DATA SET 202C-TYPE
TRANSMITTER-RECEIVER
DESCRIPTION AND OPERATION

1. GENERAL

1.01 This section includes description and operation information for Data Set 202C-type. It does not include operation information concerning the associated business machine.

1.02 This section is reissued to include information on later models of Data Set 202C-type. Because of extensive changes, arrows have been omitted.

1.03 Data Set 202C-type is a medium-speed serial transmitter-receiver intended for DATA-PHONE® and private line service. This set is capable of operating at speeds up to 1200 bits per second (bps) on the switched message network (DDD) and up to 1800 bps on conditioned private lines. It will operate half duplex on 2-wire facilities and full duplex on 4-wire facilities.

1.04 The various models of Data Set 202C are presented in Table A.

2. DESCRIPTION

2.01 This part contains a physical and functional description of Data Set 202C. Application information for Data Set 202C is also given.

PHYSICAL DESCRIPTION

2.02 Data Set 202C-type (Fig. 1) is an integrated unit combining a data transmitter-receiver, a line control unit, and a 6-button telephone set in a 2-tone gray plastic case. The case is held in place by six retaining screws in the base (Fig. 2). The weight of the data set is 16 pounds.

2.03 Data Set 202C-type is available in a rotary dial version or equipped with a TOUCH-TONE® dial. Refer to Table A for more information.

2.04 Data Set 202C-type is equipped with a 589AA key unit. The keys are designated and function as follows:

(a) Spare keys 1, 2, and 3 (counting from left) are spare keys for optional features.

(b) TEST—This key (illuminated) is used as a test key for testing the data set from a data test center.

(c) TALK—This key (illuminated) is used for voice communications on data lines.

(d) DATA—This key (illuminated) is used for data communication.

TABLE A

MANUFACTURING DISCONTINUED CODES (USING 3A1 DATA UNIT)		REPLACING CODES (USING 3A2 DATA UNIT)	DISTINGUISHING FEATURES
202C1	202C5	202C9 †	Rotary dial without reverse channel
202C2	202C6	202C10 †	Rotary dial with reverse channel
202C3*	202C7	202C11 †	TOUCH-TONE® without reverse channel
202C4*	202C8	202C12 †	TOUCH-TONE with reverse channel

* Data Sets 202C3 and 202C4 were never manufactured.
† These data sets are compatible with No. 1 ESS offices and UNIGUAGE lines.

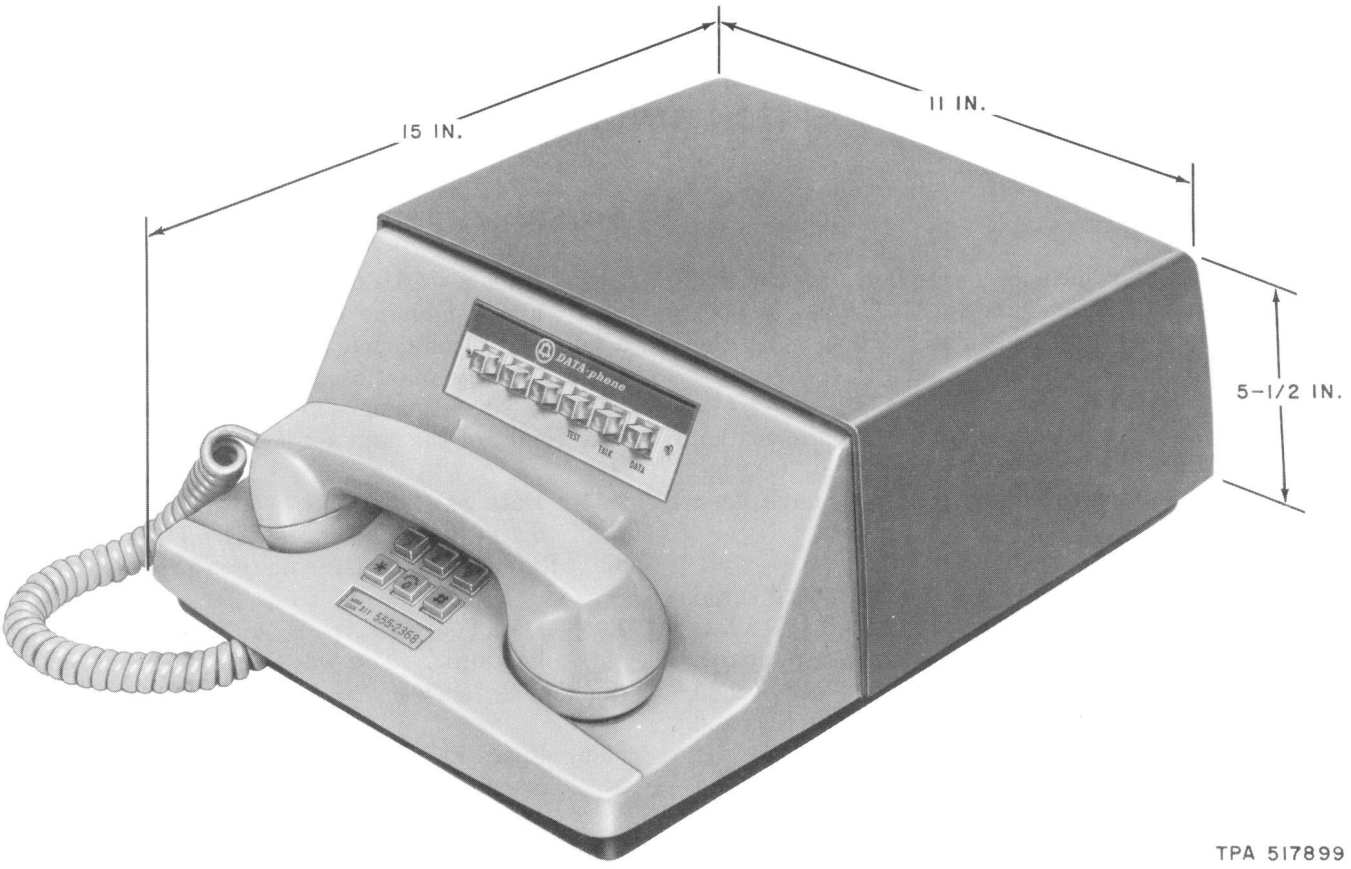

Fig. 1—Data Set 202C-Type (With TOUCH-TONE Dial)

2.05 A 25-pin connector, KS-19087-L6, is provided at the rear of the data set for connecting to the business machine of the customer. This connection is made with a customer-furnished cable (not to exceed 50 feet) equipped with a Cinch or Cannon DB-19604-432 type plug. Interface leads present at this connector are numbered and designated as indicated in Table B.

2.06 Cords supplied with the data set are:

- Power cord, KS-14532-L16, 3-conductor, 10 feet long
- Telephone line cord, D6AA-61, 5-1/2 feet long

Removing and Replacing Cover

2.07 To remove cover of data set:

(1) Loosen but do not remove captive screws located around the base.

(2) Remove covers, rear cover first.

2.08 To replace cover of data set:

(1) Position retaining wedges so that they may easily receive the cover lugs.

(2) Position front cover over the wedges, tilting the cover slightly forward. The key-mounting assembly is flexible and can be moved to facilitate positioning the cover. When the key unit and

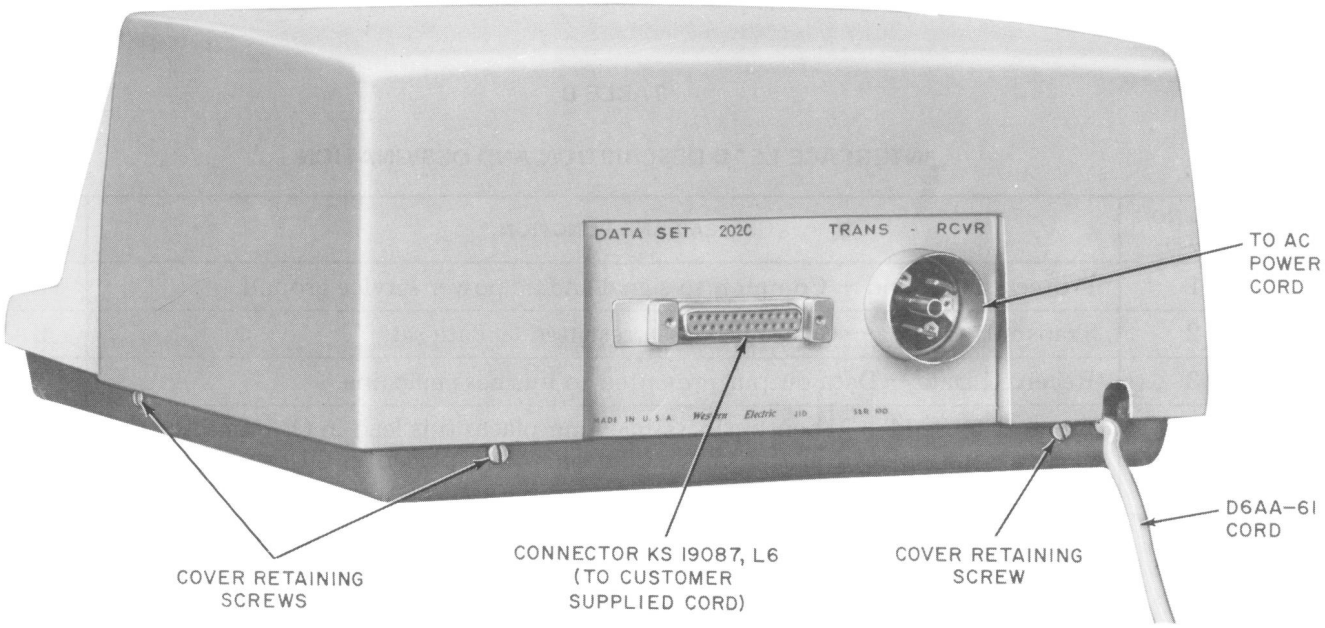

Fig. 2—Data Set 202C-Type—Rear View

the dial are aligned in their respective holes, press cover into place.

(3) Slide rear cover straight down over the circuit boards until it rests on the base of the set.

(4) Tighten captive cover retaining screws.

FUNCTIONAL DESCRIPTION

2.09 Data Set 202C-type contains a transmitter, receiver, carrier detector, and control and test circuitry (Fig. 3). Data Sets 202C2, C6, C8, C10, and C12 also contain a reverse-channel transceiver.

Transmitter

2.10 The data set transmitter contains a voltage-controlled oscillator which converts data signals from the customer equipment into FM signals (1200 $\pm$12 Hz for a mark and 2200 $\pm$22 Hz for a space) which are suitable for transmission over the transmitting line.

Control and Test Circuitry

2.11 The FM signals from the transmitter circuit are applied to the telephone line through the control and test circuitry. Through suitable strapping arrangements, modes of terminal operation or provisions for 4-wire configuration can be used with the transmit and receive signal path. The test circuit permits a check of the data set operation from a remote data test center.

Receiver

2.12 The FM signals from a distant station are applied to the receive circuitry by way of the control circuitry. The data set receiver demodulates this signal thus yielding a dc voltage output which varies linearly with input frequency. This varying dc voltage is converted to digital mark and space signals and is passed to the customer equipment as received data. The varying dc voltage output of the receiver is also applied to the carrier detector.

Carrier Detector

2.13 The carrier signal received from a distant data station is demodulated in the data set receiver and is used to operate the carrier detector

TABLE B

INTERFACE LEAD DESCRIPTION AND DESIGNATION

PIN NO. OF J5	LEAD AND FUNCTION	EIA DESIG.
1	Protective Ground — Common to signal and ac power service ground.	AA
2	Transmitted Data — Customer data presented to data set.	BA
3	Received Data — Data output presented to business machine.	BB
4	Request-to-Send — When business machine places this lead in ON condition, data set is placed in transmit condition. When placed in OFF condition, data set is placed in receive condition.	CA
5	Clear-to-Send — Signals business machine that data may be transmitted.	CB
6	Data Set Ready — Signals business machine when data set is in the data mode.	CC
7	Signal Ground — Common to frame ground and ac power service ground.	AB
8	Data Carrier Detector — Signals business machine data carrier is being received.	CF
9	+Voltage — (+18 volts) Power supply (telephone company use only)	+P
10	—Voltage — (—18 volts) Power supply (telephone company use only)	—P
11*	Supervisory Transmitted Data — Provides means of transmitting low-speed coordinating signals to data transmitting end of connection.	SA
12*	Supervisory Received Data — Provides means of receiving low-speed coordinating signals and circuit assurance signal.	SB
19†	Remote Release — When opened by business machine, terminates call. Must be connected to CD lead for data set to go to data mode.	RR
20	Data Terminal Ready — Business machine applies an ON condition for auto answer and allows data set to go to data mode. An OFF condition disconnects data set from line.	CD
21†	Ready — Is closed to CD lead by business machine when automatic answering of incoming calls is desired.	RY
22	Ring Indicator 1 — Signals business machine that an incoming call is being received.	CE
23†	Ring Indicator 2 — Signals business machine that an incoming call is being received.	R12

*Sets equipped with and wired for reverse channel (option T).
†For Data Set 202A/B type interface option only (option M).

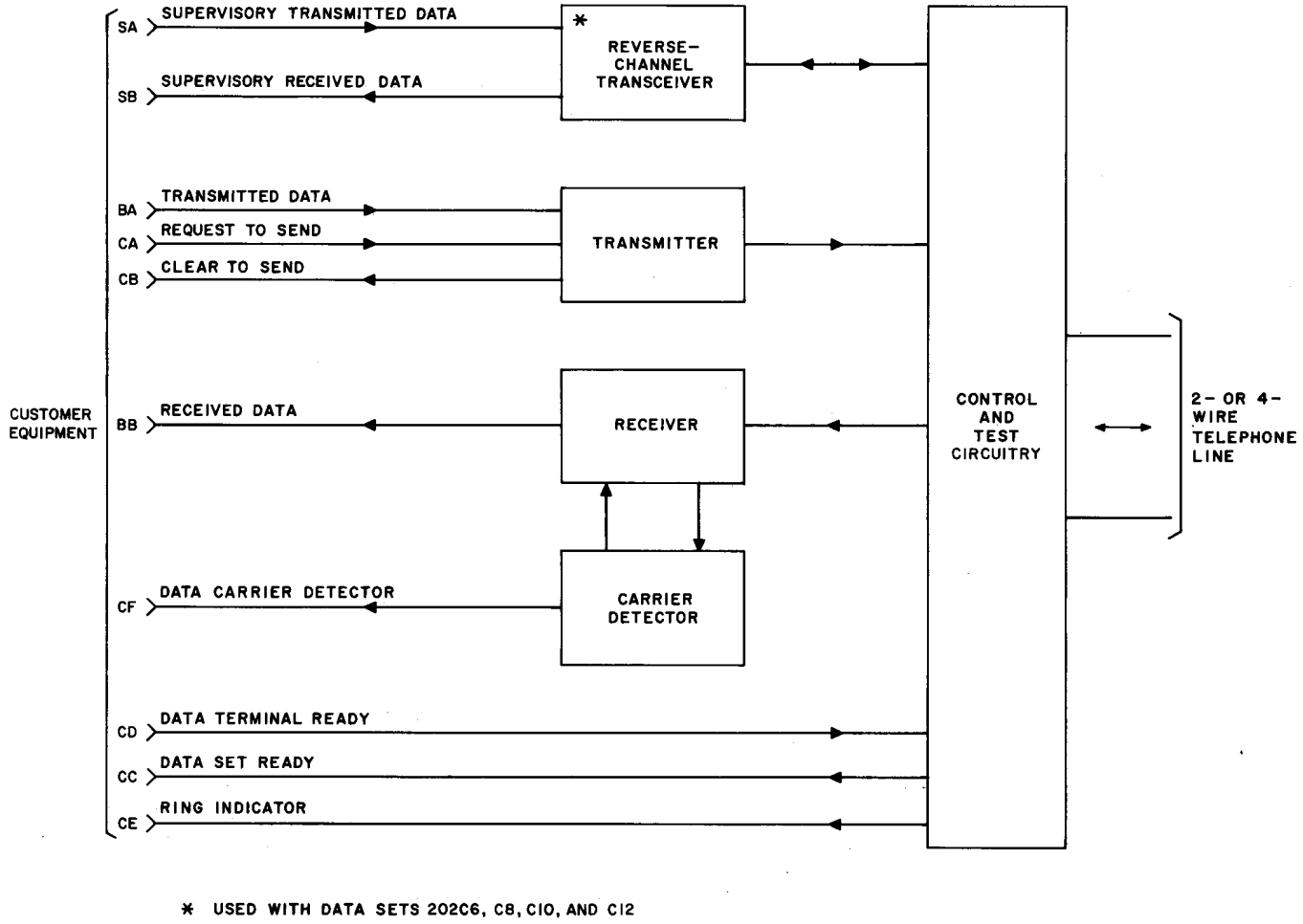

Fig. 3—Data Set 202C-Type—Block Diagram

which provides a receiver clamp action. A noise guard feature in the carrier detector provides protection against out-of-band frequency components which might falsely operate the receiver.

Reverse-Channel

2.14 Reverse-channel operation provides a means of circuit assurance to the customer. The receiving data station transmits a tone (387 Hz) to the transmitting data station thus indicating that acceptable quality of data transmission is being received. This tone also serves as a means of holding echo suppressors disabled when no data carrier is on the line.

2.15 A 1A-type Data Unit is provided in Data Sets 202C2, C6, C8, C10, and C12 (on 2-wire application) to furnish circuit assurance and low-speed coordinating signals between the customer business machines. The 1A-type Data Unit is a reverse-channel transceiver whose input and output appear on the interface of the data set. Input and output signals from the 1A-type Data Unit are EIA types (positive voltage for an ON condition and a negative voltage for an OFF condition). Wiring options are provided to enable or disable the reverse-channel transceiver when Data Set 202C-type is so equipped.

2.16 A 3A1 Data Unit incorporated in Data Sets 202C1 to C8 provides the following:

- Automatic answer of data line
- Line holding
- Answer-tone (2025 Hz) and answer-tone timing

- Transfer from talk to data mode
- Transfer from data to talk mode
- Match of data set impedance to a 600- or 900-ohm line
- Protection of the data set from electrical disturbances on the phone line.

2.17 Data Sets 202C9 to 202C12 are equipped with a 3A2 Data Unit. The principal change in the 3A2 Data Unit is in the ringing detector circuit. The sensitivity of the ringing detector circuit has been improved to enable it to detect the lower signal levels associated with long UNIGUAGE loops (about 40 volts). The holding period has been lengthened to bridge the ring trip interval battery interrupt of No. 1 ESS offices. A noise suppression network has been incorporated into the data unit across the talk (T) relay. A surge suppression diode has also been installed across the LS relay.

2.18 Calls can be answered automatically when either of the following is provided:

(a) AUTO (spare 3) key is depressed and ZE option is provided.

(b) Strapping option is connected to provide permanent automatic answering on all incoming calls (option Q). Use of this option bypasses the AUTO key.

APPLICATION INFORMATION

2.19 Signals on the data set interface are of the voltage type conforming to EIA Specification RS-232-A. A wiring option (M wiring) is provided in the data set to furnish contact closure-type signals on certain leads of the interface to make the data set compatible with some of the older installations. Refer to Table B for the interface lead description and EIA designation.

2.20 Operation of Data Set 202C-type is compatible with Data Set 202A and, with appropriate option strapping, may be used to replace the 202A. However, Data Set 202A cannot be used to replace Data Set 202C if the customer requires an all-voltage interface option (wiring option N), a reverse channel, or compatibility with the 801-type Data Auxiliary Set (ACU).

2.21 Data Set 202C-type is compatible with Data Auxiliary Set 801-type (automatic calling unit). When this data set is used with an 801, the telephone (data) line must be arranged for ground start operation, and wiring option ZJ must be provided in the data set.

2.22 Data Set 202C-type requires 117-volt ac power at 60 Hz. The power supply is not fused as damage will not result due to overload.

Note: Data sets equipped with the 17A, series 2, or 48A power unit will operate on 117-volt ac power at 57 to 63 Hz.

3. OPERATION

ATTENDED STATION

3.01 To originate a data call, depress the TALK key, lift the handset, and place a call to the distant terminal in the normal manner.

3.02 At the answering station, ringing current will cause the bell to ring and will operate circuitry in the data set. This signals the business machine that there is an incoming call. It also prepares the data set for answering. After one complete ringing cycle, the attendant at the answering data station should depress the TALK key, lift the handset to trip the ringing thus placing the data set in the talk mode. The attendant may stay in the talk mode to conduct voice communications or may go to the data mode by depressing the DATA key.

3.03 When the answering DATA key is depressed and released, the TALK key is automatically released and a timing interval of 1.5 seconds is initiated. This timing interval is the single-frequency (SF) guard interval during which there is no tone transmitted. The purpose of this guard interval is to insure the receipt of an off-hook signal by the originating office from the answering station.

In Data Set 202C-type, the TALK lamp of the called station is lighted to remind the attendant to place the called data set in the data mode first. The TALK lamp of the calling station is never lighted.

Sets With Reverse-Channel Option

3.04 At the end of the 1.5-second SF guard interval, the answering station will transmit a 2025-Hz tone to disable echo suppressors on toll trunks and to inform the originating station that the answering station has gone into the data mode. The 2025-Hz tone will be followed by a 387-Hz reverse-channel tone when the answering station is a receiver and interface lead SA is in the ON condition. Should the answering station be a transmitter, a 1200-Hz tone (data mark signal) will follow the 2025-Hz tone (in place of the 387-Hz tone as previously described). Echo suppressors will remain disabled as long as any tones are being transmitted.

Sets Without Reverse-Channel Option

3.05 Operation is the same as for sets with reverse-channel option except for the absence of 387-Hz tone.

3.06 When the originating station attendant hears the change in tone from 2025 Hz, he should momentarily depress the DATA key and the DATA lamp should light. When the DATA lamp lights, the DATA key should be released. Data transmission can now begin.

UNATTENDED STATION

3.07 On an incoming call with the data set arranged for automatic answer, ringing current will cause the bell in the telephone set to ring and a relay in the data set to operate. Operation of this relay trips ringing and causes the data set to change to the off-hook condition, provided that an ON condition is present on the CD lead. Under these conditions, the line control circuit will initiate the SF guard interval. At the end of the 1.5-second guard interval, a 2025-Hz tone will be transmitted to disable echo suppressors on toll trunks and to inform the originating station that the answering station has gone into the data mode. The 2025-Hz tone will be followed by a 387-Hz tone (on sets wired for a reverse-channel option) when the answering station is a receiver and interface lead SA is in the ON condition. Should the answering station be a transmitter, a 1200-Hz tone (data mark signal) will follow the 2025-Hz tone (in place of the 387-Hz tone as previously described). Echo suppressors will remain disabled as long as any tones are being transmitted. Data transmission can now begin.

3.08 If it is necessary to interrupt data transmission, place the data station in the talk mode and re-establish data transmission. The answering (called) station must go to the data mode first. Proceed as described in 3.03 and 3.06.

4. REFERENCES

4.01 Bell System Practices covering Data Set 202C-type transmitter-receiver are as follows:

SECTION	TITLE
592-015-200	Data Set 202C-Type, Installation and Connections
592-015-300	Data Set 202C-Type, Maintenance
592-015-500	Data Set 202C-Type, Test Procedures
668-102-512	Data Test Center 904A/B and 904C/D, Test Procedure—Data Sets 202C- and 202D-Types Loop-Back and Dynamic Tests.

4.02 A list of reference material giving further information on Data Set 202C-type is as follows:

- SD- and CD-1D048
- SD-1D060-01 Sheets J59, J400, J401, and J683
- Bell Systems Repair Specification 480.031
- P.E.L. 7287.