

Bell System

TECHNICAL REFERENCE

113-TYPE DATA STATION
INTERFACE SPECIFICATION
OCTOBER 1971



113-Type Data Station Interface Specification

October 1971



NOTICE

This Technical Reference is published by American Telephone and Telegraph Company as a guide for the designers, manufacturers, consultants and suppliers of customer-provided systems and equipment which connect with Bell System communications systems or equipment. American Telephone and Telegraph Company reserves the right to revise this Technical Reference for any reason, including, but not limited to, conformity with standards promulgated by USASI, EIA, CCITT, or similar agencies, utilization of new advances in the state of the technical arts, or to reflect changes in the design of equipment or services described therein. The limits of responsibility and liability of the Bell System with respect to the use of customer-provided systems or equipment are set forth in the appropriate tariff regulations.

If further information is required, please contact:

Engineering Director — Transmission Services
American Telephone and Telegraph Company
195 Broadway
New York, New York 10007

This Technical Reference supersedes the Preliminary Technical Reference of the same title dated February, 1971.

TABLE OF CONTENTS

	Page
1. GENERAL	1
1.1 Description	1
1.2 Data Station Service Features and Options	1
2. INTERFACE DESCRIPTION	2
2.1 EIA RS-232 Type Interface	2
2.2 Interface Circuit Description	2
2.3 Summary of Options Relating to Interface	3
3. OPERATION	4
3.1 Call Answering	4
3.2 Operation When Transferred to the Service Line	4
3.3 Monitoring and Control of Data Sets	5
3.4 Line-Busy	6
4. PHYSICAL CHARACTERISTICS	6
5. TESTING	7

LIST OF FIGURES

	Page
Fig. 1 — 113-Type Data Station With 804T Data Auxiliary Set	8
Fig. 2 — 113B Data Set	9
Fig. 3 — 32A1 Data Mounting	10
Fig. 4 — 804T Data Auxiliary Sets	11
Fig. 5 — Call Originated Manually and Answered Automatically	12
Fig. 6 — Disconnect Initiated By Answering Station	13
Fig. 7 — Disconnect Initiated By Originating Station	14

1. GENERAL

A general description of the data station and its service features and options are given in this Section.

1.1 Description

The 113-Type Data Station described herein is a multiple arrangement of Data Sets 113B for use in DATA-PHONE[®] Service applications. The Data Set 113B is a low speed (up to 300 bauds), full-duplex answer-only data set. The data station, illustrated in Figure 1, is intended for use in multiple data set installations such as those associated with time-shared computers which do not require a call-origination capability.

The data sets operate as automatic-answering stations and do not include alternate voice or call-origination capability. They are able to communicate with those 100 series DATA-PHONE data sets which are capable of operating in an originate mode, that is, transmitting and receiving the originate-mode frequencies. The data station includes a service line arrangement to facilitate maintenance and testing. Call-origination and an alternate voice capability are provided for with the service line arrangement.

The data station is designed on a modular basis to permit flexibility in the number of data sets provided at a location. As many as 120 data sets can be accommodated in one cabinet.

The data station may be equipped with an optional data auxiliary set which enables an attendant to visually monitor the status of all data sets and, if he desires, to take a terminal out of service by operation of a key.

1.2 Data Station Service Features and Options

The data station service features and options are described in this Section.

1.2.1 Answer-Only Operation

The DataSets 113B used in the data station are for answer-only service without voice communication. They are designed to transmit and receive only the answer-mode frequencies used by the 100 series data sets in DATA-PHONE Service and can communicate with 100 series data sets which are capable of operating in an originate mode.

1.2.2 The Service Line

A service line is associated with each data station. A data set may be transferred to the service line for maintenance and testing purposes. One service line is adequate for up to 60 data sets. Call-origination and alternate voice and data communication are possible over the service line.

Voice capability is provided by a telephone associated with the service line. The telephone may be one furnished with the data station and located at the data set cabinet, or optionally, a remotely located telephone set or a Data Auxiliary Set 804T-Type may be provided. (Rotary or TOUCH-TONE[®] dials are available as desired.)

1.2.3 Modular Design

The design of the data set and data set mounting permits varying the number of data sets provided at a location as required. Cabinets are available in two sizes for accommodating up to 20 or 120 data sets.

1.2.4 Optional Monitoring and Control Features

The following features or capabilities are optionally provided and require the addition of

[®]Registered Service Mark of AT&TCo.

the Data Auxiliary Set 804T shown in Figure 4. One data auxiliary set can serve up to 60 data sets.

A. Make-Busy Key

An attendant can make a data set appear busy by operation of a key.

B. Data Set Status Indication

Lamp indications are provided to inform the attendant whether a data set is in use and connected in a data mode, in an idle condition or has been made-busy

C. Interface Circuit Monitoring

The attendant can monitor the interface leads of any one data set and visually determine whether a particular lead is in an ON or OFF condition.

2. INTERFACE DESCRIPTION

2.1 EIA RS-232 Type Interface

The interface circuits have been designed to meet the electrical specifications given in EIA RS-232-B and C Standards. A brief summary of these characteristics follows.

All signals generated by the 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-to25-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.

The interface connector furnished with the data set is intended for connection to a customer-provided Cinch or Cannon DB-19604-432 plug with a Cinch DB-51226-1 hood or equivalent.

2.2 Interface Circuit Description

The interface circuits which are presented to the customer's equipment are:

Pin Assignment	Circuit	Function
1	AA	Protective Ground
2	BA	Transmitted Data
3	BB	Received Data
5	CB	Clear to Send
6	CC	Data Set Ready
7	AB	Signal Ground
8	CF	Data Carrier Detector
9	+P	Data Set Test
10	-P	Data Set Test
20	CD	Data Terminal Ready
22	CE	Ring Indicator
25	CN	Terminal Busy

All other pins are unused. Pins 9 and 10 are not to be used by the customer's terminal equipment in accord with the EIA Standard.

The functions of the interface leads are briefly described as follows:

- a) AA — Protective Ground — This lead is connected to ac power service ground and electrically bonded to the equipment chassis.
- b) AB — Signal Ground — This lead provides common grounds for all electronic circuits and may be connected to AA by an installation option.
- c) BA — Transmitted Data — The BA circuit is designed to accept serial data from the customer's terminal equipment. Data presented to the BA circuit when the CB circuit is in the ON state will be transmitted by the data set. Except as noted in Paragraph e, following, data presented when the CB circuit is OFF will be ignored.
- d) BB — Received Data — The output data from the data set is presented to the data terminal on this lead. The output will be clamped in the mark condition

during the handshake sequence. The mark hold is also applied when a loss of data carrier is detected, and when a disconnect sequence is entered.

- e) CB — Clear to Send — After the data set has connected, the customer's equipment is informed via this lead that the data set is prepared to transmit any data presented on the BA lead. An installation option is available to provide for CB being turned OFF when a loss of carrier occurs. However, with this option the BA lead is not disabled when CB does turn OFF until the data set disconnects due to loss of carrier or due to the CD lead being turned OFF.
- f) CC — Data Set Ready — This lead is turned ON when the data set is connected to the communication channel and not in the test mode.
- g) CD — Data Terminal Ready — The ON condition of this lead permits the data set to be connected to the communication channel. An OFF signal will cause a connected data set to disconnect if it is maintained for more than 50 milliseconds. A shorter duration may cause a disconnect.
- h) CE — Ring Indicator — This lead will be ON during the ringing interval whenever central office ringing is received. After the data set answers, an OFF signal is presented on this lead.
- i) CF — Data Carrier Detector — The ON state of this lead indicates to the data terminal that acceptable carrier is being received. Whenever the level of the carrier being received drops below -50 dBm for approximately 10 milliseconds, the CF lead will turn OFF. In the data mode, the carrier detector in the data set responds to energy, carrier plus noise, from the telephone line and, therefore, while circuit CF being ON is good assurance that the received carrier is valid carrier, it is not absolute assurance.

If the received carrier remains off continuously for 200 ± 50 milliseconds,

the data set will disconnect unless an available option, which precludes disconnecting on loss of carrier, is installed. When this option is used, disconnect can only be initiated by turning the CD lead OFF.

- j) CN — Terminal Busy — The customer can make the telephone line to a data set appear busy by applying an ON voltage (positive), a ground or an open circuit to this lead. An option is available to simulate the OFF voltage (negative) for installations in which the customer's equipment does not connect to the CN lead. However, if this option is used, the line will not appear busy should the interface connector to the data set become open.

2.3 Summary of Options Relating to Interface

The following options which are related to the interface of the 113-Type Data Station should be specified by the user:

- a) Common CB and CF option — With this option, the signal presented by the data set on the CB lead will be the same as that presented by the CF lead. Without this option, discrete signals will be presented on the CB and CF leads.
- b) CN Control Option — The terminal is normally permitted to make the line busy via the CN lead. When this option is not installed, the terminal is inhibited from making the line busy via the interface.
- c) Data Terminal Control of Disconnect Option — With this option installed, upon entering the data mode, the data set disconnect is under the exclusive control of the terminal via the CD lead. Without this option, the data set will also disconnect after a loss of carrier has been detected continuously for 200 ± 50 milliseconds.
- d) Common Signal Ground and Frame Ground Option — With this option installed, all data set signal grounds

(AB) are connected to frame ground (AA). Without this option, the signal grounds are connected together but not connected to frame ground.

3. OPERATION

In normal use, a data set is capable only of answering calls to enter the data mode. Calls cannot be originated and alternate voice capability is not provided. When the data set is connected to the service line, calls can be answered to enter the data mode, or calls may be originated or answered in a voice mode and alternate voice and data operation is provided.

3.1 Call Answering

Calls are automatically answered by the data set. The sequence charts in Figures 5, 6 and 7 show the status of the interface circuits as the data set progresses through the answering of a call and disconnection. For illustrative purposes, the call was originated from a Data Set 103E-Type. Calls may be from other types of originating data sets in which case the time intervals peculiar to the originating data set may not agree with those shown in the figures.

In answering a call, the Data Set 113B responds to ringing voltage and circuit CE (Ring Indicator) is turned ON but only while ringing voltage is present which is approximately 2 seconds ON and 4 seconds OFF. The modem will be connected to the line after the end of a ringing interval, if circuit CD (Data Terminal Ready) is ON. At this point, circuit CC (Data Set Ready) is turned ON but the transmitter is kept disabled for a period of 1.3 ± 0.3 seconds, after which time the F2 Mark frequency is transmitted to the originating station. After receipt of this tone for some time, the originating station will transmit the F1 Mark tone. The Data Set 113B must receive this tone continuously for a period of 150 ± 50 milliseconds before entering the data mode. If no such signal is received for 22 ± 6 seconds after connecting, an abort timer automatically disconnects the Data Set 113B. After receipt of carrier for nominally 150 milliseconds, the CF (Data Carrier Detector) and CB (Clear to Send) circuits are turned ON, a mark hold is removed

from the BB (Received Data) circuit, and the data set will transmit signals presented on the BA (Transmitted Data) circuit. Data can now be sent and received by the Data Set 113B.

Disconnect can be initiated by the terminal associated with the Data Set 113B by turning OFF the CD (Data Terminal Ready) circuit until the CC (Data Set Ready) circuit goes OFF. This will occur in less than 50 milliseconds from the time that the CD circuit is turned OFF.

The originating station can cause the Data Set 113B to disconnect by turning OFF its transmitting carrier. A loss of received carrier at the Data Set 113B for approximately 10 milliseconds will result in CF (Data Carrier Detector) being turned OFF and BB (Received Data) being clamped marking. If the carrier then remains off continuously for an additional 200 ± 50 milliseconds, the Data Set 113B will disconnect. If the carrier should come on during the 200 millisecond interval, the CF (Carrier Detector) will be turned ON again and any subsequent losses of carrier will be treated as the first loss of carrier. Disconnecting on loss of carrier assumes the option providing for inhibiting the feature is not exercised.

There is no internal provision in the Data Set 113B for disconnecting upon receipt of a spacing signal of any duration, nor is any spacing signal generated by the data set prior to disconnect.

3.2 Operation When Transferred to the Service Line

A service line is provided at each data station to which a data set may be transferred for maintenance and testing purposes. In addition, alternate voice and data communication capability over the service line is provided to facilitate testing.

A data set is transferred to the service line by manually inserting the service-line plug into the jack mounted on the faceplate of the data set. The telephone line normally associated with the data set is made busy automatically when the set is transferred to the service line.

A data set transferred to the service line will automatically connect and answer any calls made to the service line number in the manner previously described providing the (CD) Data Terminal Ready circuit is ON.

A call may be originated or answered in the voice mode by the attendant operating the TALK-CLEAR key (locking), picking up the telephone handset and, if originating a call, dialing the number of the distant station.

Operation of the TALK-CLEAR key on either the data set mounting, a data auxiliary set, or remote-type telephone set permits voice communications and inhibits a transferred data set from connecting to the service line.

To transfer from the voice mode to the data mode, the attendant operates the DATA key (nonlocking) and, when the DATA lamp (Data Auxiliary Set 804T only) lights or when the tone transmitted by the data set is heard in the handset, he replaces the handset. The TALK-CLEAR key is released when the DATA key is operated.

It should be noted that, although a call over the service line can be originated in a voice mode, when a transfer to the data mode is made, the Data Set 113B assumes the answer mode, that is, transmits and receives the answer mode frequencies. Therefore, it is necessary that the distant end data set manually assume the originate mode when the transfer to data is made; if it does not, the Data Set 113B will not enter the data mode.

The data set is removed from the line when the TALK-CLEAR key is operated and a line disconnect will take place unless the associated telephone set is off-hook.

3.3 Monitoring and Control of Data Sets

Additional features are available which may be helpful to an attendant in the operation of the data station and which facilitate testing the data sets. Most of the features are provided by the Data Auxiliary Set 804T which is an optional item and is shown in Figure 4.

3.3.1 Data Set Status Indication

The status lamps on the Data Auxiliary Set 804T indicate to an attendant whether the corresponding data set is in use, is idle, or has been made-busy as follows:

Indication	Lamp Status
Line Idle	OFF
Data set connected and in data mode (Connected to normal line)	ON
Line made busy	Wink (2.5 pulses per second)

3.3.2 Make-Busy Key

The make-busy keys on the data auxiliary set enable an attendant to make the telephone line to a specific data set appear busy without affecting other lines serving that 113-type Data Station. Other methods of making a line busy are noted in Section 3.4.

For multiple data set installations such as time share applications, the need for make-busy capability is more acute than for single data set installations. These multiple set installations are normally served by a telephone switching office line hunting arrangement which permits a number of lines to be accessed by dialing a common telephone number. The switching office automatically hunts over this group of lines in search of an idle line. If the selected line does not answer and the call is abandoned, subsequent calls to this number can be directed to that same line and encounter a no-answer condition. (A no-answer condition would occur if the Data Terminal Ready circuit is held OFF.) However, if a line is taken out of service by making the line appear busy, the line hunting process skips the made-busy line and searches for an idle line thus improving the efficiency of the system operation.

Where many or all lines are to be taken out of service for customer reasons, a voice recorded announcement would be desirable to notify the calling party of the out of service condition. The recorded announcement

arrangement is not a feature of the 113-type Data Station but can be ordered separately on a "per line" basis. The local telephone company representative should be contacted for additional information on the voice recorded announcement arrangement.

3.3.3 Interface Circuit Monitoring

Provision is made for the attendant to monitor the interface circuits between any selected data set and the associated customer equipment. A selector switch is provided in the Data Auxiliary Set 804T for selecting any one of 60 data sets.

Interface circuits monitored are: Transmitted Data, Received Data, Terminal Busy, Ring Indicator, Clear to Send, Data Set Ready, Data Terminal Ready, and Data Carrier Detector. Monitor lamps in the data auxiliary set for eight interface circuits will light when the corresponding circuit is in an ON (or SPACE) condition.

The interface circuits of a data set can be monitored when the data set is on its normal line or transferred to the service line.

3.4 Line-Busy

As noted previously, if a customer desires to take a particular terminal (computer port) out of service, the telephone line to the associated data set will be made to appear busy when the CN (Terminal Busy) circuit is turned ON or when a corresponding button on the Data Auxiliary Set 804T, if provided, is operated. The line associated with a data set will also be made busy when that set suffers a loss of power. If the CN circuit is used, the line will also be made busy if the customer's interface connector to the data set is removed.

Another method of making the line to a data set appear busy is by manually inserting a dummy telephone plug in the lower jack of the service line twin-jack.

If the make-busy condition is applied while the data set is in the data mode, the data set may not disconnect and there is no assurance that

the remote data set will disconnect. If the Data Set 113B involved has the disconnect-on-loss-of-carrier feature inhibited, the data set will not appear to disconnect, i.e., circuit CC (Data Set Ready) will remain ON. However, circuit CF (Data Carrier Detector) will turn OFF indicating a loss of carrier. Circuit CC will not turn OFF until circuit CD is turned OFF or when the set is connected to the service line, the TALK-CLEAR key is operated.

4. PHYSICAL CHARACTERISTICS

The Data Sets 113B are mounted in the 32A1 Data Mounting which has a capacity for up to 20 data sets. The data mountings in turn are mounted in one of two different sized Bell System cabinets. The small sized cabinet accommodates one data mounting and the large cabinet, six data mountings. The outside dimensions and weights of the cabinets are:

- a) 24" wide x 12" deep x 30" high; 28 pounds
- b) 34" wide x 30.5" deep x 72.18" high; 300 pounds

The overall dimensions of the 32A1 Data Mounting are 20 x 11 x 23 inches. Its weight without data sets is 50 pounds. The Data Set 113B weighs 2.25 pounds.

The standard Data Auxiliary Set 804T may be equipped with TOUCH-TONE or rotary dial and has its own integrated housing. The overall dimensions are 20 x 12 x 7 inches and the weight is 20 pounds. The set can be located at the data set cabinet or remotely situated at a distance of up to 200 feet. One data auxiliary set can serve up to 60 data sets. An arrangement is also available for mounting the data auxiliary set in a customer-provided cabinet such that the control panel of the set is flush with the surface of the cabinet. The local telephone company representative should be consulted for availability and mounting details concerning the flush mounted arrangement.

One service line must be shared by all data sets served by a Data Auxiliary Set 804T. If an installation requires more than one data auxiliary set, each should have a different

service line. In order to avoid grounding problems, all data mountings associated with a given Data Auxiliary Set 804T should receive their ac power from the same circuit.

The data sets and the data auxiliary set receive all their power from their associated 32A1 Data Mountings. The data mounting requires 125 watts of ac power at $117V \pm 10$ percent and 60 ± 3 Hz.

The 113-Type Data Station will operate in an ambient temperature between 40° and 120° F and relative humidity between 20 and 95 percent.

5. TESTING

Data Set 113B may be tested remotely by a data test center. The data set is transferred to the service line and the customer's interface

connector is removed and left unterminated. It is replaced by a test-mode connector, supplied with the data mounting, or by a data test set which connects the BA (Transmitted Data) and BB (Received Data) interface leads together and applies a positive voltage to the CD (Data Terminal Ready) interface lead. As noted previously, the BB lead to the terminal will be in an open-circuit condition when the interface connector is removed. When testing the data set, the data test center calls the data set which will automatically answer. Transmitted frequencies and levels are measured as is the receiver response. The progress of the test can be monitored by the Data Auxiliary Set 804T.

Systems tests may be conducted by the business machine attendant by transferring the data set to the service line and answering data calls over that line.

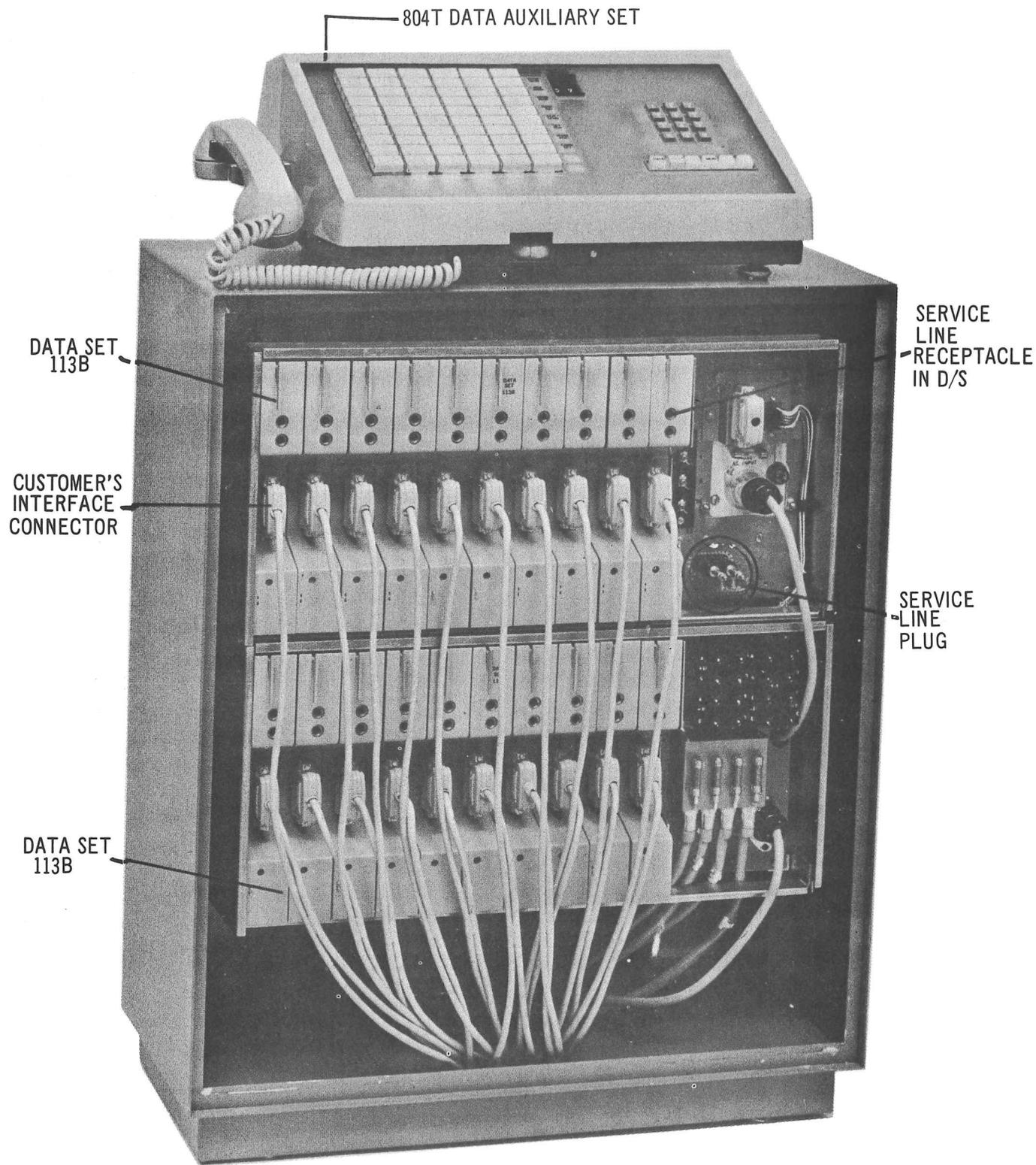


Figure 1 - 113-Type Data Station With 804T Data Auxiliary Set

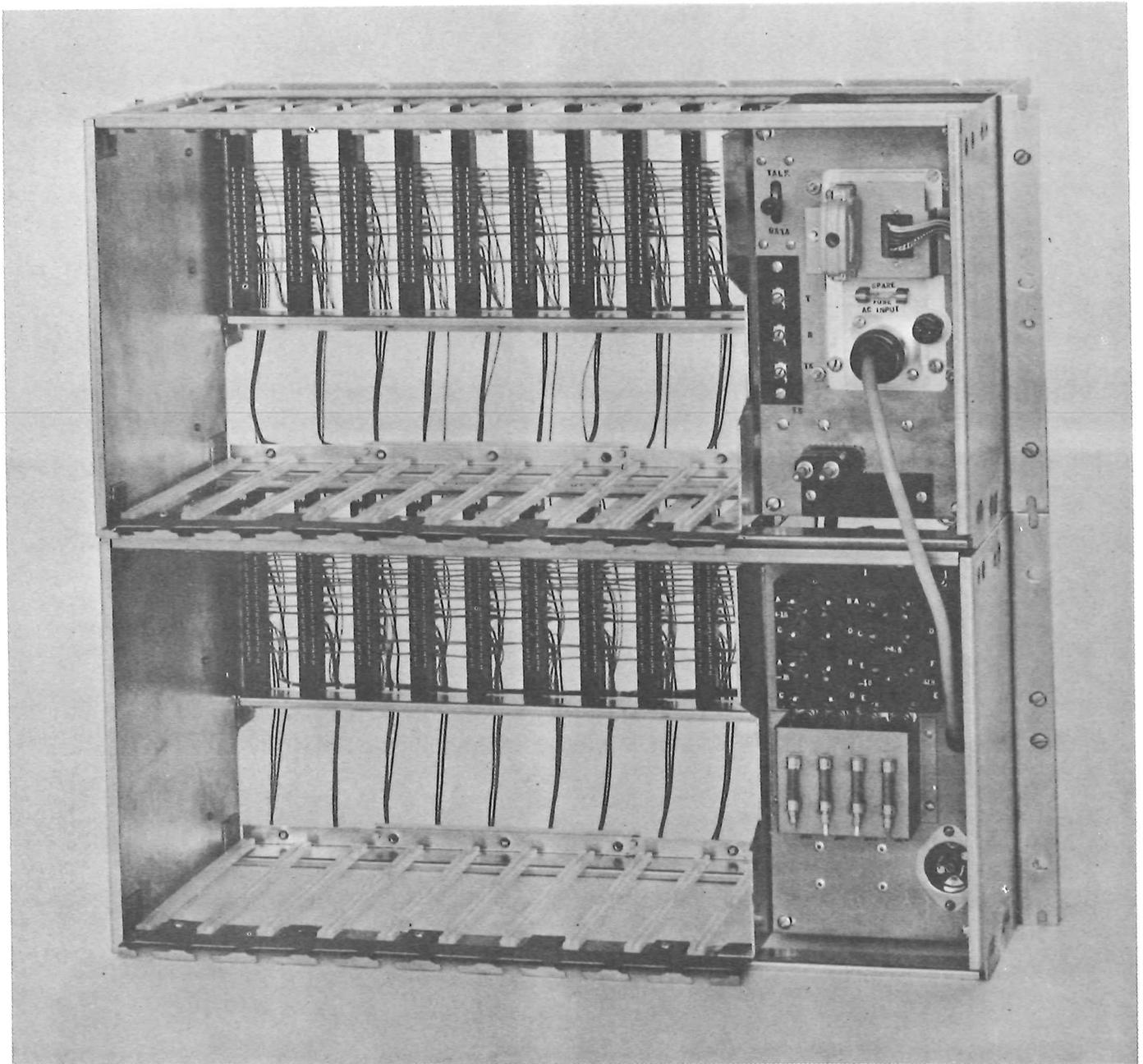
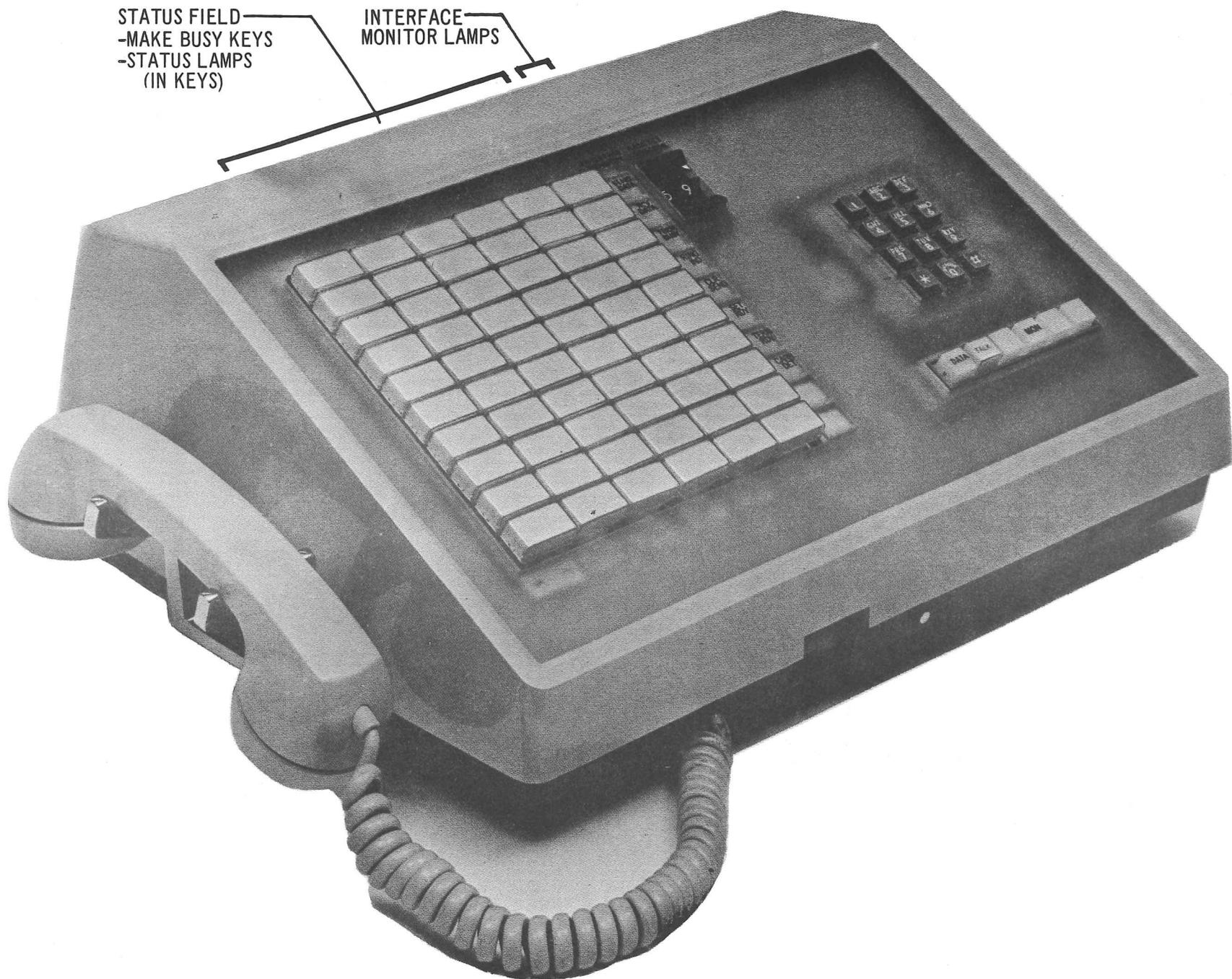


Figure 3 – 32A1 Data Mounting



STATUS FIELD
-MAKE BUSY KEYS
-STATUS LAMPS
(IN KEYS)

INTERFACE
MONITOR LAMPS

Figure 4 - 804T Data Auxiliary Set

103 E-TYPE DATA SET *
ORIGINATING STATION

113 B DATA SET
ANSWERING STATION

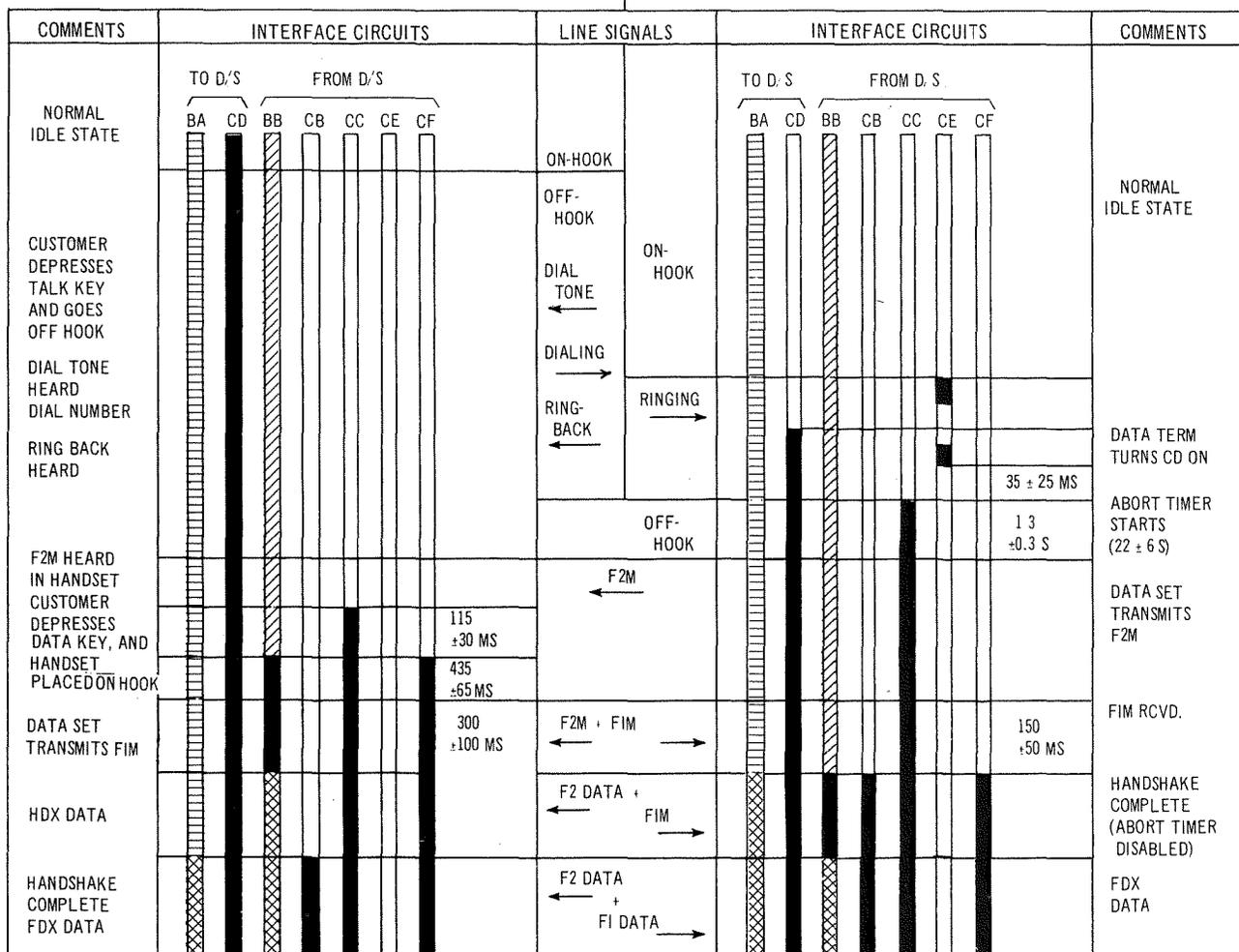
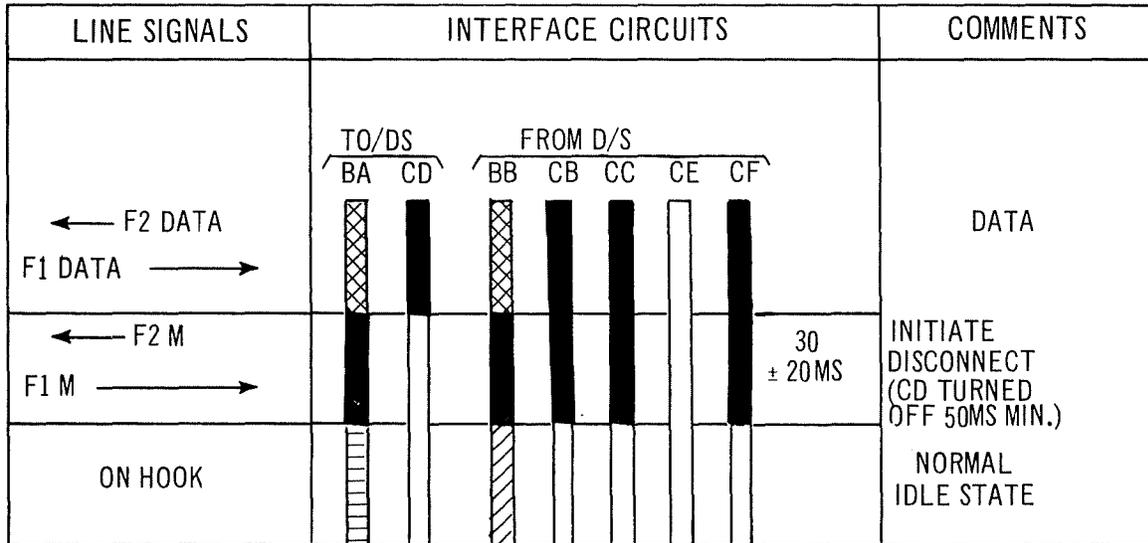


Figure 5 - Call Originated Manually And Answered Automatically

113 B DATA SET ANSWERING STATION



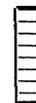
KEY:



SPACE OR OFF



MARK HOLD



DATA PRESENTED IS
NOT EFFECTIVE



MARK OR ON

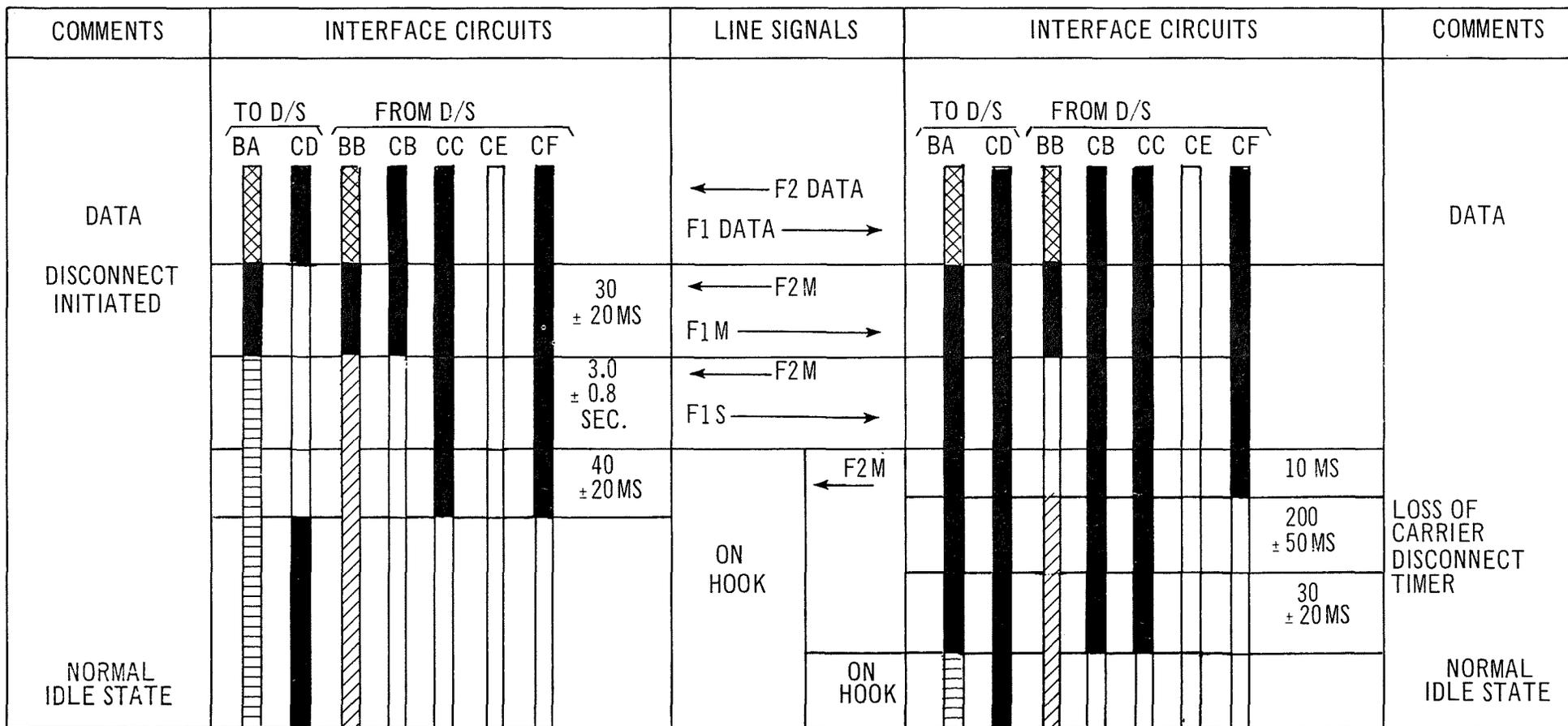


DATA PRESENTED BY CUSTOMER ON
BA IS TRANSMITTED & RECEIVED

Figure 6 – Disconnect Initiated By Answering Station

103 E TYPE DATA SET *
ORIGINATING STATION

113 B DATA SET
ANSWERING STATION



* INCLUDES 103G & 103H DATA SETS

KEY:



SPACE OR OFF



MARK HOLD



DATA PRESENTED BY CUSTOMER ON BA IS TRANSMITTED & RECEIVED



MARK OR ON



DATA PRESENTED IS NOT EFFECTIVE

Figure 7 – Disconnect Initiated By Originating Station