DATA SET 202T
TRANSMITTER-RECEIVER
DESCRIPTION AND OPERATION

CONTENTS PAGE

Fig. 1—Data Set 202T, Front View

- To add information concerning the JY2 reverse channel circuit pack
- To correct clamp OUT (option E) shown on Table C
- To remove detailed option description information
- To remove detailed functional description information.

The detailed option description has been moved to Section 592-031-200. The detailed functional description has been moved to Section 592-031-150.

1. GENERAL

1.01 This section contains the physical and functional description and operating procedures for data set (DS) 202T (Fig. 1). Other than a description of interface signals and customer options, information pertaining to the customer-provided terminal is not given.

1.02 This section is reissued:

- To indicate that C2 conditioning is required for all bit rates above 1400 bits per second (bps)

1.03 DS 202T is a nonsynchronous 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 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. However, with the reverse channel installed, the maximum bit rate is 1200 bps. DS

202T 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 provides status indicator lamps and built-in test features for local self test, analog loop-back tests, and remote tests.

Note: The private line channel must be arranged for -16 dBm receive level and 0 dBm transmit level.

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 DS 202T 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:

Operation: Nonsynchronous, binary, serial.

Modulation: Frequency shift keying.

Rate: 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.

Interface Voltage: As specified in EIA Standard RS-232C.

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

Power: 105 to 129 Vac at 57 to 63 Hz.◀

2. PHYSICAL DESCRIPTION

2.01 DS 202T is list coded as follows:

List 1—2-wire or 4-wire data set contained on a printed wiring board 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.◀

A. DS 202T-L1

2.02 Data set 202T-L1 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,*** 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

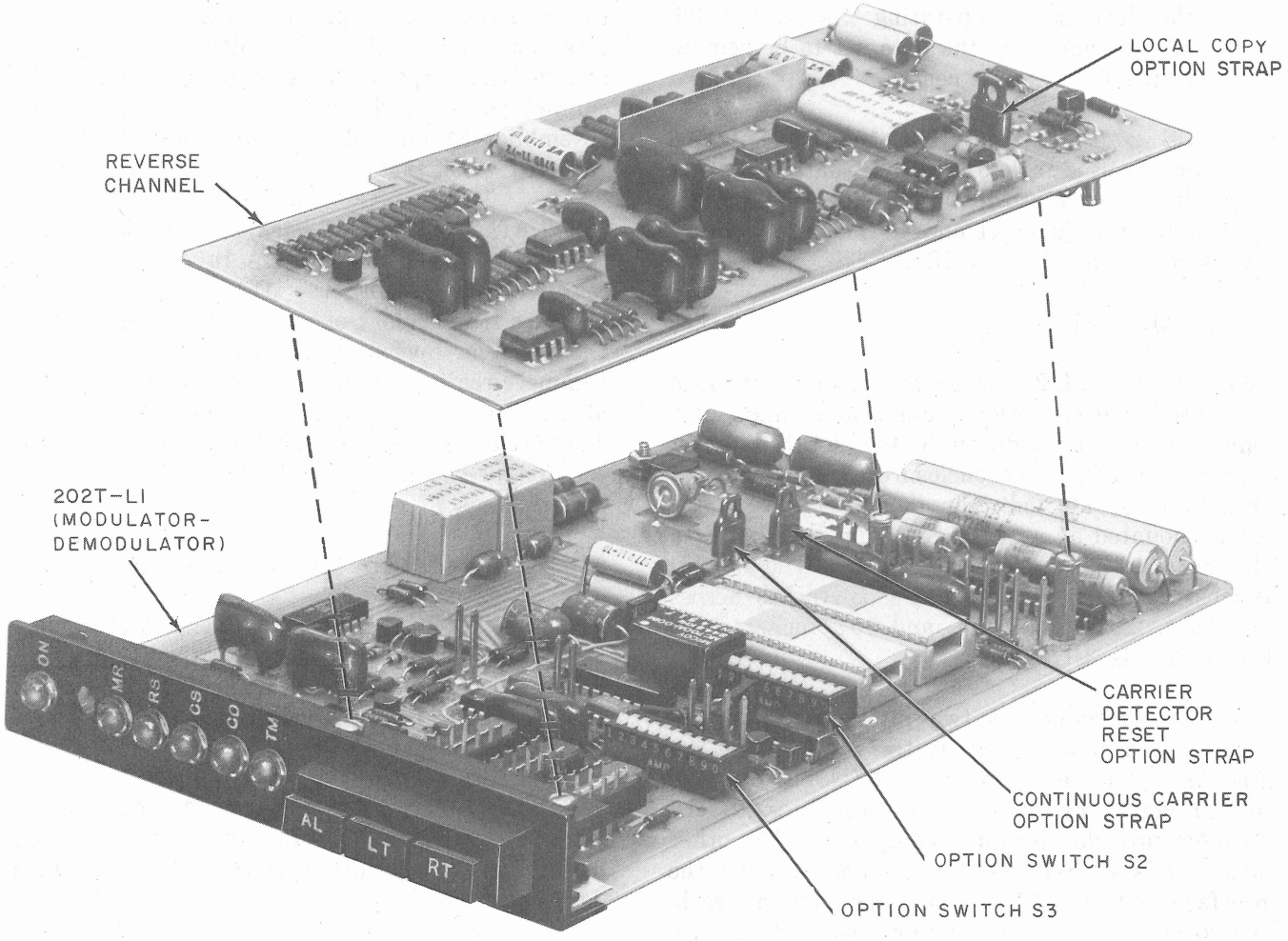

Fig. 2—Data Set 202T-L1/3

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 Loop-Back):*** 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 DS 202T-L1, 202T-L1/3, ▶or 202T-L1/3A◀ can be used in a 39A1 or 40B1 data mounting or in the housing provided by list 2. The BSPs associated with the 39A1 and 40B1 data mounting are listed in Part 6 (REFERENCES).

B. DS 202T-L1/2

2.06 DS 202T-L1/2 provides the housing, interface connectors, power transformer, and M8K connector cord in addition to the list 1 data set described in 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 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-L1 or -L4 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.

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

C. DS 202T-L1/3 ▶or 202T-L1/3A◀

2.10 DS 202T-L1/3 (Fig. 2), ▶or 202T-L1/3A◀ provides everything provided by list 1 plus a reverse channel circuit pack (JY1 or JY2). 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 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.***◀

D. DS 202T-L1/2/3/ ▶or 202T-L1/2/3A◀

2.12 DS 202T-L1/2/3 ▶or 202T-L1/2/3A◀ 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 or 3A.

2.13 DS 202T-L1, L1/3, ▶or L1/3A◀ 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 202T-L1/2 or L1/2/3 ▶or L1/2/3A.◀
- Multiple installation of a maximum of 16 DS 202T-L1 (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 ▶or 202T-L1/3A◀ (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, interface circuits, and data set options.

3.02 DS 202T consists of an oscillator, transmitter, receiver, test circuitry, and power rectifier

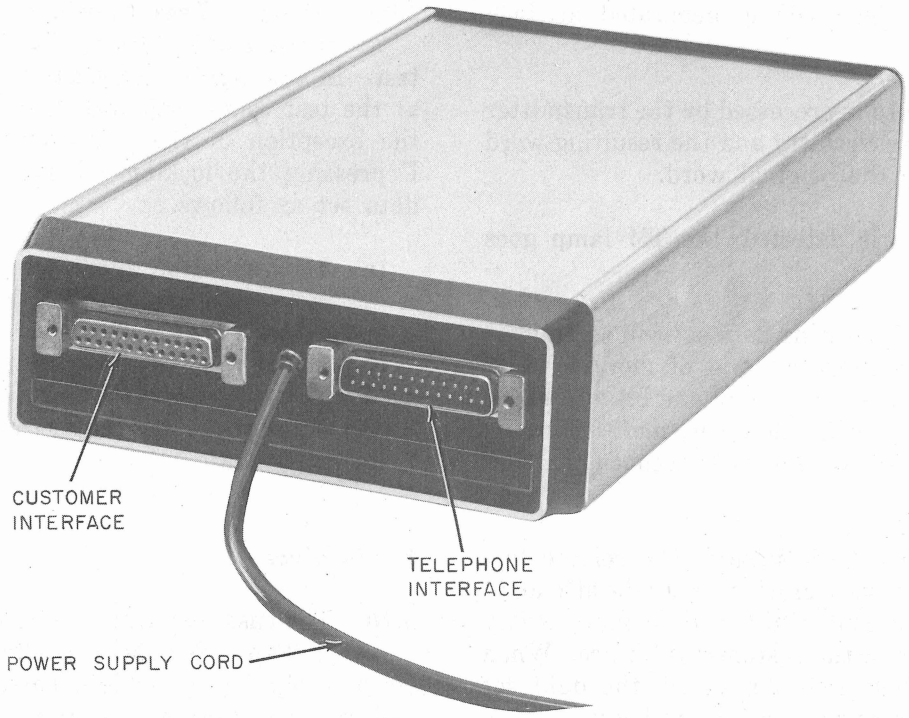

Fig. 3—Data Set 202T, Rear View

on one printed wiring board. An optional reverse channel transceiver is provided on a separate wiring board.

A. Test Modes

3.03 The data set test modes are as follows:

- Analog loop-back
- 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 Loop-Back Test:*** In the analog loop-back 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.

(b) Modifies the feedback path from transmitter to receiver to decrease the signal level of the transmitter.

(c) Lights the TM (test mode) lamp, holds the MR lamp off, and clamps the data set ready (CC) lead ***off.***

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) 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.

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

(e) 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 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.

(d) 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 loop-back 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 loop-back test. In the digital loop-back 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 loop-back test.

B. 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 descriptions are given in Table A.

3.11 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 DS 202T is provided with a number of features or options which may be requested by the user. Some of these features are available as customer options; others are available as telco engineering options.

4.02 Options are installed and removed by means of switches and strapping plugs on the data set printed wiring board, 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 Table C for a summary of options provided with DS 202T.

5. OPERATION

5.01 Attendant operation of DS 202T is limited to operation of the three test switches and

→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.
† Reserved for data set testing.

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.

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 self test procedures and requirements.

6. REFERENCES

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

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 Transmitter-Receiver—Installation and Connections

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	

SECTION	TITLE
592-031-300	Data Set 202T Transmitter-Receiver—Maintenance
592-031-500	Data Set 202T Transmitter-Receiver—Test Procedures
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 is also contained in CD- and SD-1D243-01.◖

→TABLE C←

DATA SET 202T INSTALLER OPTIONS

FEATURE	OPTIONS	DESCRIPTION		SWITCH SETTING										PROVIDE
				S3 Switch Contact Setting On Transmitter-Receiver										One Per Data Set
				1	2	3	4	5	6	7	8	9	0	
4-Wire Operation	ZK*			0	0	X	X	0	0	0	X	X	X	
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									One Per Data Set
				1	2	3	4	5	6	7	8	9	0	
4-Wire Operation	ZK*			X	—	—	—	—	—	—	—	—	—	
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	—	—	—	One Per Data Set
	K	30 ms		—	—	—	—	—	0	X	—	—	—	
	J	60 ms		—	—	—	—	—	X	0	—	—	—	
	G	180 ms		—	—	—	—	—	X	X	—	—	—	
Control by DAS 828- or 829-Type	B*	IN		—	—	—	—	—	—	—	0	—	—	One Per Data Set
	A	OUT		—	—	—	—	—	—	—	X	—	—	
Clamp	F*	IN		—	0	—	—	—	—	—	—	—	—	One Per Data Set
	E	OUT		—	X	—	—	—	—	—	—	—	—	
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 to 4-wire option when reverse channel CP is installed.