

Bell System Data Communications

TECHNICAL REFERENCE



**DATA SETS
201A AND 201B**

•
August 1969

American Telephone & Telegraph Company

Engineering Director Data Communications



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ENGINEERING DIRECTOR - DATA COMMUNICATIONS



NOTICE

This Technical Reference is specifically intended for the developers and designers of business machine data terminal equipments and devices which interface with Bell System data communications equipment and for technical consultants for use in designing data communications systems and arrangements employing Bell System data communications services and equipments. The right to revise this Technical Reference for any reason, such as conformity with USASI, EIA, CCITT or other standards, to utilize new advances in the state of the technical arts, or to reflect changes in the design of the equipment and/or service described herein is expressly reserved.

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This specification replaces the previous issue dated September, 1962 and Supplement 2 dated November, 1968 which replaced Supplement 1 dated May, 1965.

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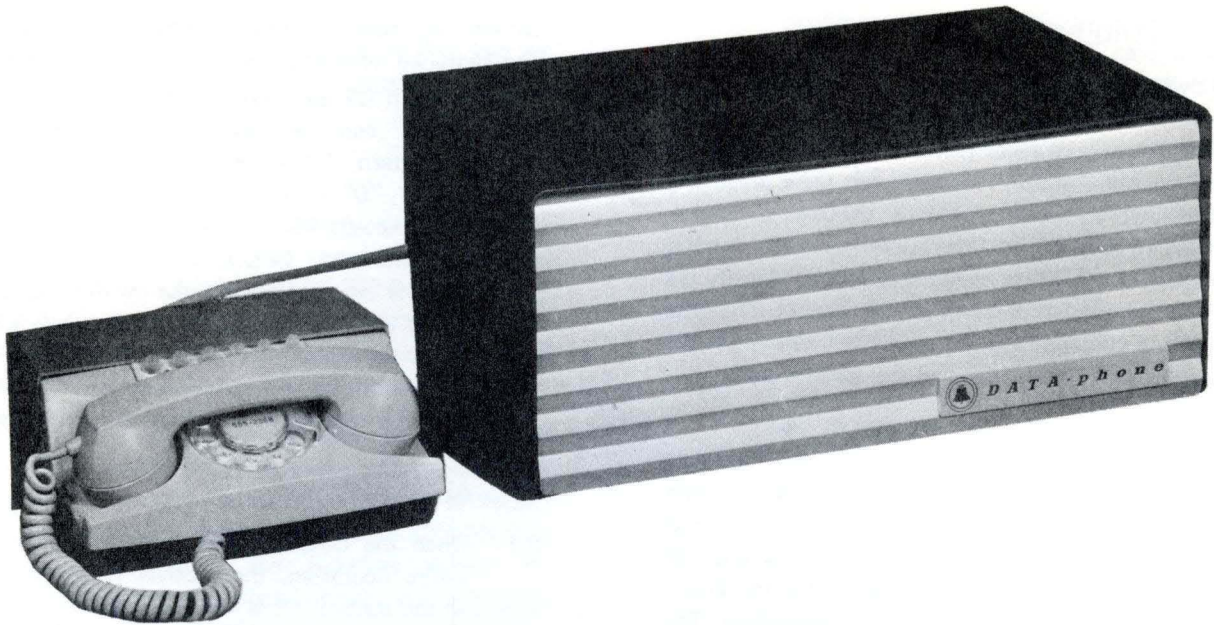


Fig. 1 – Data Set 201 – Type With Data Auxiliary Set 804A-Type

SUMMARY SHEET

Data Sets 201A and 201B

DESCRIPTION: The Data Set 201-type transmits serial binary data over voiceband telephone facilities using PSK modulation. Operation is synchronous full-duplex or half-duplex and may be at 2000 bits per second over the switched telephone network (DATA-PHONE[®] service) or at 2400 bits per second over conditioned private lines.

FEATURES: Transmitter may be self-timed or externally timed. Available options include alternate voice, unattended answer and automatic dialing.

INTERFACE: All clock, data and certain control leads conform with EIA RS-232-B. As shown in Table I, other control leads may be contact option or EIA voltage option, as specified by the customer.

PHYSICAL CHARACTERISTICS: The Data Set 201-type is enclosed in a housing measuring 7-3/4" H x 17-1/2" W x 11-5/8" D, and weighs approximately 35 pounds.

POWER REQUIREMENTS: Uses 60 Hz ac power, 117 volts, 22 watts.

ENVIRONMENTAL REQUIREMENTS: Ambient temperature 40° to 120° F; relative humidity 20 to 95 percent.

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DATA SETS 201A AND 201B

1. INTRODUCTION

1.1 This Technical Reference replaces the previous issue dated September, 1962 and Supplement 2 dated November, 1968 (which replaced Supplement 1, dated May, 1965). The data sets were previously coded 201A1, 201A2, 201A3, 201A4 or 201B1, 201B2, 201B3, 201B4. The numerical suffix is being replaced with a group of list numbers to identify the various features and options of the data set. The local telephone company representative will determine the suitable list numbers based on the specific use.

1.2 The Data Set 201-type is a fixed-rate synchronous modem which operates over voiceband facilities. Timing may be internal (self-timed) or external (provided by the business machine). The data set may be arranged for 2-wire (half-duplex) or 4-wire (full-duplex) operation. The Data Set 201A-type has a speed of 2000 bps and is intended for DATA-PHONE service over the switched telephone network. It may also be used on private line. The Data Set 201B-type has a speed of 2400 bps and is intended for private line use only. The recommended private line facilities are type 3002 channels with C2 conditioning. The objective long time error rate is 1×10^{-5} .

1.3 The Data Set 201-type uses phase shift keying to transmit binary data signals over analog telephone channels. The transmitter converts serial binary data to bit pairs, called dibits, which modulate the carrier. Each dibit is encoded to one of four possible carrier phase shifts. The line signal, therefore, consists of a serial train of phase shifted signaling elements at one-half the bit rate.

1.4 After filtering and shaping, the line signal spectrum occupies a bandwidth equal to the bit rate, centered about the carrier frequency. The line signal spectra for repeated dibit codes are shown in Fig. 2. Note that each dibit code produces two "sidebands" separated by a frequency equal to the dibit rate. The recovered timing at the receiver is derived from this "sideband" separation. The line signal is demodulated using differentially coherent detection. This requires that the incremental change in phase of each signaling element compared with the previous signaling element be determined for decoding the received baseband signal.

1.5 Performance of the Data Set 201-type can be affected by distortion at the edges of the frequency band. The Data Set 201A will provide

satisfactory operation without code restrictions over the switched telephone network or on private line channels with C2 conditioning. The Data Set 201B performance can be degraded by a repeated 1010... pattern ("1"s occur during positive 1/2 cycle of DCT, "0"s occur during negative 1/2 cycle of DCT) that exceeds 40 bits. Beyond 80 bits, receiver synchronization may be lost when random data is resumed. The receiver timing can be recentered by transmitting an equal number of random bits which exclude 10...dibits. Generally, data coded in USASCII, Baudot or four-out-of-eight formats will be satisfactory for maintaining receiver synchronization.

2. APPLICATIONS

2.1 When the Data Set 201-type is arranged for 2-wire operation, the receiver is normally on line and the transmitter is idle. When the transmitter is turned on, the transmitted data is monitored by the local receiver. When the data set is arranged for 4-wire operation, transmitted data is not monitored by the local receiver; the transmitter and receiver are independent and may be operated at the same time. In 4-wire private line operation a separate line and test key, under control of the customer, may be used to make local business machine tests through the data set. When the key is operated to the TEST position, the transmitter output is looped back to the receiver input and the business machine is given a low indication on the Interlock (IT) lead, pin 6. For normal operation, the key is placed in the LINE position and has no effect on the circuit.

2.2 Switched network DATA-PHONE operation is available only with the Data Set 201A and always includes alternate voice capability. Normal operation is 2-wire (half-duplex) which is usually furnished with unattended answering capability. An optional Data Auxiliary Set 801-type Automatic Calling Unit may be used. (Data Auxiliary Sets 801-type are described in a separate Technical Reference.) Full-duplex operation, using two 2-wire DATA-PHONE lines, is also available with manual calling and manual answering only.

2.3 The Data Set 201-type may be operated on 2-wire or 4-wire private lines with or without alternate voice. When alternate voice is provided, unattended answer may be used where applicable. The unattended answer feature operates by detecting ringing on the line, and requires specially engineered private line arrangements to provide the necessary signaling.

2.4 Alternate voice for DATA-PHONE or private line services requires a separate key telephone set or Data Auxiliary Set 804-type. Unattended answer may be selective, under control of an AUTO key or permanent, whereby the key is bypassed. This is explained more fully in Part 4.

3. INTERFACE

3.1 All data, clock and certain control leads of Data Set 201-type conform with the requirements of EIA Standard RS-232-B. As shown in Table I, the remaining control leads may be contact option or EIA voltage option, as specified by the customer.

3.2 In the following description, all voltages are EIA RS-232-B values except where identified as contact option. The numbers correspond to the pin assignments at the interface connector. Circuits that receive signals from the interface should be dependent only on the signal voltage and should be insensitive to the rise or fall time, signal overshoot, etc., as defined in EIA Standard RS-232-B.

- (1) Frame Ground (FG) – This terminal is connected to the green third wire of the power cord and is common with Signal Ground (SG), pin 7. This ground should be the same as the business machine ground.
- (2) Send Data (SD) – The data set receives data from the business machine on this lead at the time of the positive transition of the Serial Clock Transmitter (SCT) signal on pin 15 and samples the bit at the time of the negative transition. A positive voltage is used to represent binary zero and a negative voltage is used to represent binary one.
- (3) Receive Data (RD) – The polarities on this lead agree with those on the Send Data (SD) lead. Data should be sampled by the business machine on the negative transition of Serial Clock Receiver (SCR), pin 17.
- (4) Request to Send (RS) – When the business machine is ready to transmit data, a positive voltage is applied to this lead, otherwise the voltage should be negative. After applying the positive voltage the business machine should then look for a positive voltage on Clear to Send (CS), pin 5. For minimum delay between RS and CS, the positive going RS pulse should be coincident with the positive going Dibit Clock Transmitter (DCT) pulse, pin 16. (DCT cannot be used on externally timed data sets.) Request to send (RS) should remain positive until at least 100 microseconds after the last data bit is sampled on the negative transition of Serial Clock Transmitter (SCT), pin 15. When RS is made negative at the end of a message, the carrier remains ON for about 2 msec to clear the transmitter.
- (5) Clear to Send (CS) – The voltage on this lead is negative when Request to Send (RS) is negative and positive when RS is positive. The CS signal responds with some built-in delay depending upon the configuration. During this delay the data set transmits a steady mark (dibit 11) to synchronize the distant receiver. The turn-on delay between RS and CS for 2-wire applications is about 150-200 msec to allow time for line echo suppressor action and for distant receiver synchronization. For 2-wire applications, the receiver is held off for about 100 msec after RS is made negative to allow echoes on the line to decay. The turn-on delay between RS and CS for 4-wire applications is approximately 8-1/2 to 9-1/2 msec for Data Set 201A and 7 to 8 msec for Data Set 201B. For minimum delay, RS should be made positive on a positive transition of DCT (see Figure 3). This allows time for the distant receiver to achieve synchronization.
- (6) Interlock (IT)
 - (a) Contact Option – A positive six volt potential will appear on this lead when the data set is in the data mode, i.e., while transmitting or receiving data for switched operation and at all times for data-only operation. When the data set is not in the data mode, the IT voltage is zero to +0.5 volts.
 - (b) EIA Option – same as contact option except that the values are positive and negative six volts.
- (7) Signal Ground (SG) – Reference point for all voltages. Common with Frame Ground (FG), pin 1.

- (8) Carrier On (CO) — The voltage on this lead is positive when line signals are present at the receiver. In the absence of line signals this lead should be negative. However, high noise energy can cause it to be positive. For this reason employing a strong start of message code (i.e., ASCII sync character) is recommended.

If CO is negative Receive Data (RD) will be clamped negative and the Receive Clocks (Serial, Dibit.) will be clamped positive.

In a 2-wire operation, when outgoing data is being transmitted, the CO signal will be positive. This allows the transmitted data to be monitored by the receiver.

The turn-on delay of CO is 2-9 msec and the turn-off delay is about 10 msec.

- (9) Positive Battery (+12V) — Used for data set testing only.
- (10) Negative Battery (−12V) — Used for data set testing only.
- (11-13) Not used.
- (14) New Sync (NS) — This lead may be used at the hub station in multi-station arrangements such as polling, to assure rapid synchronization between messages. This is necessary because of receiver clock holdover after the end of a message which may interfere with the start of synchronization on receipt of the following message. A positive one msec pulse (or greater) is applied to this lead at the receiver to quench the existing clock. At all other times the applied voltage must be negative and supplied from a low impedance source. Use of NS is recommended when the time between messages is less than 100 msec. When this option is not used, an internal strap is provided to bypass it.
- (15) Serial Clock Transmitter (SCT) — A square wave bit rate clock signal appears on this lead for internally-timed data sets. This signal may be used to time up to eight externally-timed data sets. The leading edge of the signal on Send Data

(SD), pin 2, should be presented by the business machine on the first positive transition of SCT following the positive Clear to Send (CS) signal on pin 5. This first positive transition of SCT will always occur on a positive transition of DCT as shown in Figure 3. The SCT lead is common with Serial Clock Transmitter External (SCTE), pin 24.

- (16) Dibit Clock Transmitter (DCT) — In data sets using internal timing, a square wave clock signal at one-half the bit rate appears on this lead. Transitions in DCT coincide with the positive going signal on Serial Clock Transmitter (SCT). On 4-wire applications, where echo delay is not used, the delay between Request to Send (RS) and Clear to Send (CS) will be held within plus or minus 1/4 msec of the 8-1/2 msec for Data Set 201A, or 7 msec for Data Set 201B, provided the positive going change on RS coincides with the positive going pulse on DCT as shown in Figure 3. If this is not done, the delay may be up to one msec longer. The DCT clock signal is not available for use by the business machine on externally-timed data sets.
- (17) Serial Clock Receiver (SCR) — This lead provides a square wave timing signal derived from Dibit Clock Receiver (DCR), pin 18. The business machine should sample the received data on the negative transition of SCR. This signal contains jitter and is not suitable for providing external timing to another data set.
- (18) Dibit Clock Receiver (DCR) — This lead provides the recovered received clock at one-half the bit rate. Positive going changes in Serial Clock Receiver (SCR), pin 17, coincide with transitions in DCR.
- (19) Remote Release (RR)
- (a) Contact Option — used in all alternate voice applications for controlling the data set status. See Part 4.
- (b) EIA Option — not used.

- (20) Remote Control (RC)
 - (a) Contact Option — used in all alternate voice applications for controlling the data set status. See Part 4.
 - (b) EIA Option — used in all alternate voice applications for controlling the data set status. See Part 4.
- (21) Ready (RDY)
 - (a) Contact Option — used in all alternate voice applications for controlling the data set status. See Part 4.
 - (b) EIA Option — not used.
- (22) Ring Indicator 1 (RG1)
 - (a) Contact Option — provides a dry contact closure with RG2, pin 23, during the ringing cycle of an incoming call.
 - (b) EIA Option — a positive voltage appears during ringing and a negative voltage appears at all other times.
- (23) Ring Indicator 2 (RG2)
 - (a) Contact Option — provides a dry contact closure with RG1, pin 22, during ringing as explained above.
 - (b) EIA Option — not used.
- (24) Serial Clock Transmitter External (SCTE) — On externally timed data sets, this lead is used by the business machine to furnish bit rate timing to the transmitter. The timing signal must have a frequency of 2000 Hz \pm .01% for Data Set 201A or 2400 Hz \pm .01% for Data Set 201B, with a duty cycle from 49.5 to 50.5 per cent. This terminal is common with Serial Clock Transmitter (SCT), pin 15.
- (25) Not used.

4. OPERATION

4.1 Switched Network DATA-PHONE Service

A sequence chart for DATA-PHONE operation is given in Figure 3.

4.1.1 Half-duplex Operation — A call may be initiated manually or by using an automatic

calling unit; manual or unattended answering may be used. When the call is initiated and answered manually, voice contact is established and agreement is made to transmit data. Before going to the DATA mode, leads 19, 20, and 21 (Contact Option) or lead 20 (EIA Option) must be conditioned by the business machine as described in Part 4.4. At each station the operator should momentarily depress the DATA key and hang up the handset (called end first then calling end after receipt of tone). A positive voltage will appear on Interlock (IT), pin 6, indicating to the business machine that the data set is in the data mode. If the call is answered automatically, the calling party will hear a 2-5 second tone after ringing stops. The operator should place the calling station in the data mode as above. When an automatic calling unit is used to place the call, the answerback tone will be detected by the calling unit which will then place the calling station in the data mode. The automatic answering and call termination procedures are explained in Parts 4.4 and 4.5.

4.1.2 Full-duplex Operation — Two DATA-PHONE

lines are used at each station. These lines, designated DD1 and DD2, are associated with the transmitter and receiver, respectively. Calling and answering are manual only. Calls may be placed in either direction between each DD1 line and the opposite DD2 line, as described above for half-duplex operation. After both stations are in the data mode, the business machines have control and calls may be terminated manually or automatically as described in Part 4.5.

4.2 Switched Private Line Service

The procedures for two-wire or four-wire operation will generally be as described in Part 4.2.1. Because of the many types of specially engineered private line arrangements possible, these procedures may be modified or replaced by local instructions.

4.3 Non-Switched Private Line Service

4.3.1 Half-duplex (2-Wire) Operation — The receiver

is normally on the line and the transmitter is normally idle. With the data set in the data mode (positive voltage on Interlock (IT), pin 6), the business machine applies a positive voltage to Request to Send (RS), pin 4, and waits for a positive voltage on Clear to Send (CS), pin 5, before sending data. The local receiver monitors the output of the transmitter.

4.3.2 Full-duplex (4-Wire) Operation — The receiver

is on the line at all times. Either continuous carrier or controlled carrier may be used. In both cases it is necessary to apply a positive voltage to Request to Send (RS), pin 4, while transmitting data.

With continuous carrier the transmitter sends an idle code of steady mark (dibit 11) when RS is negative.

4.4 Unattended Answer and Data Mode Transfer

Unattended answer responds to central office ringing or specially engineered private line ringing. This feature requires the use of a key telephone set or a Data Auxiliary Set 804-type. With permanent automatic answer the on-hook station is always ready to answer automatically; when selective automatic answer is used, the on-hook station will answer automatically only when the AUTO key is down. The procedures described in the following paragraphs for unattended answer must also be followed for manually answered calls before transferring from the talk mode to the data mode. In data-only applications, where alternate voice capability is not provided, leads 19, 20 and 21 (Contact Option) or lead 20 (EIA Option) is not used.

4.4.1 Contact Option — The business machine should furnish a closure between Remote Control (RC) and Ready (RDY) (leads 20 and 21). This can be a permanent strap if desired. A contact closure will appear on Ring Indicator 1 (RG1) and Ring Indicator 2 (RG2) (leads 22 and 23) during each ringing cycle. Ringing will continue until the business machine closes Remote Release (RR) and Remote Control (RC) (leads 19 and 20). This connection allows the data set to answer the call and provides a holding path after the call has been answered. If this connection is made prior to receiving the call, the call will be answered on the first full ringing cycle. Within about 1-1/2 seconds after the end of ringing, the called station will generate an answer-back tone lasting for 2.5 sec. Following this sequence, the Interlock (IT) lead, pin 6, will go positive indicating that the data set is in the data mode. It is possible to go to the talk mode by lifting the handset and depressing the TALK key. The data mode can be re-established by momentarily depressing the DATA key and hanging up the handset. The closure between RR (Remote Release) and RC (Remote Control) (leads 19 and 20) must be maintained for the duration of the call.

4.4.2 EIA Option — Leads 19, 21 and 23 are not used and Remote Control (RC), pin 20, and Ring Indicator 1 (RG1), pin 22, operate with EIA bipolar voltages. When ringing is detected, a positive voltage appears on RG1 during each ringing cycle. Ringing will continue until RC (Remote Control) is made positive. This lead may be held positive prior to receiving the call, in which case the call will be answered on the first full ringing cycle. RC (Remote Control) must be held positive for the duration of the call. Within about 1-1/2 sec after the end of ringing the called station will generate an answer-back tone

lasting for 2-5 sec. The Interlock (IT) lead, pin 6, will then go positive indicating that the data set is in the data mode. It is possible to go to the talk mode by lifting the handset and depressing the TALK key. The data mode can be re-established by momentarily depressing the DATA key and hanging up the handset.

4.5 Call Termination

Switched connections must be terminated by taking positive action at both terminals. The call may be terminated manually by lifting the handset, depressing the TALK key and replacing the handset on hook. Unattended call termination should be accomplished as follows:

4.5.1 Contact Option — the connection between Remote Release (RR) and Remote Control (RC), pins 19 and 20, must be opened for at least 150 msec. The DATA lamp will extinguish and Interlock (IT), pin 6, will drop to 0 to +0.5 volt.

4.5.2 EIA Option — The voltage on Remote Control (RC), pin 20, must be made negative for at least 50 msec. The DATA lamp will extinguish and Interlock (IT), pin 6, will go from positive to negative.

5. CUSTOMER OPTIONS

5.1 The following options must be specified by the customer:

- (1) Internal timing (self-timed) or external timing (provided by the business machine).
- (2) EIA option or contact option.
- (3) With alternate voice or without alternate voice.
- (4) With permanent unattended answer or with selective unattended answer.*
- (5) With automatic calling or without automatic calling.**
- (6) Half-duplex operation (2-wire) or full-duplex operation (4-wire).
- (7) Continuous carrier or carrier controlled by Request to Send.***
- (8) With New Sync or without New Sync.

* Unattended answer options require alternate voice option.

** Automatic calling only available for DATA-PHONE service or for certain switched private lines.

*** Continuous carrier only available on 4-wire operation.

6. POWER AND ENVIRONMENTAL REQUIREMENTS

6.1 AC input: 117 volts + 10%, 60Hz± 0.5 Hz, 22 watts A 3-wire outlet, not under control of a switch, must be furnished by the customer. The ground should be common with the business machine ground.

6.2 Ambient temperature: 40 to 120°F.

6.3 Relative humidity: 20 to 95 per cent.

7. PHYSICAL DESCRIPTION

7.1 The Data Set 201-type is contained in a dark gray housing. It measures 7-3/4" H x 17-1/2" W x 11-5/8" D, and weighs approximately 35 pounds.

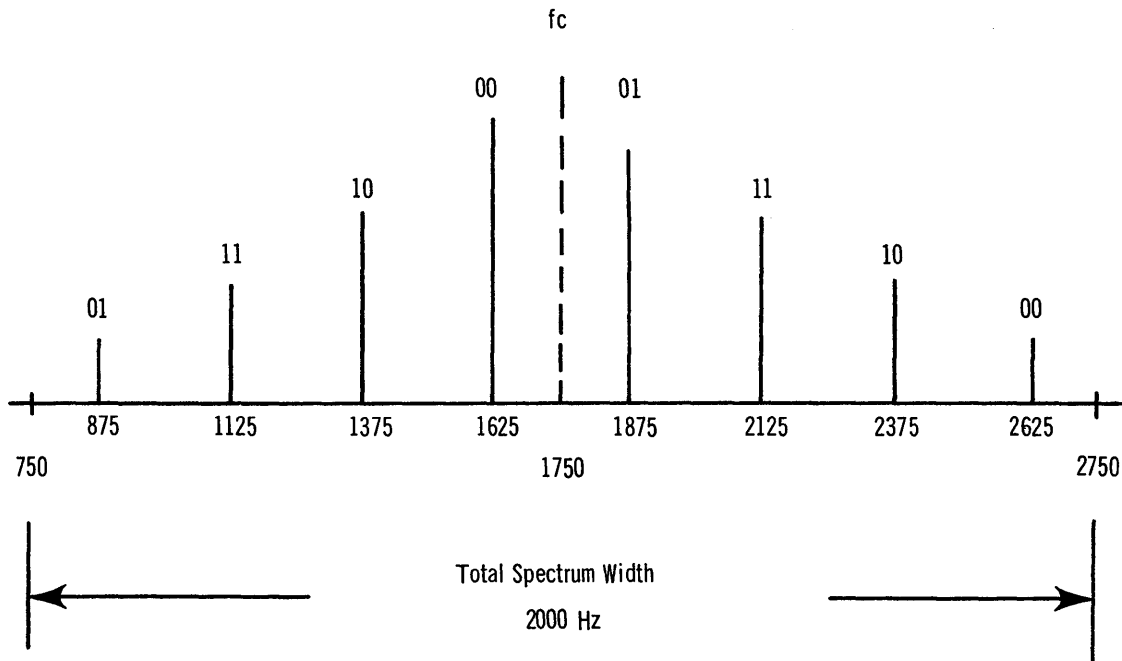
7.2 The interface connector is intended for connection to a customer-furnished Cinch or Cannon DB-19604-432 plug with a Cinch DB-51226-1 hood, or equivalent. Details on the connectors are listed in the Bell System Technical Reference "Data Set Interface Connectors, July 1963."

TABLE I
Data Set 201-Type Interface Pin Assignments

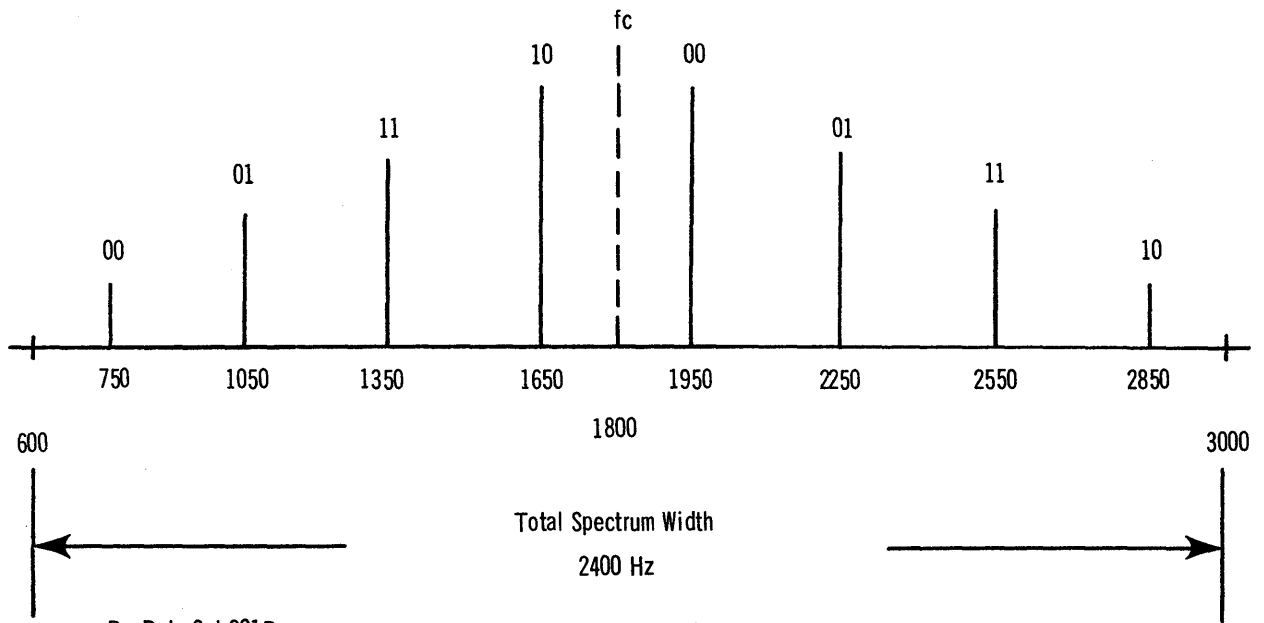
Pin No.	EIA Nomenclature	Lead Designation	Operating Range
1	Protective Ground (AA)	Frame Ground (FG)	—
2	Transmitted Data (BA)	Send Data (SD)	Note 1
3	Received Data (BB)	Receive Data (RD)	Note 1
4	Request to Send (CA)	Request to Send (RS)	Note 1
5	Clear to Send (CB)	Clear to Send (CS)	Note 1
6	Data Set Ready (CC)	Interlock (IT)	Note 2
7	Signal Ground (AB)	Signal Ground (SG)	—
8	Data Carrier Detector (CF)	Carrier On (CO)	Note 1
9	Not defined	Positive Battery (+12V)	Note 5
10	Not defined	Negative Battery (−12V)	Note 5
11	Not defined	Not Used	—
12	Not defined	Not Used	—
13	Not defined	Not Used	—
14	Not defined	New Sync (NS)	Note 1
15	Trans. Sig. Element Timing (DB)	Serial Clock Transmitter (SCT)	Note 1
16	Not defined	Dibit Clock Transmitter (DCT)	Note 1
17	Rec. Sig. Element Timing (DD)	Serial Clock Receiver (SCR)	Note 1
18	Not defined	Dibit Clock Receiver (DCR)	Note 1
19	Not defined	Remote Release (RR)	Note 3
20	Data Terminal Ready (CD)	Remote Control (RC)	Note 4
21	Not defined	Ready (RDY)	Note 3
22	Ring Indicator (CE)	Ring Indicator 1 (RG1)	Note 4
23	Not defined	Ring Indicator 2 (RG2)	Note 3
24	Trans. Sig. Element Timing (DA)	Serial Clock Transmitter External (SCTE)	Note 1
25	Not defined	Not Used	—

Notes:

1. Nominal +6 volts or −6 volts. The region between ± 3 volts is undefined.
2. For contact option, nominal +6 volts or 0 volts. For EIA option, same as Note 1.
3. For contact option, operates on a contact closure basis. Not used with EIA option.
4. For contact option, operates on a contact closure basis. For EIA option, same as Note 1.
5. For Telephone Company use only.



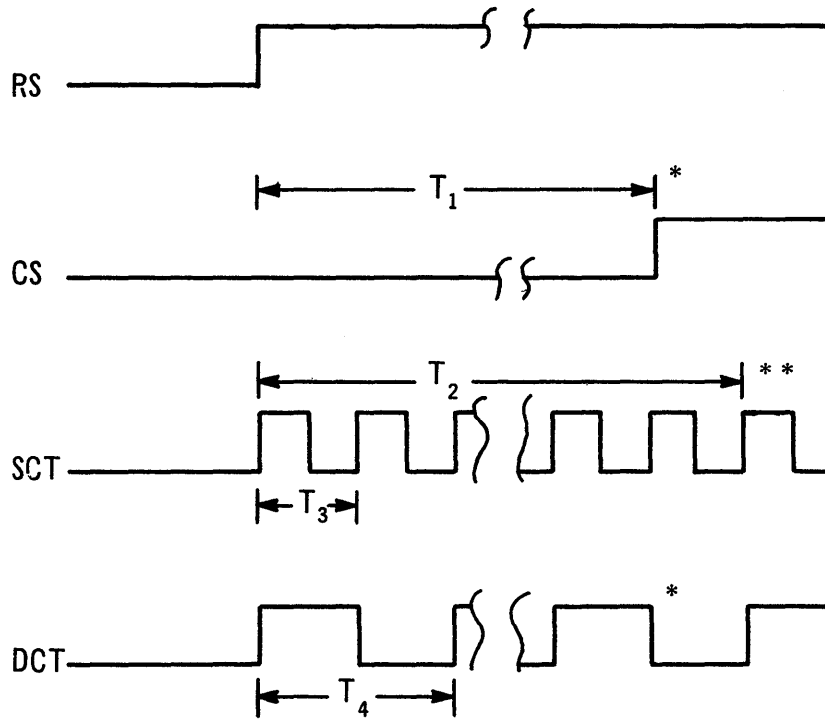
A. Data Set 201A



B. Data Set 201B

FIG. 2 - LINE SIGNAL SPECTRA

MINIMUM ELAPSED TIME FROM REQUEST TO SEND



* CS will always go positive during a negative transition of DCT

** Do not send data until this positive transition begins

Minimum Elapsed Time	Description	201A	201B
T_1	from positive transition of RS to positive transition of CS	8.5 ms	7.1 ms
T_2	from positive transition of RS until business equipment can begin to send data	9.0 ms	7.5 ms
T_3	1 cycle of SCT	500 us	417 us
T_4	1 cycle of DCT	1000 us	834 us

Figure 3

Description of Events In A DATA-PHONE Call

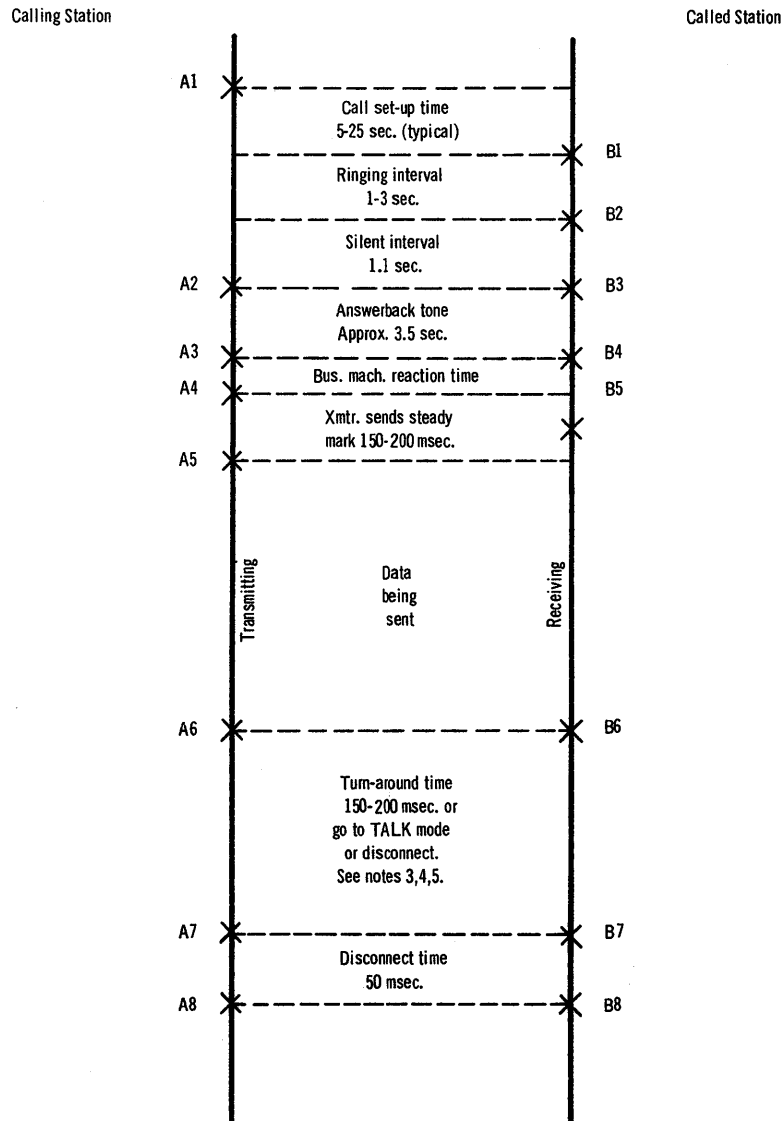
Calling Station

- A1 – End of dialing
- A2 – Receive answer-back tone
- A3 – Interlock (IT) goes positive
- A4 – Business machine makes Request to Send (RS) positive
- A5 – Clear to Send (CS) goes positive
- A6 – Business machine sends EOM and makes Request to Send (RS) negative.
Clear to Send (CS) goes negative.
- A7 – Business machine makes Remote Control (RC) negative
- A8 – Interlock (IT) goes negative

Called Station

- B1 – Ring Indicator 1 (RG1) goes positive
- B2 – Ring Indicator 1 (RG1) goes negative
- B3 – Start of answer-back tone
- B4 – Interlock (IT) goes positive
- B5 – Carrier detected within 2-8.5 msec after which Carrier On (CO) goes positive and Receive Data (RD) and timing (DCR and SCR) are unclamped
- B6 – Business machine recognizes EOM from calling station business machine.
Carrier On (CO) goes negative within 10 msec and Receive Data (RD) and timing (DCR and SCR) are clamped.
- B7 – Business machine makes Remote Control (RC) negative
- B8 – Interlock (IT) goes negative

Data Set 201A-Type with Data Auxiliary Set 804A Arranged for Unattended Answer on Switched Network DATA-PHONE Operation.



Notes:

1. Propagation times are not included.
2. After Interlock (IT) goes positive at A3, B4, either station may begin transmitting by making Request to Send (RS) positive. In this chart, calling station is arbitrarily shown as transmitting first.
3. At A6, B6 the receiving station can prepare to transmit by making Request to Send (RS) positive. The turn-around time in each case is the Clear to Send (CS) delay of 150-200 msec.
4. If it is desired to go to the talk mode, the operators should lift the handsets and depress the TALK keys at both terminals.
5. When transmission is completed, the station transmitting should notify the station receiving with a suitable EOT. Both business machines should then disconnect as described in Part 4.5.

FIG. 4

