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

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Fig. 1—Data Set 202T-Type, Front View

1. GENERAL

1.01 This section contains the physical and functional description and operating procedures for data set (DS) 202T-type (Fig. 1).

1.02 This section is reissued to include information concerning DS 202T-L1A and JY4 reverse channel circuit pack. Due to extensive revision, arrows ordinarily used to denote changes have been omitted.

1.03 The DS 202T is an asynchronous transmitter-receiver of medium-speed binary serial data. It uses frequency-shift-keying modulation and is capable of transmitting and receiving data at speeds up to 1400 bits per second (bps) on basic 3002 private lines. Speeds between 1400 and 1800 bps require C2 conditioning. When used as a 2-wire data set, it can be equipped with a 387-Hz reverse channel for signaling speeds up to 5 bps. With reverse channel circuit pack JY1 or JY2 installed, DS 202T-L1 is limited to a maximum bit rate of 1200 bps. Data set 202T-L1A with JY4 reverse channel circuit pack installed can operate up to a maximum rate of 1800 bps (over C2-conditioned lines). Data set 202T or DS 202T-L1 or DS 202T-L1A is line compatible with all 202-type sets and can be used (with or without reverse channel) to replace DS 202D and can be used (without reverse channel) to replace DS 202R. In addition, DS 202T-type provides status indicator lamps and built-in test features for local self test, analog loopback tests, and remote tests.

Note: The private line channel must be arranged for -16 dBm receive level and 0 dBm transmit level at the data set telephone interface.

1.04 In 2-wire service, the data set can transmit or receive (but not simultaneously). With the reverse channel option installed, signaling (at 5 bps) is possible in the opposite direction to the primary channel. The local copy feature may be provided for either or both channels by option switches. The data set terminates the 2-wire line with a 600-ohm impedance.

1.05 In 4-wire service, the data set can transmit and receive simultaneously and independently (duplex operation). The reverse channel is not provided in 4-wire service. The data set terminates each pair of the 4-wire line with a 600-ohm impedance.

1.06 The DS 202T-type is designed to work with the data auxiliary set (DAS) 829-type in single or multiple arrangements.

1.07 The following is a specification summary for DS 202T-type:

Operation: Asynchronous, binary, serial.

Modulation: Frequency shift keying.

Rate (DS 202T-L1): Up to 1400 bps on basic 3002 private line without reverse channel. Up to 1800 bps on C2-conditioned 3002 private line without reverse channel. Maximum bit rate of 1200 bps when data set is equipped with reverse channel.

Rate (DS 202T-L1A): Up to 1400 bps channel and up to 1200 bps with reverse channel on basic 3002 private line. Up to 1800 bps on C2-conditioned 3002 private line with or without reverse channel.

Interface Voltage: As specified in Electronic Industries Association (EIA) Standard RS-232C.

Mode: Half duplex (2-wire) or duplex (4-wire)

Power: 105 to 129 Vac at 57 to 63 Hz. A single data set consumes a maximum of 6 watts.

2. PHYSICAL DESCRIPTION

2.01 The DS 202T-type is list coded as follows:

List 1—2-wire or 4-wire data set circuit pack without reverse channel

List 1A—2-wire or 4-wire data set circuit pack without reverse channel

List 2—Data set housing, interface connectors, power transformer, and M8K connector cord

List 3—JY1 reverse channel circuit pack.

List 3A—JY2 reverse channel circuit pack.

List 3B—JY4 reverse channel circuit pack.

List 4—Data set housing and data set interface connectors.

A. DS 202T-L1 or 202T-L1A

2.02 Data set 202T-L1 or 202T-L1A is contained on a printed circuit wiring board (Fig. 2). There are three test switches and six status indicator lamps on the faceplate of the printed circuit wiring board.

2.03 The status indicator lamps monitor test functions and customer interface signals. The lamp names and their normal functions are as follows:

- ***ON:*** Indicates that power is applied to the data set.
- ***MR (Modem Ready):*** Indicates the status of the data-set-ready lead. The lamp lights when the data set is in the data mode (data set ready lead is ***on***).
- ***RS (Request-to-Send):*** Indicates the status of the request-to-send lead from the customer interface. The lamp lights whenever the lead is ***on,*** or during local self test and remote test (2-wire), or when the continuous carrier option (ZN) is installed.
- ***CS (Clear-to-Send):*** Indicates the status of the clear-to-send lead from the data set. The lamp lights whenever the lead is ***on,***

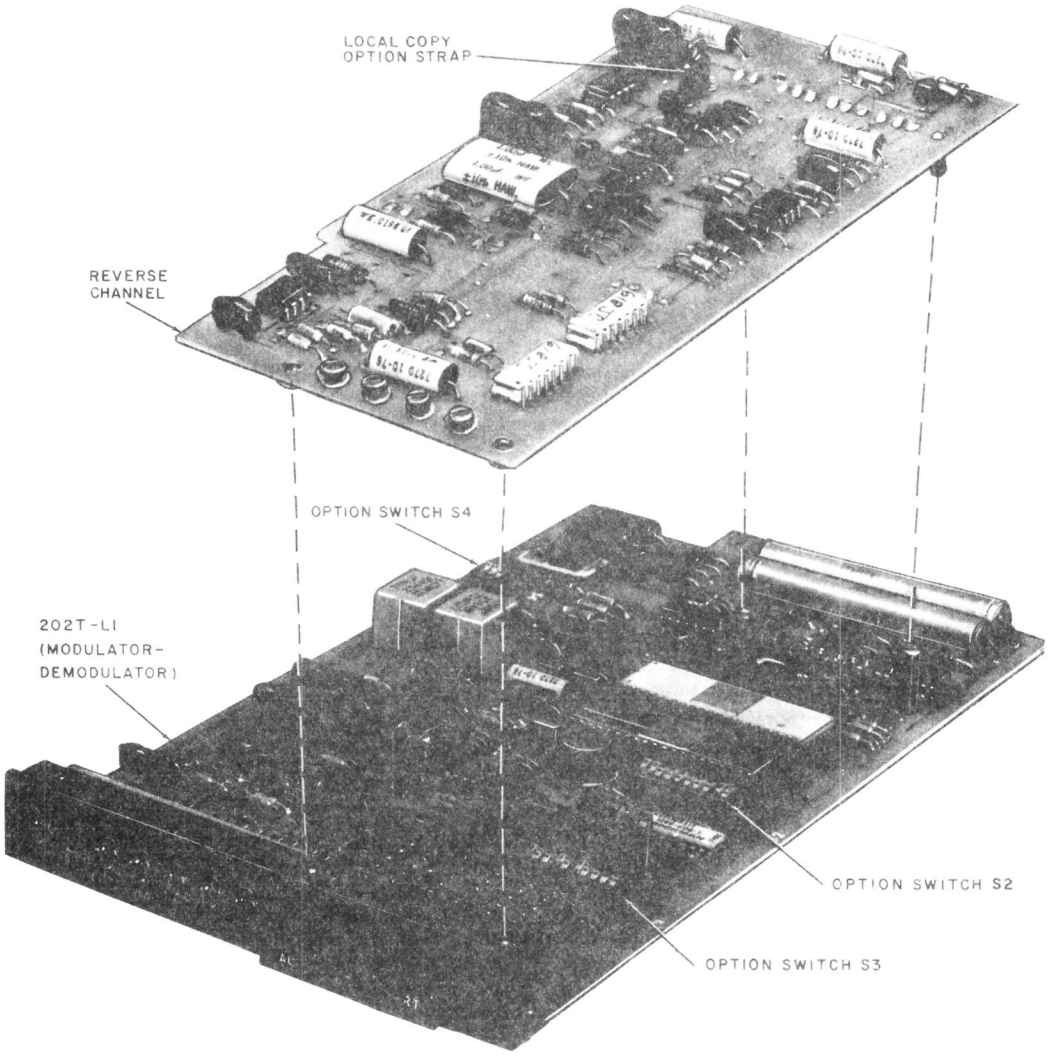

Fig. 2—Data Set 202T-L1A/3B

or during local self test and remote test (2-wire), or when the continuous carrier option (ZN) is installed.

- ***CO (Carrier On):*** Indicates the status of the received line signal detector lead from the data set. The lamp lights whenever the lead is in the ***on*** condition, or during local self test and remote test (2-wire).

- ***TM (Test Mode):*** Indicates that the data set is in the test mode. The lamp

lights whenever one of the test switches is depressed. If an error is detected during local self test, the TM lamp goes off.

2.04 The data set is equipped with three pushbutton switches which are accessible at the front panel. The functions of the switches are as follows:

- ***AL (Analog Loopback):*** This switch is a push-to-operate, push-to-release type. When the button is operated, the TM lamp lights and the output of the data set transmitter is looped back to the receiver input for test purposes.

- ***LT (Local Self Test):*** This switch is a push-to-operate type and must be held in during the test. When the switch is depressed, all status indicator lamps light to provide a lamp test. The output of the transmitter is looped to the input of the receiver and a random 63-bit word is transmitted at 1547 bps.

- ***RT (Remote Test):*** This button is a push-to-operate, push-to-release type. If the data set is operating 4-wire, the RT switch connects received data to send data. This conditions the data set to operate as a repeater for remote testing purposes. If the data set is operating 2-wire, the RT switch conditions the data set to be remote tested from a test center.

2.05 Data set 202T-L1, 202T-L1A, 202T-L1/3, 202T-L1/3A, or 202T-L1A/3B can be used in a 39A1 or 40B1 data mounting or in the housing provided by list 2 or 4. The BSPs associated with the 39A1 and 40B1 data mounting are listed in Part 6 (REFERENCES).

B. DS 202T-L1/2 or 202T-L1A/2

2.06 The DS 202T-L1/2 or 202T-L1A/2 provides the housing, interface connectors, power transformer, and M8K connector cord in addition to the list 1 data set described in paragraph 2.02. The enclosure for the data set consists of front and rear molded black plastic covers mounted on an extruded aluminum housing. The housing has a brushed finish. The top surface of the housing is depressed to allow for nesting of several housings. The overall dimensions of the data set are 5.8 inches across the front, 2.2 inches high, and 10.8 inches deep. The weight is 3-1/2 pounds.

2.07 The housing has two interface connectors and a power cord at the rear of the set (Fig. 3). One connector is a KS-19087-L6 type and provides the digital interface leads to the customer-provided terminal equipment. The other connector is a KS-19088-L22 type and provides the interface connections for the telephone network. The power cord is a 4-conductor, spade-ended type.

2.08 A KS-21239-L4 or -L5 transformer is also included as part of list 2. This transformer is a plug-mounted type designed to mount in a standard 117-Vac 3-conductor outlet. A tab is provided to secure the plug to the outlet and prevent it from being accidentally unplugged. This transformer provides 24 volts ac to the power rectifier in the data set.

Caution: If the outlet has a metal cover, do not remove the center screw to mount the transformer. When this screw is removed, it is possible for the metal cover to fall across the prongs of the transformer.

2.09 The equipment provided as list 2 is also available as the 47B1 data mounting.

C. DS 202T-L1/3, 202T-L1/3A, or 202T-L1A/3B

2.10 Data set 202T-L1/3 (Fig. 2), 202T-L1/3A or 202T-L1A/3B provides everything provided by list 1 plus a reverse channel circuit pack (JY1, JY2, or JY4). This circuit pack is a printed wiring board measuring 1 inch high, 3.4 inches wide, 7.5 inches long, and weighing 0.5 pounds. It includes the filters, switching circuits, and demodulator circuits needed to perform the reverse channel function. Interconnection to the data set is accomplished by 20 female contact receptacles mounted on the bottom of the reverse channel circuit pack. This circuit pack mounts on contact posts on the data set and covers switch assemblies S2 and S3. The circuit pack must be removed when installing or removing options.

2.11 The JY1 circuit pack is rated MD and is replaced by the JY2. In addition to the features provided by the JY1 circuit pack, JY2 provides independent operation of reverse channel. Independent operation means that the reverse

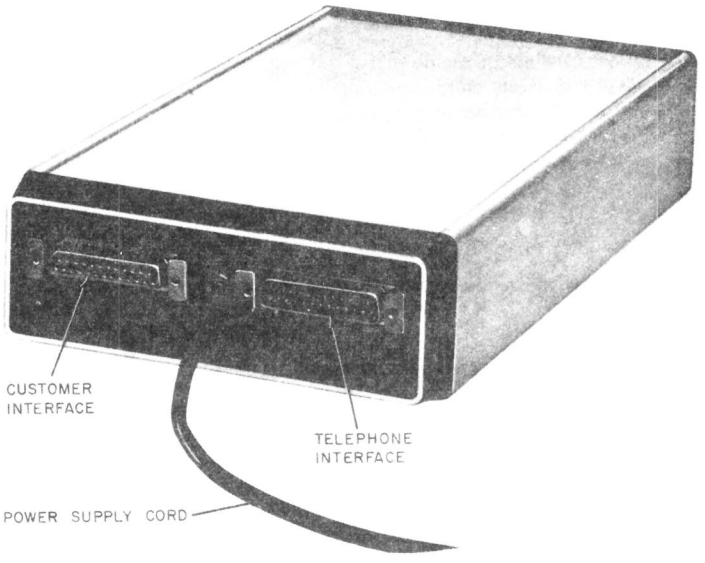

Fig. 3—Data Set 202T-Type, Rear View

channel circuits are able to receive a signal regardless of the state of the request-to-send circuit. The JY1 circuit pack is able to receive a signal from the distant-end data set only if the request-to-send circuit is ***on***.

2.12 The JY4 reverse channel circuit pack is designed for use with DS 202T-L1A but may also be used with DS 202T-L1. In addition to the features provided by the JY2 reverse channel circuit pack, the JY4 together with improvements incorporated in the DS 202T-L1A allows for operation of the primary channel at speeds up to 1800 bps over 3002 C2-conditioned private lines. (JY2 helped to limit the primary channel operation of DS 202T-L1 to 1200 bps in all cases.)

D. DS 202T-L1/2/3, 202T-L1/2/3A, or 202T-L1A/2/3B

2.13 Data set 202T-L1/2/3, 202T-L1/2/3A, or 202T-L1A/2/3B provides everything provided by list 1 plus the housing, connectors, power transformer, and M8K cord provided by list 2 and the reverse channel circuit pack provided by list 3, 3A, or 3B.

2.14 Data set 202T-L1, L1/3, L1/3A, or L1A/3B can be installed in a variety of configurations from a single installation to a multiple installation of up to 48 data sets:

- Single installation consisting of DS 202T-L1/2, L1A/2, L1/2/3, L1/2/3A, L1A/2/3B, or L1A/4.
- Multiple installation of a maximum of 16 DS 202T-L1 or L1A (without reverse channel) in a 39A1 or 40B1 data mounting. Refer to Part 6 for a list of BSPs which contain more information.
- Multiple installation of a maximum of eight data sets 202T-L1/3, 202T-L1/3A, or 202T-L1A/3B (with reverse channel) in a 39A1 or 40B1 data mounting. Refer to Part 6 for a list of BSPs which contain more information.

3. FUNCTIONAL DESCRIPTION

3.01 This part contains a brief description of the data set test modes and interfaces. Refer

to Fig. 4 for a simplified block diagram of DS 202T-type.

3.02 The DS 202T-type consists of an oscillator, transmitter, receiver, test circuitry, and power rectifier on one printed wiring board. An optional reverse channel transceiver can be provided on a separate circuit pack.

TEST MODES

3.03 The data set test modes are as follows:

- Analog loopback
- Local self test
- Remote test (2-wire)
- Remote test (4-wire).

Three test switches on the front of the data set are labeled AL, LT, and RT.

3.04 ***Analog Loopback Test:*** In the analog loopback mode, data signals applied on the BA (transmitted data) interface lead with CA (request-to-send) positive are processed through the transmitter and looped back through the receiver to the BB (received data) interface lead. The customer interface leads may be monitored for proper operation. Depressing the AL switch until it locks conditions the data set as follows:

(a) Disconnects the data set from the line and terminates the line in 600 ohms.

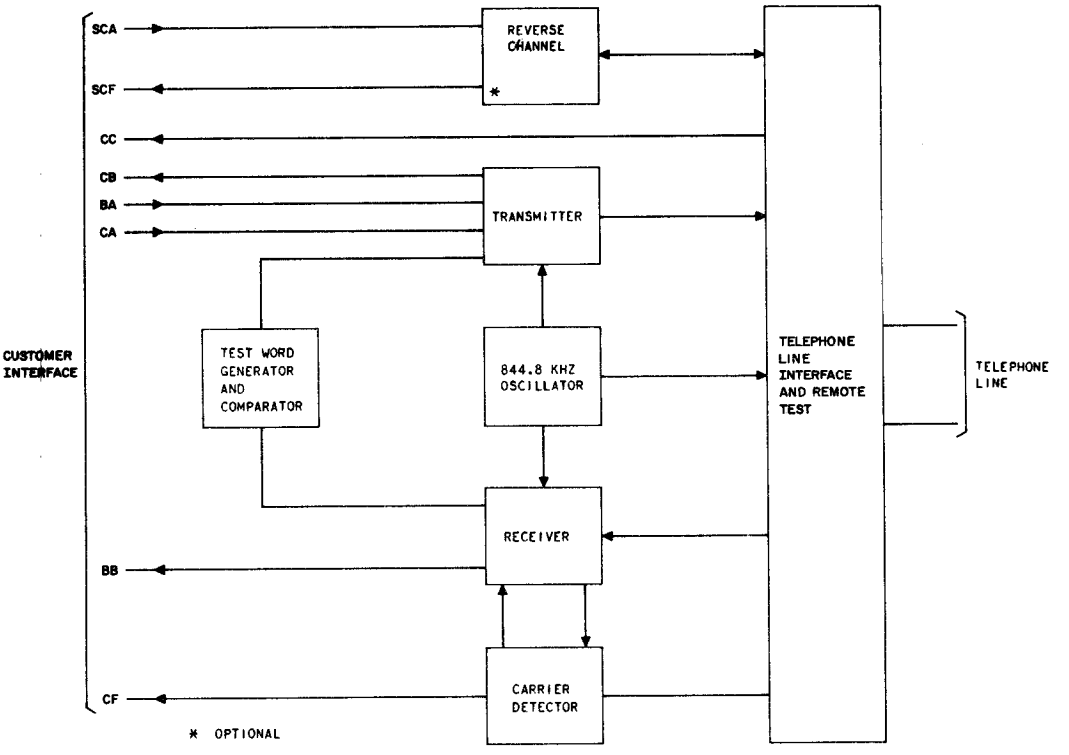

Fig. 4—Data Set 202T-Type, Simplified Block Diagram

(b) Modifies the feedback path from transmitter to receiver to decrease the signal level into the receiver on DS 202T-L1. The level is not decreased in DS 202T-L1A. Rather, the switch is used to enable the minimum compromise delay equalization option (ZV) to reduce distortion during the test.

(c) Lights the TM (test mode) lamp and holds the MR lamp off. The data set ready (CC) lead is held ***off*** on DS 202T-L1. The state of (CC) during this test is optional on DS 202T-L1A.

3.05 ***Local Self Test:*** When the nonlocking LT button is depressed, the data set is conditioned for self test as follows.

(a) All interface leads are made inoperative and the data line is terminated in 600 ohms.

(b) All status indicator lamps light to check for lamp failures.

(c) The feedback path from transmitter to receiver of DS 202T-L1 (the primary channel input to the shaping filter of DS 202T-L1A is attenuated) for a reduced signal level into the receiver.

(d) A repeating 63-bit pseudo-random word (identical to the test word in the 914- and 903-types data test set) is generated at 1547 bps.

(e) The test word is processed by the transmitter and receiver circuitry and the resulting word is compared to the original word.

(f) If an error is detected, the TM lamp goes off.

3.06 A properly operating data set will sometimes fail in a self-test interval of more than 15 seconds because an error in only one bit will cause the TM lamp to go off. However, more than one failure in five successive tests of 15 seconds duration should not occur.

3.07 ***Remote Test (2-Wire):*** The remote test mode for 2-wire operation allows the attendant at the serving test center to test data set circuitry with the exception of the customer interface. When the locking RT button is depressed, the data set is conditioned for remote test as follows:

(a) All customer interface leads are made inoperative and all status indicator lamps light.

(b) A repeating 63-bit pseudo-random word is generated at 1547 bps.

(c) The feedback path from transmitter to receiver is modified in order to reduce the level of the locally generated signal entering the receiver.

(d) The test word is processed by the transmitter and receiver circuitry, and the resulting word is compared to the original word. In addition, the test word is transmitted to the serving test center.

(e) If an error is detected, constant spacing (2200 Hz) is transmitted to the serving test center instead of the random word.

3.08 At the serving test center, the 63-bit pseudo-random word can be checked for errors to establish an error rate (caused by the channel). The attendant at the test center can apply a tone to the line to cause errors in the internal loopback signal of the data set under test. This will cause the data set to transmit constant spacing. If the data set under test is equipped with reverse channel, it will transmit steady marking (1200 Hz) whenever 387 Hz is transmitted by the test center and detected by the reverse channel receiver.

3.09 ***Remote Test (4-Wire):*** The remote test for a 4-wire data set is a digital loopback test. In the digital loopback mode, the attendant at the test center can test data set circuitry with the exception of the customer interface circuits. Depressing the locking RT switch conditions the data set as follows.

(a) All customer interface leads are made inoperative and the ON and TM lamps light.

(b) The output of the demodulator is coupled to the input of the modulator so that the attendant at the test center can perform a digital loopback test.

INTERFACE

A. Customer Interface

3.10 The customer interface is accessible through a 25-pin female connector at the rear of the housing. The pin assignments, lead designations, and lead functions are given in Table A.

3.11 ***Protective Ground (AA):*** This lead is electrically bonded to the data set housing and chassis. It is connected to local power ground through the power transformer. Later model data sets do not provide frame ground at the interface.

3.12 ***Transmitted Data (BA):*** Signals on this lead are generated by the transmitting data terminal and are transferred to the modulator of the data set for transmission to the distant end. A positive signal is a binary "0" or space, and a negative signal is a binary "1" or mark. The CPE must not transmit data unless an ***on*** condition is present on the clear-to-send (CB) and data set ready (CC) interface circuits (except for analog loopback test, described later). The transmitting CPE should hold BA in the marking condition when no data is to be transmitted. With 0 volts on the BA circuit and the clear-to-send and data set ready circuits ***on***, the BA circuit is in an indeterminate state and either a marking or spacing data signal will be transmitted.

3.13 ***Received Data (BB):*** Signals on this lead are generated by the receiving data set in response to data signals received from the distant data set. With the local copy option installed

TABLE A

CUSTOMER INTERFACE

LEAD NO.	FUNCTION	EIA DESIGNATION (RS-232-C)
1	Protective Ground*	AA
2	Transmitted Data	BA
3	Received Data	BB
4	Request-to-Send	CA
5	Clear-to-Send	CB
6	Data Set Ready	CC
7	Signal Ground	AB
8	Received Line Signal Detector	CF
9	Positive 14 Volts	—†
10	Negative 14 Volts	—†
11 & 19	Secondary Request-to-Send	SCA
12	Secondary Received Line Signal Detector	SCF
25	Carrier Detector Reset	Unassigned

* Not provided on later models of DS 202T-L1 or on DS 202T-L1A.

† Reserved for data set testing.

in half-duplex operation, the BB signal follows the transmitted data signal delayed by less than 2 ms, and may be used to monitor the transmitted data.

3.14 ***Request-to-Send (CA):*** Signals on this lead are generated by the CPE to condition the local data set to transmit data. With the data set ready lead ***on***, the carrier is transmitted in less than 1 ms after the CA lead turns ***on***. The ***on*** condition must be maintained whenever the CPE has information ready for transmission. The data set transmits all signals on the transmitted data lead while the ***on*** condition is maintained on the request-to-send and clear-to-send leads. In half-duplex operation, the ***off*** condition of request-to-send holds the data set in the receive mode, and the ***on*** condition holds the data set in the transmit mode. CPE designed for either transmit-only or duplex operation may continuously hold CA in the ***on*** condition. If the data set is equipped with the JY2 or JY4 reverse channel circuit pack, a signal may be received on the reverse channel regardless of the state of the local CA lead. This type of operation is called independent reverse channel operation. If the data set is equipped with the JY1 reverse channel circuit pack, the local CA circuit must be ***on*** in order for the reverse channel to be able to receive. This is called dependent reverse channel operation.

3.15 ***Clear-to-Send (CB):*** The ***on*** condition of the CB lead is a response to an ***on*** condition on the request-to-send circuit delayed by 180, 60, 30, or 8 ms, depending on the clear-to-send interval option selected. The ***on*** state of CB indicates to the CPE that signals presented on the transmitted data lead will be transmitted to the communication channel. The ***off*** condition is an indication to the CPE that it should not transfer data on the transmitted data lead. When request-to-send is turned ***off*** by the CPE, CB goes ***off*** in less than 1 ms.

3.16 ***Data Set Ready (CC):*** Signals on the CC lead indicate the mode of the data set. The ***on*** condition indicates that the data set is in the data mode and is capable of transmitting and receiving data signals. The ***on*** condition is required in conjunction with an ***on*** condition on the request-to-send and clear-to-send circuits when transmitting data. The ***off*** condition indicates that the data set is in some mode other than the data mode. The ***on*** condition of this circuit should not be interpreted to mean that a communication channel has been established to a remote data station or to determine the status of any remote terminal equipment.

3.17 ***Signal Ground (AB):*** This circuit establishes the common ground reference potential for all interface circuits except protective ground. This circuit is normally connected to protective ground to minimize the introduction of longitudinal power line noise into electronic circuitry through the power transformer. Depending on local procedures and conditions, this connection to protective ground can be removed by the telco installer.

3.18 ***Received Line Signal Detector (CF):*** An ***on*** condition on the CF lead indicates that the data carrier is being received and has been received for at least 7 ms (option Q) or 23 ms (option N). This circuit normally does not turn ***on*** in the presence of noise, out-of-band signals or other non-FSK signals even when the fast mode carrier detection option (Q) is selected. When the data carrier is lost due to an end of transmission or to a telephone line interruption, the ***off*** condition follows after a 10 ms time delay. The ***off*** condition on CF causes the received data circuit to be clamped to the mark condition if the clamp option (F) is installed. The CF circuit responds to carrier signals from either the local or distant transmitting data set when optioned for local copy of the primary channel (option ZA). The CF circuit is ***off*** during the squelch interval when the squelch option is used.

3.19 ***Circuits 9 and 10:*** These circuits originate in the data set for use by the telco personnel in data set testing. Pin 9 provides an access to the +14 volt dc supply; pin 10 provides an access to the -14 volt dc supply. The CPE must not be connected to these leads.

3.20 ***Secondary Request-to-Send (SCA):*** This circuit is available on data sets equipped with reverse channel, and is used to provide communication from the receiving data set to the transmitting data set simultaneously with the primary data channel.

3.21 ***Secondary Received Line Signal Detector (SCF):*** This lead is provided only on data sets equipped with reverse channel. It is used to signal the data set transmitting on the primary channel regarding conditions at the receiving data set simultaneously with the transmission

on the primary data channel. With the local copy option for the reverse channel (option ZE), the SCF circuit responds to reverse channel carrier from either the local or distant data set. If the data set is equipped with the JY1 reverse channel circuit pack, the request-to-send (CA) lead must be ***on*** in order to receive the reverse channel signal from the distant data set. If the data set is equipped with the JY2 or JY4 reverse channel circuit pack, the reverse channel can receive independently of the state of the request-to-send (CA) lead.

3.22 ***Carrier Detector Reset (Non-EIA):*** This circuit is used to reset the carrier detector on systems requiring fast turnaround. A positive pulse of greater than 0.2 μs duration resets the carrier detector so that the receiver is ready for new data. The carrier detector reset terminator is ***off*** for a negative applied voltage or if the terminal is left unconnected. An option is provided to disable the carrier detector reset terminator.

B. Telephone Line Interface

3.23 The telephone interface is a 25-pin male connector which provides access through the M8K cord to the DAS 828-type or 829-type. The pin assignments, lead designations, and lead descriptions are given in Table B.

4. OPTIONS

4.01 The DS 202T-type is provided with a number of options. Refer to Tables C and D for a summary of options provided with DS 202T-L1 and 202-L1A respectively. Refer to Section 592-031-200 for a description of these options.

4.02 Options are installed and removed by means of switches (DS 202T-type) and strapping plugs (DS 202T-L1 only) on the data set circuit pack, by a strapping plug on the reverse channel circuit pack (when provided), and by a screw switch on the backplane (frame ground to signal ground option).

4.03 Refer to Tables E and F for a summary of options recommended for use with DS 202T-L1 and 202T-L1A.

5. OPERATION

5.01 Attendant operation of DS 202T-type is limited to operation of the three test switches and observation of the six status indicators. The data set is in the data mode under the following conditions:

- All test switches are in the OUT position.
- ON and MR status indicators are lighted.

TABLE B

TELEPHONE LINE INTERFACE

PIN NUMBER	DESIGNATION	DESCRIPTION
7	DT1	First tip and ring pair. In 2-wire operation, the data signals are transmitted and received through these terminals. In 4-wire operation, data signals are transmitted through these terminals.
8	DR1	
9	DT	Second tip and ring pair. In 2-wire operation, these terminals are not used. In 4-wire operation, data signals are received through these terminals.
10	DR	
11	TEK6	A relay contact (provided by DAS 828- and 829-types) may be connected to these terminals to remotely control the data set ready (CC) and clear-to-send (CB) customer interface drivers.
13	TEK5	

5.02 The data set is in the test mode when any of the test switches is depressed and the TM status indicator is lighted. Refer to Section 592-031-500 for test procedures and requirements.

6. REFERENCES

6.01 The following Bell System Practices provide additional information concerning DS 202T-type and data stations using DS 202T-type.

SECTION	TITLE
590-102-130	39A Data Mounting—Identification
590-102-131	40-Type Data Mountings—Identification
590-102-137	47-Type Data Mounting—Identification
592-031-180	Data Set 202T Transmitter-Receiver—Summarizing Specification
592-031-200	Data Set 202T-Type Transmitter-Receiver—Installation and Connections
592-031-300	Data Set 202T Transmitter-Receiver—Maintenance
592-031-500	Data Set 202T-Type Transmitter-Receiver—Test Procedures and Maintenance
592-861-100	Data Station Using Data Set 202T—Description and Operation
592-861-200	Data Station Using Data Set 202T—Installation
592-861-500	Data Station Using Data Set 202T—Test Procedures
598-080-100	Data Auxiliary Set 828A—Description and Operation
598-080-200	Data Auxiliary Set 828A—Installation
598-080-101	Data Auxiliary Set 828C—Description and Operation
598-080-201	Data Auxiliary Set 828C—Installation
598-082-100	Data Auxiliary Set 829-Type Channel Interface Units—Voiceband Private Line Channels—Description
666-511-502	Test of Data Services Provided by Data Set 202T From a Private Line Test Room

6.02 Detailed information concerning DS 202T-type is also contained in CD- and SD-1D243-01.

TABLE C

DATA SET 202T-L1 OPTIONS

FEATURE	OPTION	DESCRIPTION		SWITCH SETTING										PROVIDE
				S3 Switch Contact Setting On Transmitter-Receiver										
				1	2	3	4	5	6	7	8	9	0	
4-Wire Operation	ZK*			0	0	X	X	0	0	0	X	X	X	One Per Data Set
2-Wire Operation w/o Reverse Channel	ZD			X	0	X	0	0	X	X	0	0	0	
2-Wire Operation With Reverse Channel	ZC†			X	X	0	0	X	0	X	0	0	0	
				S2 Switch Contact Setting On Transmitter-Receiver										
				1	2	3	4	5	6	7	8	9	0	
4-Wire Operation	ZK*			X	—	—	—	—	—	—	—	—	—	One Per Data Set
Local Copy on Primary Channel in 2-Wire	ZA	IN		X	—	—	—	—	—	—	—	—	—	
	ZB†	OUT		0	—	—	—	—	—	—	—	—	—	
Soft Turnoff and Squelch Intervals		Soft Turnoff	Squelch											One Per Data Set
	Z	0	0	—	—	0	X	—	—	—	—	0	X	
	Y*	8 ms	0	—	—	0	X	—	—	—	—	0	0	
	X	24 ms	0	—	—	0	X	—	—	—	—	X	0	
	W	0	9 ms	—	—	0	0	—	—	—	—	0	X	
	V	0	156 ms	—	—	X	0	—	—	—	—	0	X	
	T	8 ms	9 ms	—	—	0	0	—	—	—	—	0	0	
	S	8 ms	156 ms	—	—	X	0	—	—	—	—	0	0	
	R	24 ms	156 ms	—	—	X	0	—	—	—	—	X	0	
Fast Carrier Detection	Q*	IN		—	—	—	—	0	—	—	—	—	—	One Per Data Set
	N	OUT		—	—	—	—	X	—	—	—	—	—	
Clear-to-Send Interval	M*	8 ms		—	—	—	—	—	0	0	—	—	—	
	K	30 ms		—	—	—	—	—	0	X	—	—	—	
	J	60 ms		—	—	—	—	—	X	0	—	—	—	
	G	180 ms		—	—	—	—	—	X	X	—	—	—	
External Control of CC (Data Set Ready)	B*	IN		—	—	—	—	—	—	—	0	—	—	One Per Data Set
	A	OUT		—	—	—	—	—	—	—	X	—	—	
Clamp	F*	IN		—	0	—	—	—	—	—	—	—	—	One Per Data Set
	E	OUT		—	X	—	—	—	—	—	—	—	—	

TABLE C (Contd)

DATA SET 202T-L1 OPTIONS

FEATURE	OPTION	DESCRIPTION	SWITCH SETTING	PROVIDE
Carrier Detector Reset			Strapping on Transmitter-Receiver CP	One Per Data Set
	ZL	IN	Install E21-E23	
	ZM*	OUT	Install E22-E23	
Continuous Carrier	ZN	IN	Install E24-E25	One Per Data Set
	ZO*	OUT	Install E25-E26	
Compromise Equalization	ZU*	Maximum	Install E27	One Per Data Set
	ZV	Minimum	Install E28	
Local Copy on Reverse Channel			Strapping on Reverse Channel CP	One Per Data Set
	ZE	IN	Install E21-E22	
	ZF*	OUT	Install E21-E23	
Grounding Option			Screw Switch S1 Setting on Interface Circuit	One Per Data Set
	ZG*	Signal Ground Connected to Frame Ground	S1 Closed	
	ZH	Signal Ground Not Connected to Frame Ground	S1 Open	

X Rocker down on side adjacent to numbers.
0 Rocker up on side adjacent to numbers.
— Rocker may be in either position.
* Factory furnished.
† Factory furnished instead of 4-wire option when reverse channel CP is installed.

TABLE D

DATA SET 202T-L1A OPTIONS

FEATURE	OPTION	DESCRIPTION		SWITCH SETTING										PROVIDE
				S3 Switch Contact Setting On Transmittter-Receiver										
				1	2	3	4	5	6	7	8	9	0	
4-Wire Operation	ZK*			0	—	—	0	—	X	X	X	X	X	One Per Data Set
2-Wire Operation w/o Reverse Channel	ZD			X	—	—	X	—	X	0	0	0	0	
2-Wire Operation With Reverse Channel	ZC†			X	—	—	X	—	0	0	0	0	0	
Compromise Delay Equalization	ZV	Minimum		—	X	—	—	—	—	—	—	—	—	One Per Data Set
	ZU*	Maximum		—	0	—	—	—	—	—	—	—	—	
Compromise Amplitude Equalization	ZX	Minimum		—	—	—	—	X	—	—	—	—	—	One Per Data Set
	ZW*	Maximum		—	—	—	—	0	—	—	—	—	—	
Channel Condition	ZZ	C2		—	—	X	—	—	—	—	—	—	—	One Per Data Set
	ZY*	Basic		—	—	0	—	—	—	—	—	—	—	
				S2 Switch Contact Setting On Transmitter-Receiver										
				1	2	3	4	5	6	7	8	9	0	
4-Wire Operation	ZK*			X	—	—	—	—	—	—	—	—	—	One Per Data Set
Local Copy on Primary Channel in 2-Wire	ZA	IN		X	—	—	—	—	—	—	—	—	—	
	ZB†	OUT		0	—	—	—	—	—	—	—	—	—	
Soft Turnoff and Squelch Intervals		Soft Turnoff	Squelch											
	Z	0	0	—	X	—	—	—	0	X	0	—	—	One Per Data Set
	Y*	8 ms	0	—	X	—	—	—	0	0	0	—	—	
	X	24 ms	0	—	X	—	—	—	0	0	X	—	—	
	W	0	9 ms	—	0	—	—	—	0	X	0	—	—	
	V	0	156 ms	—	0	—	—	—	X	X	0	—	—	
	T	8 ms	9 ms	—	0	—	—	—	0	0	0	—	—	
	S	8 ms	156 ms	—	0	—	—	—	X	0	0	—	—	
	R	24 ms	156 ms	—	0	—	—	—	X	0	X	—	—	
Fast Carrier Detection	Q*	IN		—	—	0	—	—	—	—	—	—	—	One Per Data Set
	N	OUT		—	—	X	—	—	—	—	—	—	—	
Clear-to-Send Interval	M*	8 ms		—	—	—	0	—	—	—	—	—	0	One Per Data Set
	K	30 ms		—	—	—	0	—	—	—	—	—	X	
	J	60 ms		—	—	—	X	—	—	—	—	—	0	
	G	180 ms		—	—	—	X	—	—	—	—	—	X	

TABLE D (Contd)

DATA SET 202T-L1A OPTIONS

FEATURE	OPTION	DESCRIPTION	SWITCH SETTING	PROVIDE
External Control of CC (Data Set Ready)	B*	IN	— — — — — — — — 0 —	One Per Data Set
	A	OUT	— — — — — — — — X —	
Clamp	F*	IN	— — — — 0 — — — — —	One Per Data Set
	E	OUT	— — — — X — — — — —	
			S4 Switch Contact Setting on Transmitter-Receiver	
			1 2 3	
Carrier Detector Reset	ZL	IN	— X —	One Per Data Set
	ZM*	OUT	— 0 —	
Continuous Carrier	ZN	IN	X — —	One Per Data Set
	ZO*	OUT	0 — —	
State of CC (Data Set Ready) During Analog Loopback	YB	ON	— — X	One Per Data Set
	YA*	OFF	— — 0	
Local Copy on Reverse Channel			Strapping on Reverse Channel CP	One Per Data Set
	ZE	IN	Install E21-E22	
	ZF†	OUT	Install E21-E23	
Grounding Option (Data Set)			Screw Switch S1 Setting on Interface Circuit	One Per Data Set
	ZG*	Signal Ground Connected to Frame Ground	S1 Closed	
	ZH	Signal Ground Not Connected to Frame Ground	S1 Open	
Grounding Option (Data Mounting)			Strapping on 39A1 or 40B1 Data Mounting	
	ZI*	Signal Ground Connected to Frame Ground	Wire Strap of Power Supply In	
	ZJ	Signal Ground Not Connected to Frame Ground	Wire Strap if Power Supply Out	

X Rocker down on side adacent to numbers.
0 Rocker up on side adjacent to numbers.
— Rocker may be in either position.
* Factory furnished.
† Factory furnished instead of 4-wire option when reverse channel CP is installed.

TABLE E

RECOMMENDED CUSTOMER OPTIONS FOR 2-WIRE PRIVATE LINE AND 4-WIRE PRIVATE LINE WITH TALK-BACK USING DATA SET 202T-TYPE

OPTION	NEAR END	FAR END 202C, 202D, OR 202R (NOTE 1)
Received Data Squelch	156 ms	IN
Clear-to-Send Delay	180 ms	200 ms
Fast Carrier Detection	OUT (Normal) (23 ms)	40 ms
Soft Carrier Tunroff	24 ms	IN
Received Data Clamp	IN	IN
Alternate Voice	Optional	Optional
Switched Network Backup	Optional	Optional
Reverse Channel	Optional in 2-Wire Private Line	Optional in 2-Wire Private Line (Note 2)
Carrier Detector Reset	Not Used	Not Offered
Local Copy	Optional in 2-Wire Private Line	Always Provided for 2-Wire Data Set
Continuous Carrier	OUT—Carrier Under Control of Request-to-Send	Carrier Controlled by Request-to-Send (Note 3)

Notes:

1. If far-end data set is a 202T-type the recommended options are the same as those for the near end.
2. Not offered with DS 202R.
3. Not offered with DS 202C or D.

TABLE F

RECOMMENDED OPTIONS FOR 4-WIRE POINT-TO-POINT AND MULTIPOINT WITHOUT TALK-BACK USING DATA SET 202T-TYPE

OPTION	RECOMMENDATION
Clear-to-Send Delay	8 ms if remote data set is a 202T-type with fast mode carrier detection. 30 ms if remote data set is a 202T-type with normal mode carrier detection or a 202R, 202D5, or D6 with 20 ms carrier detector timing. 60 ms if remote data set is a 202C, 202D3, 202D4, or a 202R, 202D5, or 202D6 with the 40 ms carrier detector timing.
Fast Carrier Detection	IN (fast mode) if remote data set is a 202T-type with 8 ms clear-to-send delay. OUT (normal mode) if remote data set is optioned for 30, 60, 180, or 200 ms clear-to-send delay.
Soft Carrier Turnoff	24 ms if remote data set is a 202C, 202D3, D4, D5, D6, 202R, or 202T with normal mode fast carrier detection. (See Note) 8 ms if remote data set is a 202T-type with fast carrier detection option. **0 ms** turnoff if remote data set uses carrier detector reset option.
Received Data Clamp	IN
Carrier Detector Reset	IN—at master station of broadcast polling or bridge multipoint system when remote data sets use the quick carrier turnoff and master station is able to implement this circuit. OUT—all other times.
Continuous Carrier	IN—for point-to-point applications and for data set as master station of split bridge multipoint systems. OUT—may be used for above applications and should be used for data set at the remote station of split bridge multipoint system.
Alternate Voice	Optional (with DAS 828A or 829-type).
Switched Network Backup	Optional (with DAS 828A or 829-type).

Note: Data set 202T-type must be optioned for the 8 ms or **0 ms** turnoff interval when the interval between consecutive turnoffs of the request to send circuit is less than 165 ms.