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## DATA SET 202E-TYPE DESCRIPTION AND OPERATION

### 1. GENERAL

**1.01** This section includes description, operation, and remote test information for Data Set 202E-type. Information concerning the business machine other than an identification of interface signals is not included.

**1.02** This section is reissued primarily to add information on Data Sets 202E10, E11, E12, and E13.

**1.03** Data Set models 202E1, E2, E7, and E9 have a rotary dial (X option) and differ in basic features on a modular basis. Their functional equivalents in a TOUCH-TONE® dial version (W option) are 202E10, E11, E12, and E13 respectively. These sets are identical except for the dial mechanism.

**1.04** Data Set 202E-type provides serial transmit only data service. These sets are capable of operating at speeds up to 1200 bits per second (bps) over switched network (DDD) with voltage signal interface. Data Sets 202E2, E7, E8, E9, E11, E12, and E13 are designed for voltage signal interface only. Data Set 202E1 and 202E10 are designed for either contact or voltage interface; however, maximum bit rate for contact interface is 600 bps. All data sets using voltage signal interface meet the requirements of EIA Standard RS-232-B. These sets are compatible with Data Set 202C-type.

**1.05** Data Set 202E-type provides the capability of switched network (two-wire) data transmission with alternate voice communication. Features of the different models of Data Set 202E-type are as follows:

- **202E1, E10**—These sets are factory-wired for voltage interface; to convert to the contact interface, refer to the section entitled Data Set 202E-Type, Theory Of Operation And Supplementary Information (592-018-150), or to SD-1D078-01. The key unit built into

the data sets provides for talk, tone, data, and test modes of operation.

- **202E2, E11**—These sets provide the transmitting business machine with the output of a reverse supervisory tone detector when in the data mode. This supervisory tone detector allows the business machine associated with the receiving data set to supervise the operation of the transmitter while data transmission is taking place.

- **202E7, E12**—These sets provide unattended automatic answer and remote test features. The automatic answer feature allows the unattended data set to answer a call, transmit an answer-tone, and place the data set in the data mode. The remote test feature is required in the more complex data sets to adequately conduct a test from a Data Test Center.

- **202E8 (Manufacture Discontinued)**—This set combines the features of Data Sets 202E2 and 202E7. The modules of Data Set 202E8 are not interchangeable with those of other models of Data Set 202E-type.

- **202E9, E13**—These sets combine the features of Data Sets 202E2 and 202E7.

**1.06** All Data Sets 202E-type (except 202E8) are convertible to any other Data Set 202E-type. The conversion methods are described in Section 592-018-150 and in SD-1D078-01.

**1.07** Power for Data Set 202E1 is supplied over the telephone loop from a central office battery. Data Sets 202E2, E7, E8, E9, E11, E12, and E13 require a power rectifier and an external transformer to power additional circuit packs.

**1.08** For detailed information concerning Data Set 202E type, refer to SD- and CD-1D078-01.

**2. PHYSICAL DESCRIPTION**

**2.01** Data Set 202E-type (Fig. 1) is a transmitting data terminal integrated with a rotary dial telephone set in a two-tone gray housing. It consists of an 11C Apparatus Unit, a 589AY Key Unit, and from two to seven modular printed wiring boards. (See Table A.) Early models use a 589AU Key Unit which is Manufacture Discontinued.

**2.03** The dimensions of the data set are shown in Fig. 1. It weighs approximately 7-3/4 pounds.

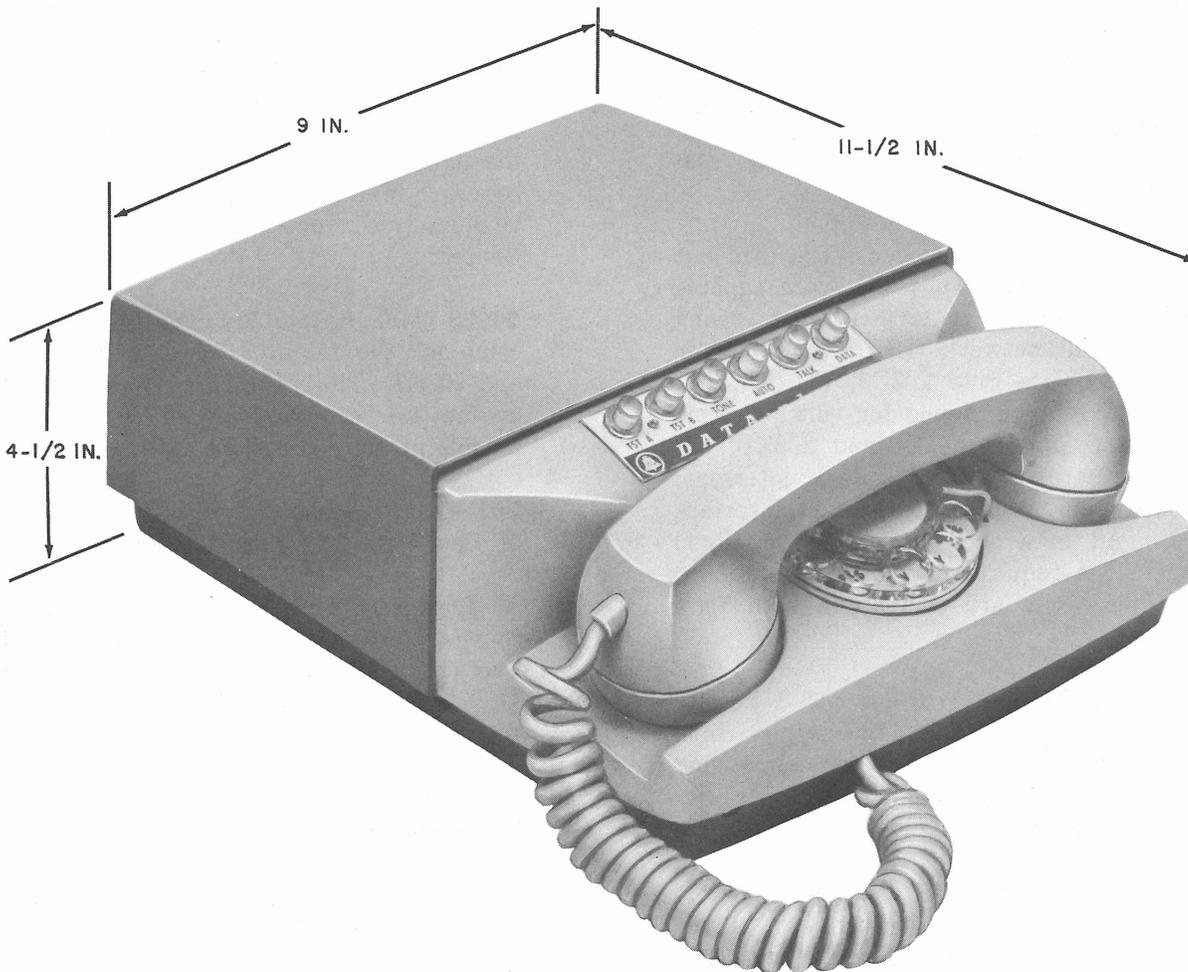
**2.04** A 25-pin connector KS-19087 L6 is provided at the rear of the data set for connection to the business machine. Connections to the

telephone line and ac power are made with a D4BJ-61 cord.

**2.05** External transformer KS-20426 L1 requires standard 115-volt ac power and supplies 24-volt ac power to the power rectifier module. The power rectifier module provides 24-volt dc power to the EIA interface module, reverse-channel module, and remote test module. Early models of Data Set 202E-type use a KS-16886 L2 transformer.

**2.06** Data Set 202E-type is provided with a 589AY Key Unit. These key buttons have the following purposes:

- The TALK button is used on all models of



**Fig. 1—Data Set 202E-Type**

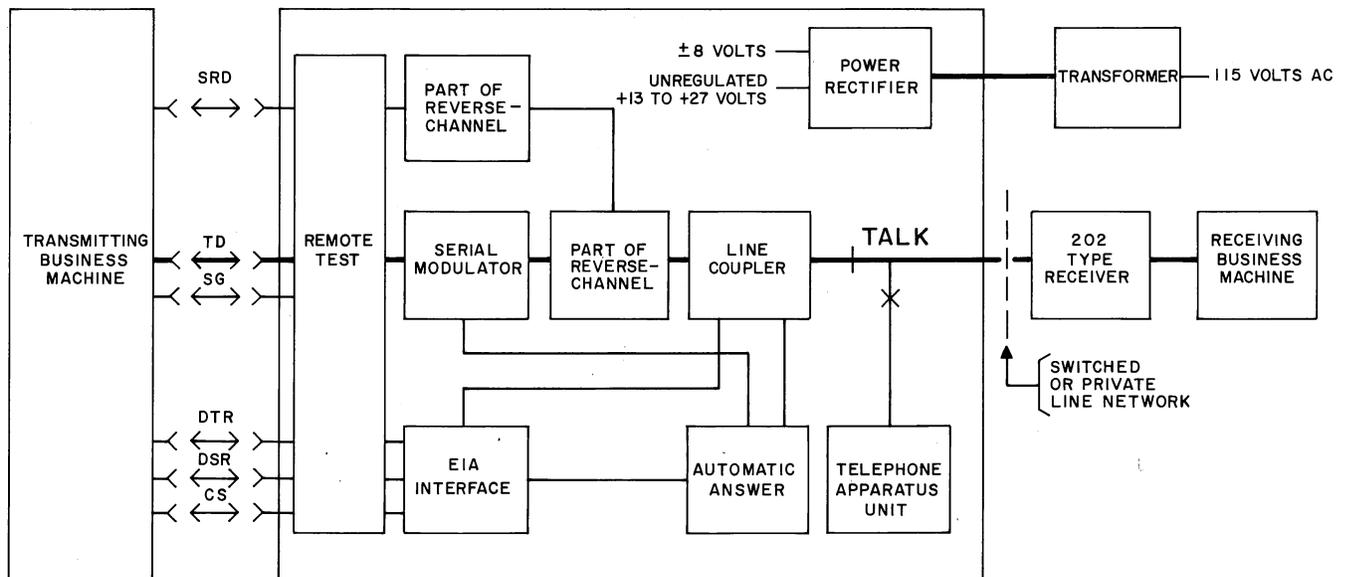


Fig. 2—Data Set 202E-Type—Functional Block Diagram

the data set. This button is depressed when voice communication is required.

employed when testing the data set from a remote location.

- The TONE button is used on all models of the data set. This button is depressed to generate an answer-tone when Data Set 202E-type answers a data call manually. This answer-tone signals the receiving data set operator that data transmission is about to begin. The answer-tone is also used to condition the telephone line for reverse-channel reception of the supervisory tone in the presence of forward data transmission.
- The AUTO button is used on Data Sets 202E7, E9, E12, and E13. This button is depressed for unattended operation.
- The DATA button is used on all models of the data set. This button is depressed to begin data transmission.
- The TST A button is used on all models of the data set. This button is employed when testing the data set from a remote location. On Data Sets 202E7, E8, E9, E12, and E13, a test lamp lights under the TST A button during the remote test.
- The TST B button is used on Data Sets 202E1, E7, E10, and E12. This button is

All buttons are a locking-releasing type except the DATA button (nonlocking-releasing type) which releases all other buttons on the up-stroke. Depression of a locking-releasing button releases any other button on the down-stroke.

### 3. FUNCTIONAL DESCRIPTION

**3.01** A functional block diagram of Data Set 202E-type with associated apparatus is shown in Fig. 2. Interface lead identification is given in Table B. Letters shown in parentheses under FUNCTIONAL DESIGNATION are to clarify abbreviations in Fig. 2.

**3.02** The transmitting business machine provides either contact closure or voltage interface signals over the Transmitted Data lead to the serial modulator in the data set. The serial modulator converts either type of signal to a frequency-shift signal which is passed through the line coupler to the telephone line. Data Set 202C-type at the receiving terminal converts the mark and space frequencies into interface signals which are processed by the receiving business machine.

**TABLE A**  
**PERMISSIBLE ARRANGEMENTS FOR DATA SET 202E TYPE**

FEATURE	202E1, E10	202E2, E11	202E7, E12	202E8	202E9, E13
Serial Modulator	BE22	BE22	BE22	BE16	BE22
Line Coupler *	BE58	BE58	BE58	BE6	BE58
EIA Interface	—	—	BE25	BE5	BE25
Power Rectifier	—	BE1	BE1	BE1	BE1
Automatic Answer	—	—	BE26	BE7	BE26
Reverse-Channel	—	BE24	—	BE8	BE24
Remote Test	—	—	BE23	BE17	BE23

\*Early models contain BE27 which is Manufacture Discontinued.

**TABLE B**  
**INTERFACE LEADS**

CONNECTOR J1 TERMINAL NUMBER	EIA DESIGNATION	FUNCTIONAL DESIGNATION	DATA SET 202
7	AB	Signal Ground (SG)	E1, E2, E7, E8, E9, E10, E11, E12, E13
2	BA	Transmitted Data (TD)	E1, E2, E7, E8, E9, E10, E11, E12, E13
12	SBB	Supervisory Received Data (SRD)	E2, E8, E9, E11, E13
9		+P (Test Voltage)	E2, E7, E8, E9, E11, E12, E13
10		-P (Test Voltage)	E2, E7, E8, E9, E11, E12, E13
20	CD	Data Terminal Ready (DTR)	E7, E8, E9, E12, E13
6	CC	Data Set Ready (DSR)	E7, E8, E9, E12, E13
5	CB	Clear To Send (CS)	E7, E8, E9, E12, E13

**3.03** The functions of the models of Data Set 202E type are as follows:

- **202E1, E10**—These sets contain a serial modulator and line coupler which convert business machine signals to voice-frequency tones suitable for transmission over the telephone network.
- **202E2, E11**—These sets are basically 202E1s with power rectifier and reverse-channel receiver modules added. The reverse-channel receiver allows the customer's terminal equipment to supervise data transmission by detecting a 387-Hz tone from the receiving terminal.
- **202E7, E12**—These sets are basically 202E1s with power rectifier, automatic answer, remote test, and an EIA interface module. (This set permits unattended operation.)
- **202E9, E13**—These sets are basically 202E1s equipped with power rectifier, automatic answer, remote test, reverse-channel receiver, and an EIA interface module. This set combines all of the functions of Data Sets 202E2 (202E11) and 202E7 (202E12).

**3.04** Data Set 202E-type contains a telephone set which may be used as a conventional telephone and as a coordinating voice circuit to set up data calls. With the TALK button depressed, the telephone apparatus unit and handset are connected to the telephone line and the line coupler is disconnected.

**3.05** The functional purpose and use of each module is covered in the following paragraphs.

- (a) The serial modulator is used in all Data Sets 202E-type. This module consists of an oscillator which is keyed between two frequencies depending on the input data. The voltage signal input is converted to mark and space frequency output signals of 1300 and 2100 Hz respectively. On Data Set 202E1 or 202E10 with contact closure input, mark and space frequencies are 1375 and 2025 Hz respectively. The modulator also generates a 2025-Hz answer-tone which is controlled by the automatic answer module on those sets with the automatic answer option, ie, 202E7, E8, E9, E12, and E13. Answer-tone is controlled by the TONE button on all Data

Sets 202E-type. The modulator is intended to be used in tandem with a line coupler.

- (b) The line coupler is used in all Data Sets 202E-type. This module provides means for connecting the data set to the customer loop and for insuring proper polarity of the central office battery supplying current to the data set. When the set is installed, the circuits of the coupler are adjusted to maintain the proper output power and output impedance to the telephone line. Lightning protection is also provided by this module.

- (c) The reverse-channel is used in Data Sets 202E2, E8, E9, E11, and E13. This module maintains supervision by detecting and monitoring a signal from the receiving terminal. The module detects a 387-Hz signal which has an amplitude equal to or greater than -48 dBm. The presence or absence of this reverse-channel tone is converted into a positive or negative voltage which is fed to the transmitting business machine over the Supervisory Received Data (SRD) lead. In Data Sets 202E8, E9, and E13, this signal passes through normally closed relay contacts in the remote test module before being fed to the transmitting business machine.

- (d) The automatic answer module is used in Data Sets 202E7, E8, E9, E12, and E13. This module provides timing and switching functions required to detect ringing, answer a call, transmit a 2025-Hz answer-tone, provide a  $60 \pm 40$  millisecond (ms) quiet period, and connect the serial modulator to the line. The automatic answer module causes the EIA module to generate Data Set Ready (DSR) and Clear to Send (CS) control signals when the automatic answer module completes its cycle.

- (e) The EIA interface module is used in Data Sets 202E7, E8, E9, E12, and E13. This module accepts a Data Terminal Ready (DTR) signal from the transmitting business machine and sends DSR and CS signals back to the machine. These signals are exchanged by way of control circuits in the remote test module. An ON signal (+5 to +25 volts) on the DTR lead causes the signal flow path to be completed through the line coupler. After passing the DSR ON indication, the module causes the CS ON indication to be delayed  $325 \pm 125$  ms to insure

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completion of the switching functions in the automatic answer sequence.

(f) The remote test module is used in Data Sets 202E7, E8, E9, E12, and E13. This module is required in the more complex sets to adequately test the data set from a telephone company Data Test Center. The test includes a check of the data frequencies, automatic answer and EIA interface module operation, and reverse-channel sensitivity.

(g) The power rectifier module is used in Data Sets 202E2, E7, E8, E9, E11, and E13. This module accepts an input of 25 volts ac from an external transformer. The output of the module is  $\pm 8$  volts with respect to ground (pin 7) and an unregulated +13 to +27 volts.

### 4. OPERATION

**4.01** The method of operation of Data Set 202E-type is as follows:

(a) **202E1, E10**—To originate a data call, the attendant depresses the TALK button and places a call to the receiving station in the normal manner. The receiving station must be placed in the data mode first. When this occurs, the attendant will hear a high-pitched tone. When this tone changes to a lower pitch or goes off, the attendant will insure that the business machine is ready to transmit data and will depress the DATA button. To answer a data call, the attendant must depress the TALK button and answer in the normal manner. When verbal agreement is made to transmit data, the attendant must depress the TONE button, wait approximately two seconds, and depress the DATA button.

(b) **202E2, E11**—Manual operation of Data Set 202E2 (202E11) is the same as the 202E1 (202E10).

(c) **202E7, E12**—Manual operation of Data Set 202E7 (202E12) is the same as the 202E1 (202E10). To prepare Data Set 202E7 (202E12) for automatic operation, the attendant places the handset on-hook, depresses the AUTO button, and causes the transmitting business machine to place the DTR interface lead in the ON state. The data set can then detect ringing, answer a call, condition the data set, and notify the business machine to transmit data.

(d) **202E9, E13**—Operation of Data Set 202E9 (202E13) is the same as the 202E7 (202E12).



***For manual operation of all sets, the handset must be kept off-hook during data transmission.***

**4.02** A call is terminated by placing the handset on-hook. Data Sets 202E7, E9, E12, and E13 can terminate a call by causing an OFF (-5 to -25 volts) condition to exist on the DTR lead for a minimum of 50 milliseconds.

**4.03** To switch to the talk mode with Data Sets 202E7, E9, E12, and E13 after the data set has automatically answered a call, the telephone handset is placed off-hook and the TALK button is depressed. To return to the data mode after this interruption, the attendant should proceed as given in 4.01.

### 5. REMOTE TEST

**5.01** The remote test procedure for Data Set 202E-type is as follows:

(a) **202E1, E10**—The Data Test Center calls the data station and the call is answered in the normal manner. The attendant of the data set is then instructed to remain off-hook, depress the TST A button, wait approximately one minute, and then depress the TALK button for further instructions. The Data Test Center then instructs the attendant of the data set to remain off-hook, depress the TST B button, wait approximately one minute, and then depress the TALK button. While in the test A mode, the level and frequency of the marking signal are measured. While in the test B mode, the level and frequency of the spacing signal are measured.

(b) **202E2, E11**—The Data Test Center calls the data station and the call is answered in the normal manner. The attendant of the data set is then instructed to remain off-hook, depress the TST A button, wait approximately one minute, and then depress the TALK button. During the one-minute test interval, the level and frequency of the marking and spacing signals are measured and the sensitivity and bandwidth of the reverse-channel tone detector are determined.

- (c) **202E7, E12**—The Data Test Center places a call to the data station and instructs the attendant to depress the TST A button, verify that the TST A button lights, and then depress the TALK button. The attendant will then be instructed to place the handset on-hook and depress the TST A button. After ringing is answered, the attendant will wait approximately one minute and then depress the TALK button. The Data Test Center will then instruct the data set attendant to depress the TST B button and wait approximately one minute before depressing the TALK button. This will terminate the test. With the TST A button on the data set depressed, the Data Test Center receives and measures the level and frequency of either the mark or space signal. With the TST B button depressed, the Data Test Center receives and measures the level and frequency of the other data signal.
- (d) **202E8**—The Data Test Center places a call to the data station and instructs the attendant

to place the handset on-hook and wait for a second call. Upon receiving the second call, the TST A button is depressed thereby lighting the test lamp. The remainder of the test is controlled by the remote test module and is terminated automatically. While the data set is in the test mode, the Data Test Center measures the level and frequency of the mark and space signals, the level and frequency of the answer-tone, and the sensitivity and bandwidth of the reverse-channel tone detector.

- (e) **202E9, E13**—Remote test procedure for Data Set 202E9 (202E13) is the same as for the 202E7, (202E12) with the exception that the TST B button is not used on Data Set 202E9 (202E13). While the data set is in the test mode, the Data Test Center measures the level and frequency of the mark and space signals, the level and frequency of the answer-tone, and the sensitivity and bandwidth of the reverse-channel tone detector.