

Bell System

TECHNICAL REFERENCE

DATA SET 103A3

DATA SET 103E

DATA SET 103G

DATA SET 103H

INTERFACE

SPECIFICATION

OCTOBER 1973



Bell System Data Communications

TECHNICAL REFERENCE



Data Set 103A3

Data Set 103E

Data Set 103G

Data Set 103H

Interface Specification



October 1973



ENGINEERING MANAGER - DATA SYSTEMS



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TECHNICAL REFERENCE

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If further information is required, please contact:

Engineering Manager — Data Systems
American Telephone and Telegraph Company
195 Broadway
New York, New York 10007

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1. GENERAL

1.1 Data Set 103E has been designed to provide a multi-purpose 300 baud modem equipped with an EIA RS-232 type serial data interface. The basic 103E does not include attendant controls or power supply. Both of these functions are obtained from other apparatus provided in connection with the particular application in which the 103E is used. A photograph of Data Set 103E is shown in Figure 1.

1.2 The code 103G (see Figure 2) has been assigned to the version of the 103E which provides a common integrated housing for the attendant's set and the data set. The 103E and 103G therefore have identical electrical interfaces. The 103G set is no longer being manufactured. Information on Data Set 103G-type is included here since there are a number of such sets in service and some may continue to be provided from Telephone Company stock.

1.3 The code 103H (see Figures 3 and 4) has been assigned to the version of the 103E which provides separated units consisting of data set, attendant set and hand telephone set for mounting in a data terminal. The 103H set is no longer being manufactured. Information on Data Set 103H-type is included here since there are a number of such sets in service and some may continue to be provided from Telephone Company stock.

1.4 The 103A3 (see Figure 5) has been assigned to the data set consisting of Data Set 103E5 mounted in Data Mounting Unit 38A1. The data set operates with one of four standard key telephone sets to provide the necessary attendant set features. (Refer to Section 11.)

2. PURPOSE OF THE DATA SET

2.1 Data Sets 103A3, 103E, 103G and 103H-types are intended to provide full-duplex, low speed, serial data transmission over switched network connections. The data sets are capable of operating asynchronously at speeds up to 300 bauds in DATA-PHONE Service. The data sets accept serial binary data at these speeds from any generating or data handling device which provides signals conforming to the Electronic Industries Association's Standard RS-232-B. Certain control and signaling features are also

provided as necessitated by the switched network usage of the data set.

2.2 Data Set 103E-type is intended for use in multiple data set installations where the controls and power supplies are shared by several data sets. In this configuration, (see Figure 13) the equipment is rack mounted in a common cabinet.

2.3 Data Set 103E-type is also intended for use in Data Sets 103A3, 103G and 103H. In such applications it is associated with an appropriate housing and provided with dial capability.

2.4 Data Set 103G-type is intended for use with customer-provided terminal equipment. The 103G-type is essentially a combined packaging of a 103E, its manual controls and power supply to provide a free standing integrated data set. The 103G is available with optional rotary dial or TOUCH-TONE dial with card dialer.

2.5 Data Set 103H-type is intended for use in the Bell System Model 37 teletypewriter where it is housed within the teletypewriter cabinet and where its manual controls are incorporated into a common attendant's set with the manual controls for the station control unit.

2.6 Data Set 103A3 is intended as a supplement to Data Set 103A2 and as a replacement for Data Sets 103G- and 103H-type.

3. COMPATIBILITY WITH EXISTING DATA SETS

3.1 The interfaces and line signals of Data Set 103A3, Data Set 103E-type, Data Set 103G-type and Data Set 103H-type are identical. The following sections are applicable to Data Sets 103A3, 103E, 103G and 103H; however, for convenience, they will only be referred to as the 103A3/E/G/H-type.

a. Interface Compatibility

The interface of the Data Set 103E-type is basically the same as that of the Data Sets 103A1 and 103A2. The differences that do exist are minor and are pointed out in the following sections. It is expected that any terminal device operating with a 103A2 will be capable of operating with a 103E-type set

without any modifications to either the data set or the terminal device. The Data Set 103E-type will be equipped with certain features which are not available in the 103A2. Hence, while a 103E may replace a 103A2 in an existing installation, the reverse may not be true.

b. On Line Compatibility

The Data Set 103A3/E/G/H will be compatible on line with Data Set 103A2 when used in DATA-PHONE Service along with 4-row teletypewriter type data sets modified for DATA-PHONE Service use.

Timing used in the handshaking sequence will provide full compatibility with any of the above data sets and with Data Set 101-type and in Bell System teletypewriters.

An installer option has been provided to allow selection of the 1.5 second "long space disconnect" feature provided in the 103A2, the 400 millisecond long space disconnect feature usually provided with 4-row teletypewriter terminals, or no "long space disconnect" feature. In order to insure that a teletypewriter terminal will disconnect a 103E by sending a "long spacing" signal, the 103E must be wired for the 400 millisecond long space disconnect option. (This feature is not presently available in Data Set 103A2.)

4. INTERFACE DESCRIPTION

4.1 EIA RS-232 Type Serial Data Interface

The Data Set 103A3/E/G/H-type data processing terminal equipment interface has been designed to meet the electrical specifications given in EIA RS-232-B. A brief summary of these characteristics follows.

All signals generated by data set are in the 5 to 25 volt range when measured across a load of 3000 ohms or greater. The receiving circuits of the data set will accept signals in the 3 to 25 volt range. The negative voltages are considered "OFF" or "marking" and the positive voltages are considered "ON" or "spacing." The input impedances of all data set circuits which accept

signals from the data processing terminal equipment have DC resistances of 3000 ohms or greater and an effective shunt capacitance of 2500 picofarads or less. For more specific details, the standard itself should be consulted.

4.2 Functional Descriptions of Interface Circuits

A total of thirteen interchange leads are provided for connection to the data processing terminal equipment or the installer's test equipment as follows:

- a. AA — Protective Ground: Common to the AC power service ground.
- b. AB — Signal Ground: Connected to protective ground by a removable strap.
- c. BA — Transmitted Data: The BA circuit is designed to accept serial data from the customer's data terminal equipment. The customer has control of this circuit whenever circuit CB (Clear-to-Send) is in the ON condition. At all other times, except when the "CB — CF Indication Common" option is used and CB is off due to loss of carrier, data presented to this circuit will be ignored. Loss of carrier at the data set does not remove the customer's control of this circuit as in the 103A2.
- d. BB — Received Data: The BB circuit is designed to deliver serial data to the customer's data terminal equipment. When the data set is not in the DATA mode, the BB circuit is clamped in the marking condition. As shown in the attached sequence charts, the mark-hold condition is removed after carrier is received from the distant station. After handshaking is completed, the BB circuit is clamped marking whenever carrier is not being received as indicated by the condition of the CF (Carrier Detector) circuit.

Initiation of the disconnect sequence causes the mark-hold condition to be applied to the Received Data circuit. This does not occur in the Data Set 103A2.
- e. CB — Clear-to-Send: The CB circuit presents an OFF condition to the data

processing terminal equipment whenever the data set is not arranged to transmit data. The CB circuit will be turned ON at the end of the handshake sequence. Unlike the 103A2, the CB circuit in the 103A3/E/G/H remains ON while the data set is in the DATA mode and carrier is lost if the "CB — CF Indication Separate" option is used.

f. CC — Data Set Ready: The CC circuit will be in the OFF condition when either —

1. Power is OFF in the data set,
2. The data set is on-hook, or
3. The data set is off-hook but in the "TEST" mode or
4. An originating data set is off-hook and carrier from the called station has not yet been detected. This condition applies only where a Data Set 103E6 is being used (e.g., Data Sets 103G5, 103G6, or 103H2) and the CC Indication Early option is removed. For all other conditions the CC lead will be on.

g. CD — Data Terminal Ready: The Data Terminal Ready circuit is designed to accept signals from the data processing terminal equipment as an indication of the terminal's desire to —

1. Answer or don't answer incoming calls,
2. Allow transfer to data mode on manual calls, and
3. Disconnect already established calls.

When no call is in progress, the OFF condition on the CD circuit will cause an incoming call to ring but not be automatically answered. The ON condition will, if the set is conditioned for automatic answer, cause the data set to automatically answer incoming calls and initiate the handshaking sequence.

When a call is in progress, the normal condition of the CD circuit should be ON. Turning the CD lead OFF for more than 50 milliseconds will initiate the disconnect sequence.

The CD circuit has fail-safe operation, i.e., both open circuit and short circuit to circuit AB Signal Ground conditions are recognized as OFF.

h. CE — Ring Indicator: The data set will normally hold the CE circuit in the OFF condition. When ringing is received, the Ring Indicator circuit will be turned ON during the ringing portion of the ring cycles (nominally 2 seconds) and OFF during the quiet interval (nominally 4 seconds).

An installer option has been provided in the data set to govern the condition of the CE circuit once an incoming call has been answered. With the "CE OFF" option applied, the CE circuit will remain off during the call (as it does in the 103A2).

With the "CE ON" option applied, the CE circuit will be turned ON when an incoming call is answered and will remain ON for the duration of the call (including any time spent in the "TALK" mode). The CE lead will remain OFF throughout any call originated by the data set in either case.

i. CF — Carrier Detector: The carrier detector circuit indicates to the data processing terminal equipment the presence or absence of incoming carrier in the data set. During the handshaking sequence, the CF circuit will be turned ON approximately 110 milliseconds after the reception of either F2M at the calling data set or F1M at the called data set.

Any loss of carrier in excess of 60 milliseconds will be indicated by turning the CF lead OFF. Any loss of carrier less than 10 milliseconds in duration will not be indicated on the CF lead. After a complete loss of carrier, a return of carrier for at least 60 milliseconds is required before the CF circuit is returned to the ON condition. In all cases, a return of carrier for more than 140 milliseconds will assure that CF lead is turned ON.

- j. +P — Positive
 - k. -P — Negative Power
- } for use with the Telephone Company test equipment only.

Pin assignments are as follows:

Pin #	Circuit	Pin #	Circuit
1	AA	11-16	—
2	BA	17	—
3	BB	18	—
4	—	19	—
5	CB	20	CD
6	CC	21	—
7	AB	22	CE
8	CF	23	—
9	+P	24	—
10	-P	25	—

5. ABORT TIMER OPERATION

5.1 The Data Set 103A3/E/G/H has been provided with a timer which is started in a called data set when the set goes off-hook. The timer times for 27 ± 7 seconds (in early model the interval was 12 ± 4 seconds). If the data set is arranged for automatic answer and the timer completes timing this interval before the handshaking sequence is completed, the called data set will terminate the call by going on-hook. This feature is not provided in the Data Set 103A2.

6. LOSS OF CARRIER DISCONNECT OPTION

6.1 The Data Set 103A3/E/G/H-type is equipped with an installer option which, when applied, will cause the data set to disconnect upon prolonged periods of no carrier. Under this option, if the data set had been receiving uninterrupted carrier prior to a loss of carrier, the data set will require more than 100 milliseconds of no carrier to initiate the disconnect sequence. If the loss of carrier exceeds 350 milliseconds, initiation of the disconnect sequence is assured. When the data set experiences intermittent losses of carrier, the timer may not completely reset between periods of no carrier. Hence, a succession of periods of lost carrier separated by only milliseconds of carrier may result in disconnection in spite of the fact that no one loss of carrier exceeded 100 milliseconds in length.

6.2 When the "LOSS OF CARRIER DISCONNECT," "LONG SPACE DISCONNECT," or "SHORT SPACE DISCONNECT" option is used, a specific sequence of operations by the attendants is required to achieve a transfer from the "DATA" mode to the "TALK" mode.

The required sequence is as follows. The attendant at station A preconditions the data set by lifting the telephone handset. He then informs station B via a transmitted data message of his desire to transfer to the "TALK" mode.

The attendant at station B, upon receipt of the message from station A, lifts his telephone handset and initiates the transfer by momentarily depressing the "CLEAR-TALK" key. The data set sends 3 seconds of spacing signal then transfers the telephone line to the attendant set.

Station A responds to either the spacing signal or loss of carrier which results when station B transfers to the "TALK" mode and transfers the telephone line and the attendant set thus completing the "DATA" to "TALK" mode transfer.

If neither station has any of the aforementioned disconnect options, the transfer is accomplished the same as for Data Sets 103A2. Both attendants must momentarily depress the "CLEAR-TALK" key while having the telephone handset off-hook.

If one station has one or more of the aforementioned disconnect options and the other station has none, the station without any disconnect option must initiate the transfer by momentarily depressing the "CLEAR-TALK" key while having the telephone handset off-hook. The distant station must have its handset off-hook before the transfer is initiated by the local station.

6.3 The loss of carrier disconnect feature is not available in the Data Set 103A2.

7. DISCONNECTING

7.1 Two independent installer options are provided in conjunction with disconnection.

7.11 Recognition of disconnect signals from the remote terminal: The disconnect signal

referred to here is a timed continuous spacing signal. Three arrangements are available.

- a. The data set takes no action upon receipt of long space.
- b. The data set disconnects after receiving 400 ± 125 milliseconds of continuous spacing signal.
- c. The data set disconnects after receiving 1.5 ± 0.4 seconds of continuous spacing signal.

This option will be referred to as the "Space Disconnect" option with arrangements a., b., and c. referred to as "NONE," "SHORT," and "LONG," respectively.

7.12 Response to a disconnect signal on circuit CD: Two arrangements are provided for responding to a minimum of 50 milliseconds OFF signal on circuit CD while a call is in progress.

- a. The data set disconnects immediately.
- b. The data set transmits 3.0 ± 0.8 seconds of continuous spacing signal prior to disconnecting.

This option will be referred to as the "Send Disconnect" option with arrangements a. and b. referred to as "Send Disconnect - NO" and "Send Disconnect - YES," respectively.

8. TEST MODES

8.1 The "TEST" mode of operation electrically divorces the data set and the data processing terminal equipment and conditions the data set for remote testing from a data test center.

8.2 The disposition of the interface leads when the data set is in the test mode is as follows:

Circuit	Condition
AA and AB	Normal
BA	Open Circuit
BB	Clamped Marking
CB	OFF
CC	OFF
CD	Open Circuit
CE	Normal
CF	OFF

8.3 Interlocks to prevent disruption of the DATA mode by the TEST key will be described in a subsequent section.

9. SUMMARY OF OPTIONS AVAILABLE TO THE CUSTOMER

9.1 The following is a summary of the various options which are available to the user of a Data Set 103A3-, 103E-, 103G- or 103H-type. This summary does not include those options which will be determined by the Operating Company (normal or inverted frequency assignments, provision of a handset or not, transmit levels, etc.).

1. Answer Mode Indication
 - a. CE OFF — CE circuit follows ringing only.
 - b. CE ON — CE circuit remains in ON state for duration of incoming call.
2. Send Disconnect
 - a. No — Data set disconnects immediately in response to CD off.
 - b. Yes — Data set transmits 3.0 seconds of spacing signal prior to disconnecting in response to CD off.
3. Space Disconnect
 - a. Long — Data set disconnects in response to receipt of 1.5 seconds of spacing signal from the remote station.
 - b. Short — Data set disconnects in response to receipt of 0.4 seconds of spacing signal from the remote station.
 - c. None — Data set takes no action upon receipt of spacing signal.
4. CC Indication (For Data Set 103E6)
 - a. Early — The CC lead is turned on when the data set is across the telephone line.
 - b. Delayed — The CC lead remains off at an originate station until carrier from the called station is detected.

Data sets without the option function in the CC Indication Early mode.

5. Loss of Carrier Disconnect
 - a. Yes — Data set disconnects when incoming carrier is lost for more than 100-350 milliseconds.
 - b. No — Data set does not disconnect on carrier losses.
6. CB and CF Indications
 - a. Separate — CB remains on when carrier is lost.
 - b. Common — CB turns off with loss of carrier.
7. Dialing Features
 - a. Rotary dial
 - b. Rotary dial with card dialer (not available for 103G or 103E Data Station).
 - c. TOUCH-TONE dial (not available for 103G).
 - d. TOUCH-TONE dial with card dialer (not available for 103E Data Station).

10. MANUAL CONTROLS PROVIDED WITH DATA SETS 103G AND 103H

10.1 As stated previously, the Data Set 103G-type has the attendant's set integrated into the same housing as the data set modem. The four specific codes described here differ from one another only in the provision of TOUCH-TONE or rotary dialing and the provision of card dialing mechanism as follows:

- 103G1, G5 — Rotary dial
- 103G4, G6 — TOUCH-TONE dial with card dialer

The Data Set 103H-type consists of three basic separate units: a data set modem and power unit in a common housing, an attendant set with the same four different types of dials as listed below, a hand telephone set, a connecting cord connects the individual units. Both the telephone and the attendant set are intended to be mounted in a pedestal door or its equivalent as shown in Figure 4.

- DAS 804P5 — Rotary dial
- DAS 804P6 — TOUCH-TONE dial
- DAS 804P7 — TOUCH-TONE dial with card dialer
- DAS 804P8 — Rotary dial with card dialer

10.2 All four types of dials are intended for use in providing DATA-PHONE Service and are therefore equipped with telephone handsets. In addition, each is equipped with a loudspeaker (and volume control knob) for monitoring call progress tones when calls are originated in the data mode. This eliminates the need for the attendant to hold the telephone handset during call origination.

10.3 Finally, each is provided with a six-button key strip with keys and lamps labeled as follows:

- DATA — Non-locking, releasing key with lamp
- CLEAR/TALK — Non-locking, releasing key with lamp
- TEST — Non-locking, non-releasing key with lamp
- SPARE — An unused locking-releasing key
- SPARE — An unused locking-releasing key
- AUTO — Double action (locks and unlocks on successive depressions) key with lamp

11. MANUAL CONTROLS PROVIDED WITH DATA SET 103A3

11.1 The Data Set 103A3 consists of a Data Set 103E5 mounted in a 38A1 data mounting unit and requires connection to one of the following key telephone sets:

- 565HK — Rotary dial
- 2565HK — TOUCH-TONE dial
- 2662A1 — TOUCH-TONE dial with card dialer
- 662A1 — Rotary dial with card dialer

The data set does not provide a loudspeaker for monitoring call progress tones as does the Data Sets 103G and 103H.

11.2 Each key telephone set provides a six-button key strip with lamps as follows:

- DATA — non-locking, non-releasing key with lamp
- CLEAR/TALK — non-locking, non-releasing key with lamp
- TEST — non-locking, non-releasing key with lamp

- AUTO ANS — locking, releasing key with lamp
- MANUAL ANS — locking, releasing key
- DIAL TONE — non-locking, releasing key (If a ground start telephone line is not used, the DIAL-TONE key is blocked and the label left blank).

12. OPERATION WITH DATA-PHONE SERVICE

12.1 Calls may be originated in two different ways.

- a. Lift the handset off the switchhook. Proceed as in a normal voice call.
- b. Depress the DATA key (Data Sets 103G and H only) momentarily while the handset is left on the switchhook. Dial tone will be heard through the loudspeaker as will other call progress tones. When the called data set returns the answer tone, the calling data set will automatically disconnect the loudspeaker and initiate the necessary "handshaking" sequence to condition both stations for data transmission.

If the called data set is answered in the Talk mode, the attendant at the calling station will hear the voice and can transfer to the Talk mode as described below.

12.2 Calls may be answered manually in two different ways.

- a. Lift the handset off the switchhook.
- b. Depress the DATA key momentarily while the handset is left on the switchhook. Hold the DATA key down until the lamp under it lights indicating that the call has been answered in the Data mode.

12.3 To transfer to the Data mode from the Talk mode, depress the DATA key momentarily and then place the handset in its cradle.

12.4 To transfer to the Talk mode from the Data mode, remove the handset from its cradle and depress the CLEAR/TALK key. Wait until no tone is heard before speaking into the handset. (See Section 6.2.)

12.5 In order to originate or answer a call by depressing the DATA key or to transfer to the Data mode, the CD (Data Terminal Ready) circuit must be in the ON condition.

12.6 Whenever the DATA key is lit, the call may be abandoned or disconnected by momentarily depressing the CLEAR/TALK key. If the data set is transmitting carrier when the CLEAR/TALK key is depressed, 3.0 seconds of spacing signal will be transmitted before the data set disconnects. If the data set is not transmitting carrier when the CLEAR/TALK key is depressed, the data set will disconnect immediately.

12.7 Operation of the AUTO ANS key causes the data set to automatically answer incoming calls in the Data mode (assuming the interface is properly conditioned). When the key is not operated, incoming calls will ring and may be answered manually. A lamp under the key indicates when the data set is in the automatic answering mode. When the data set is not in the auto answer mode, (MANUAL ANS key operated in 103A3) the abort timer is inoperative.

13. ABNORMAL OPERATING MODE

13.1 The TEST key is used as instructed by the Data Test Center to condition the data set for remote testing from the Data Test Center. The light under the TEST key will be lit until the test call is remotely terminated by the Data Test Center. If the Data Test Center is unable to remotely terminate the call, the customer can manually do so by pressing the CLEAR/TALK key.

13.2 When the data set is in the Data mode and the handshaking sequence completed, operation of any key except CLEAR/TALK while the handset is on-hook will not interrupt the Data mode.

14. SEQUENCE CHARTS

14.1 The sequence charts in Figures 6 through 12 show the status of the interface circuits as the data set progresses through handshaking and disconnecting. As in the 103A2, the Data Sets 103A3-, 103E-, 103G- and 103H-type must have ringing applied to one and only one of the two data sets involved in a connection. Comments regarding key operations, lamp indication and the loudspeaker apply only where these items are provided.

15. 103E DATA STATION

15.1 A station arrangement is available for the multiple installation of Data Set 103E-type. This arrangement is called 103E Data Station and provides mounting and control features for up to 40 data sets in a cabinet. The 103E Data Station will normally be used where there is a large concentration of data sets at large computer installations, such as with time-shared computers.

All interface leads and data set options previously described for Data Set 103A3/E/G/H-type pertains to the 103E Data Station and therefore will not be repeated.

15.2 Additional features provided by the 103E Data Station are:

1. Computer make or release busy via interface lead CN, pin 25. Provided by installer's strapping option.
2. Operator make or release busy via keys on Data Auxiliary Set 804J.
3. Automatic make busy on loss of local AC power.
4. Installer's strapping option for either sleeve lead or tip-ring make-busy.
5. Key telephone controls and lamps provided.
6. Transfer of any data set to a service line (vacated line made busy).
7. Full Talk-Data-Test mode control over any data set.
8. Data Set status indication for all data sets via lamps on Data Auxiliary Set 804J as follows:

Idle	Off
Ringing on line (preconnect)	Flash (1 pulse per sec, 500 ms on)
Data mode (connected)	On
Made busy	Wink (2.5 pulses per sec, 370 ms on)
Selected for control	Flutter (10 pulses per sec, 75 ms on)

9. Interface monitor lamps which may be switched to any data set in the cabinet.

10. Automatic Calling Units 801A5, 801C3, or 801C4 may be used.

15.3 Operator controls on the Data Auxiliary Set 804J may be described using Figure 14. If control or interface monitoring of a set is desired, the operator presses the PICK-UP key until the PICK-UP lamp lights, then depresses the desired data set key until the PICK-UP lamp goes out and the data set lamp under the key depressed begins to "flutter." In this condition, the interface monitor lamps display the interface conditions and complete control over the data set may be exercised by using the TEST, TALK, DATA or AUTO keys. If the set is to be tested on the service line, the LINE TRFR key is depressed until the lamp under that key lights. If it is desired to release control of the data set, the attendant simply depresses the PICK-UP key. To make any line busy, the attendant presses the MAKE-BUSY key until its lamp lights, then presses the desired data set key. To release a busy condition, the BUSY RLS key is depressed until its lamp lights and the desired data set key is pressed. A set transferred to the service line may be released at any time by simply pressing the TRFR RLS key. If the attendant wishes to talk over the service line, he may do so at any time without affecting any of the data sets (so long as none are on the service line) by pressing the SERV LINE key and going off-hook. A ringer is associated with the service line; a buzzer with a selected set.

15.4 All customer's interface connectors are located in a compartment accessible through a door on the left of the cabinet (see Figure 13). Data sets and other components may be installed and maintained through doors on the front and rear of the cabinet.

15.5 For a fully equipped cabinet, the total weight is 1033 lbs. The cabinet is 34 inches wide, 30.5 inches deep, and 72 inches high. Because of the size of the doors, at least 20 inches of clearance must be provided in front of the cabinet and 25 inches in back.

For one row of cabinets, this yields an effective space usage of 17.8 square feet and a floor load of 58 pounds per square foot. If a large number of rows is installed, the effective floor area and load approach 13.1 square feet and 79 pounds per square foot, respectively.

15.6 The power consumption of a fully equipped cabinet is 520 watts with a resultant air conditioning load of 1780 BTU per hour. Electrical power (117 volts \pm 10 percent and 60 \pm 0.1 cps) enters the cabinet via a standard 3-

prong connector and cord attached to the KS-20129 AC Power Strip. The data station will operate over a temperature and humidity range of 40° to 120°F and 20 to 95 percent, respectively.

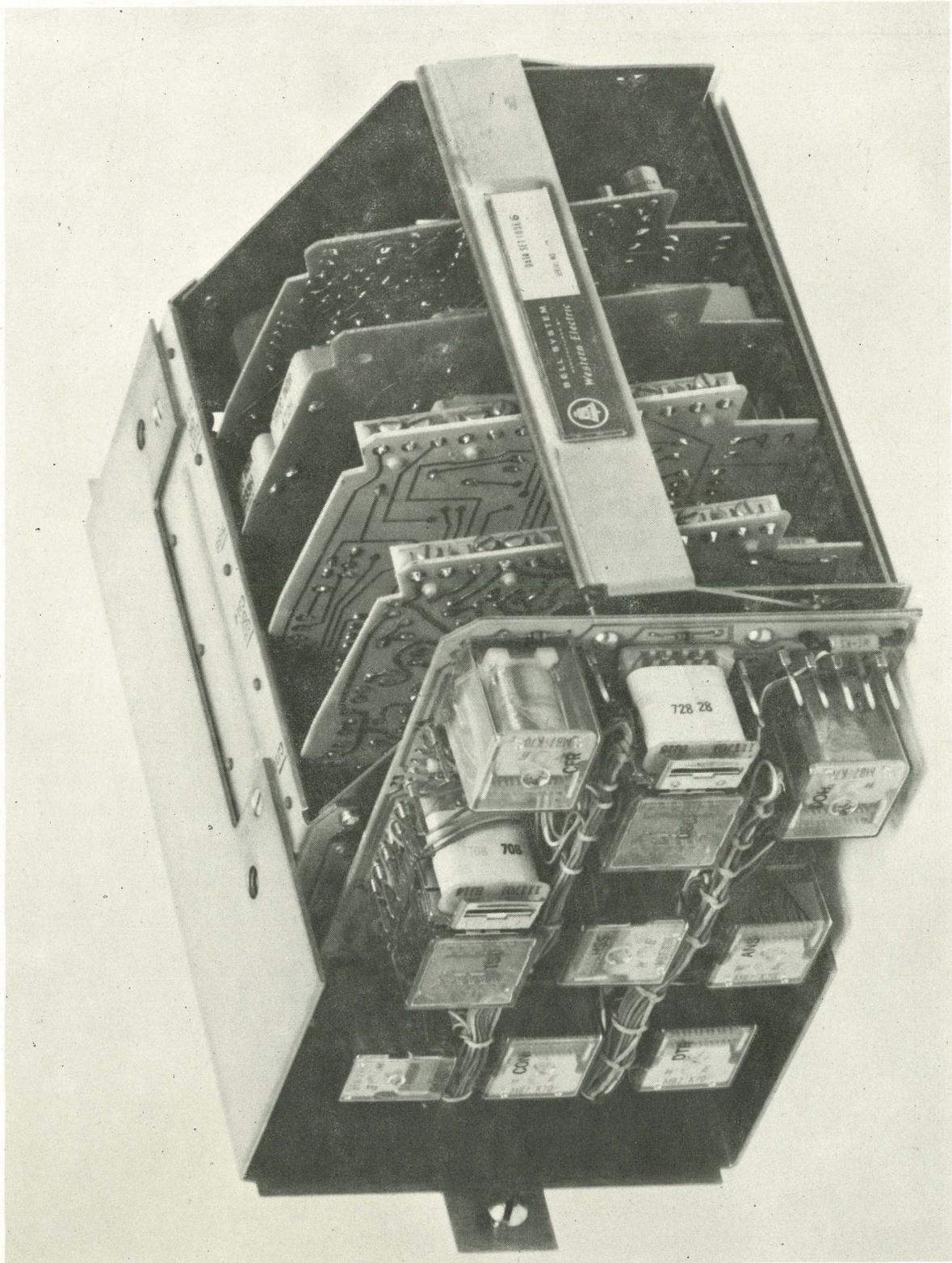
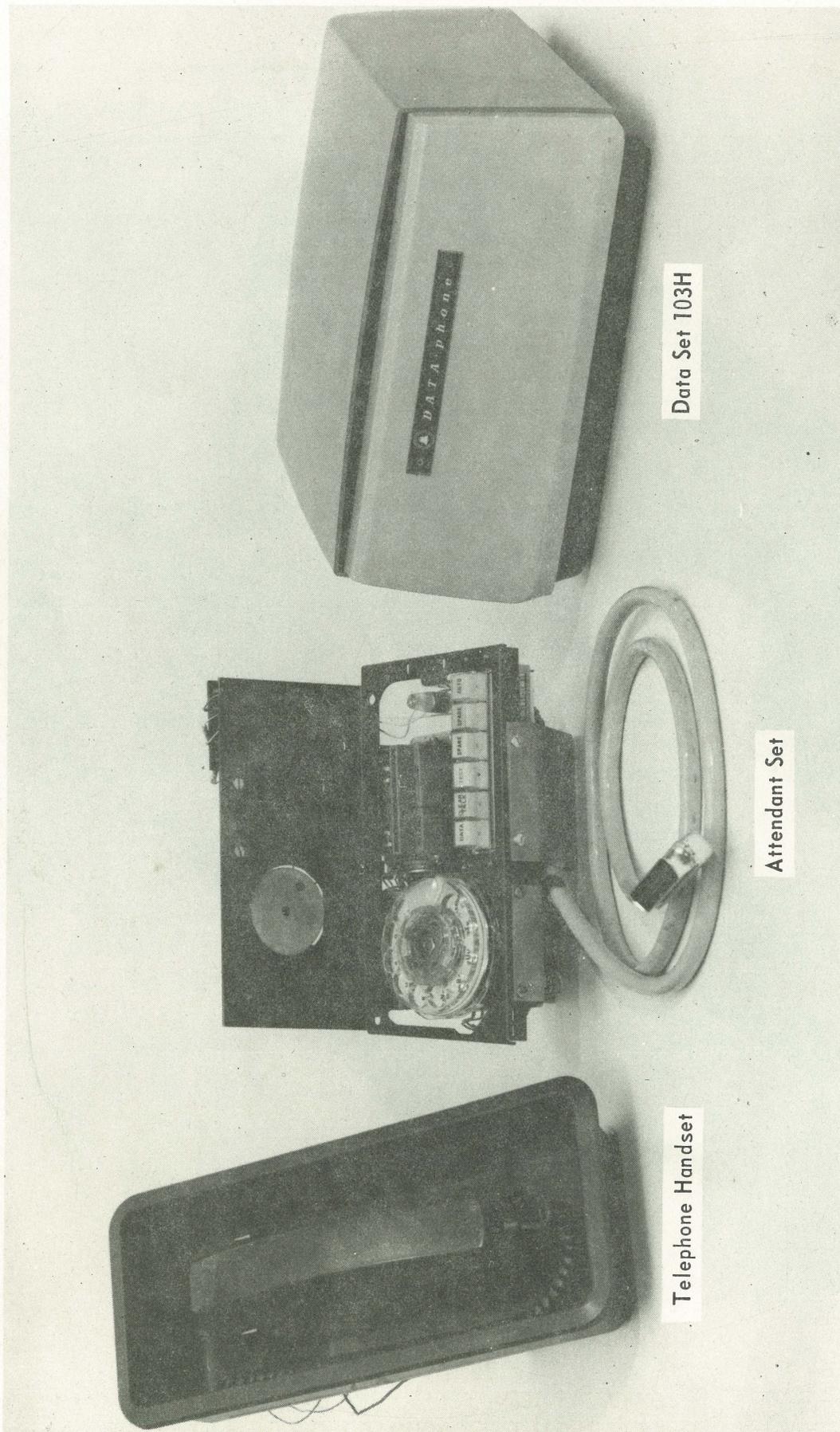


FIGURE 1
DATA SET TYPE 103E6, ELECTRONICS PACKAGE



FIGURE 2
DATA SET TYPE 103G
WITH TOUCH-TONE DIAL AND CARD DIALER



Data Set 103H

Attendant Set

Telephone Handset

FIGURE 3
DATA SET 103H AND
ASSOCIATED ATTENDANT SET

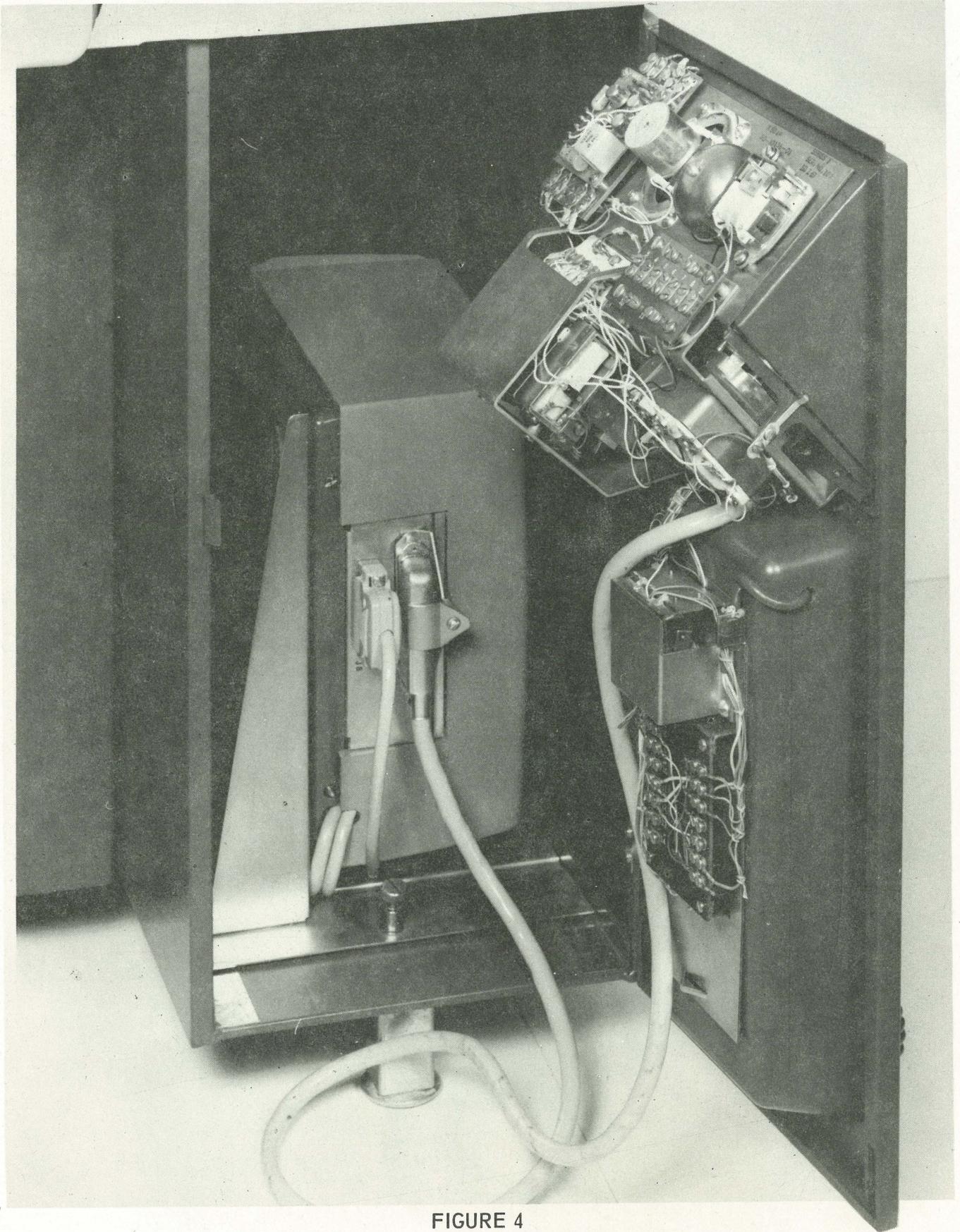


FIGURE 4
DATA SET 103H, TELEPHONE HANDSET
AND ATTENDANT SET MOUNTED VERTICALLY
IN MOUNTING PANEL

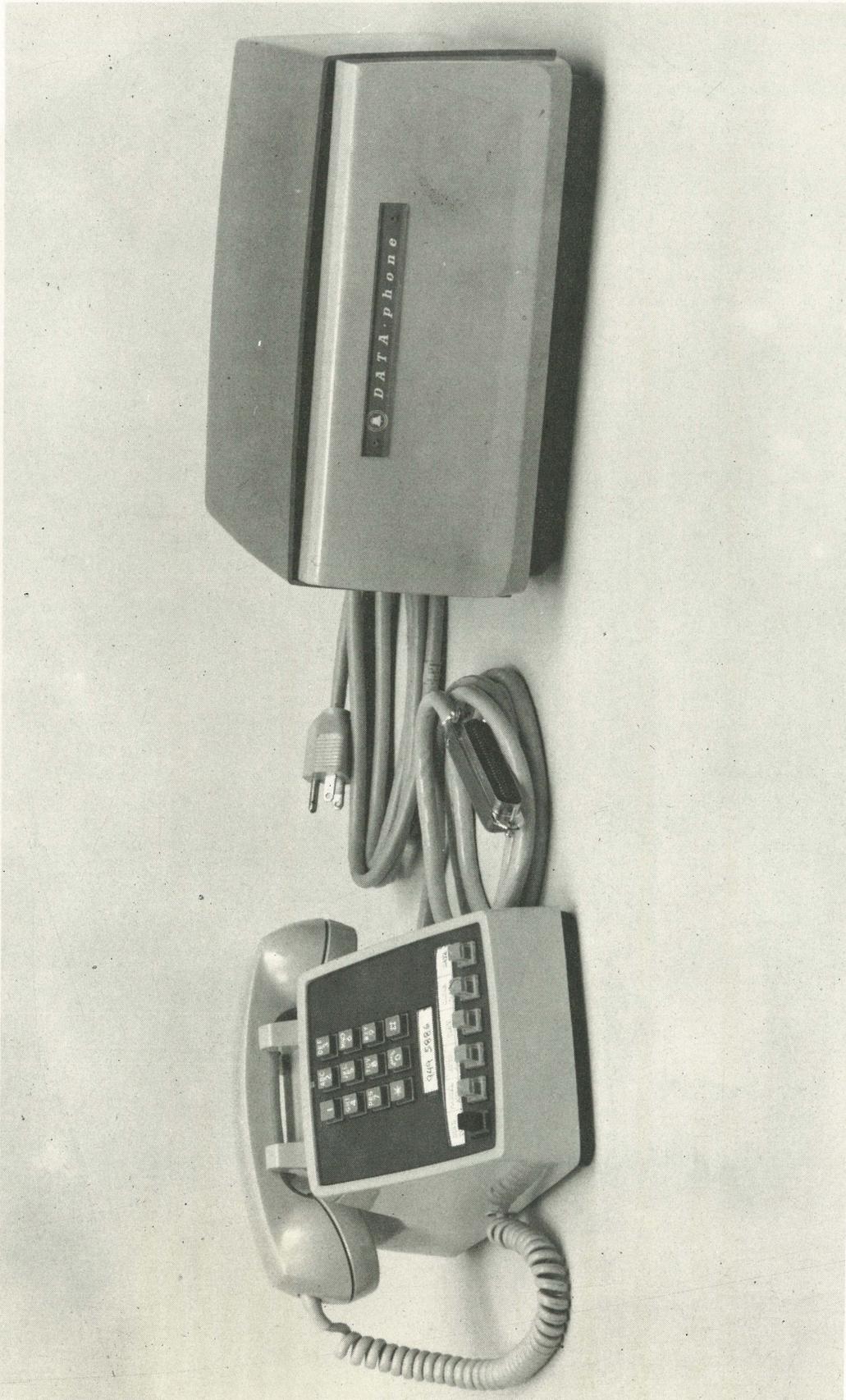
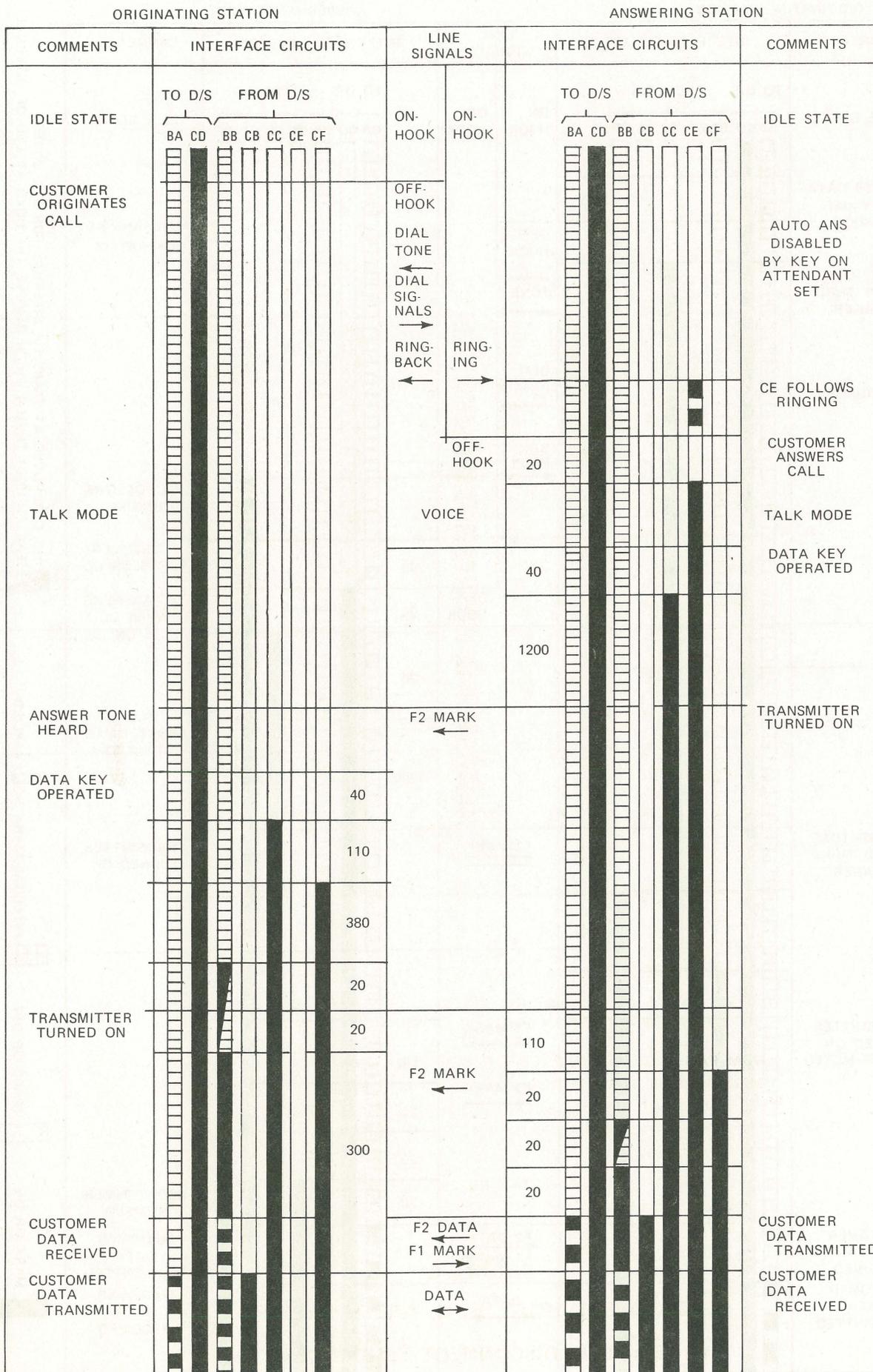


FIGURE 5
DATA SET 103A3 WITH 2565HK TELEPHONE

FIGURE 7
 DATA SET 103A3, E, G, H TYPE
 SEQUENCE CHART FOR A CALL ORIGINATED MANUALLY
 AND ANSWERED IN THE TALK MODE



HOLD REMOVED AT BEGINNING OF INTERVAL FOR ALL CODES EXCEPT 103E1-4 WHICH REMOVES THE HOLD AT END OF INTERVAL

INTERNAL MARK HOLD APPLIED

SPACE OR OFF

MARK OR ON

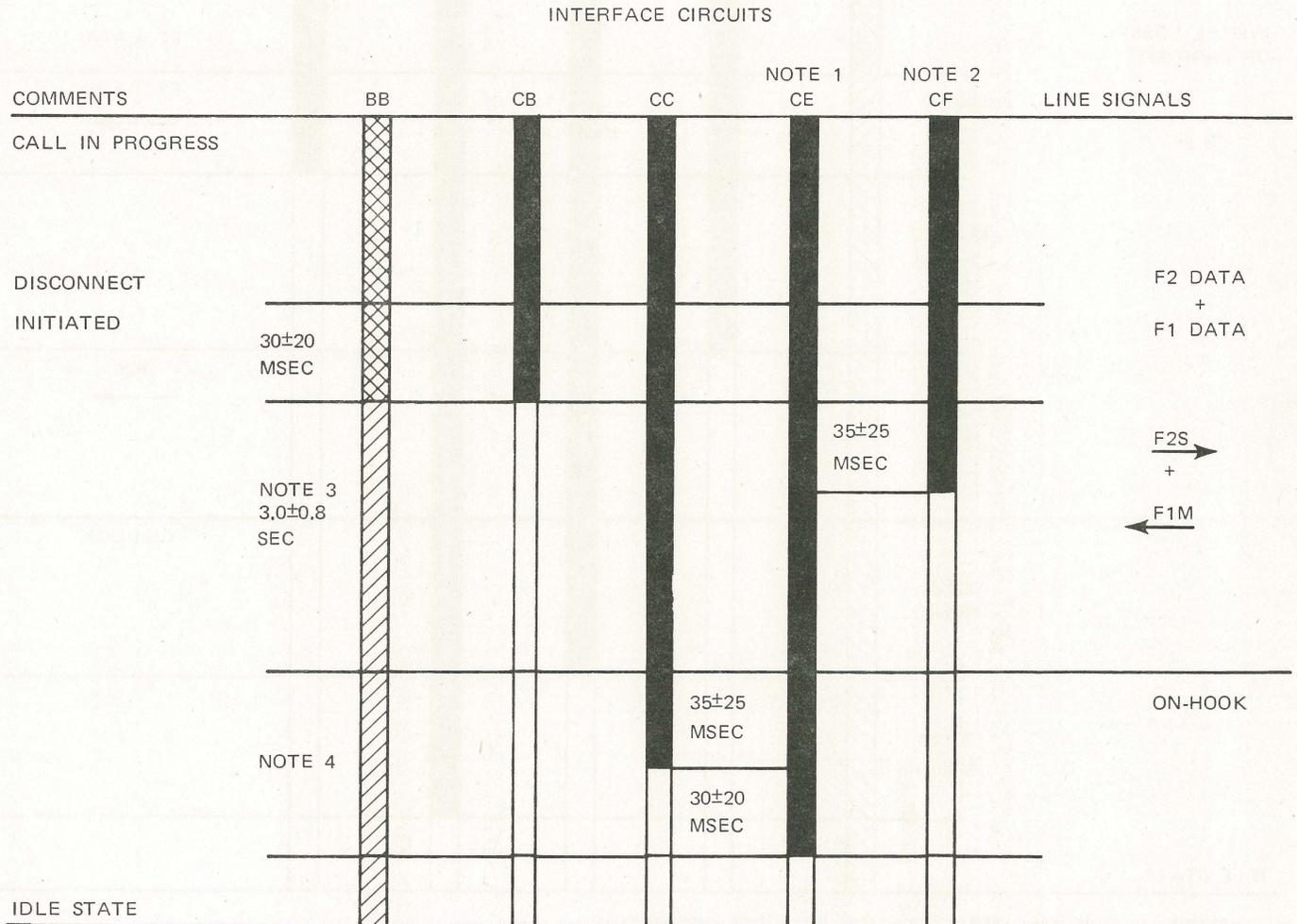
NOTE: INTERVALS INDICATED ARE TYPICALLY EXPRESSED IN MILLISECONDS.

KEY:



I - DISCONNECT INITIATED BY EITHER

- A) BUSINESS MACHINE TURNING CKT, CD OFF
- B) ATTENDANT DEPRESSING CLEAR KEY, OR
- C) AUTOMATIC CALLING UNIT SIGNALING DATA SET TO DISCONNECT

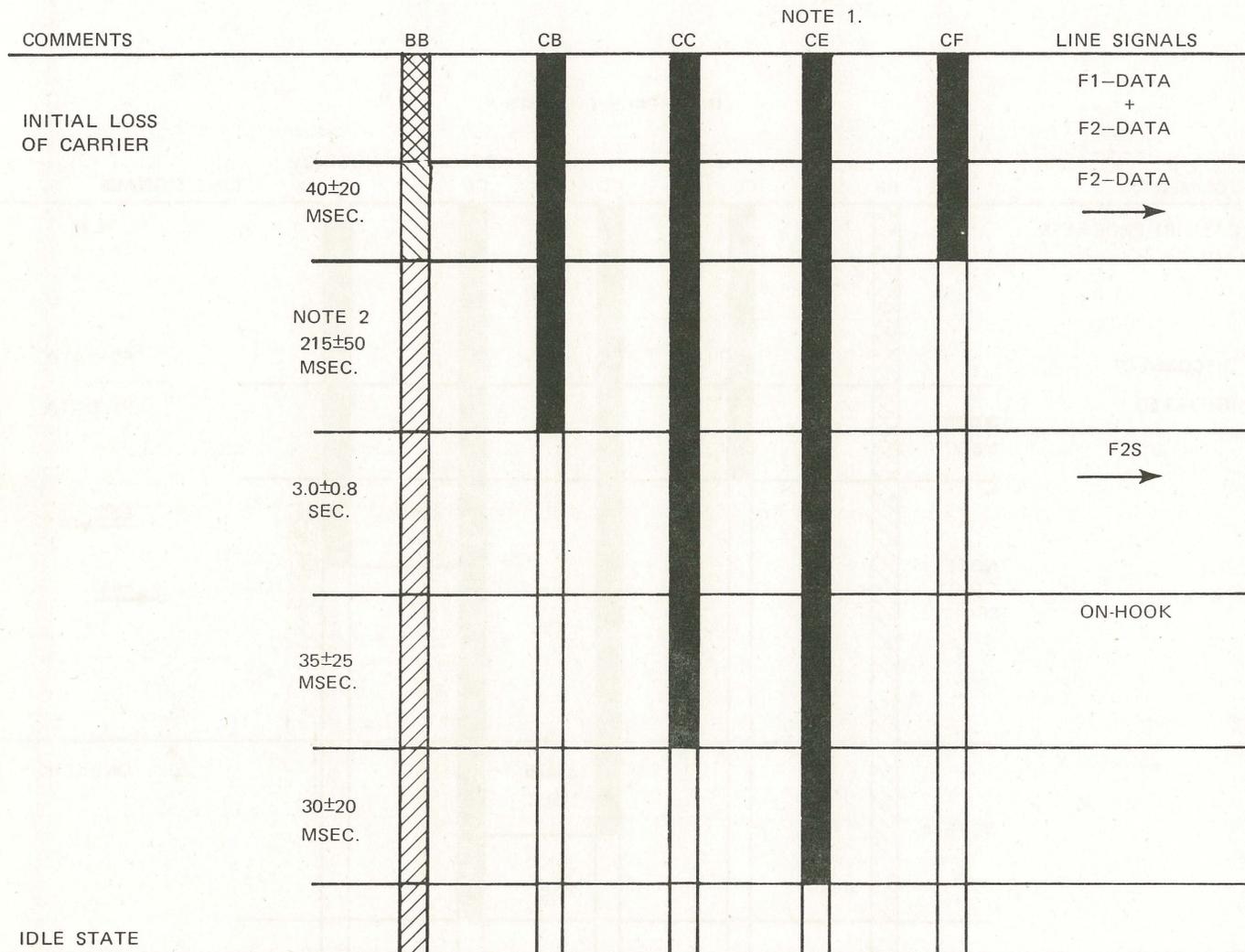


- NOTES:
1. FOR ANS MODE STATION WITH "CE-ON" OPTION.
 2. TIME SHOWN IS FOR "CB-CF INDICATIONS SEPARATE" OPTION. FOR "CB-CF INDICATIONS COMMON" OPTION, CF TURNS OFF WITH CB. (FOR EARLIER SETS, CF TURNS OFF 40 ± 20 MSEC AFTER CARRIER FROM FAR END IS REMOVED OR SET GOES ON-HOOK.)
 3. TIME SHOWN IS FOR "SEND DISCONNECT-YES" OPTION. TIME FOR "SEND DISCONNECT-NO" OPTION IS 30 ± 20 MSEC, IF DISCONNECT IS INITIATED BY CD OFF OTHERWISE TIME IS AS SHOWN.
 4. SEQUENCING OF TURNOFFS MAY BE EITHER CF, CC, CE, OR CC, CF, CE, OR CC, CE, CF.

FIGURE 8
DATA SET 103A3, E, G, AND H TYPE
DETAILED DISCONNECT SEQUENCES

II - DISCONNECT ORIGINATED BY LOSS OF CARRIER

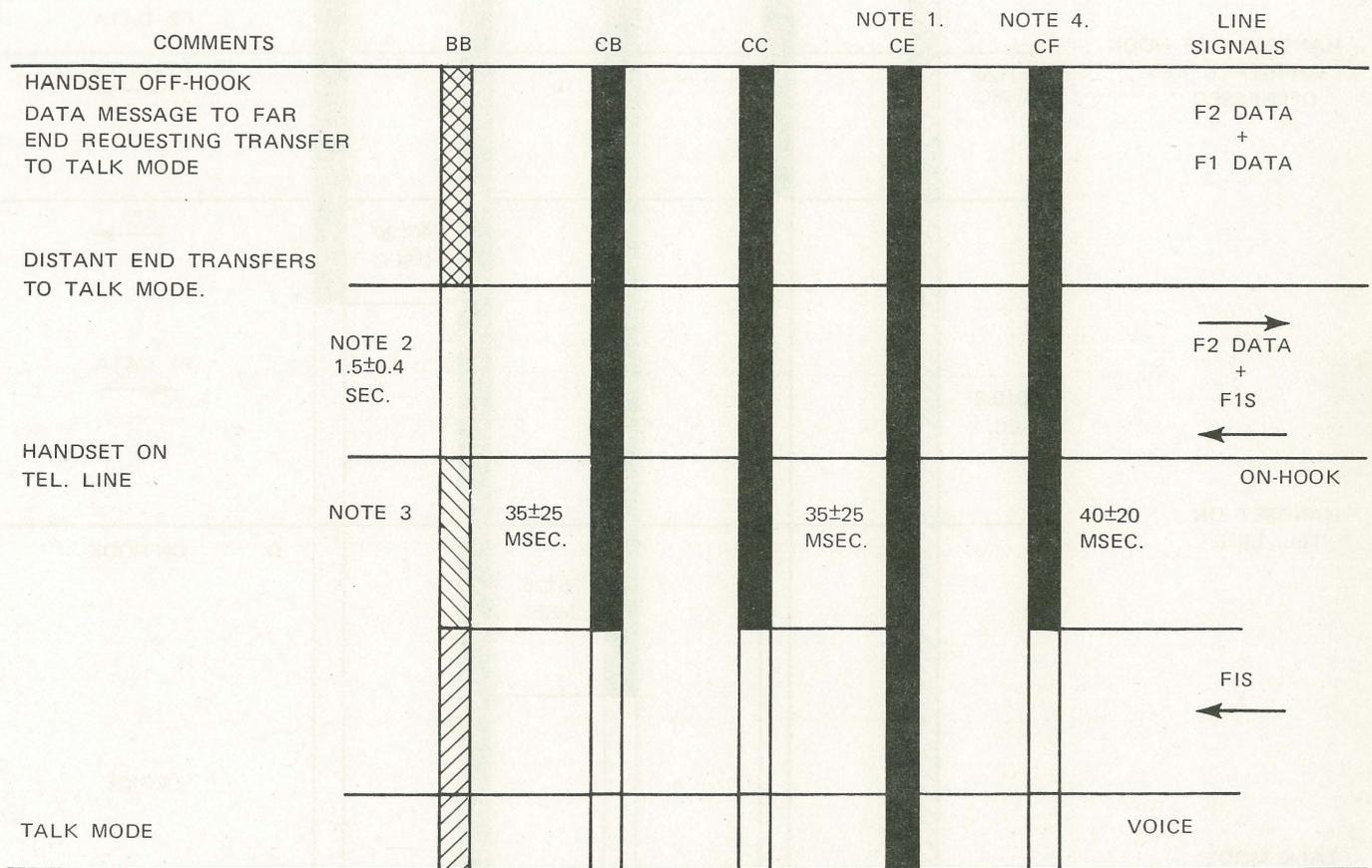
INTERFACE CIRCUITS



- NOTES: 1. FOR ANS MODE STATION WITH "CE-ON" OPTION.
2. AN ISOLATED LOSS OF CARRIER OF LESS THAN 100 MS WILL NEVER CAUSE A DISCONNECT, ONE OF MORE THAN 350 MS WILL ALWAYS CAUSE A DISCONNECT.
3. TIME SHOWN IS FOR "CB-CF INDICATIONS SEPARATE" OPTION. FOR "CB-CF INDICATIONS COMMON" OPTION CB TURNS OFF WITH CF.

FIGURE 9
DATA SET 103A3, E, G, AND H TYPE
Detailed Disconnect Sequences

INTERFACE CIRCUITS

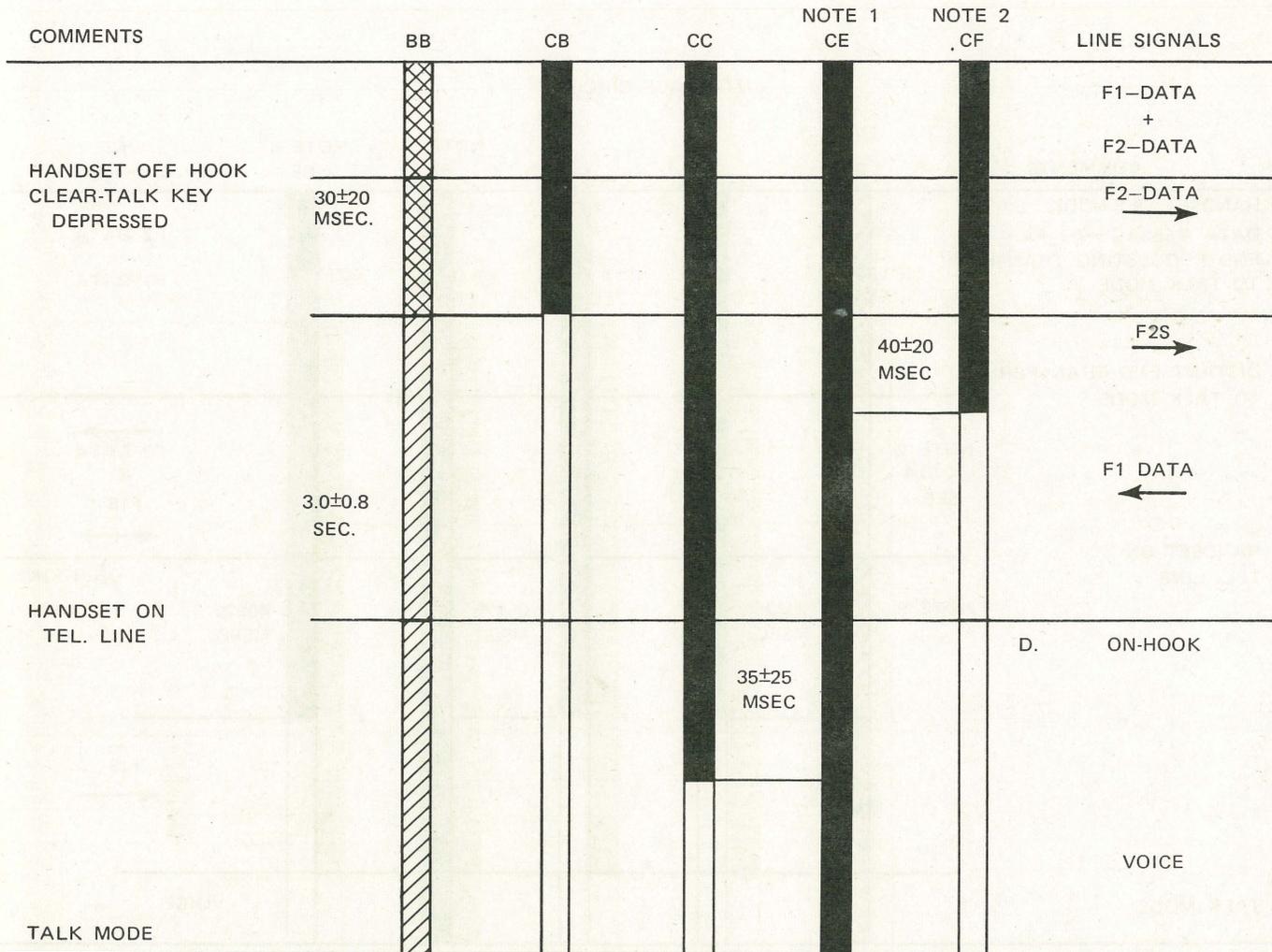


- NOTES: 1. FOR ANS MODE STATION WITH "CE-ON" OPTION.
 2. TIME SHOWN IS FOR "SPACE DISCONNECT-LONG" OPTION. TIME FOR "SPACE DISCONNECT-SHORT" OPTION IS 400-125 MSEC.
 3. CKT BB IS CLAMPED MARK-HOLD WHEN EITHER CF OR CB IS TURNED OFF WHICHEVER OCCURS FIRST.
 4. TIME SHOWN IS FOR "CB-CF INDICATIONS SEPARATE" OPTION. FOR "CB-CF INDICATIONS COMMON" OPTION CF TURNS OFF WITH CB.

FIGURE 10
 DATA SET 103A3, E, G, AND H TYPE

Detailed DATA to TALK Transfer
 Sequence for Station Desiring Transfer

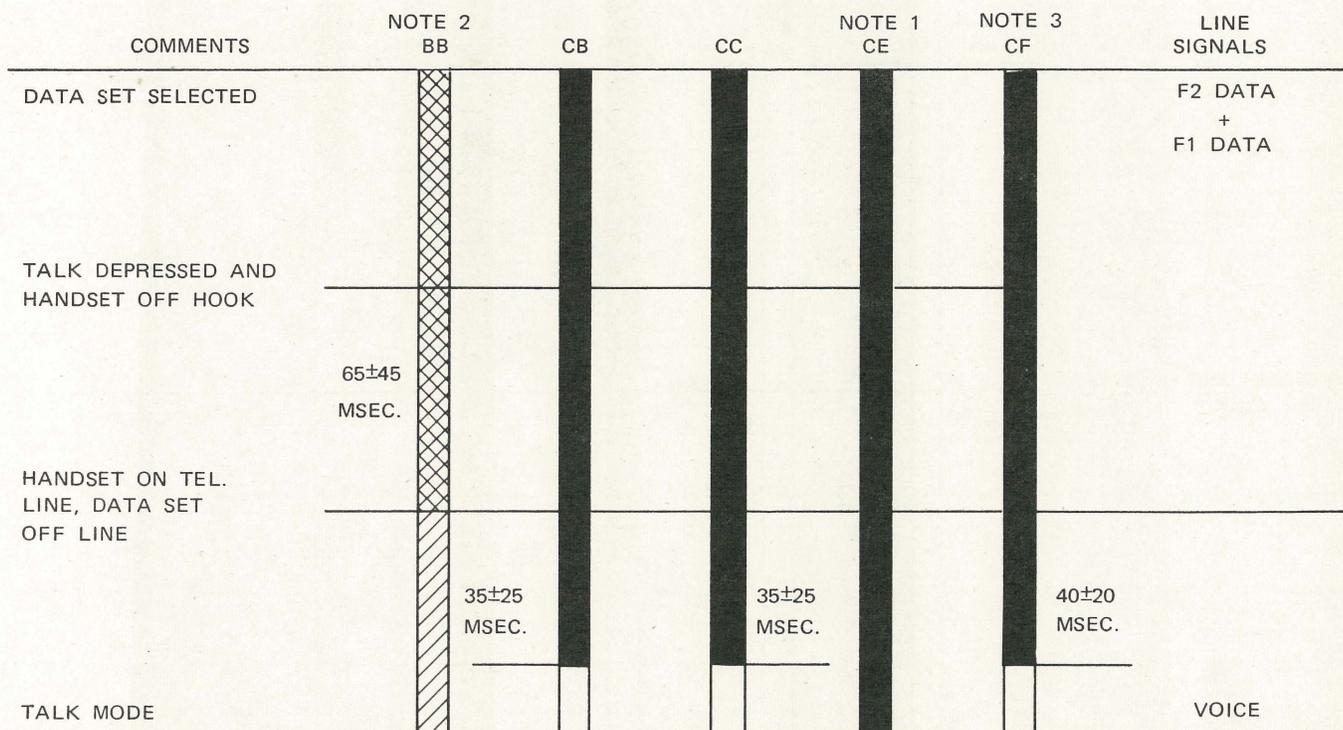
INTERFACE CIRCUITS



- NOTES: 1. FOR ANS MODE STATION WITH "CE-ON" OPTION.
 2. TIME SHOWN IS FOR "CB-CF INDICATION SEPARATE" OPTION.
 FOR "CB-CF INDICATION COMMON" OPTION CF TURNS OFF WITH CB.

FIGURE 11
DATA SET 103A3, E, G, and H TYPE
Detailed DATA to TALK Transfer Sequence
for Station Initiating Transfer

INTERFACE CIRCUITS



- NOTES:
1. FOR ANS MODE STATION WITH "CE-ON" OPTION.
 2. FOR DATA SETS 103E5 AND 103E6. FOR DATA SET 103E2 THE MARK HOLD IS APPLIED WHEN EITHER CB OR CF TURNS OFF.
 3. TIME SHOWN IS FOR "CB-CF INDICATION SEPARATE" OPTION. FOR "CB-CF INDICATION COMMON" OPTION CF TURNS OFF WITH CB.

FIGURE 12

103E DATA STATION

Detailed DATA to TALK Transfer Sequence



FIGURE 13
103E DATA STATION FRONT VIEW
SHOWING CUSTOMER'S INTERFACE COMPARTMENT

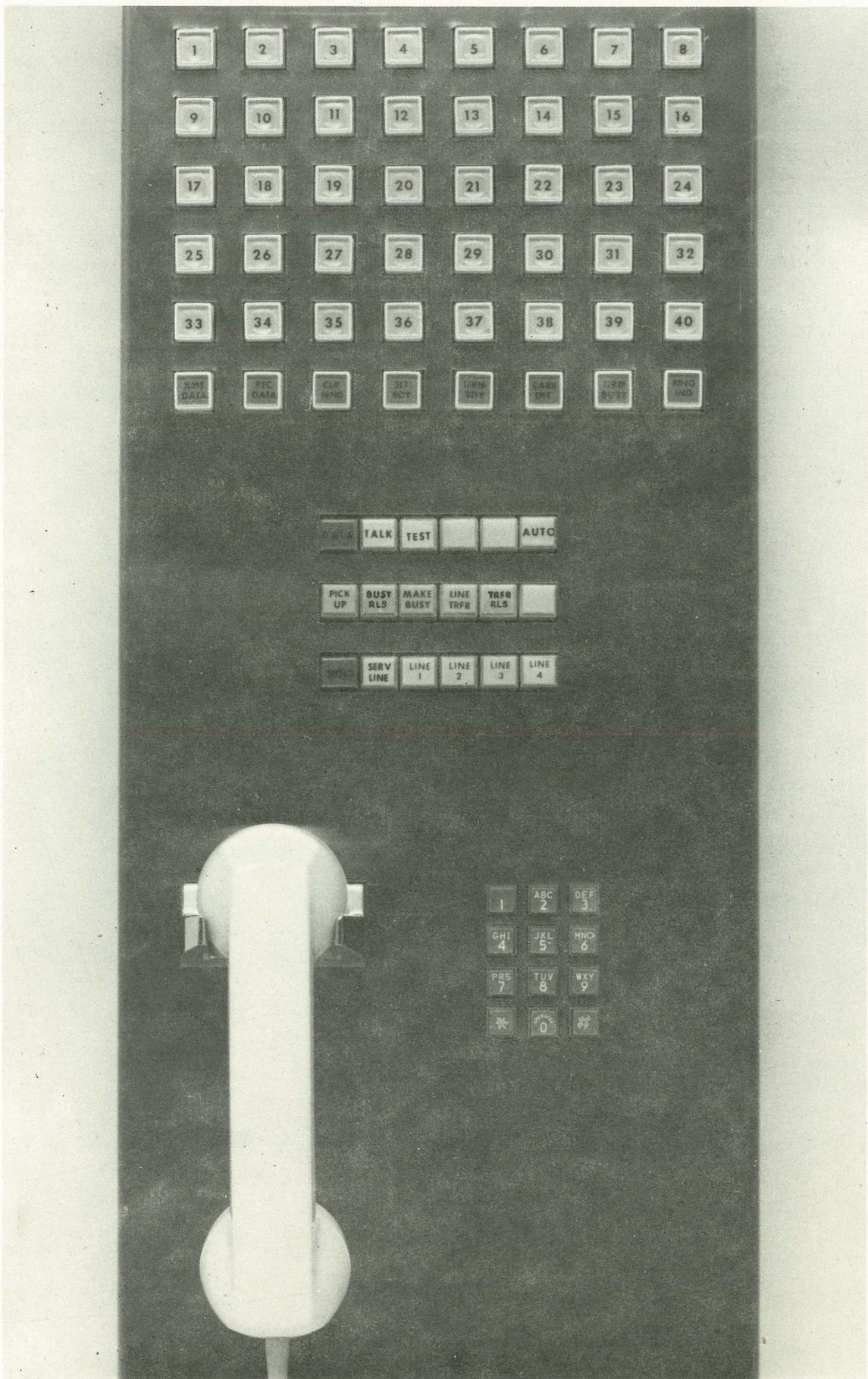


FIGURE 14
DATA AUXILIARY SET 804J-TYPE

