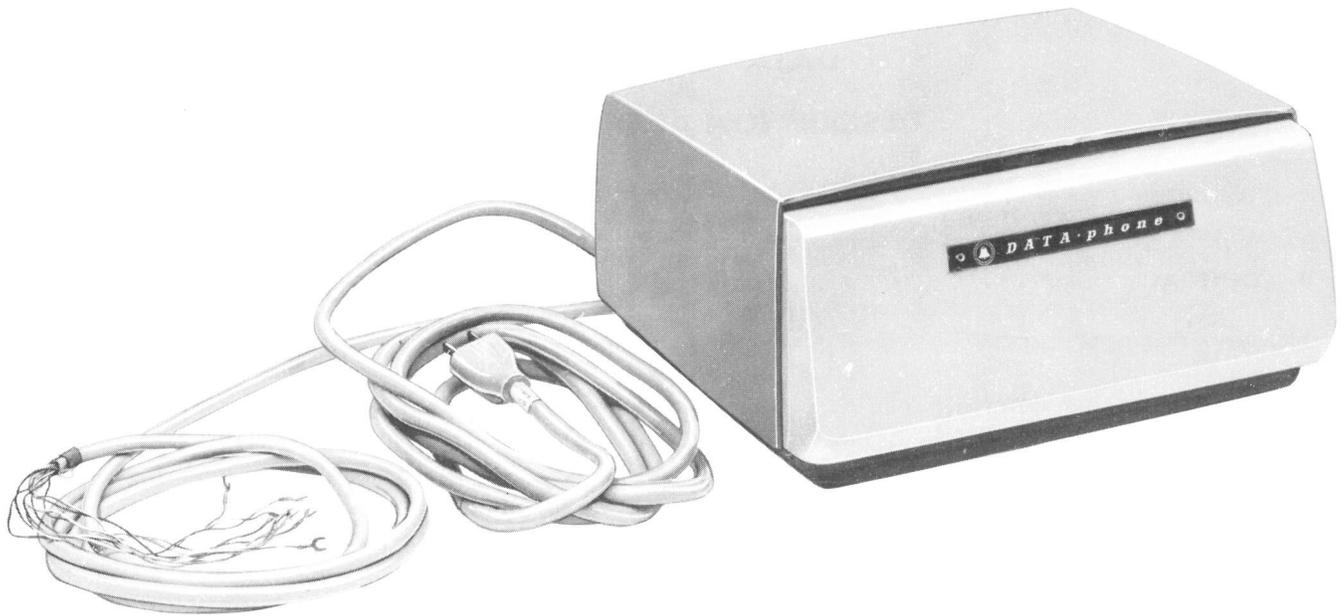


Fig. 1—Data Set 103H-Type

2. PHYSICAL DESCRIPTION

2.01 Data Set 103H-type (Fig. 1) consists of a Data Set 103E5 or 103E6 (data modem) and a 17A or 48A power unit packaged in a plastic housing. Connectors are provided for connecting Data Set 103H-type to the associated data terminal and attendant set. The connectors provided for interconnection of Data Set 103H-type and the attendant set are 50-conductor AMPHENOL® connectors. This allows, by use of one or more telephone company-provided A25B connector cables, locating the data set and attendant set further apart. A cord is provided for connection of Data Set 103H-type to the telephone facility and, if used, the ACU. In addition, an ac power cord is provided as part of the data set. For a description of the Data Sets 103E5 and 103E6, refer to SD- and CD-1D147-01.

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2.02 Data Set 103H-type is approximately 11 inches wide, 10-1/4 inches deep, 5-1/2 inches high, and weighs approximately 13.5 pounds. When used with the 37-type TTY, Data Set 103H-type is mounted inside of the TTY pedestal on a 98A bracket (Fig. 2). When used with a CPT, the data set, attendant set, and hand telephone set

will be mounted in accordance with local engineering practices.

2.03 Data Set 103H-type is used with any one of four attendant sets. The attendant sets each contain a ringer, a telephone network and dial, a six button key/lamp strip, an audio amplifier, a loudspeaker, and a volume control. The internal circuitry for each of the four attendant sets is the same except for the dial and the presence of a card dialer. Given in Table A are the attendant sets by code, the type dialer used in each, and which sets are equipped with a card dialer.

3. FUNCTIONAL DESCRIPTION

A. General

3.01 Data Set 103H-type is controlled by the operation of the data modem in response to signals from the attendant set, data terminal, transmission facility, and if used, the ACU. It is designed to operate in two-frequency bands. When the data set originates a call, the transmit frequency band is designated f_1 and the receive frequency band is designated f_2 . When it answers an incoming call, the f_2 band is the transmit frequency band and the f_1 band is the receive frequency band. The

Data Set 103H-type transmit and receive frequencies are shown by mode of operation in Table B.

3.02 The Data Set 103H-type interface leads (Fig. 3) to the data terminal are provided by the data modem. The interface leads which have designations beginning with A (ie, AA) are ground leads. The interface leads which have designations beginning with B (ie, BA) are data

leads. The data leads are positive for spacing signals and negative for marking signals. The interface leads which have designations beginning with C (ie, CB) are control leads. A positive voltage on a control lead means it is on and a negative voltage means it is off. The interface leads are listed, by designation, in Table C along with the name and purpose of each lead.

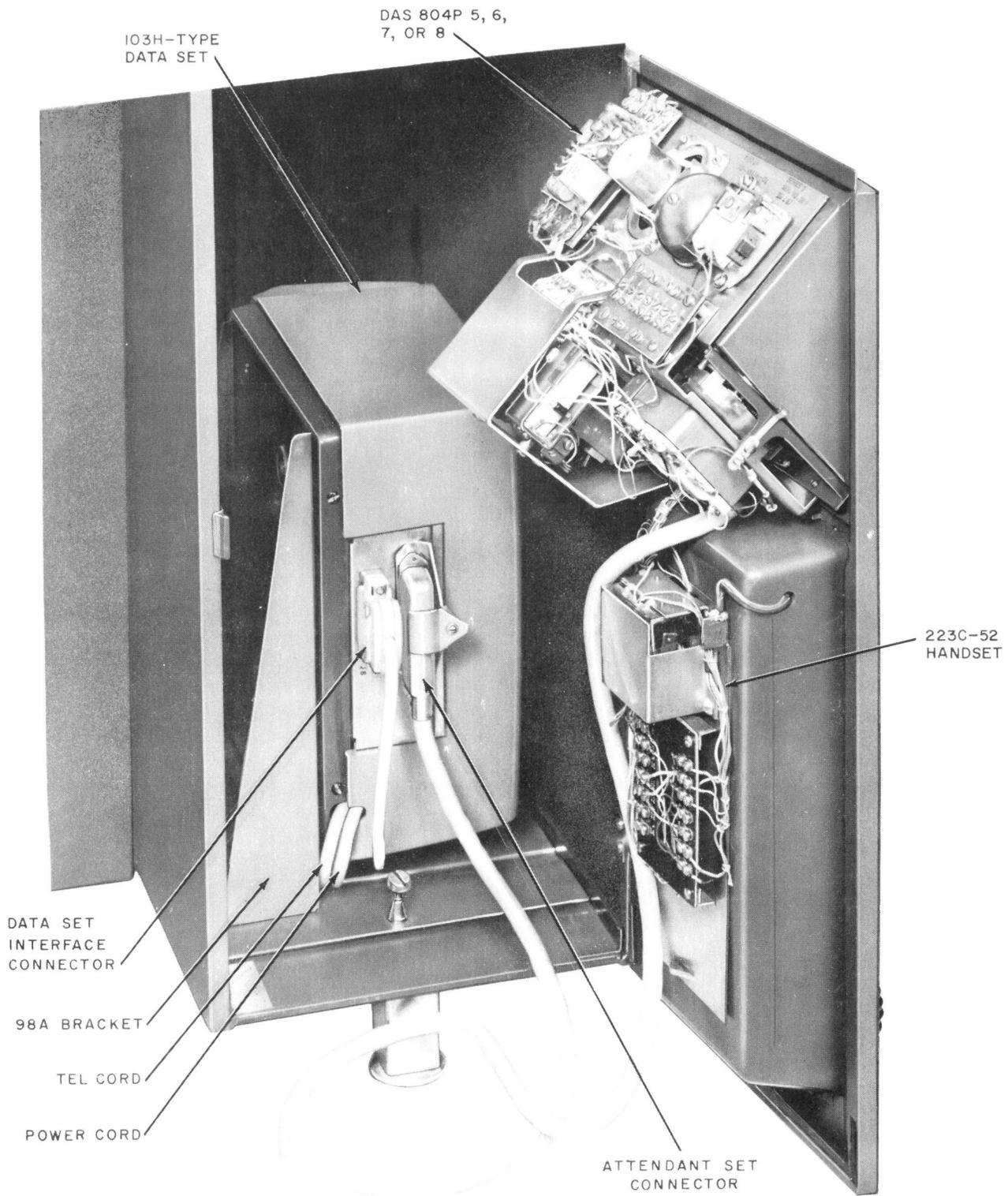


Fig. 2—Data Set 103H-Type Mounted in 37 TTY Pedestal

TABLE A
DATA AUXILIARY SET 804P-TYPES
(ATTENDANT SETS)

TYPE ATTEND. SET	TYPE OF DIAL	EQUIPPED WITH CARD DIALER
804P5	Rotary (8J)	NO
804P6	TOUCH-TONE® (35C3A)	NO
804P7	TOUCH-TONE (36H)	YES (P/O 36H)
804P8	Rotary (8J)	YES (41B)

TABLE B
DATA SET 103H-TYPE FREQUENCIES

MODE	FREQ BAND	FREQ	
		MARK	SPACE
ORIGINATE	TRMT F ₁	1270 Hz	1070 Hz
	RCV F ₂	2225 Hz	2025 Hz
ANSWER	TRMT F ₂	2225 Hz	2025 Hz
	RCV F ₁	1270 Hz	1070 Hz

3.03 The tip and ring of the transmission facility (Fig. 3) are connected directly to the data

modem of the data set via two leads of cord D10R-61 and then delivered to the associated attendant set.

3.04 Since the data set does not contain a polarity guard circuit, the tip and ring connections from the transmission facility must not be reversed. When an attendant set equipped with TOUCH-TONE dial is used, a reversal of the tip and ring connections to the data set will inhibit the operation of the TOUCH-TONE dial.

3.05 When an optional ACU is used, its interface leads (see Fig. 3) are provided by the data modem and extended to the ACU via cord D10R-61. The designations, names, and functions of the ACU interface leads are given in Table D.

3.06 When Data Auxiliary Set 804P8 is used, the ac power required for the card dialer is supplied by a 2012B, or equivalent transformer and delivered to the card dialer via the 18 VAC and GND leads of cord D10R-61.

3.07 When connected to the 223C-52 hand telephone set, the attendant set (Fig. 4, 5, 6, and 7) serves as a standard telephone for call origination and voice communications. In addition, six keys are provided to enable the attendant to control the data set. The six keys provided are the DATA, CLEAR-TALK, TEST, SPARE, SPARE, and AUTO keys. Each key has a built-in lamp by which the data modem signals the attendant.

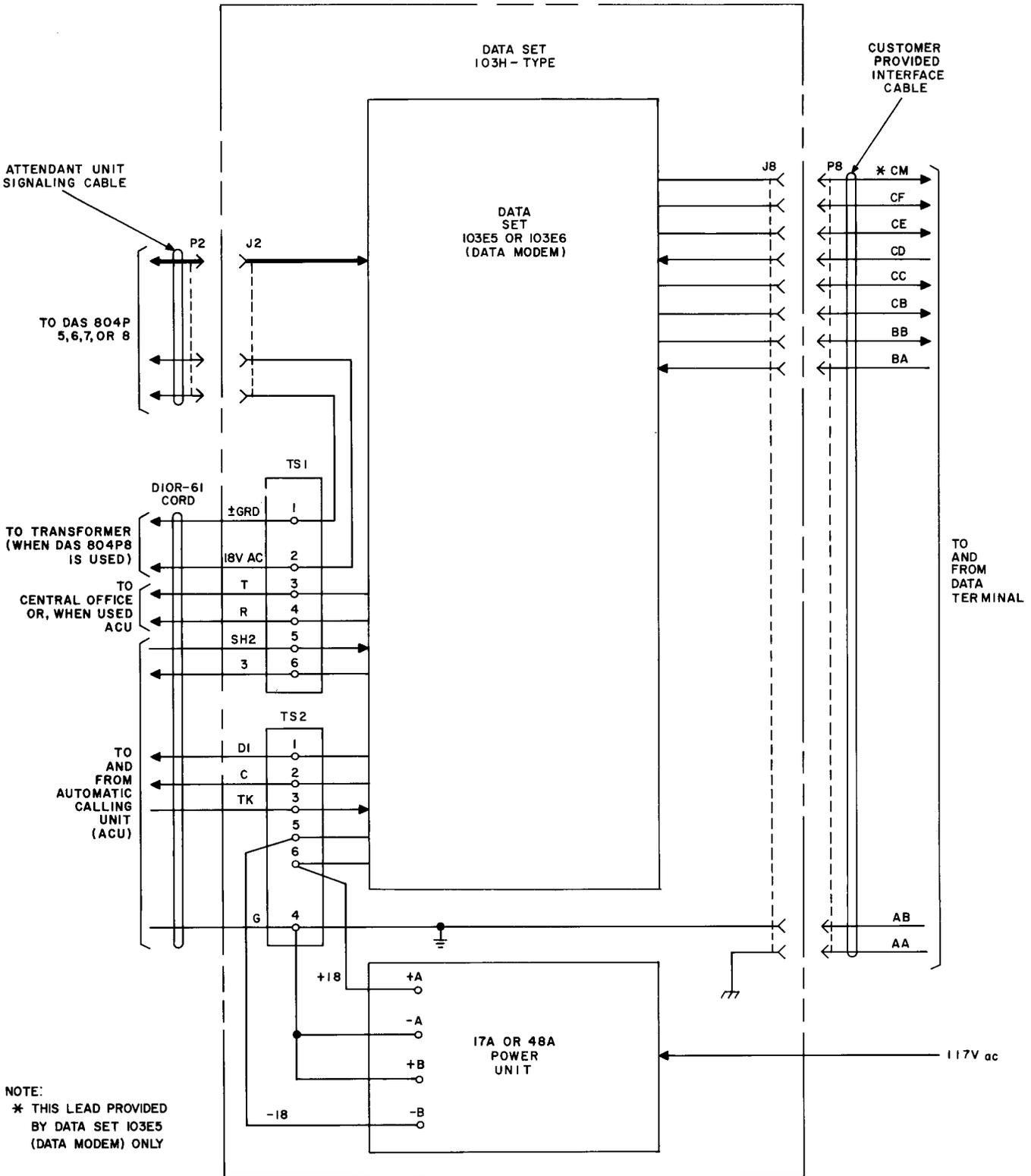


Fig. 3—Block Diagram of Data Set 103H-Type

TABLE C
DATA SET INTERFACE LEADS

DESIG	NAME	PURPOSE
AA	Protective Gnd	To connect ac power service ground to equipment chassis.
AB	Signal Gnd	To provide ground for all electronic circuits. (May be connected to AA by installer screw switch option.)
BA	Transmitted Data	To present customer data to data set.
BB	Received Data	To present data output from data set to customer data terminal.
CB	Clear to Send	To inform customer that data set is ready to transmit any data presented on lead BA.
CC	Data Set Ready	To inform customer that the data set is connected to the transmission facility.
CD	Data Terminal Ready	To inform the data set that the data terminal is ready to originate or answer data calls.
CE	Ring Indicator	To indicate to the customer that ringing current is being received.
CF	Data Carrier Detector	To indicate to the customer that carrier is being received.
CM See Note	Answer Control	To allow data terminal to inhibit the automatic answering feature. (Can be enabled or disabled by a screw switch option.)

Note: The CM lead is provided by Data Set 103E5 only.

TABLE D
ACU INTERFACE LEADS

DESIG	NAME	FUNCTION
DT	Data Tip	To extend the tip side of the transmission facility through the ACU to the data set.
DR	Data Ring	To extend the ring side of the transmission facility through the ACU to the data set.
"3"	—	To provide an alternate path for extension of the ring side of the telephone. (Used only during automatic call origination.)
C	Data Mode	Signal flow from data set to ACU informs ACU that the data set is in the data mode. (Automatic call origination inhibited.)
TK	Talk Mode	Signal flow from data set to ACU informs ACU, if C is OFF, that the attendant wishes to originate a call. If C is ON, the ACU is informed that a data-to-talk mode transfer has occurred and automatic call origination is inhibited.
G	Circuit Gnd	To provide a common ground reference for the data set and the ACU.
D1	—	Signal flow from ACU to data set places the data set off-hook when a call is originated automatically.
SH2	—	Signal flow from ACU to data set to clear data set from data mode when ACU terminates data call.

TABLE E
DATA SET 103H-TYPE CONTROL OPTIONS

OPTION	NAME	FEATURE PROVIDED
X	CE ON	CE lead of answering station will remain ON after ringing is removed. (Informs data terminal that station is answering, not originating a call.)
W	CE OFF	CE lead is turned ON only while ringing is present.
V	Long Space Disconnect	Receipt of 1.5 seconds of continuous spacing signal will disconnect data set.
H	Short Space Disconnect	Same as V option except timing interval is 400 milliseconds.
T	Send Disconnect	Data set transmits 3 seconds of spacing signal during disconnect sequence initiated by turning off CD control lead.
S	Loss of Carrier Disconnect	Data set disconnects upon loss of carrier.
G	Originate - Only Test	Allows entrance to test mode from talk mode (originate-only stations).
Q	Common Grounds	Connects signal and frame grounds together.
N	Without Answer/ Originate Transfer	Removal of this option allows transfer from answer mode to originate mode after call is answered.
*M	Answer Control Combined	Removal of this option allows data terminal to override AUTO key and inhibit automatic answer feature of data set.
B	Separate Carrier-Detected, Clear-To-Lead Indication	CB and CF interface leads are independent.
A	Common Carrier-Detected, Clear-To-Send Indications	CB and CF interface leads are dependent (turn OFF and ON together).
†ZD	CC Indication Early	CC Interface lead conforms to EIA RS-232-B when this option is provided. When the option is not provided, the interface lead conforms to EIA RS-232-C.

(*) Not optional in Data Set 103H2 as the Answer Control Combined is always provided.

(†) Not optional in Data Set 103H1 as CC Indication Early is always provided.

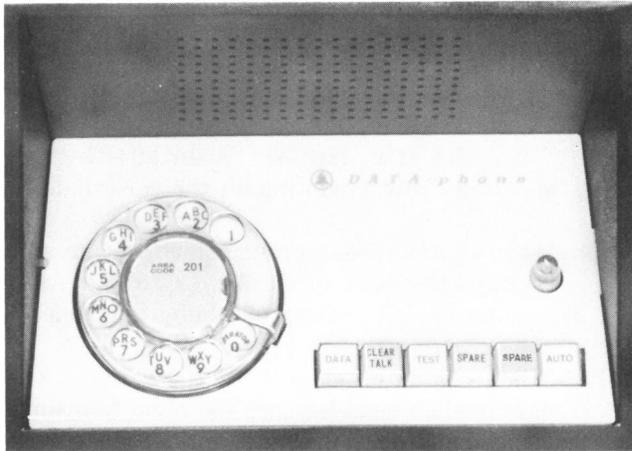


Fig. 4—Data Auxiliary Set 804P5



Fig. 6—Data Auxiliary Set 804P7



Fig. 5—Data Auxiliary Set 804P6

- 3.08** The two keys and lamps designated SPARE are provided for possible future use.
- 3.09** The DATA key is a nonlocking, nonreleasing key. Operation of the DATA key by itself will connect the data modem across the transmission facility (data set off-hook) and light the DATA lamp to indicate to the attendant that the data set

is off-hook. Simultaneous operation of the DATA and TEST keys puts the data modem into the answer mode to allow testing of the data terminal.

3.10 The TEST key is a nonlocking, nonreleasing key used to place the data set in the test mode to allow remote testing. The TEST lamp indicates to the attendant that the data set is in the TEST mode. The data set will automatically disconnect from the test mode upon completion of the test call; however, if the test mode is entered inadvertently, it may be cleared by operation of the CLEAR-TALK key. Simultaneous operation of the TEST and DATA keys is described in 3.09.

3.11 The CLEAR-TALK key is a nonlocking, releasing key. Operation of the CLEAR-TALK key, when the handset is off-hook, will transfer the data set from the data mode to the talk mode. Operation of the CLEAR-TALK key, when the handset is on-hook, will disconnect (clear) the data set from the transmission facility and return it to idle. The CLEAR-TALK lamp will be lighted by the data set whenever the data set is going through the 3-second disconnect sequence.

3.12 The AUTO key is a push-to-operate, push-to-release key. Operation of the AUTO key will light the AUTO lamp and enable the automatic answer feature of the Data Set 103H2. The Data Set 103H1 automatic answer feature is enabled when the M option is provided or when the CM lead is turned on in addition to the AUTO key being operated (See Table E).

3.13 The attendant set is equipped with a monitor amplifier, loudspeaker, and volume control. The monitor amplifier and loudspeaker enable the attendant to monitor call progress tones when a data call is established by the hands-free method (see 3.20 through 3.23). The volume control will adjust the output level of the loudspeaker but will not turn the monitor amplifier on or off. When a call is originated by the hands-free method, the data modem automatically turns the monitor amplifier on or off as required for the monitoring of the call progress tones.

3.14 A transfer from the talk mode to the data mode in an originating station will also turn on the monitor amplifier. In this case, it will remain turned on until an f2 marking signal is received from the answering station.

3.15 In addition, the monitor amplifier is turned on during:

- (a) An automatic call origination.
- (b) A portion of a remote test call.

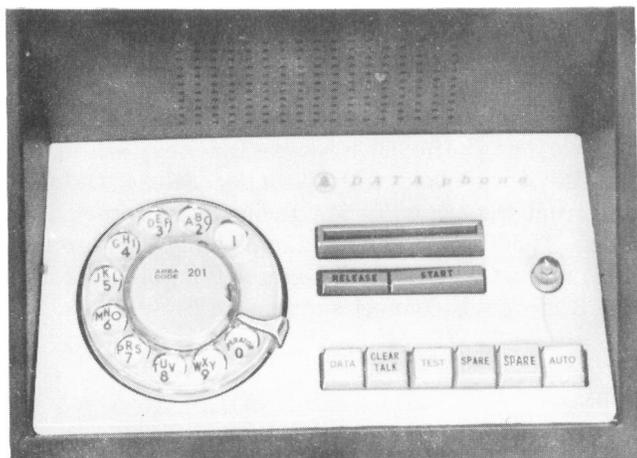


Fig. 7—Data Auxiliary Set 804P8

3.16 When the data set is in the idle mode or without ac power, the hand telephone set and attendant set dial can be used as a standard telephone with the following exceptions:

- (a) When the attendant set is an 804P7 or 8, loss of ac power will inhibit the card dialer.
- (b) When an ACU uses a ground-start transmission facility, the loss of ac power to the ACU will prevent the ACU from obtaining dial tone.

3.17 When the data set is in the data mode, the data modem disables both the hand telephone set and the dial. This prevents interference with data transmission if an attempt to use either the dial or hand telephone set should be made. Operation of the CLEAR-TALK key will signal the data modem to relinquish control of the transmission facility.

3.18 One set of switch-hook contacts on the hand telephone set is used to signal the data modem to remember whether the call is an answer or originate call. This allows a transfer to the data mode on completion of the voice communications. All of the other hand telephone set switch-hook contacts are used with the telephone.

3.19 The Data Set 103H-type features and options are those provided by the installer screw switches in the data modem. Therefore, if the loss of carrier disconnect option is desired, it is provided by adding option S (loss of carrier disconnect) to the data modem. The control options, their names, and the features they provide for Data Set 103H-type are listed in Table E.

B. Hands-Free Origination and Automatic Answering of Data Calls

3.20 To originate a hands-free data call, the attendant set DATA key must be operated and held operated until the DATA lamp lights.

Note: The DATA lamp will not light unless the CD lead is on.

At this time, dial tone will be heard in the loudspeaker. The number of the station being called (answering station) can now be dialed and the call progress tones will be heard in the loudspeaker. If the call is not completed for any reason or the called station does not answer,

operation of the CLEAR-TALK key on the originating station attendant set will return the station to the on-hook (idle) condition.

3.21 In order for station to answer a call automatically, the following conditions must exist:

- The Auto key on the attendant set must be operated
- The CD lead must be on
- The CM lead must be on when M option is not provided (This is applicable only to Data Set 103H1 equipped with Data Set 103E5).

When these conditions exist, the answering station will detect ringing, go off-hook and into the answer mode of operation. After waiting 1.2 seconds to ensure successful completion of supervisory signaling, an F₂ marking signal is sent. The f₂ marking signal disables any echo suppressors in the transmission facility and they remain disabled as long as continuous energy is on the line. Disabling the echo suppressors permits simultaneous transmission in both directions.

3.22 Due to the operation of the DATA key and the absence of ringing at the originating station, the data set is conditioned to respond to an f₂ marking signal and the modulator is squelched. The f₂ marking signal from the answering station is detected and timed for 545 milliseconds. This time ensures the disabling of echo suppressors and that a valid f₂ marking signal has been received. At the end of the 545 milliseconds, the loudspeaker is silenced, the modulator is turned on in the marking state (f₁ marking signal is transmitted), and a timer is started that will turn on lead CB and enable lead BA in 350 milliseconds.

3.23 When the answering station originally went off-hook, a 27-second timer was started. In the event that the f₁ marking signal from the originating station is not received within 27 seconds, the answering station would terminate the call. When the f₁ marking signal is received by the answering station, it is timed for 100 milliseconds, the 27-second timer is disabled, lead CB is turned on, and lead BA is enabled. This connection sequence during which the f₂ and f₁ marking signals are exchanged is commonly referred to as the "handshaking" sequence. When the handshaking

sequence is complete, the station is ready to transmit data. For a more detailed description of the handshaking sequence, refer to the sequence charts in SD-1D147-01.

3.24 If the call is answered manually rather than automatically, the answering station response will be heard in the loudspeaker at the originating station (to assure that the Data Set 103H-type will change from the originate mode to the answer mode, ringing should be allowed to exist for one complete ringing cycle before the call is answered). The originate station may then switch to the talk mode by lifting the hand telephone set and operating the CLEAR-TALK key. After voice communications are complete, operation of the DATA key at both ends of the connection will switch the data sets into the data mode. The handshaking sequence described in 3.20 through 3.23 will now be performed and the data connection established for data transmission.

C. Manual Origination of Calls (Using Handset)

3.25 Manual origination of calls is performed in the same manner as for any normal phone call. If the distant end answers automatically, operation of the DATA key at the originating end will switch the data set to the data mode. However, if the distant end answers manually, operation of the DATA key at both ends is necessary to switch the data sets to the data mode. In either case, the handshaking sequence will now be performed and the data connection established for data transmission.

D. Disconnecting

3.26 Reception of a timed spacing signal, loss of carrier, turning off the CD interface lead, operation of the CLEAR-TALK key, or transferring to the talk mode will return the data set to the on-hook (idle) condition.

3.27 There are three options available for the timed space disconnect feature:

- (a) No space disconnect.
- (b) Short space disconnect.
- (c) Long space disconnect.

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With the no space disconnect option provided, the data set will not disconnect on a spacing signal of any duration. The short space disconnect option (option H) will cause the data set to disconnect on recognition of a 400-millisecond spacing signal. The long space disconnect option (option V) is the same as the short space disconnect option except the duration of the spacing signal must be 1.5 seconds.

3.28 The loss of carrier option (option S) will cause the data set to disconnect whenever carrier is removed for a period of time which is determined by a timer. This period is nominally 200 milliseconds. However, due to timer tolerances, the length of time the carrier is lost before disconnect occurs can be as short as 100 milliseconds or as long as 300 milliseconds. In those marginal cases where carrier is going on and off periodically, disconnect will occur on an individual loss of carrier less than 100 milliseconds in duration. When a loss of carrier disconnect occurs, the data set always sends 3 seconds of spacing signal, thereby causing the other stations, if equipped with the short or long space disconnect option, to space disconnect.

3.29 If it is desired to go to the talk mode at one station (A), the hand telephone set must be picked up and a message sent over the data link to the other station (B). On reception of this message at B, the hand telephone set must be picked up and the CLEAR-TALK key operated. If loss of carrier option is provided, station A will detect the loss of carrier, enter the disconnect sequence, light its CLEAR lamp, and transmit a spacing signal for 3 seconds. If loss of carrier disconnect option is not provided, the CLEAR-TALK key at station A must be operated *after* the CLEAR-TALK key has been operated at station B. Station A and B will now be in the talk mode.

3.30 When the data terminal ready interface lead (CD lead) is turned off, a data terminal disconnect will occur and, if the send disconnect option (option T) is provided, the CLEAR lamp will light. The CD lead must be turned off for at least 50 milliseconds in order to ensure proper disconnect. The data terminal disconnect will occur in either of two ways. If the send disconnect option is not provided, the data set will disconnect immediately. If the send disconnect option is

provided, the data set will send 3 seconds of spacing signal before disconnecting. The send disconnect option is controlled by an installer screw switch.

3.31 Manual disconnect can be achieved by operation of the CLEAR-TALK key. If the data set is not in the data mode, it will go on-hook immediately. However, if the data set is in the data mode, operation of the CLEAR-TALK key will cause the CLEAR-TALK lamp to light and a spacing signal to be sent for 3 seconds before disconnect occurs.

E. Test Mode

3.32 When the data set is in the test mode, the transmitted data lead (BA) is looped around to the received data lead (BB) and all of the other customer interface leads except for CE are turned off. In this condition, most of the data set circuitry can be tested from a 904-type Data Test Center.

3.33 There are two methods of entering the test mode. One method is used for data sets serving outgoing-only lines (ie, WATS service) and the other for data sets which are used for both origination and answering of data calls. The method to be used by a particular data set is selected on installation of the data set by means of a screw switch option (see Table E).

3.34 In order to place a data set serving outgoing only lines in the test mode, a call must be placed to the data test center. At the request of the data test center, the attendant must operate the TEST key. This will place the data set in the test mode as an originating station. After the test is complete, the data test center will return the data set to the on-hook condition. Operation of the CLEAR-TALK key will also return the data set to the on-hook condition.

3.35 In order to place a data set used to originate and answer data calls into the test mode, the AUTO key must be released. The data test center will call the data set to be tested. When ringing is received, the TEST key must be operated and held operated until the TEST lamp lights. The data test center can now perform the required tests. When the tests are complete, the data set is returned to the on-hook condition by loss of carrier or operation of the CLEAR-TALK key.