

Bell System Data Communications

TECHNICAL REFERENCE MANUAL

●
**Data Set 103E
Data Set 103G
Data Set 103H**

●
Interface Specification

●
October 1968

●
**DATA AND TELETYPEWRITER PLANNING ENGINEER
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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.

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.

2. PURPOSE OF THE DATA SET

2.1 The Data Sets 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 with DATA-PHONE Service. The facilities encountered in TWX-CE service, however, impose an upper bound of 150 bauds when the data sets are used with this 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 The 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, the equipment is rack mounted in a common cabinet.

2.3 It is also intended for use (as part of Data Set 103H) in Bell System teletypewriters 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. The 37-type teletypewriter will be one of the first teletypewriters adapted for use with Data Set 103E.

2.4 Data Set 103H-type which uses the 103E-type modem may be considered available for mounting within business machine equipment furniture should there be sufficient interest in such an application. This data set will require a separate attendant set and telephone handset. The 103H-type will be available with an attendant set which has optional rotary or TOUCH-TONE dialing and with or without card dialers.

2.5 The 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 will be available with optional rotary or TOUCH-TONE dialing and with or without card dialers.

3. COMPATIBILITY WITH EXISTING DATA SETS

3.1 The interfaces and line signals of the Data Set 103E-type, Data Set 103G-type and the Data Set 103H-type are identical. The following sections are applicable to both the 103E, 103G and 103H; however, for convenience, they will only be referred to as the 103E/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 103A 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 103A. Hence, while a 103E may replace a 103A in an existing installation, the reverse may not be true.

(b) On Line Compatibility

The Data Set 103E/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.

An ordering option will also permit Data Set 103E to be compatible on line with Data Set 103A1 when used in TWX-CE service along with teletypewriter type data sets modified for TWX-CE 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 103A-type, 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 103A.)

4. INTERFACE DESCRIPTION

4.1 EIA RS-232 Type Serial Data Interface

The Data Set 103E/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 103A.
- (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 515 ± 115 milliseconds after carrier is received at the calling (ORIG) data set and 135 ± 65 milliseconds after carrier is received at the called (ANS) data set. 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 103A
- (e) CB - Clear to Send: The CB circuit presents an OFF condition to the data processing terminal equipment whenever the the data set is not arranged to transmit data. The CB circuit will be turned ON by the calling data set 350 ± 50 milli-

seconds after F1M is transmitted or by the called data set 195 ± 105 milliseconds after F1M is received. Unlike the 103A, the CB circuit in the 103E/G remains ON while the data set is in the DATA mode 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 "TALK" or "TEST" modes.

(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, and

(2) 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 103A).

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 100 ± 40 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 Power)

) for use with the

(k) -P - Negative Power) 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 103E/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 12 ± 4 seconds. If 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 103A-type.

6. LOSS OF CARRIER DISCONNECT OPTION

6.1 The Data Set 103E/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 110 milliseconds of no carrier to initiate the disconnect sequence. If the loss of carrier exceeds 270 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 110 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 103A-type. 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.

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

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 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, restraint detection, 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. Answer Control

- a. Control of automatic answering is combined with the disconnect function in circuit CD.

5. Loss of Carrier Disconnect

- a. Yes - Data set disconnects when incoming carrier is lost for more than 110 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
- c. TOUCH-TONE dial
- d. TOUCH-TONE dial with card dialer

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 – rotary dial
- 103G2 – TOUCH-TONE dial
- 103G3 – rotary dial with card dialer
- 103G4 – 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 for the 103G-type, 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.

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 (from right to left):

- 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 depression) key with lamp

11. OPERATION WITH DATA-PHONE SERVICE

11.1 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 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.

11.2 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.

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

11.4 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)

11.5 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.

11.6 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.

11.7 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, the abort timer is inoperative.

12. ABNORMAL OPERATING MODE

12.1 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.

12.2 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.

13. OPERATION WITH TWX-CE SERVICE

13.1 Additional codes of the Data Set 103G- and 103H-type may be assigned to cover equipment arrangements for use in TWX-CE service. No handset will be provided for these arrangements and the CLEAR/TALK key will only clear the data set. Details of the equipment configuration and manual controls for these codes will be added to this specification in a future issue.

14. SEQUENCE CHARTS

14.1 The sequence charts in Figures 5 through 10 show the status of the interface circuits as the data set progresses through handshaking and disconnecting. As in the 103A, the Data Set 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 103E/G/H-type pertain 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 ON, 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.
11. An installer's strapping option is provided to inhibit the handset microphone for sets assigned to TWX-CE service.

15.3 Operator controls on the Data Auxiliary Set 804J may be described using Figure

12. 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 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 11). 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 lb. 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 KS20129 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.

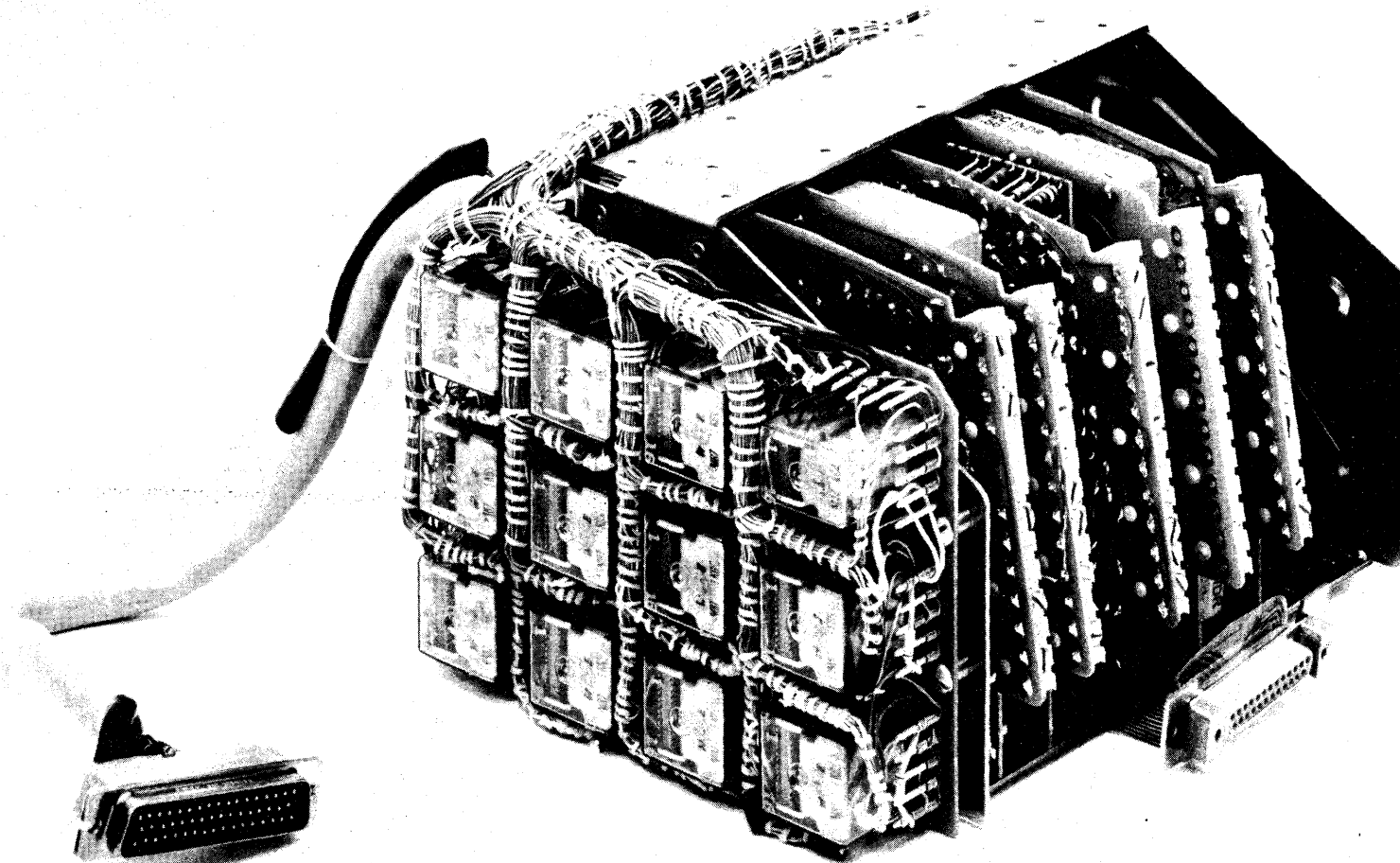
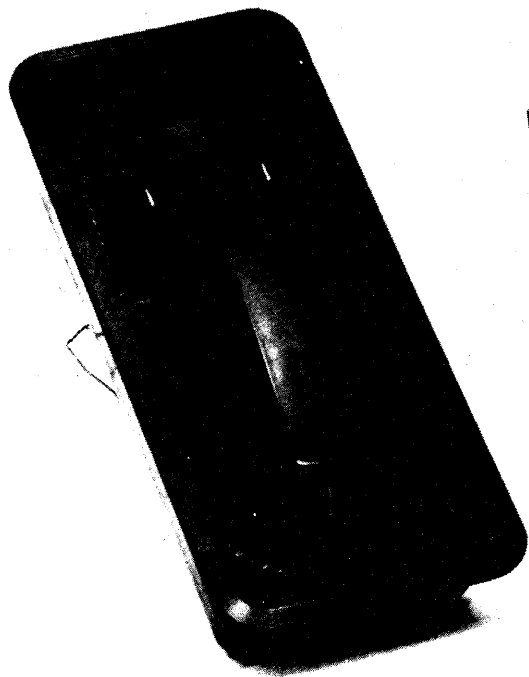


FIGURE 1
DATA SET TYPE 103E
MODE M ELECTRONICS PACKAGE



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

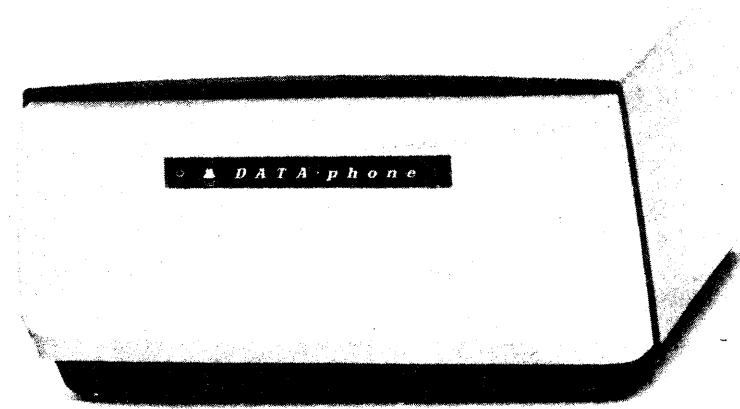
-H-



Telephone Handset



Attendant Set



Data Set 103H

FIGURE 3
DATA SET 103H AND
ASSOCIATED ATTENDANT SET

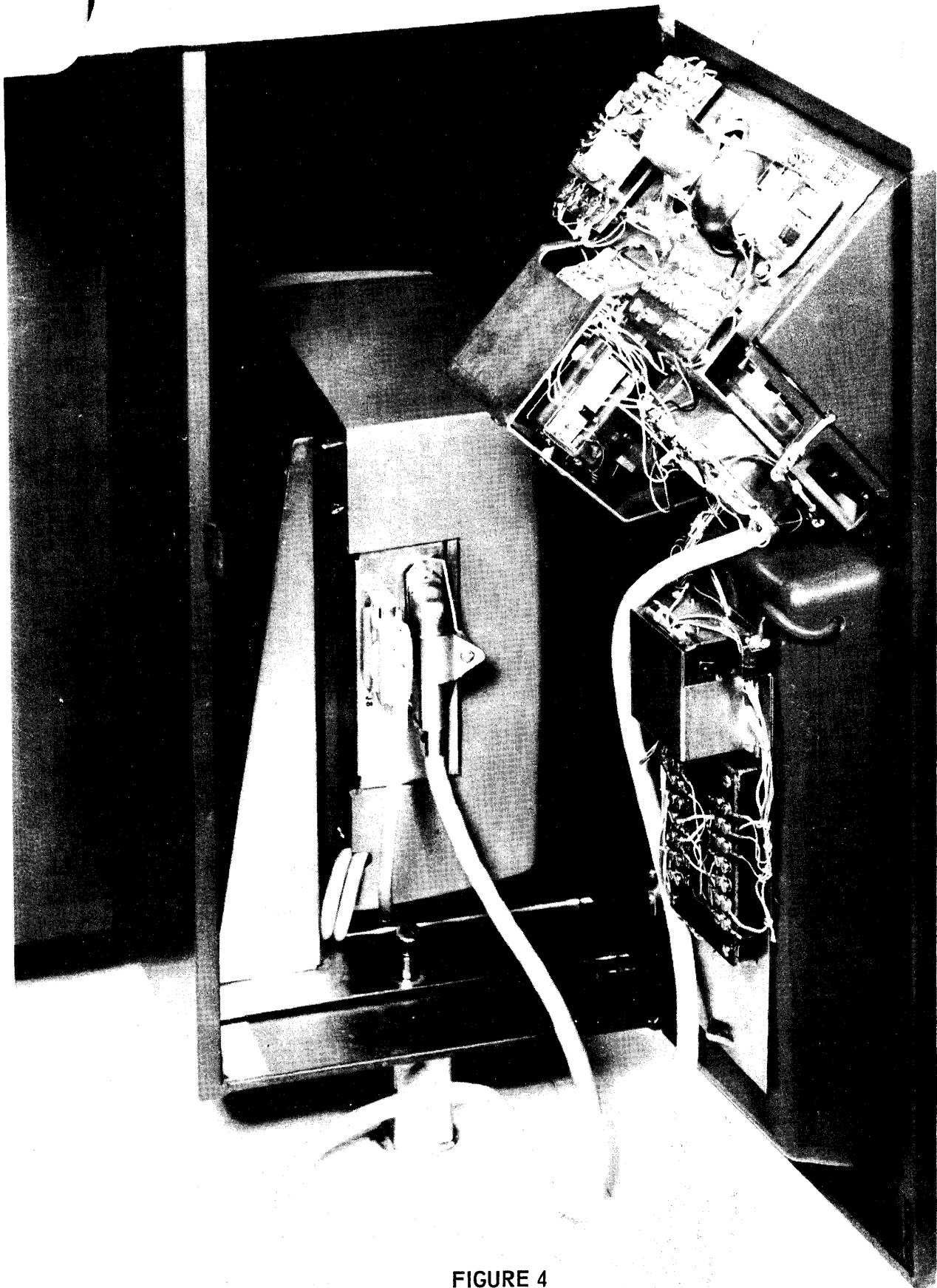
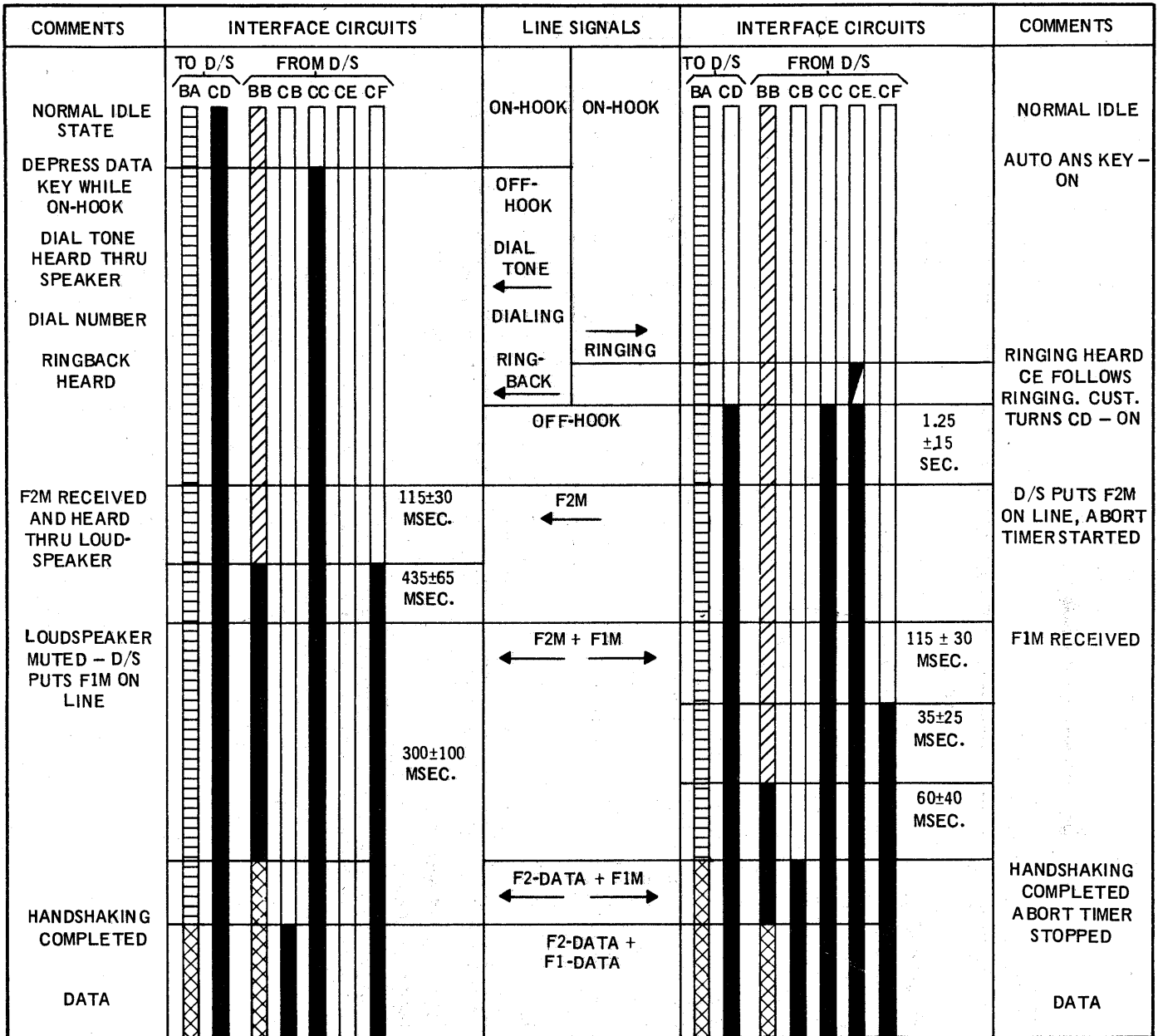


FIGURE 4
DATA SET 103H, TELEPHONE HANDSET
AND ATTENDANT SET MOUNTED VERTICALLY
IN MOUNTING PANEL

ORIGINATING

ANSWERING



KEY:



SPACE OR OFF



MARK OR ON



MARK HOLD



DATA PRESENTED IS NOT EFFECTIVE



DATA PRESENTED BY CUSTOMER ON BA IS TRANSMITTED AND RECEIVED

NOTES: 1. TIMING SHOWN IS FOR "CB-CF INDICATIONS SEPARATE" OPTION, FOR "CB-CF INDICATION COMMON" OPTIONS CF TURNS ON WITH CB.

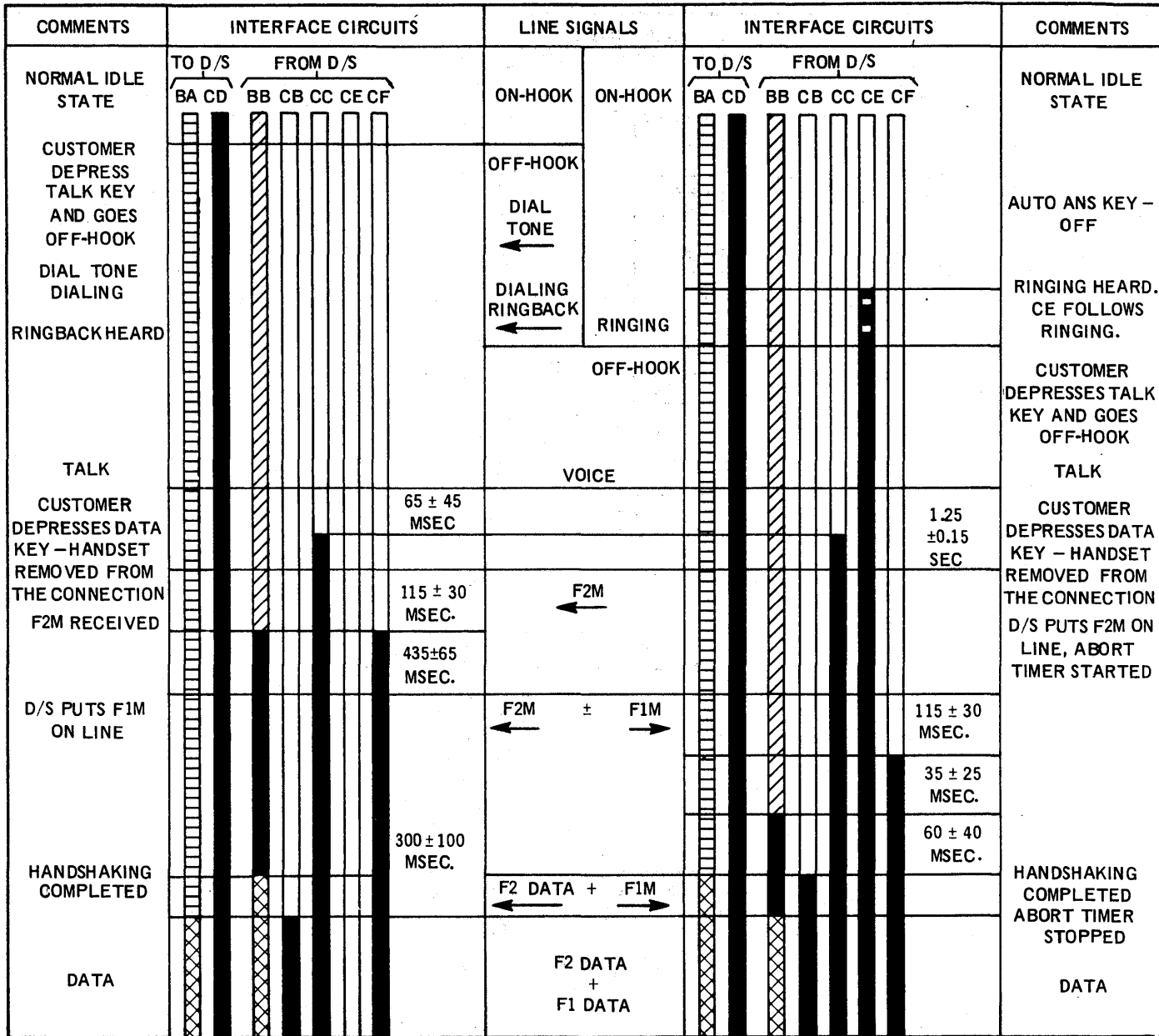
2. CHART FOR STATION USING "CE ON" OPTION.

DATA SET 103E TYPE

FIG. 5 - Sequence chart for a call originated in the semi-automatic manner and answered automatically.

ORIGINATING

ANSWERING



KEY:

- [] SPACE OR OFF
- [█] MARK OR ON
- [▨] MARK HOLD

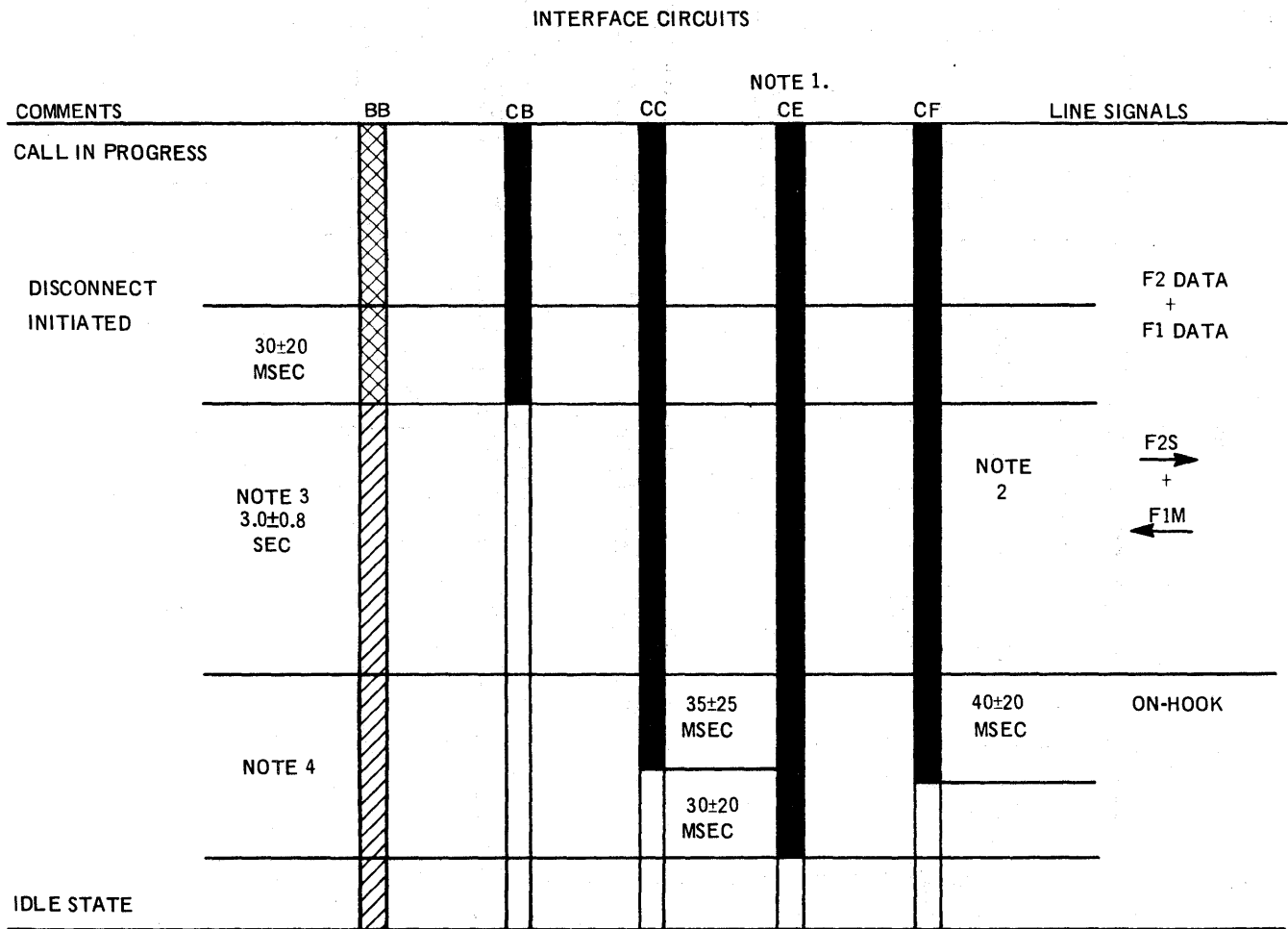
- [] DATA PRESENTED IS NOT EFFECTIVE
- [▨] DATA PRESENTED BY CUSTOMER ON BA IS TRANSMITTED AND RECEIVED

* If CE is "ON" when call is answered, it will remain "ON". If call is answered between ring cycles, CE turns "ON" 35 ± 25 msec after lifting the telephone handset.

DATA SET 103E TYPE

FIG. 6 - Sequence chart for a call originated manually and answered in the TALK mode.

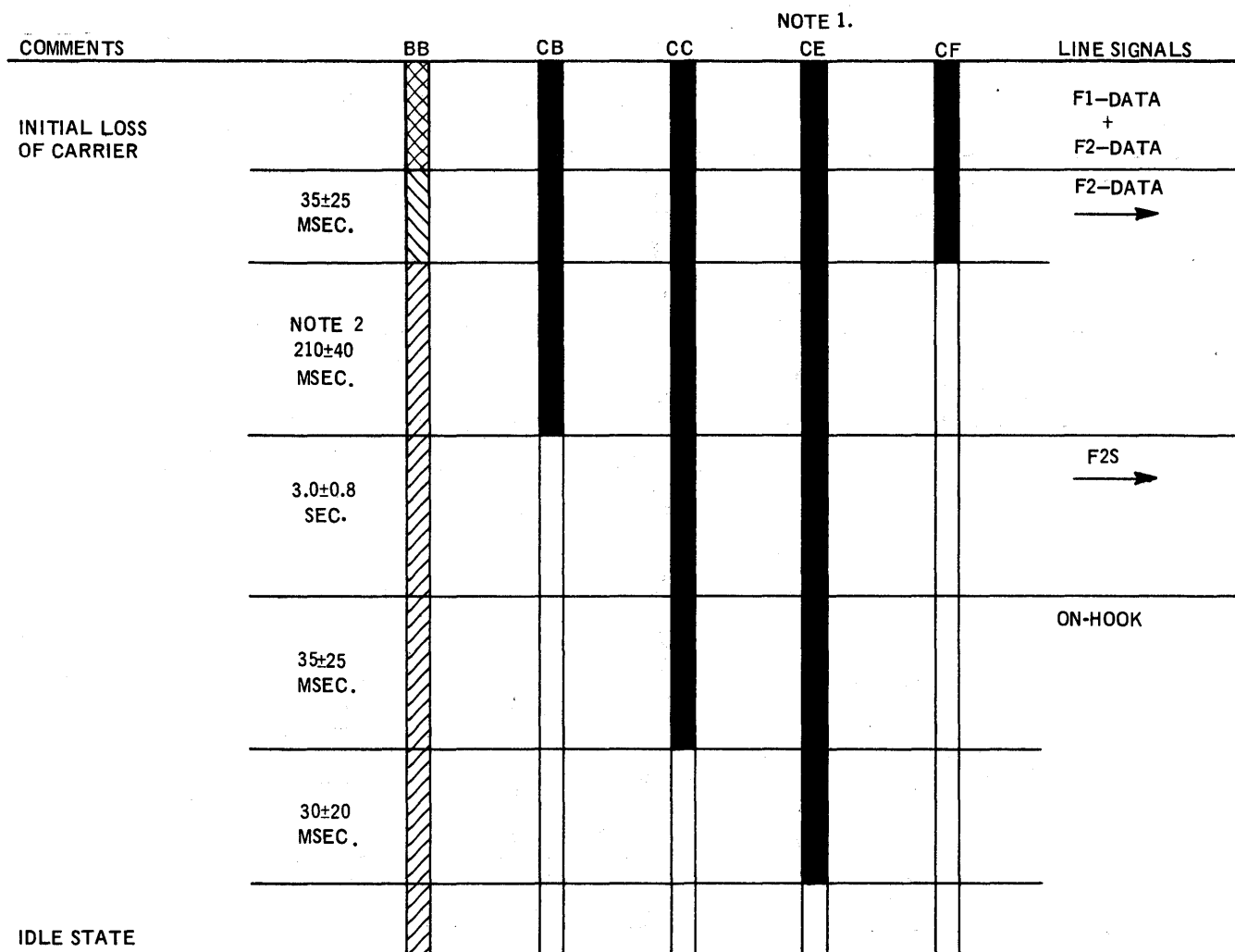
- I - DISCONNECT INITIATED BY EITHER
- A) BUSINESS MACHINE TURNING CKT. CD OFF
 - B) ATTENDANT DEPRESSING CLEAR KEY, OR
 - C) AUTOMATIC CALLING UNIT SIGNALING DATA SET TO DISCONNECT



- NOTES: 1. FOR ANS MODE STATION WITH "CE-ON" OPTION.
2. IF THE OTHER STATION IS WIRED TO DISCONNECT ON SPACE, CF WILL GO OFF DURING THIS INTERVAL.
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 TURN-OFFS MAY BE EITHER CF, CC, CE, OR CC, CF, CE, OR CC, CE, CF.
5. TIME SHOWN IS FOR "CB-CF INDICATIONS SEPARATE" OPTION. FOR "CB-CF INDICATIONS COMMON" OPTION, CF TURNS OFF WITH CB.

FIGURE 7
DATA SET 103E TYPE
Detailed Disconnect Sequences

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 400 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.

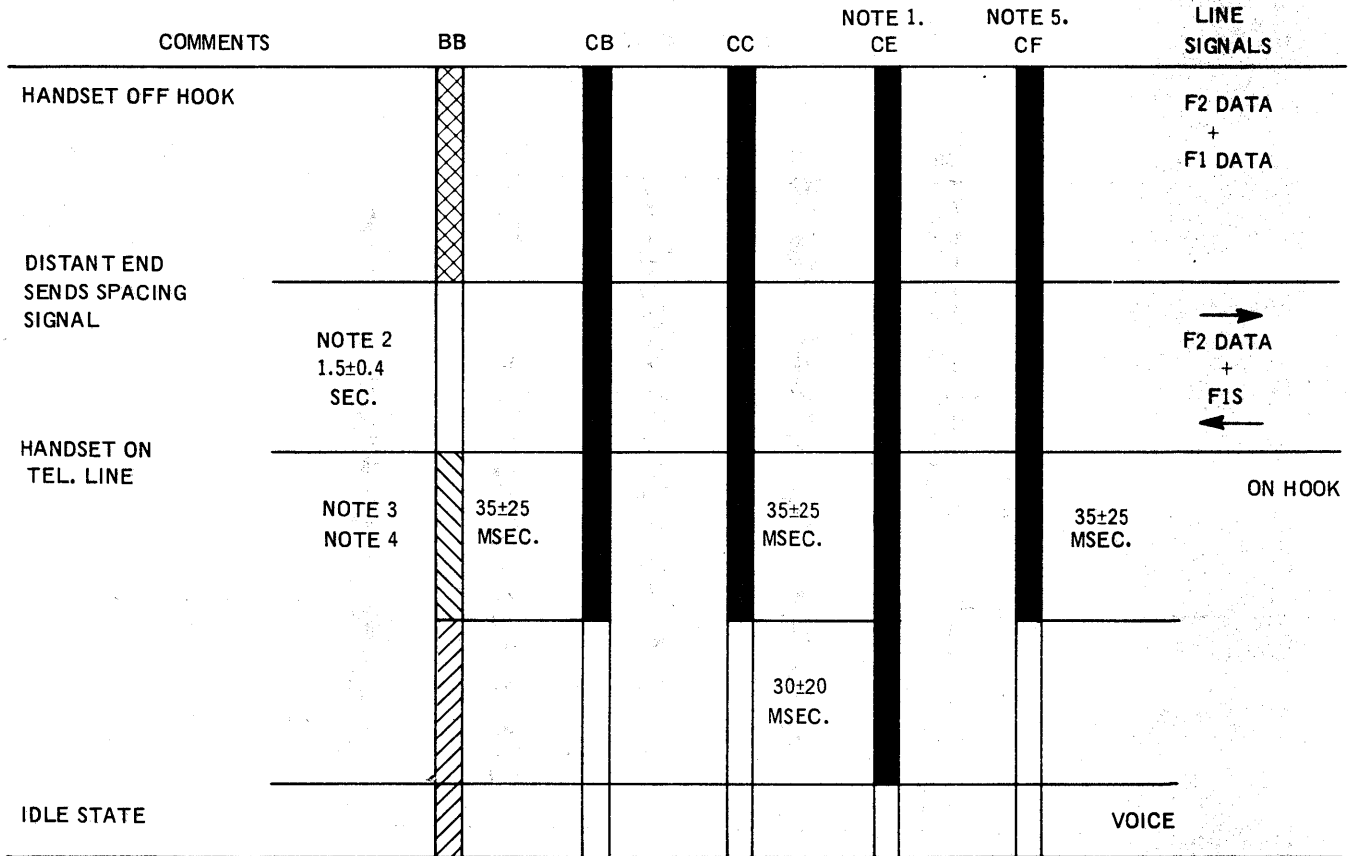
FIGURE 8

DATA SET 103E TYPE

Detailed Disconnect Sequences

II - Disconnect originated by loss of carrier

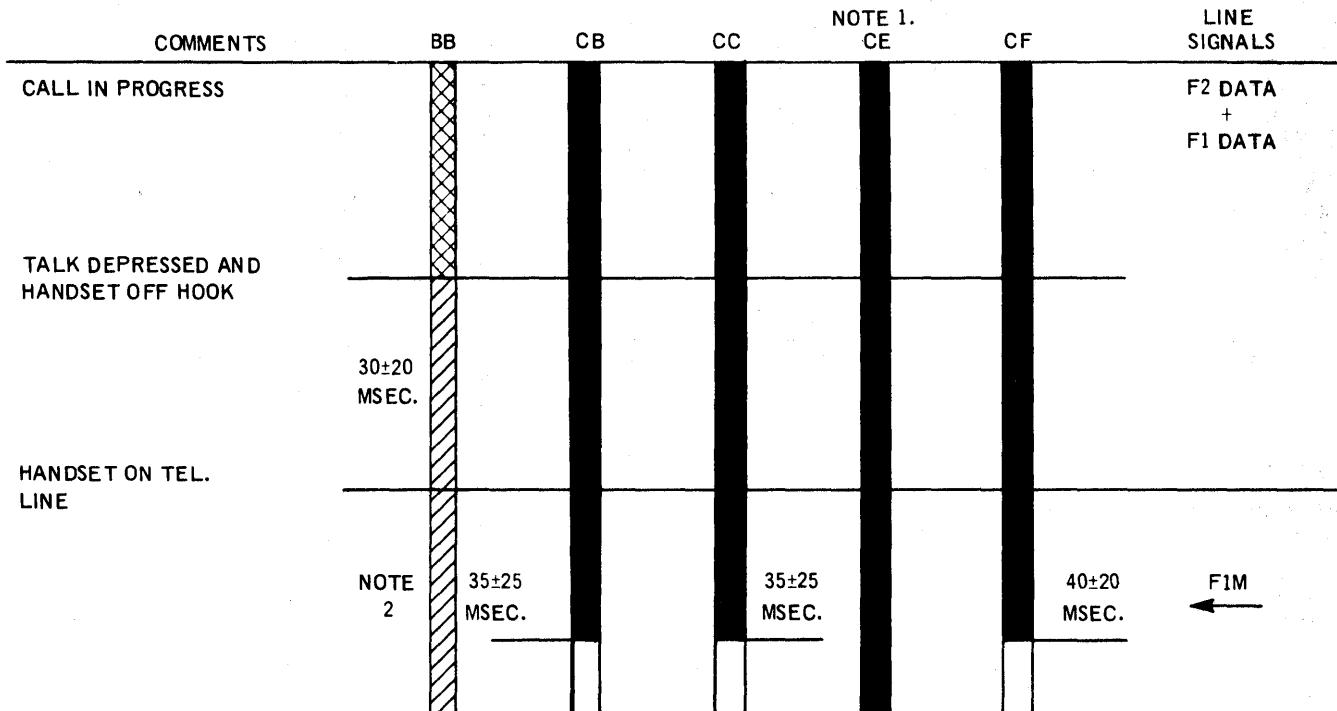
INTERFACE CIRCUITS



- 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. ORDER IN WHICH CIRCUITS CB, CC, CE AND CF TURN OFF IS NOT FIXED EXCEPT THE CE CKT ALWAYS TURNS OFF 30±20 MSEC. AFTER CC.
4. CKT BB IS CLAMPED MARK-HOLD WHEN EITHER CF OR CB IS TURNED OFF WHICHEVER OCCURS FIRST.
5. TIME SHOWN IS FOR "CB-CF INDICATIONS SEPARATE" OPTION. FOR "CB-CF INDICATIONS COMMON" OPTION CF TURNS OFF WITH CB.

FIGURE 9
DATA SET 103E TYPE
Detailed DATA to TALK Transfer
Sequence for Station Desiring Transfer

INTERFACE CIRCUITS



- NOTES: 1. FOR ANS MODE STATION WITH "CE-ON" OPTION.
 2. ORDER IN WHICH CKTS CB, CC AND CF ARE TURN OFF IS NOT FIXED.
 3. TIME SHOWN IS FOR "CB-CF INDICATION SEPARATE" OPTION. FOR "CB-CF INDICATION COMMON" OPTION CF TURNS OFF WITH CB.

FIGURE 10
 DATA SET 103E TYPE
 Detailed DATA to TALK Transfer Sequence



FIGURE 11
103E DATA STATION FRONT VIEW
SHOWING CUSTOMER'S INTERFACE COMPARTMENT

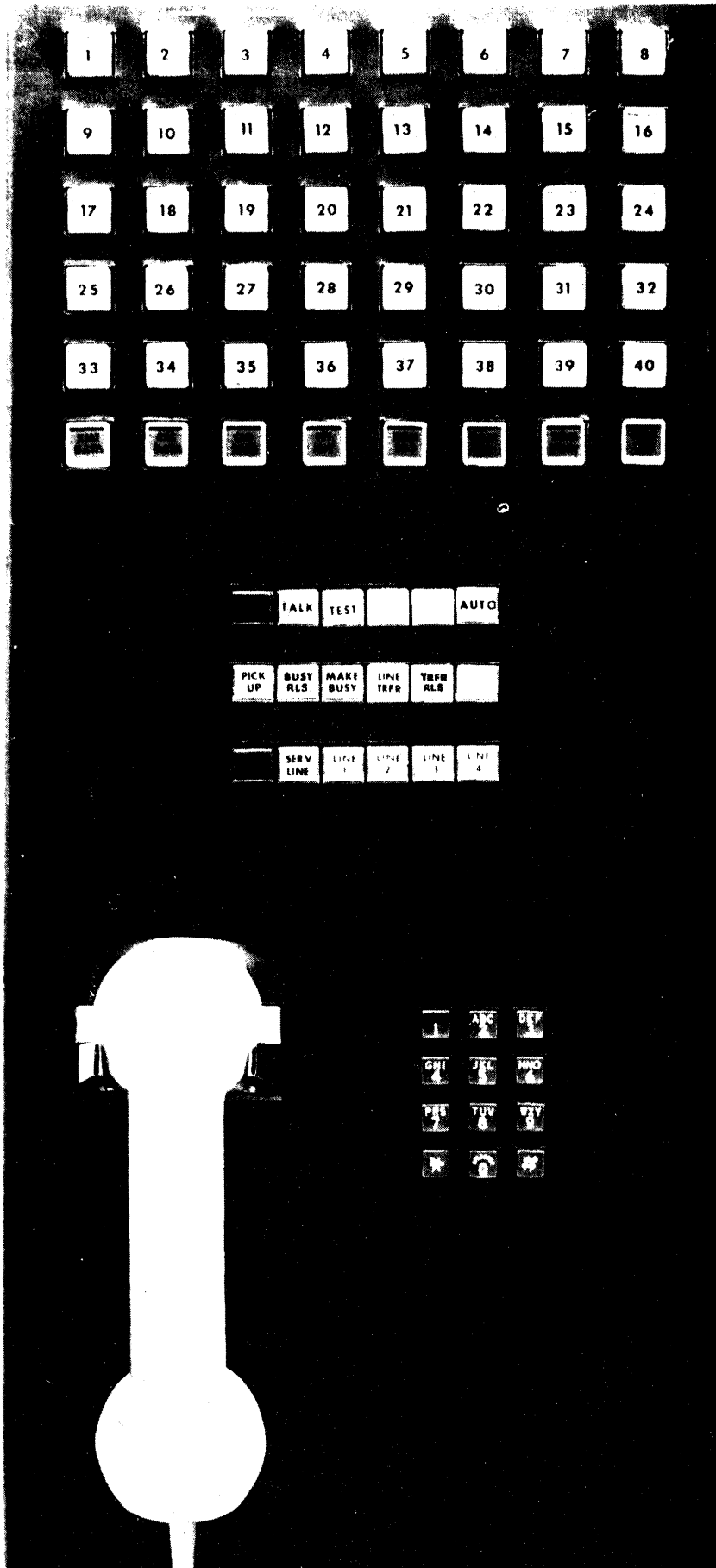


FIGURE 12
DATA AUXILIARY SET 804J-TYPE