

Bell System Data Communications

TECHNICAL REFERENCE



DATA SET 103A

**INTERFACE
SPECIFICATION**

February 1967

American Telephone & Telegraph Company

Engineering Director Data Communications



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Data Set 103A

Interface Specification



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ENGINEERING DIRECTOR - DATA COMMUNICATIONS



P R E F A C E

This specification is specifically intended for designers of business machine equipment to be used with Bell System Data Set 103A in DATA-PHONE and similar services.

If additional details on the interface and its operation are needed, please contact:

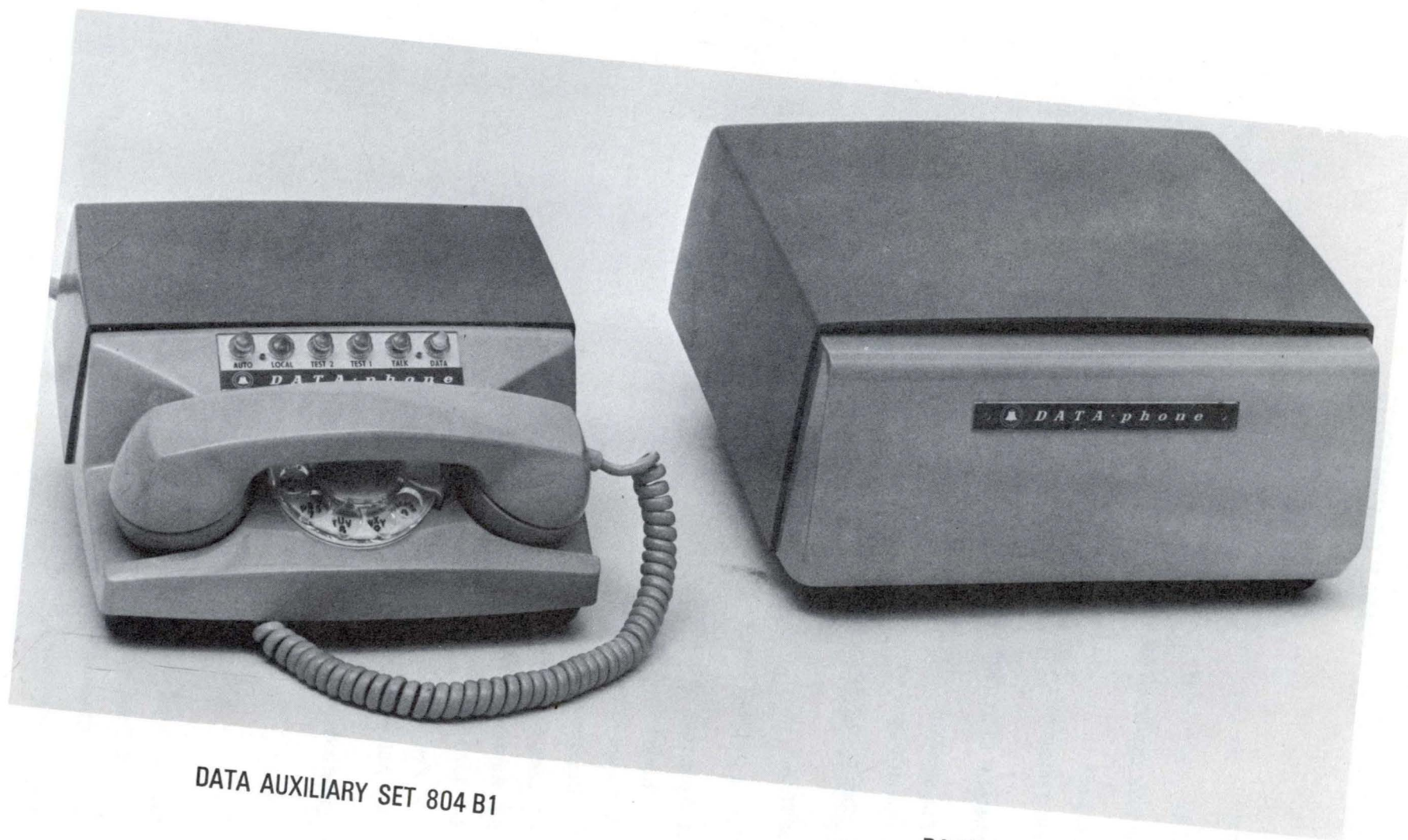
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DATA AUXILIARY SET 804 B1

DATA SET 103A

FIGURE 1

DATA SET 103A - INTERFACE SPECIFICATION

1. GENERAL

Data Set 103A provides for the transmission of binary serial data in DATA-PHONE and TWX-CE services. In DATA-PHONE service, the sets permit transmission rates up to 300 bauds (300 bits/second maximum) in either or both directions, simultaneously if desired. In TWX-CE service the corresponding rate is 150 bauds.

Two models of Data Set 103A are available:

Data Set 103A1 - for use in TWX-CE service

Data Set 103A2 - for use in DATA-PHONE service

Both models are identical in performance, functional operation and interface circuit details. The two models, however, are not compatible on the same communications line connection.

DATA-PHONE service provides for alternate voice and data communications between telephone stations in the exchange and toll switched voice message (DDD) network. Data Communications between customer-owned business machine, computing and data processing terminals are made possible through an interface connection with an appropriate data set on the telephone line at each end of the connection.

TWX-CE service permits data communications between customer-owned terminals connected to the interfaces of data sets on lines having access to the Teletypewriter Exchange (TWX) network. Communications between customer-provided terminals with TWX-CE service and regular TWX teletypewriter stations are not permitted. When communications between a customer-provided terminal (CPT) and regular TWX teletypewriter stations are desired, a CPT-TWX access arrangement using Data Auxiliary Set 811B may be provided. Further information on this arrangement can be found in:

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STATION ARRANGEMENTS TO

PROVIDE TWX SERVICE FOR

CUSTOMER-PROVIDED TERMINALS

(DATA AUXILIARY SET 811B)

In DATA-PHONE service alternate voice/data operation is provided. Unattended operation (automatic answer) may be provided if the customer's data terminal equipment is capable of performing in an unattended environment. An Automatic Calling Unit (ACU) may be associated with the set to permit automatic placing of calls under control of the customer's data equipment.

2. PHYSICAL

Data Set 103A, shown in Figure 1, is housed in a two-tone gray plastic cabinet approximately 11" W x 5-1/2" H x 10" D. It is normally mounted horizontally on a table or shelf. Its weight is approximately 18 pounds. A bracket is available to permit mounting the set face up on a vertical surface.

A separate control unit, Data Auxiliary Set 804B1, with six push button keys is used to control the data set and to establish calls. It is also used for alternate voice operation where appropriate.

A 5-1/2 foot gray cord is provided between the data set and the telephone line connecting block. The control unit has a 5-1/2 foot gray cord which mates with a cable running to the connecting block.

The customer must provide a receptacle supplying continuous 120 volt, 60 cycle AC power. The power consumption of the set is less than 16 watts. The set is equipped with a detachable 10-foot long gray cord, equipped with a U-blade-ground type plug. The power receptacle provided must accept such a plug and supply a valid ground to the ground pin.

The sets will perform satisfactorily over a temperature range of 40° to 120°F, and a relative humidity range of 20% to 95%.

A receptacle is provided at the rear of the set for connection of customer's data equipment.

3. INTERFACE CONNECTOR

3.1 Physical

The customer's data equipment should be equipped with a cable terminating in a Cinch or Cannon DB-19604-432 plug mounted in a Cinch DB-51226-1 hood assembly or equivalent. The receptacle on the data set is equivalent to Cinch or Cannon DB-19604-433, and is equipped with threaded retaining spacers. The DB-51226-1 hood

assembly includes retaining screws which enter these spacers, retaining the plug against accidental disengagement.

The cable should not exceed 50 feet in length.

A detailed discussion of the characteristics of the interface connector are covered in:

Bell System Data Communications

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DATA SET

INTERFACE CONNECTORS

3.2 Pin Assignments

The 25 pins of the interface connector are assigned as shown in Table 1. Column I/O indicates whether the signals on each lead are inputs or outputs with respect to the data set.

T A B L E 1

Interface Connector Pin Assignments

Pin	Circuit	I/O	Function
1	AA	-	Protective Ground
2	BA	I	Transmitted Data
3	BB	O	Received Data
4	-	-	-
5	CB	O	Clear to Send
6	CC	O*	Data Set Ready
7	AB	-	Signal Ground
8	CF	O	Carrier Detector
9	Reserved	(for Telephone Company Use Only)	
10	Reserved	(for Telephone Company Use Only)	
11	-	-	-
12	-	-	-
13	-	-	-
14	-	-	-
15	-	-	-
16	-	-	-
17	-	-	-
18	-	-	-
19	-	-	-
20	CD	I*	Data Terminal Ready
21	-	-	-
22	CE	O	Ringng Indicator
23	-	-	-
24	-	-	-
25	-	-	-

*"Fail Safe" circuit; See Section 4.1

4. INTERFACE ELECTRICAL

4.1 EIA Standard

All data and control circuits in the interface operate with the interchange signals recommended by the Electronic Industries Association in their document RS-232, "Interconnection of Data Terminal Equipment with a Communications Channel."

The following description is in accordance with this document:

All circuits (other than the protective and signal grounds) carry bi-polar low-voltage signals suitable for use with electronic circuitry. The two binary conditions conveyed by these signals are:

DATA CIRCUITS	CONTROL CIRCUITS	POLARITY
Mark ("1")	OFF	-
Space ("0")	ON	+

All voltages are measured with respect to circuit AB (Signal Ground) at the point of interconnection; i.e., the interface connector.

The source of an interchange signal shall deliver a voltage of between 5 and 25 volts (positive or negative) into an open circuit or a load whose resistance is not less than 3000 ohms.

The destination of an interchange signal shall present an essentially resistive load of resistance not less than 3000 ohms. The capacitance of the load (measured from the interface connector) shall not be greater than 2500 pf (uuf).

The load shall not contain an internal potential of more than 2 volts.

The destination shall respond without damage to interchange signals of between 3 and 25 volts (positive or negative). A 2-volt margin is thus assured.

Voltage conditions between +3 and -3 volts are anomalous and require no specific response except in the case of "fail safe circuits," described below. Data and timing circuits shall have rise times so that the signal remains in this anomalous region during each transition for no more than 3% of the minimum signal element length appropriate to the speed of the channel.

Certain control circuits shall be designed to "fail safe." These include such circuits as Data Set Ready and Data Terminal Ready. "Fail safe" operation implies that the destination can interpret the signal condition as "OFF" when the source has lost power. In this case, no potential is applied by the source.

The source of any "fail safe" circuit shall, under conditions of loss of power, provide a resistance to Signal Ground of not less than 300 ohms. This allows the use in the destination of shunt biasing circuits to insure the "OFF" response under this condition.

4.2 Circuit Functions

Circuit AA (Protective Ground) is tied to the frame of the data set, which is in turn grounded to the power system ground through the power cord. It may be tied to the frame of the customer's data terminal equipment. Such equipment, if operated by commercial power, should also have an appropriate ground applied to its frame.

In no case should Circuit AA (Protective Ground) be used to provide the sole protective ground to commercially powered data terminal equipment.

Whenever possible the data set and data terminal equipment should obtain their frame grounds from the same receptacle box or ground bus.

Circuit AB (Signal Ground) provides the reference point for all other interchange circuits. In this data set it is tied to the frame. It may be tied to the frame of the customer's data terminal equipment if the circuit so requires.

Circuit BA (Transmitted Data) is used by the data terminal equipment to present the data to be transmitted. It is only operative when circuit CB (Clear to Send) is "ON."

Circuit BB (Received Data) delivers the data received by the data set. When the data set is idle, or when circuit CF (Carrier Detector) is "OFF," circuit BB (Received Data) is held in the MARK condition.

Circuit CB (Clear to Send) indicates when "ON" that the data set has established a connection with the distant data set and that signals may be applied to circuit BA (Transmitted Data).

Circuit CC (Data Set Ready) indicates when "ON" that the data set is connected to

the telephone line and is in the data mode; that is, that it is not in the idle, talk, test, or local condition, nor is it without power.

Circuit CD (Data Terminal Ready) is used by the customer-provided data terminal to permit the data set to enter and remain in the data mode. It should be turned "ON" to allow the data set to automatically answer an incoming call, if all other conditions are met. It should also be turned "ON" to allow the set to be manually placed in the data mode. It is turned "OFF" to command the data set to disconnect the line at the end of the call.

Circuit CE (Ringing Indicator) turns "ON" to indicate the receipt of a ringing signal by the data set. If all conditions for automatic answering are met, it will turn "ON" for a brief period when the call is answered. If automatic answering is not enabled, the "ON" indication follows the ringing cycle, typically 2 seconds "ON," 4 seconds "OFF."

Circuit CF (Carrier Detector) indicates when "ON" that data carrier is being received from the distant end. In the method of operation used by Data Set 103A, this circuit and circuit CB (Clear to Send) carry simultaneous signals.

4.3 Modulation Rate

The maximum modulation rate of the channel provided by Data Set 103A is 300 bauds (300 bits per second maximum) in DATA-PHONE service. The corresponding rate for TWX-CE service is 150 bauds (150 bits per second maximum).

Under the 300 baud limit the shortest signal element transmitted must be no shorter than 3.33 ms; at 150 bauds, 6.66 ms. Transmission may be at any modulation rate from zero to the applicable maximum.

If the distant set is arranged for "Respond to Disconnect," no period of continuous SPACE longer than 1.0 second may be transmitted during the data message. A longer period of continuous SPACE would cause the distant set to disconnect. Any 1 second interval of data should contain an aggregate of at least 10 ms of MARK to allow the reset of the disconnect timer.

No limit on the interval of SPACE which may be transmitted exists when the distant set is not arranged for "Respond to Disconnect."

5. CONTROLS

The associated control unit is equipped with six push button keys for control of the station:

DATA - (nonlocking; releases any depressed locking key) - If the Talk key has been depressed and the telephone handset is off the cradle, the DATA key transfers the set from the voice mode to the data mode. It is illuminated when the set is in the data mode.

TALK - (Locking) - When depressed and the handset is lifted the set is placed in the voice mode. If it had been in the data mode, it is transferred to the voice mode.

TEST 1 - (nonlocking) - Places the data set in the answer mode for test purposes. This key should be used only when and as directed by Telephone Company personnel. It is illuminated when the data set is in the test mode. If activated accidentally, the test mode may be canceled by operating the DATA key.

TEST 2 - (nonlocking) - Returns the set from the answering to the originating mode for test. This key should be used only when and as directed by Telephone Company personnel.

LOCAL - (locking) - Places data set in the local mode. In this mode signals sent into circuit BA (Transmitted Data) appear on circuit BB (Received Data). This permits customers to make a check of the continuity of the interface connections and of the signal handling stages adjacent to the interface in the customer's equipment. It may be released by depressing the DATA, TALK, or AUTO keys.

AUTO - (locking) - When automatic answer is provided on a key-controlled basis, this key is depressed to enable the feature. Circuit CD (Data Terminal Ready) must also be "ON" for the feature to function. The key is illuminated when depressed. It may be released by depressing the DATA, TALK, or LOCAL keys.

If the option for continuous automatic answer is provided, the AUTO key is inoperative.

6. SYSTEM OPERATION

6.1 Frequency Assignment

Two different frequency bands are simultaneously used on a 103A-type data connection, one carrying data in each direction.

Each band contains a single frequency carrier which is shifted to one of two frequencies one representing the MARK state and one the SPACE state.

The two frequencies in the lower band are designated F1M and F1S for MARK and SPACE, respectively.

The corresponding frequencies in the higher band are designated F2M and F2S.

The data set has two frequency modes, originating and answering. The originating, or calling, data set transmits F1 and receives F2. The answering, or called, set transmits F2 and receives F1.

Each set is normally in the originating mode. When a ringing signal indicates the arrival of an incoming call, the set switches to the answering mode and remains in it for the duration of the call. If the call is unanswered, the called set reverts to the originating mode.

6.2 Channel Establishment

Prior to the transmission of data, the two data sets must be placed in the data mode and an exchange of carrier tones called "channel establishment" performed. This process is repeated each time the data sets enter the data mode.

The sequence of channel establishment, shown in Figure 2, is as follows: (All time intervals are nominal)

1. Assume that each end the customer's equipment has circuit CD (Data Terminal Ready) "ON."
2. Assume that the answering data set is placed in the data mode first, either automatically upon automatic answer or by depressing the DATA key after an interval of voice communication.

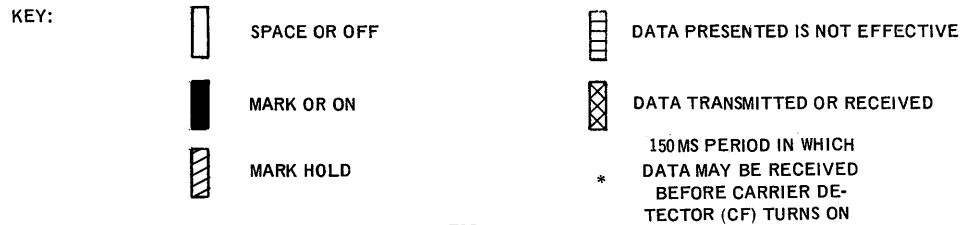
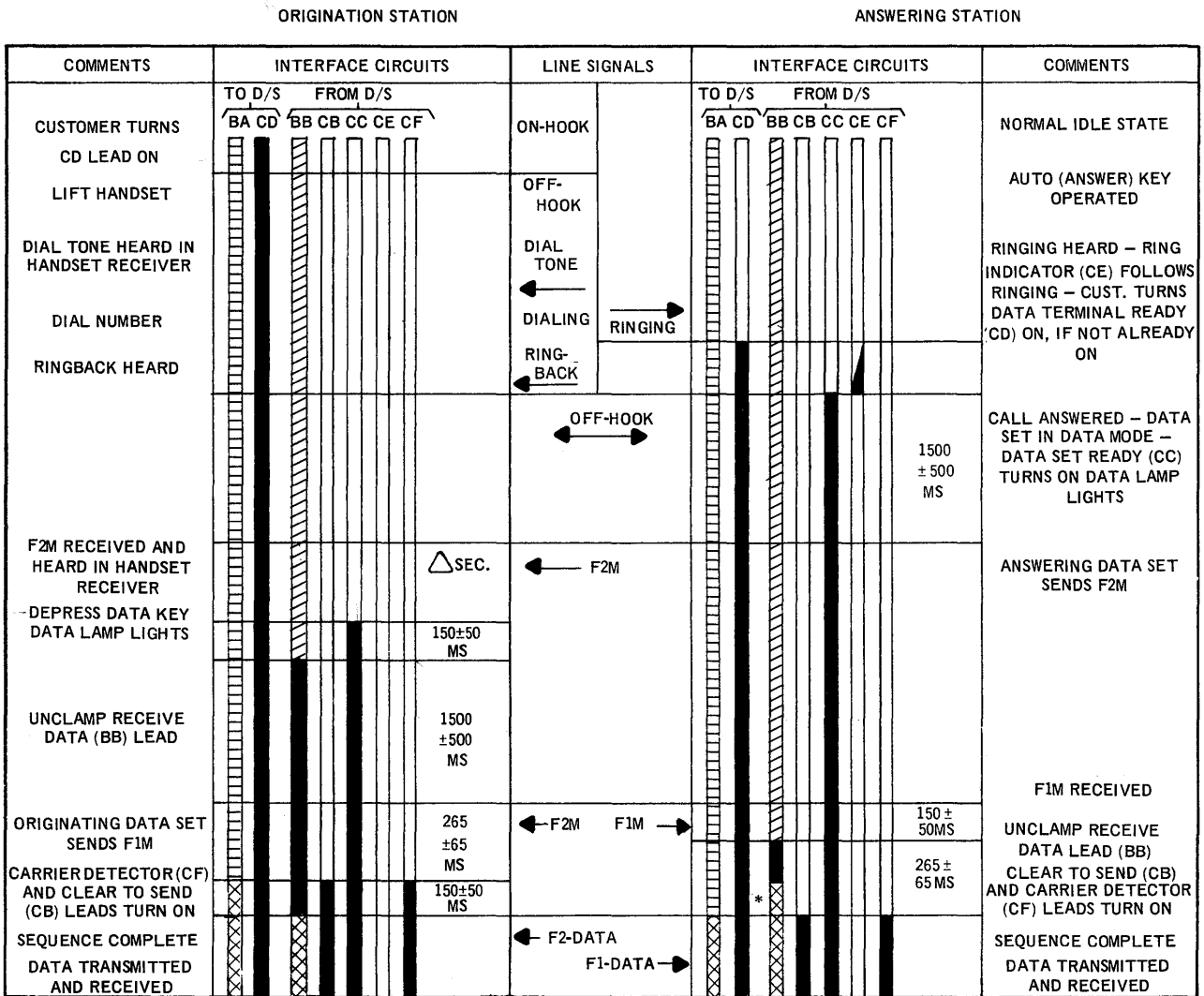


FIG. 2
DATA SET 103A
CHANNEL ESTABLISHMENT SEQUENCE

3. As the answering data set enters the data mode, its circuit CC (Data Set Ready) comes "ON" and its DATA key is illuminated.
4. After a delay of 1.5 seconds, the answering set sends F2M (regardless of the state of circuit BA (Transmitted Data) – only MARK frequencies are used in channel establishment). This delay is needed to permit the completion of certain supervisory functions occurring within the telephone switching network after the called station has answered.
5. F2M is heard by the attendant or ACU (Automatic Calling Unit) at the originating station, which is subsequently placed in the data mode by operation of its DATA key or by an electrical signal from the ACU. Circuit CC (Data Set Ready) also comes "ON" and its DATA key is illuminated.
6. After F2M has been received (with the set in the data mode) for 150 ms, the originating set removes the MARK HOLD from its circuit BB (Received Data), placing it under control of the received signal, which is at this time MARKING.
7. After an additional 1.5 seconds, the originating set begins to send F1M – regardless of the state of its circuit BA (Transmitted Data). The delay permits the presence of F2M alone on the connection for 1.5 seconds. This condition permits the recognition of this call as a data call by echo suppressor disablers within the telephone network. Echo suppressors on the network normally permit voice transmission in but one direction at a time, and must be disabled to permit these data sets to function.
- 8A. After another 265 ms, circuits CB (Clear to Send) and CF (Carrier Detector) at the originating set turn "ON." At this time, its send circuit (previously sending F1M) is placed under control of the customer's data on circuit BA (Transmitted Data).

The delay insures that the "ON" signal is not presented until the terminating end has had time to recognize F1M as described in Step 8B.
- 8B. (Occurs in parallel with 8A) After F1M has been received for 150 ms, the answering set removes the MARK HOLD from its circuit BB (Received Data), placing it under control of the data received, which is at this time MARK.

9. After an additional delay of 265 ms, the answering set turns its circuits CB (Clear to Send) and CF (Carrier Detector) "ON" and puts its send circuit (previously sending F2M) under control of the customer's data on the circuit, BA (Transmitted Data).

The total elapsed time from the placing of the answering data set into the data mode to the receipt of Clear to Send signal at each end is approximately 3.6 seconds plus the time required for the originating attendant or ACU to hear F2M and place that set in the data mode (Step 5).

If the originating station is prematurely placed in the data mode, it will listen patiently for F2M. Its circuit CC (Data Set Ready) will be "ON" and its DATA key illuminated. When F2M is received, the originating set proceeds with channel establishment, starting with Step 6.

Note that when either end receives a Clear to Send signal it may transmit at once if desired. Analysis of the time intervals covered in Steps 7 and 8 will show that, if the originating station begins to send as soon as it receives a Clear to Send signal, the data may appear at the answering station's circuit BB (Received Data) 150 ms before that station receives its Carrier Detector and Clear to Send signals.

The customer's equipment at each end, therefore, should be ready to receive data any time circuit CC (Data Set Ready) is "ON." If the answering data terminal equipment cannot be arranged to be ready to receive data until after the CF (Carrier Detector) signal is presented, the sending terminal must delay transmission of data for at least 150 ms after it receives the CB (Clear to Send) signal.

Alternatively the customer's terminal equipment at the answering station may wish to send a coded "go ahead" character when it receives the CB (Clear to Send) indication. This character can serve to inform the customer's equipment at the originating end that it may commence sending and that the answering data set is ready to receive data.

6.3 Return to Voice Mode

Either end may return to the voice mode by lifting the handset and depressing the TALK key if it is not already depressed. This transfers the telephone line to the telephone set and stops the transmission of tone.

As the set leaves the data mode, circuits CB (Clear to Send), CC (Data Set Ready), and CF (Carrier Detector) go the "OFF" and the DATA key lamp is extinguished. Circuit BB (Received Data) is placed in the MARK hold condition.

Note that a momentary change of state of the circuit BB (Received Data) may occur at the distant end during the interval between loss of carrier and the application of MARK hold. Steps should be taken to prevent misinterpretation of this unavoidable transient. The transmission of a discrete end of transmission and "go to voice" code sequence before returning to voice is one such measure.

When return to the data mode is affected by operation of the DATA keys, channel establishment proceeds as previously described.

6.4 Disconnect

At the end of calls in data communications systems using switched telephone network facilities, the customer's data terminal attendant personnel or the data terminal equipment itself must arrange to signal the telephone switching equipment to disconnect the line at both ends of the connection. This action can be compared to the way telephone users disconnect by replacing the telephone handsets on the cradle at the end of each call. When disconnect is desired in systems without manual assistance from attendant personnel, the data terminal equipment must furnish a disconnect command to the data set. Consideration of the disconnect command to data sets is especially important in systems where the customer wants the data set to automatically answer all calls dialed to the telephone number associated with the data set.

With Data Set 103A there are three ways to achieve a disconnect:

1. Both data sets may be returned to the talk mode by depressing the TALK key. When disconnect is desired, the telephone handsets may be replaced in the cradle of the associated control units to operate the switchhook contacts, in the same way that normal telephone sets are disconnected. When the TALK is depressed, circuits CB (Clear to Send), CC (Data Set Ready) and CF (Carrier Detector) will turn "OFF," and circuit BB (Received Data) will go to MARK hold. The data set at the other end will put circuit BB (Received Data) in MARK hold and turn circuits CB (Clear to Send) and CF

(Carrier Detector) "OFF." If the handset is replaced while in the talk mode, the telephone line at the near end will be released. In this case, it is necessary that the distant end be released either as above or as described in the following.

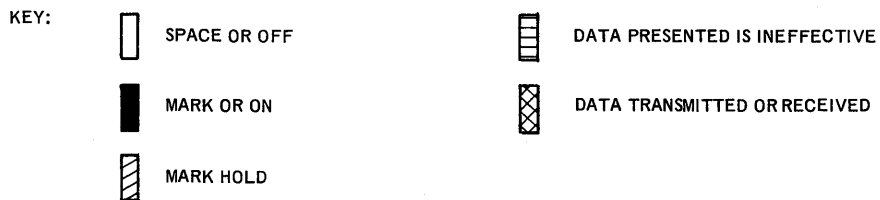
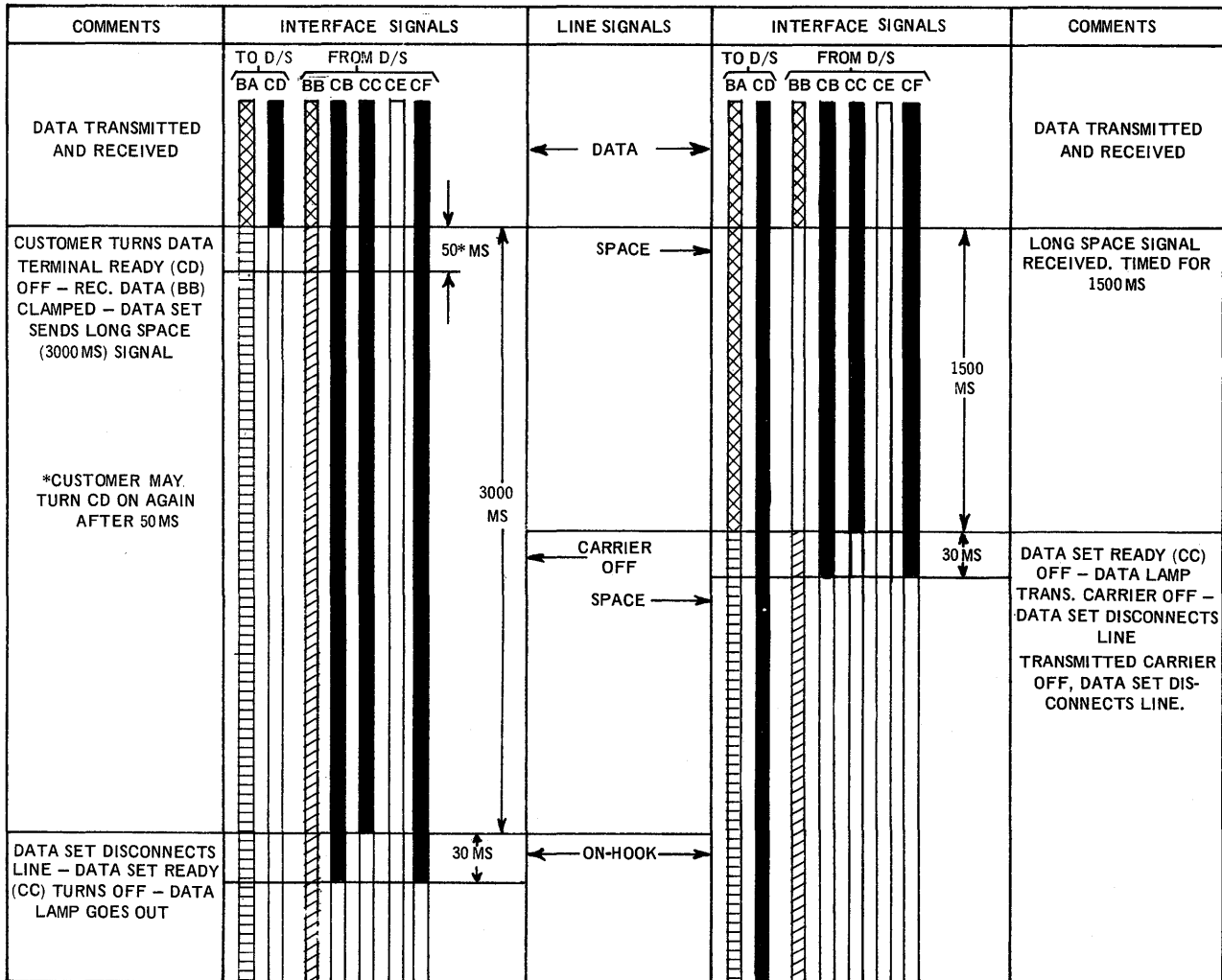
2. When the data sets are in the data mode – as indicated by an "ON" condition on the CC (Data Set Ready) lead – the customer's terminal equipment can command a data set to disconnect the line by placing an "OFF" condition on the CD (Data Terminal Ready) lead for at least 50 ms or until the CC (Data Set Ready) lead goes to an "OFF" condition. It is recommended that an end of transmission character be transmitted before the CD (Data Terminal Ready) lead is turned "OFF." In this case, circuits CB (Clear to Send) and CF (Carrier Detector) go to the "OFF" condition and circuit BB (Received Data) goes to MARK hold 30 ms after the line is released or carrier is lost from the distant end. Circuit CC (Data Set Ready) goes off as soon as the line is released. The CD (Data Terminal Ready) lead may then, at the customer's discretion, be returned to the "ON" condition to tell the data set to automatically answer the next call (if automatic answer has been provided). It alternatively may be left in the "OFF" condition until just before the customer wishes to originate a new call or until an "ON" condition is observed on the CE (Ringing Indicator) lead in response to a new call being placed to the data set.

The data terminal equipment should be capable of initiating this type of disconnect command to the data set under the following circumstances:

- a. Whenever the terminal equipment detects a character or signal on the BB (Received Data) interface lead which can be interpreted to be an end of transmission indication sent from the remote terminal.
- b. Whenever an indication of loss of carrier transmitted by the remote data set is presented to the terminal equipment as an "OFF" condition on the CF (Carrier Detector) interface lead for an abnormal length of time, and it can be determined that the remote attendant has not entered the voice mode.
- c. Whenever a call has been answered automatically as indicated by a brief "ON"

STATION INITIATING DISCONNECT

STATION RESPONDING TO DISCONNECT



DATA SET 103A
 FIG. 3 - Space Disconnect Sequence

condition on the CE (Ringing Indicator) interface lead followed by an "ON" condition on the CC (Data Set Ready) interface lead without an "ON" condition presented on the CF (Carrier Detector) interface lead within 5 seconds. (This may happen when a call is placed in error by a voice telephone subscriber to the telephone number assigned to the line on which the data set normally receives data calls.)

3. A disconnect may also be achieved when the optional capability to initiate and respond to long SPACE disconnect signals has been provided. With this method of operation, the customer's terminal equipment may command a data set to send a long SPACE signal, by presenting an "OFF" condition on the CD (Data Terminal Ready) lead for at least 50 ms or until the CC (Data Set Ready) lead goes "OFF," and after a three second interval disconnect the line. Upon receipt of 1.5 seconds of a SPACE signal, the distant data set will also disconnect the line. Circuit CC (Data Set Ready) will go "OFF" as soon as the line is released. Circuits CB (Clear to Send) and CF (Carrier Detector) will go "OFF" 30 ms later as shown by the long SPACE disconnect sequence in Figure 3. The long SPACE disconnect action is recommended as a back-up in addition to using an end of transmission type character in the data message format.

6.5 Loss of Circuit

Loss of continuity of either direction of transmission of the telephone channel will cause circuits CB (Clear to Send) and CF (Carrier Detector) to go "OFF" at the end or ends 30 ms after losing tone. This may be used to call attention to this loss, if return to voice is not expected at the time.

6.6 Automatic Answer

Automatic answer is available for use as desired by the customer to automatically answer all calls placed to the telephone line on which the data set has been installed. When the customer elects to use the automatic answer feature, the customer's data terminal equipment commands the data set to automatically answer calls by placing an "ON" condition on the CD (Data Terminal Ready) interface lead. If the data

terminal equipment is not ready or if the customer does not want calls to be automatically answered, the CD (Data Terminal Ready) lead may be held in the "OFF" condition. Under this condition, the telephone bell on the associated control unit will ring without answering the call. Circuit CE (Ringing Indicator) will come "ON" with each ringing cycle. The customer may answer the call manually by lifting the telephone handset or command the data set to automatically answer the call by placing an "ON" condition on the CD (Data Terminal Ready) lead.

When the automatic answer feature is used, careful consideration for the disconnect of calls answered must be provided in the data terminal equipment.

The options available regarding the automatic answer feature are:

1. Automatic answer controlled by AUTO key
2. Automatic answer always available

The automatic answer feature is effective only when circuit CD (Data Terminal Ready) is "ON."

When all conditions for automatic answer have been met, an incoming call will be automatically answered, the data set will be put in the data mode, and channel establishment will proceed.

The DATA key will be illuminated when the data set achieves the data mode.

A short "ON" signal on circuit CE (Ringing Indicator) will occur as the call is answered.

6.7 Local Mode

When the LOCAL key (locking) is depressed, the data set enters the local mode. In this mode, the signals applied to circuit BA (Transmitted Data) are repeated out through the circuit BB (Received Data). This permits a "loop-back" test of the customer's interface cable, the interface connectors, and the signal handling stages in the customer's equipment adjacent to the interface. Circuits CB (Clear to Send), CC (Data Set Ready) and CF (Carrier Detector) are "OFF" while in the local mode.

If an incoming call should be automatically answered while in the local mode, the data set will revert to normal operation for the duration of the call. The local mode is inoperative while

in the test mode.

6.8 Test Mode

A remote test feature has been provided with Data Set 103A in order to permit customer participation in determining maintenance responsibility, in the interest of holding service outages to a minimum. In the event that trouble in the data set is suspected, the customer should call the Telephone Company Repair Service. The trouble report then will be forwarded to a Telephone Company data test center where an attendant can call the customer at the data set location and request the customer to operate the data set TEST keys as described in Section 5. The remote tests performed check circuits in the data set up to the customer interface for the purpose of determining whether Telephone Company maintenance forces need to be dispatched or whether the customer should arrange for a maintenance check of his own equipment.

When the set is in the test mode, circuits CB (Clear to Send), CC (Data Set Ready) and CF (Carrier Detector) are "OFF" and circuits BA (Transmitted Data) and BB (Received Data) are opened.

6.9 Automatic Calling Unit Compatibility

Data Set 103A can be optionally arranged to operate with 801A or 801C type Automatic Calling Units. When Automatic Calling Units are used, control of the line is assumed by the calling unit at the time calls are originated until a valid connection has been established. A valid connection is indicated by the presence of the initial F2M tone transmitted by the answering data set. After a connection has been established, the line is transferred to the data set in the data mode. The channel establishment procedure then proceeds as described starting with Section 6.2, Step 5.

It is important that Automatic Calling Units used with Data Set 103A be arranged for "Detect: Beginning of Answer Tone;" and if the long SPACE disconnect option is used, "Call Termination: Under Control of the Data Set."

Further information on automatic calling units may be found in the:

Bell System Data Communications

TECHNICAL REFERENCE

for Data Auxiliary Set 801A or 801C.

7. SUMMARY OF OPTIONS

The following options must be specified by the customer when ordering the data set, and are put into effect by the Telephone Company at the time of installation:

FEATURE	OPTION
Automatic Answer	Key Controlled Permanently Wired
Initiate Long SPACE Disconnect	Yes No
Respond to Long SPACE Disconnect	Yes No
Operation with Automatic Calling Unit	Yes No

