DATA SETS 201A1, A2 AND 201B1, B2

TRANSMITTER-RECEIVER

DESCRIPTION AND OPERATION

1. GENERAL

1.01 This section contains information concerning the description and operation of Data Sets 201A1, A2 and 201B1, B2. Other than a description of interface signals, information pertaining to the business machine is not given.

1.02 This section is reissued to update the contents and to add information concerning Data Sets 201B1, B2. Prior to this issue, information concerning Data Sets 201B1, B2 was in Section 592-012-102. Because revision is extensive, change arrows have been omitted.

1.03 Unless a particular model of data set is to be discussed, Data Sets 201A1, A2 and 201B1, B2 will hereafter be referred to as Data Sets 201A and 201B, respectively.

1.04 Data Sets 201A and 201B are medium-speed, 4-phase serial binary transmitter-receivers. Data Set 201A is to be used on DATA-PHONE® service or private lines at 2000 bits per second

(bps). Data Set 201B is for use on private lines at 2400 bps.

1.05 Data Sets 201A1 and 201B1 are internally timed. Data Sets 201A2 and 201B2 are externally timed. The internally timed data sets contain a crystal oscillator which provides the transmitter with a clock signal. For the externally timed data sets, the customer must provide the source of clock signal. The clock signals must be 2000 Hz ($\pm$0.01 percent) for Data Set 201A2 and 2400 Hz ($\pm$0.01 percent) for Data Set 201B2. The clock signals must consist of a square wave having a 50 ($\pm$0.5) percent duty cycle.

2. PHYSICAL DESCRIPTION

2.01 Data Set 201-type (Fig. 1) contains a transmitter, receiver, and power supply in a dark gray aluminum housing with an anodized aluminum front panel. It measures 7-3/4 inches high by 17-1/2 inches wide by 11-5/8 inches deep and weighs approximately 35 pounds.

2.02 The data set cover is held in place by three captive retaining screws (Fig. 2). For removal and replacement of the cover, refer to the section entitled Data Sets 201A1, A2 and 201B1, B2, Transmitter-Receiver, Installation and Connections (592-011-200).

3. FUNCTIONAL DESCRIPTION

3.01 Data Sets 201A and 201B are designed to operate over 2- or 4-wire lines. In 2-wire operation, Data Sets 201A and 201B can transmit or receive, but not simultaneously. When the data set transmits, the receive portion monitors the transmitted data to provide local copy to the transmitting station. In 4-wire operations, the data set can transmit and receive simultaneously and independently; however, the transmitted data will not be monitored.
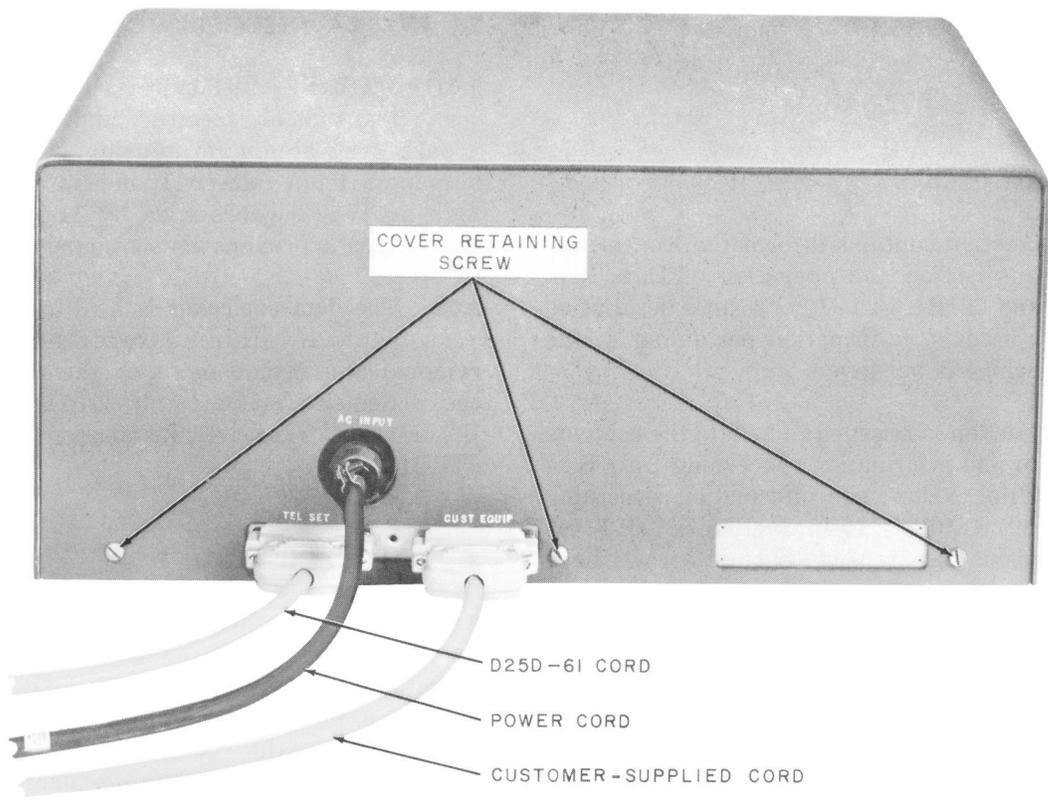
Fig. 1—Data Set 201—Front View

Fig. 2—Data Set 201—Rear View

3.02 The data set accepts serial binary data from the customer's business machine. Two consecutive bits are combined to form a dibit which is used to phase-modulate a carrier (1750 Hz for 201A and 1800 Hz for 201B). The phase-modulated carrier then goes through the telephone line circuits which match impedance, provide a means for adjusting the transmit level, and provide strapping for 2-wire or 4-wire operation.

3.03 The data set receiver accepts the phase-modulated carrier from the telephone line through the line circuits. Control signals from the receiver alert the business machine that data is being received. The receiver converts the phase-modulated carrier into serial binary form and delivers the received data to the business machine.

3.04 The transmitter and receiver include internally controlled circuits which are connected to the line. The line circuits contain the electronic transmit-receive switch, transmit and receive input pads, a compromise equalizer for the received signal, and repeat coils for connecting the transmitter and receiver to the line. Optional modes of operation may be selected from strapping points provided on the data set circuit boards.

3.05 Three cords are provided with Data Sets 201-type. The 25-conductor cord (D25D-61 or D25C-61) connects the data set to a connecting block or bridging adapter. Another cord (M26H-61) is furnished to connect the 569NB telephone set to a bridging adapter. The 3-conductor, light gray power cord (KS-14532-L15) connects 117-volt 60-Hz power to the data set.

3.06 The customer must provide an interface cord to connect the business machine to the data set. The connector on the data set is a KS-19087-L2 25-pin receptacle. The customer interface cord should be equipped with a Cinch (or Cannon) DB-19604-432 plug and a DB-51226-1 or similar hood. The length of the cord should not exceed 50 feet.

3.07 Transmission and control leads from the data set to the line or to data auxiliary sets are functionally designated as shown in Table A. Refer to Table B for the designations of interface connections between the data set and the customer equipment.

TABLE A

DATA SET CONNECTIONS

TO LINE OR TELEPHONE SET

J1 PIN NO.	DESIGNATION
1	RTA
2	RRA
3	T1A
4	R1A
5	TA
6	RA
7	DT1
8	DR1
9	DT
10	DR
11	Not Used
12	Not Used
13	Not Used
14	DS
15	HL
16	HLG
17	SH1
18	SH2
19	D1
20	D2
21	TR1
22	TR2
23	SG
24	IT1
25	IT

4. APPLICATION INFORMATION

4.01 Data Sets 201A1, A2 are capable of providing the following services:

● 2-wire or 4-wire DATA-PHONE service with a telephone set

● 2-wire or 4-wire DATA-PHONE service with a telephone set which is part of a 1A or 1A1 key telephone system

TABLE B

CUSTOMER INTERFACE CONNECTIONS

J2 PIN NO.	LEAD DESIGNATION
1	Frame Ground (FG)
2	Send Data (SD)
3	Receive Data (RD)
4	Request to Send (RS)
5	Clear to Send (CS)
6	Interlock (IT)
7	Signal Ground (SG)
8	Carrier On-Off (CO)
9	+Power (+12V Filt)
10	−Power (−12V Filt)
11	Not Used
12	Not Used
13	Not Used
14	New Sync (NS)
15*	Serial Clock Transmit (SCT)
16	Dibit Clock Transmit (DCT) (not usable in set with external timing)
17	Serial Clock Receive (SCR)
18	Dibit Clock Receive (DCR)
19	Remote Release (RR)
20	Remote Control (RC)
21	Ready (RDY)
22	Ring Indicator 1 (RG1)
23	Ring Indicator 2 (RG2)
24*	Serial Clock Transmit (External) (SCTE)
25	Not Used

* Data sets will accept external timing signals on pin 15 or 24 except for some early sets which will accept timing on pin 15 only.

● 2-wire or 4-wire private line data service without a telephone set.

4.02 Data Sets 201A and 201B are capable of providing the following services:

● 2-wire or 4-wire private line data service without a telephone set

● 2-wire private line data service with a telephone set

● 2-wire or 4-wire private line data service with a telephone set which is part of a 1A or a 1A1 key telephone system.

4.03 Optional wiring in the data set will permit the following arrangements:

● Choice of selective automatic answering or permanent automatic answering (with a 2-wire key telephone set)

● Variation of data set terminal impedance to match 600- or 900-ohm lines

● Use of echo delay on either 2-wire or 4-wire lines

● Use of new sync

● Use of compromise equalizer and adjustment of receiver signal level coordinated with maximum line noise level

● Adjustment of transmitter line signal level.

4.04 The 569NB telephone set used with Data Set 201 is equipped with a D50J-61 cord and a C5A ringer. In place of the ringer, a 7-type buzzer mounted on a 44B bracket may be installed. The 569NB telephone set has a 6-button key which provides functions as specified in Table C.

4.05 Table D lists circuit boards used in Data Sets 201A and 201B. Data Sets 201A1, A2 and 201B1, B2 can be converted to any other model of Data Set 201-type by changing the appropriate circuit boards. When this is done, the designation on the nameplate should be changed accordingly.

4.06 The data set is always equipped with automatic answer equipment. However, when used, the automatic answer requires a 569NB telephone set. Two options are available: selective automatic answering (option W) or permanent automatic answering (option X). With selective automatic answering, the AUTO ANS button on the telephone set must be manually operated in order to condition the data set to answer automatically. With permanent automatic answering, the AUTO ANS button is bypassed and the data set is permanently conditioned for automatic answering.

5. OPERATION

5.01 Data sets without a telephone set are controlled by the business machine and do not require manual operation. When the data set is strapped for 4-wire continuous-carrier operation, the transmitter and receiver are always on-line.

TABLE C

KEY FUNCTIONS OF 569NB TELEPHONE SET

KEY NUMBER	DESIG-NATION	FUNCTION
1	DATA HOLD	A nonlocking key used to shift from talk to data mode of operation on data line and as a hold key for central office or PBX lines if connected to keys 4, 5, and 6
2	TALK	Connects the telephone set to the data line
3	TEST	Nonlocking key used to test the data set under direction of the Data Test Center
4	1st Pickup Key	Used for pickup of an additional central office or PBX line; can be used in 1A1, 1A, or 6A key telephone systems
5	2nd Pickup Key	Same as first pickup key; may also be converted to a single key if desired
6	AUTO ANS or 3rd Pickup Key	Used either as automatic answer key (W option) or same as pickup key 2 when X option is used

When the data set is strapped for 4-wire controlled carrier, the receiver of the data set is always on-line while the transmitter is on-line only when the request-to-send (RS) lead from the business machine is high (greater than +6 volts). When the data set is strapped for 2-wire operation, the transmitter is on-line when RS is high, and the receiver is on-line when RS is low (more negative than −6 volts). When the installation does not include a telephone set, 5.02 through 5.04 do not apply.

Switched Network Operation

5.02 *Procedure at Calling Station:* To signal the distant data station, depress the TALK button, lift the handset, and dial the call in the normal manner. The called station may answer either manually or automatically. If the called station is answered manually, verbally agree to begin data transmission. Momentarily depress the DATA button. If the called station is answered automatically, a 2025-Hz tone will be heard. This tone indicates that the distant data set is ready to receive data. Momentarily depress the DATA button. In either case, when the DATA button is released, the TALK button is restored to normal and the lamp under the DATA button should light. The handset can then be placed on-hook.

5.03 *Procedure at Called Station:* To answer an incoming call manually, depress the TALK button, lift the handset, and answer in the usual manner. After agreeing to begin data transmission, momentarily depress the DATA button. When the DATA button is released, the TALK button will be restored to normal and the lamp under the DATA button will light. The handset can then be placed on-hook. If the called data station is equipped with automatic answer and the AUTO ANS button is depressed, manual operation is not required.

5.04 Both the calling and the called data stations must terminate a call in either of the following ways:

(a) The call can be terminated manually by depressing the TALK button, lifting the handset, and then placing the handset on-hook.

(b) The business machine can be arranged to open the connection between the remote release (RR) and the remote control (RC) leads. This will terminate the call.

Private Line Operation

5.05 *Procedure at Calling Station:* For 2-wire private line operation with a telephone set,

depress the TALK button, lift the handset, and signal the remote station in accordance with local instructions. If the called station answers manually, verbally agree to begin data transmission. Momentarily depress the DATA button. If the called station answers automatically, a 1350-Hz tone will be heard. This tone indicates that the remote station is ready to receive data. Momentarily depress the DATA button.

> *Note:* When the DATA button is released, the TALK button will be restored to normal and the lamp under the DATA button will light. The handset must then be placed on-hook.

5.06 *Procedure at Called Station:* To manually establish the line connection, depress the TALK button, lift the handset, and answer the call in the normal manner. Verbally agree to begin data transmission and momentarily depress the DATA button. When the DATA button is released, the TALK button will be restored to normal and the lamp under the DATA button will light. Sets arranged for automatic answering do not require manual operation.

5.07 Both the calling and the called data stations must terminate the call in either of the following ways:

(a) The call can be terminated manually by depressing the TALK button, lifting the handset, and then placing the handset on-hook.

(b) The business machine can be arranged to open the connection between the RR and the RC leads. This will terminate the call.

6. REFERENCES

6.01 Detailed information concerning Data Sets 201A1, A2 and 201B1, B2 is contained in CD- and SD-1D015-01. The following Bell System Practices contain additional information concerning Data Sets 201A1, A2 and 201B1, B2:

SECTION	TITLE
592-011-200	Data Sets 201A1, A2 and 201B1, B2, Transmitter-Receiver, Installation and Connections
592-011-300	Data Sets 201A1, A2 and 201B1, B2, Transmitter-Receiver, Maintenance
592-011-500	Data Sets 201A1, A2 and 201B1, B2, Transmitter-Receiver, Test Procedures
668-102-500	Data Test Center—904B- and 904D-Types, Test Procedures—Data Set 201-Type, Dynamic Test

6.02 Information concerning the 569NB telephone set is contained in the section entitled Telephone Sets—569NB (502-533-100).

TABLE D

CIRCUIT PACKS USED IN DATA SET 201-TYPE

CIRCUIT PACK DESCRIPTION	CARD LOCATION	CPS AN CODE	CPS CODE	EQUIPMENT DESIGNATION	ASSEMBLY NUMBER	SD-1D060-01 SHEET	DATA SET 201-TYPE							
							A1	A2	A3	A4	B1	B2	B3	B4
CIRCUIT PACKS COMMON TO ALL 201-TYPE SETS														
Transmitter Data Logic	T4	AN43	CPS 5	ED-1D028-30,G2	A-835985	J473	X	X	X	X	X	X	X	X
Envelope Binary Count	T6	AN46	CPS 7	ED-1D030-30,G2	A-835988	J476	X	X	X	X	X	X	X	X
Phase Logic	T7	AN47	CPS 8	ED-1D031-30,G1	A-835989	J477	X	X	X	X	X	X	X	X
Timing Control	T9	AN3	CPS 10	ED-1D033-30,G3	A-835290	J127	X	X	X	X	X	X	X	X
Line Circuits II	L1	AN6	CPS 14	ED-1D037-30,G1	A-835293	J130	X	X	X	X	X	X	X	X
360A Equalizer	L3	—	—	—	—	—	X	X	X	X	X	X	X	X
Auto Vol Control I ⎫ CPS	R1	AN8	CPS 16	ED-1D013-30,G1	A-835645	J182	X	X	X	X	X	X	X	X
Auto Vol Control II ⎬ BT1	R2	AN9	CPS 17	ED-1D014-30,G1	A-835646	J183	X	X	X	X	X	X	X	X
Preamplifier ⎭	R3	AN1	CPS 18	ED-1D015-30,G1	A-835228	J125	X	X	X	X	X	X	X	X
Demodulator	R6	AN54	CPS 19	ED-1D016-30,G1	A-835996	J484	X	X	X	X	X	X	X	X
Data Sample	R7	AN55	CPS 20	ED-1D017-30,G1	A-835997	J485	X	X	X	X	X	X	X	X
Demodulator	R8	AN54	CPS 19	ED-1D016-30,G1	A-835996	J484	X	X	X	X	X	X	X	X
Data Sample	R9	AN56	CPS 33	ED-1D018-30,G1	A-835998	J486	X	X	X	X	X	X	X	X
Receiver Data Logic	R10	AN57	CPS 21	ED-1D019-30,G2	A-835999	J487	X	X	X	X	X	X	X	X
Carrier On-Off	R12	AN59	CPS 23	ED-1D021-30,G1	A-836001	J489	X	X	X	X	X	X	X	X
CIRCUIT PACKS USED IN SPECIFIC 201-TYPE SETS														
Osc for Int Timing	T1	AN38	CPS 2	ED-1D025-30,G3	A-835980	J468	X		X					
Osc for Int Timing	T1	AN60	CPS 2	ED-1D025-30,G4	A-836026	J517					X		X	
Osc for Ext Timing	T1	AN39	CPS 27	ED-1D057-30,G1	A-835981	J469		X		X				
Osc for Ext Timing	T1	AN61	CPS 27	ED-1D057-30,G2	A-836027	J518						X		X
Timing I for Int Timing	T2	AN40	CPS 3	ED-1D026-30,G5	A-835982	J470	X		X					
Timing I for Int Timing	T2	AN62	CPS 3	ED-1D026-30,G6	A-836028	J519					X		X	
604C Filter	T2	—	—	—	—	—		X		X				
604D Filter	T2	—	—	—	—	—						X		X
Timing II for Int Timing	T3	AN41	CPS 4	ED-1D027-30,G3	A-835983	J471	X		X					
Timing II for Int Timing	T3	AN63	CPS 4	ED-1D027-30,G4	A-836029	J520					X		X	
Timing for Ext Timing	T3	AN42	CPS 28	ED-1D058-30,G3	A-835984	J472		X		X		X		X
Input Buffer — Int Timing	T5	AN44	CPS 6	ED-1D029-30,G1	A-835986	J474	X		X		X			
Input Buffer — Ext Timing	T5	AN45	CPS 29	ED-1D059-30,G1	A-835987	J475		X		X		X		X
Channel Binary Counter	T8	AN48	CPS 9	ED-1D032-30,G1	A-835990	J478	X	X	X	X	X		X	
Channel Binary Counter	T8	AN49	CPS 30	ED-1D060-30,G1	A-835991	J479						X		X
Line Amplifier	T10	AN50	CPS 11	ED-1D034-30,G2	A-835992	J480	X	X			X	X		
Line Amplifier	T10	AN4	CPS 11	ED-1D034-30,G2	A-835291	J128			X	X			X	X
Line Transformer	T11	AN51	CPS 12	ED-1D035-30,G1	A-835993	J481	X	X			X	X		

TABLE D (Cont)

CIRCUIT PACKS USED IN DATA SET 201-TYPE (Cont)

CIRCUIT PACK DESCRIPTION	CARD LOCATION	CPS AN CODE	CPS CODE	EQUIPMENT DESIGNATION	ASSEMBLY NUMBER	SD-1D060-01 SHEET	A1	A2	A3	A4	B1	B2	B3	B4
CIRCUIT PACKS USED IN SPECIFIC 201-TYPE SETS														
Line Transformer	T11	AN5	CPS 12	ED-1D035-30,G1	A-835292	J129			X	X			X	X
Modulators and Filters	T12	AN52	CPS 13	ED-1D036-30,G1	A-835994	J482	X	X	X	X				
Modulators and Filters	T12	AN64	CPS 13	ED-1D036-30,G2	A-836030	J521					X	X	X	X
Line Circuits I	L2	AN53	CPS 15	ED-1D038-30,G1	A-835995	J483	X	X			X	X		
Line Circuits I	L2	AN7	CPS 15	ED-1D038-30,G1	A-835294	J131			X	X			X	X
Automatic Answer Unit	L4	—	—	ED-1D039-30,G2	—	—	X	X			X	X		
Interface Circuit	L4	AP1	—	—	A-835295	J124			X	X			X	X
844A Network	R4, R5	—	—	—	—	—	X	X	X	X				
844B Network	R4, R5	—	—	—	—	—					X	X	X	X
Output Buffer	R11	AN58	CPS 22	ED-1D020-30,G1	A-836000	J488	X	X	X	X				
Output Buffer	R11	AN65	CPS 22	ED-1D020-30,G2	A-836031	J522					X	X	X	X
604A Filter	R13	—	—	—	—	—	X	X	X	X				
Bit Sync Mod (CPS BT2)	R14	AN10	CPS 24	ED-1D022-30,G1	A-835647	J185	X	X	X	X				
Bit Sync Filter	R15	AN11	CPS 25	ED-1D023-30,G1	A-835648	J186	X	X	X	X				
Bit Sync Amp	R16	AN2	CPS 26	ED-1D024-30,G1	A-835229	J126	X	X	X	X				
604B Filter	R13	—	—	—	—	—					X	X		
Bit Sync Mod (CPS BT3)	R14	AN10	CPS 24	ED-1D022-30,G1	A-835647	J185					X	X		
Bit Sync Filter	R15	AN12	CPS 25	ED-1D023-30,G2	A-835649	J188					X	X		
Bit Sync Amp	R16	AN13	CPS 26	ED-1D024-30,G1	A-835360	J190					X	X		
604B Filter	R13	—	—	—	—	—					X	X	X	X
Bit Sync Mod (CPS BT4)	R14	AN10	CPS 24	ED-1D022-30,G1	A-835647	J185					X	X	X	X
Bit Sync Filter	R15	AN12	CPS 25	ED-1D023-30,G2	A-835649	J188					X	X	X	X
Bit Sync Amp	R16	AN66	—	—	A-836081	J581					X	X	X	X
POWER SUPPLIES USED IN 201-TYPE SETS														
J87212A Rectifier	—	—	—	—	—	—	X	X			X	X		
J87212B Rectifier	—	—	—	—	—	—	X	X	X	X	X	X	X	X

Notes:

1. Use CPS AN Code for ordering replacement circuit packs.
2. Groups BT1, BT2, BT3, and BT4 contain matched cards. When replacement of any card in the group is required, the entire group must be replaced.
3. When converting from 201B1, B2 to 201B3, B4, CPS BT3 need not be replaced.