DATA SET 202S
TRANSMITTER-RECEIVER
DESCRIPTION AND OPERATION

CONTENTS PAGE

1. GENERAL

1.01 This section describes the physical and functional characteristics of data set (DS) 202S (Fig. 1). The key telephone set shown is required if manual calling and/or answer is needed. General operating information is also included.

1.02 This section is reissued to show DS 202S-L1, -L1/2, -L1/3, -L1/2/3, -L1A, -L1A/2, -L1A/3A, and -L1A/2/3A rated manufacture discontinued (MD). The replacing data sets are DS 202S-L1C, -L1C/2, -L1C/2/3B, and -L1C/3B. Circuit pack (CP) JY2 (reverse channel) is also rated MD, and is replaced by CP JY3. CP JY3 meets requirements for registration. The replacing data sets provide the following new options and features not provided on earlier DS 202S-type:

- Echo suppressor enable installer option—This option eliminates echo problems that may be encountered during startup over satellite transmission circuits. ***This option cannot be used with reverse channel installed.***

- Carrier controlled turnaround installer option—This option delays turnon of the clear-to-send circuit until the remote data set has entered the receive mode.

- Early data set ready indication installer option—With this option installed, the data-set-ready circuit turns on at the beginning of the answer tone sequence in the called data set.

- An adjustable output level of -4 to -12 dBm is provided. This can be adjusted to a fixed output level of -4 dBm whenever FCC registration requires this value to be met.

- A filter is provided to prevent "glitches" from causing a call disconnect during talk to data transfer.

Fig. 1—Data Set 202S With 2565HK Telephone Set

- A filter is provided on the request-to-send circuit to eliminate contact bounce problems sometimes encountered when using the 914-type data test set.

- The transmit shaping filter is modified to improve performance when used with DS 202C-type.

- The filter on the D1 lead of the telephone interface is improved to prevent noise from causing the data set to enter the data mode.

Since this reissue constitutes a general revision, arrows ordinarily used to indicate changes have been omitted.

1.03 DS 202S is intended for use on 2-wire switched network circuits at speeds up to 1200 bps. An optional reverse channel allows the set to signal at up to 5 bps in the opposite direction to the signal on the primary channel.

1.04 The following is a specification summary for DS 202S.

Operation: Nonsynchronous, binary, serial.

Modulation: Frequency shift keying.

Rate: Up to 1200 bps on 2-wire switched network.

Interface Voltages: Electronic Industries Association (EIA) Standard RS-232-C.

Mode: Simplex (1-way) or half-duplex (2-way nonsimultaneous).

Customer Interface Connection: Customer-provided equipment must connect via a 25-pin Cinch or Cannon DB-19604-432 (male) connector plug with Cinch DB-51226-1 hood (or equivalents). Interface cable must not exceed 50 feet in length per EIA Standard RS-232-C.

Power: 105 to 129 Vac at 57 to 63 Hz; 7 watts maximum per data set.

Environment: Ambient temperature = 4 to 49° Celsius (40 to 120°F), relative humidity = 20 to 95 percent.

Note: These environmental conditions are valid only under the condition that no condensation occurs.

Dimensions: Height 5.6 cm, width 14.7 cm, depth 27.4 cm (2.2 in. by 5.8 in. by 10.8 in.).

Weight: 2 kg (4.3 lbs) 2.4 kg (5.2 lbs) with reverse channel and KS-21239 transformer.

Compatibility: Line signal compatible with all DS 202-type on switched network. Call setup sequence difference between 202C and 202S-L1 (MD) may require modification of latter or replacement with 202S-L1A (MD) or 202S-L1C.

Installation Configuration: Single set or multiple, automatic calling and/or answer.

Testing: Two local modes are local self test and analog loopback; also, a remote test capability is provided.

1.05 A DS 202S multiple installation may be configured in one of two ways.

- Up to five stand-alone (individually housed) sets may be connected to a key telephone set (565HK or 2565HK). A KS-21253-L3 adapter is used to interconnect each of the sets to one of the line keys on the telephone set.

- A maximum of 24 data sets may be installed in a single cabinet in installations using three 40A1 (MD), 40A2 (MD), or 40A3 (or combinations of the three) data mountings. Each 40A-type data mounting can house up to eight sets, and a maximum of three mountings may be installed in one of the available cabinets. Smaller cabinets are available for stations using less than three data mountings. The data mounting provides power, access to the service line for testing, and the necessary hardware to rack-mount the data set.

2. DESCRIPTION

2.01 This description contains information applicable to the following data set list codes.

MD sets: 202S-L1, -L1/2, -L1/3, -L1/2/3, -L1/3A, -L1/2/3A, 202S-L1A, -L1A/2, -L1A/3A, -L1A/2/3A

Orderable codes: 202S-L1C, -L1C/2, -L1C/2/3B, -L1C/3B

PHYSICAL DESCRIPTION

2.02 A description of the DS 202S list codes follows:

- The basic data set (Fig. 2) is a circuit pack with a faceplate coded -L1C.

- The housing, power transformer (with cord) and interface assembly (coded 47A-type data mounting) are specified by adding /2 to the basic data set code, eg, 202S-L1C/2.

- The reverse channel circuit pack (coded JY3) is ordered by adding /3B to the data set code, eg, 202S-L1C/2/3B. For existing service, JY2 (specified by /3A) can be used on 202S-L1 and shall be used on DS 202S-L1A. The MD reverse channel circuit pack specified with /3 (coded JY1) cannot be used on DS 202S-L1A or C, but may be used on DS 202S-L1.

A. Data Sets 202S-L1 (MD), -L1A (MD), and -L1C

2.03 These list codes specify the basic data set, which is a printed wiring board measuring 3.8 cm high, 14.2 cm wide, and 26.4 cm long (1.5 in. by 5.6 in. by 10.4 in.). The data set weighs 0.7 kg (1.5 lb). A faceplate is provided which contains the status indicators described in Table A and the three test switches covered in Part 3. All interconnections to the circuit pack are made via a connector at the rear of the board. The additional circuitry of the -L1C is accommodated on a mother-daughter board arrangement, as opposed to the single-board arrangement of earlier models. Data mounting arrangements have not been changed.

2.04 The miniature rocker switch assemblies (Fig. 2 and 3) S2, S3 and S4 allow the telephone company (telco) employee to select options

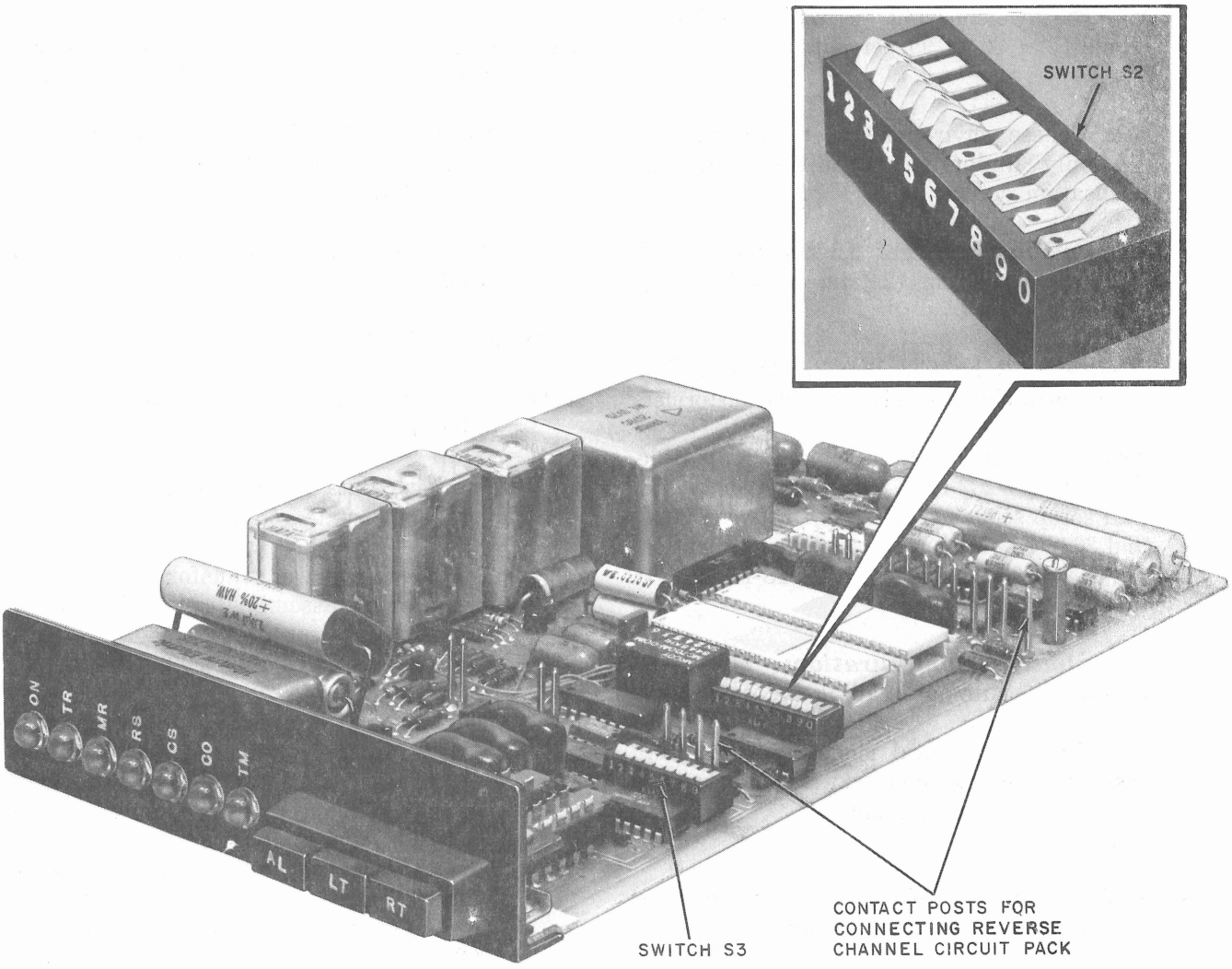

Fig. 2—Data Set 202S-L1 (-L1A Is Similar)

and set transmit signal levels. Switch S3 is closest to the faceplate on DS 202S-L1 and -L1A and is used to set the transmit signal level and the reverse channel option. For DS 202S-L1A, S3 also provides the transmit-only option. S4, not used on DS 202S-L1 or -L1A, is used to set the transmit signal level on DS 202S-L1C, while S3 provides the reverse channel and transmit-only options along with the three new options: echo suppressor enable, carrier controlled turnaround, early CC (DSR) indication. All options are listed in Table B.

B. Data Sets 202S-L1/2 (MD), -L1A/2 (MD), and -L1C/2

2.05 These list codes specify the basic "stand alone" configuration. They consist of the basic data set previously described, enclosed in a housing.

2.06 The housing is an extruded aluminum shell measuring 5.6 cm high, 14.7 cm wide, and 27.4 cm deep (2.2 in. by 5.8 in. by 10.8 in). The set weighs 1 kg (2.3 lb) [1.5 kg (3.2 lb) with KS-21239 transformer] (Fig. 4). The front cover is molded black plastic with seven translucent designations and a cutout for the test switches. The rear cover is also molded black plastic with a cutout for the two interface connectors and the power cord.

2.07 A KS-21239-L1 (MD), -L4 (MD), or -L5 transformer, M13F (1-foot long) telephone set cord, and a line cord are included with the

TABLE A

STATUS INDICATORS

INDICATOR	DESCRIPTION
ON	Lighted when power is applied to data set.
TR (Terminal Ready)	Lighted when data-terminal-ready lead is *on.*
MR (Modem Ready)	Lighted when data-set-ready lead is *on.*
RS (Request-to-Send)	Lighted when request-to-send lead is *on.*
CS (Clear-to-Send)	Lighted when clear-to-send lead is *on.*
CO (Carrier On)	Lighted when received line signal detector lead is *on.*
TM (Test Mode)	Lighted when any of the three test switches are depressed. It extinguishes if an error is detected in the local self test mode.

Note: All indicators are lighted when the RT or LT key is depressed.

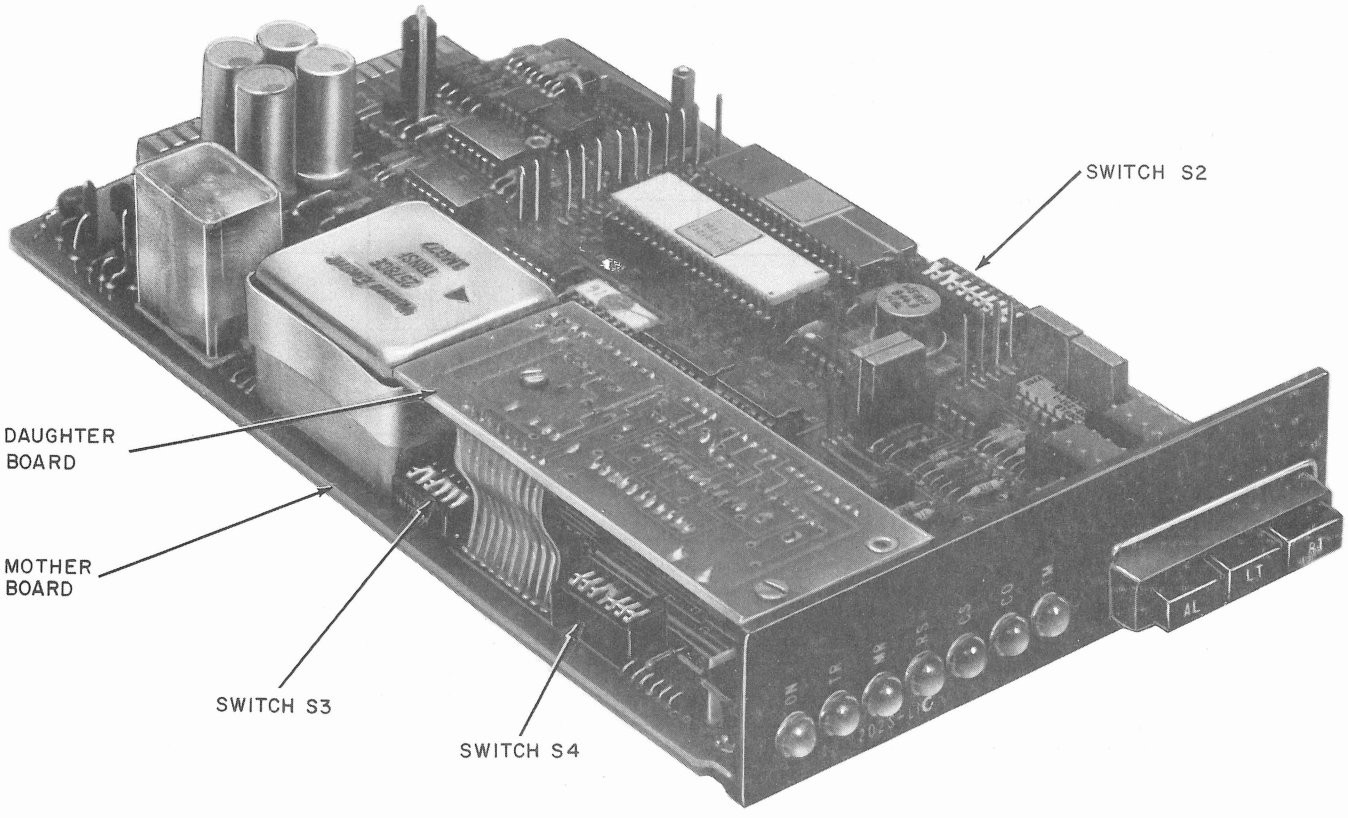

Fig. 3—Data Set 202S-L1C

TABLE B

OPTIONS

FEATURE	DESIGNATION	DESCRIPTION		PROVIDE
Transmit Line Signal Level		Without Reverse Channel [1]	With Reverse Channel	One Per Set
	ZK [2]	0	−1	
	ZL [2]	−1	−2	
	ZM [2]	−2	−3	
	ZN [2]	−3	−4	
	ZO	−4	−5	
	ZP	−5	−6	
	ZQ	−6	−7	
	ZR	−7	−8	
	ZS	−8	−9	
	ZT [3]	−9	−10	
	ZU	−10	−11	
	ZV	−11	−12	
	ZW	−12	−13	
Reverse Channel [4]	ZC [5]	In		One Per Set
	ZD [3]	Out (Remove CP)		
Soft Turnoff and Squelch Intervals		Soft Turnoff	Squelch	One Per Set
	Z	0	0	
	Y	8 ms	0	
	X	24 ms	0	
	W	0	9 ms	
	V	0	156 ms	
	T	8 ms	9 ms	
	S	8 ms	156 ms	
	R [3]	24 ms	156 ms	

TABLE B (Contd)

OPTIONS

FEATURE	DESIGNATION	DESCRIPTION	PROVIDE
Fast Carrier Detection[6]	Q	In (7 ms)	One Per Set
	N[3]	Out (23 ms)	
Clear-to-Send Interval	M	8 ms	One Per Set
	K	30 ms	
	J	60 ms	
	G[3]	180 ms	
Automatic Answer	B[3]	In	One Per Set
	A	Out	
Local Copy on Primary Channel	ZA	In	One Per Set
	ZB[3]	Out	
Clamp (202S-L1 Only)	F[3]	In	Must Be Provided
Condition of CC (DSR) During Analog Loop-back (202S-L1A Only)	Y1	On	One Per Set
	YJ[3]	Off	
Local Copy on Reverse Channel	ZE	In	One Per JY1, JY2, or JY3 Circuit Pack
	ZF[3]	Out	
Grounding Option	ZG[3]	Signal Ground Connected to Frame Ground	One Per 47A-Type Data Mounting
	ZH	Signal Ground Not Connected to Frame Ground	
Transmit Only	YG YH[3]	In Out	One Per Set
Echo Suppressor Enable	YQ YR[3]	In Out	One Per Set
Carrier Controlled Turnaround	YS[3] YT	In Out	One Per Set
Early CC (DSR) Indication	YU YV[3]	In Out	One Per Set

Note 1: This column (-4 through -12) applies for DS 202S-L1C both with and without reverse channel.

Note 2: Does not apply to DS 202S-L1C.

Note 3: Factory furnished.

Note 4: DS 202S-L1A operates with JY2 only. DS 202S-L1C operates with JY3 only.

Note 5: Factory furnished instead of option ZD when reverse channel is installed.

Note 6: Same as carrier acquisition timing in earlier model DS 202-types.

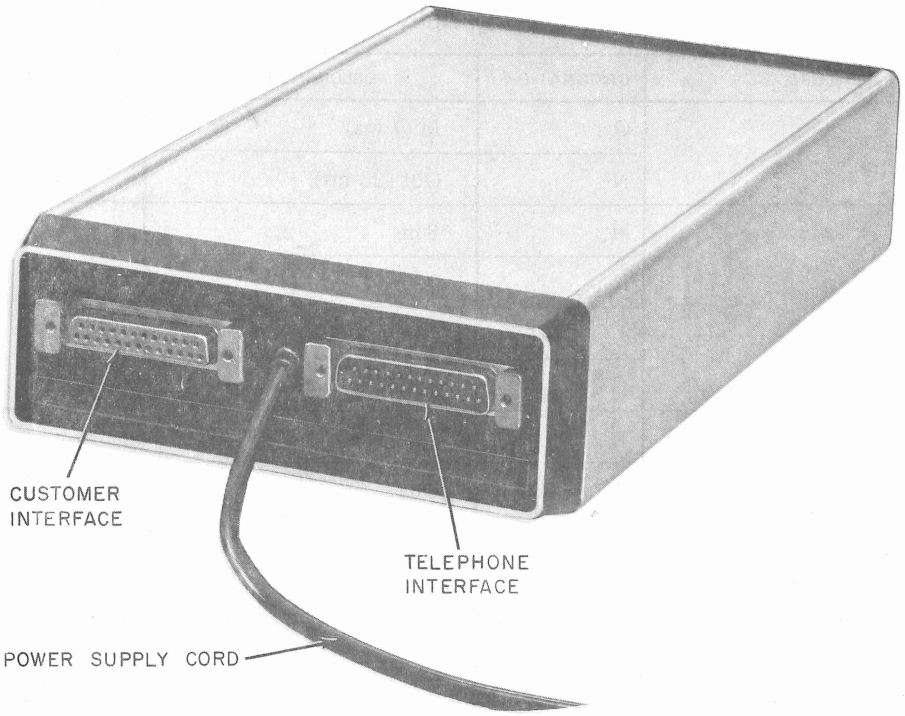

Fig. 4—Data Set 202S Rear View

housing. The transformer plugs into a standard nonswitched, 3-wire 117-volt 60-Hz outlet. It is equipped with a tab which should be secured to the outlet (where allowed by local electrical codes) to prevent inadvertent removal of power from the data set.

C. Data Sets 202S-L1/3 (MD), -L1A/3A (MD), -L1/3A (MD), and -L1C/3B

2.08 These list codes specify the basic data set with the reverse-channel circuit pack installed (Fig. 5 and 6). The reverse-channel circuit pack [JY1 (MD), JY2 (MD) or JY3] is a printed wiring board measuring 2.54 cm high by 8.6 cm wide by 19 cm long (1 in. by 3.4 in. by 7.5 in). It includes filters, switching circuits, and demodulator circuits needed to perform the reverse-channel function. Interconnection to the data set is via 20 female contact receptacles mounted on the bottom of the board which mate with the contact posts on the data set. Four retaining screws secure the circuit packs together mechanically. The screws are stored in threaded eyelets on the front edge of the circuit pack.

2.09 When installed, the reverse channel circuit pack makes option switches S2 and S3 inaccessible on DS 202S-L1 and -L1A. Therefore, it must be removed in order to set the options on these two sets.

> *Note:* The reverse channel circuit pack must not be installed if option ZD is installed (reverse channel OUT).

D. Data Sets 202S-L1/2/3 (MD), -L1/2/3A (MD), -L1A/2/3A (MD), and -L1C/2/3B

2.10 These list codes are the basic data set equipped with reverse channel and enclosed in the housing. These are the only allowable codes.

FUNCTIONAL DESCRIPTION

2.11 DS 202S provides service in the following configurations:

- One data set enclosed in a 47A-type housing and a 565HK or 2565HK key telephone set. An 801A- or C-type automatic calling unit (ACU) may be installed as an option using

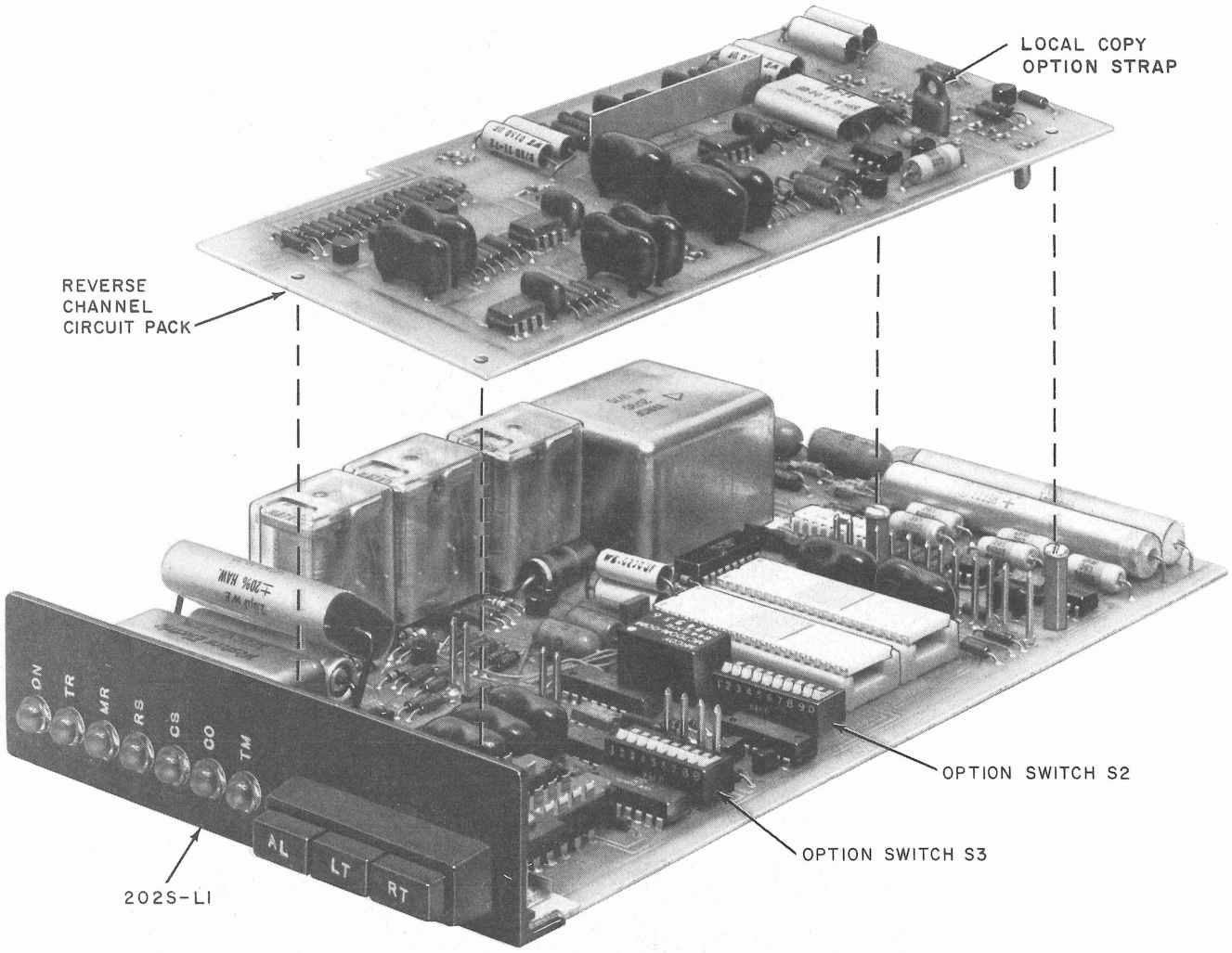

Fig. 5—Data Set 202S-L1/3 (-L1A/3A Is Similar)

a 149B adapter. The telephone set is not required when automatic calling is used or when the automatic answer option is installed and manual operation is not needed.

- A maximum of five data sets in individual housings connected to one key telephone set and a KS-21253-L3 adapter (used to interconnect the data sets to the telephone set). The 801A- or C-type ACU is optional in this configuration and does not require the 149B adapter.

- A maximum of 24 data sets mounted in three 40A-type data mountings which are housed in a KS-20018-type cabinet. A KS-20018-L12A cabinet is used to house one or two mountings while a KS-20018-L11A is needed to house three. A CALL DIRECTOR® may be used to control the data sets, although two key telephone sets may be used to control up to eight sets. As in the case for single data sets, a CALL DIRECTOR or key telephone set is not required in a multiple installation if only automatic calling and/or automatic answering is provided.

A. Customer Interface

2.12 The customer interface is accessible through the female connector at the rear of the data

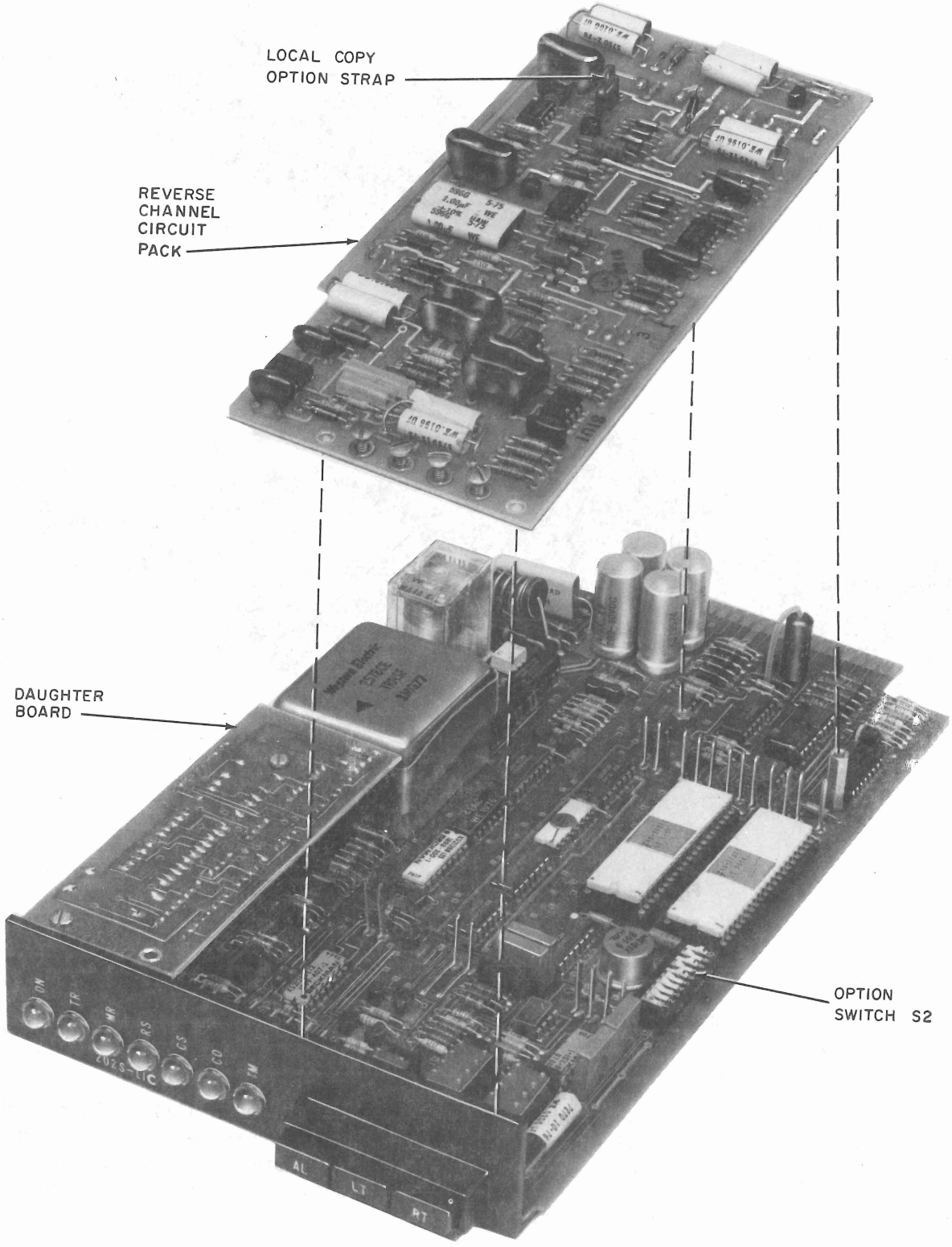

Fig. 6—Data Set 202S-L1C/3B

set. Connector pin designations and functions are itemized in Table C.

B. Telephone Interface

2.13 The telephone interface is accessible through the male connector at the rear of the data set. Connector pin designations and functions are itemized in Table D.

C. Options

2.14 Table B provides a list of available options. The installation section provides descriptive information for each. Recommended options are shown in Table E.

Note: For DS 202S-L1, clamp (option F) must be provided.

3. OPERATION

DATA MODE

3.01 ***Manual Data Call:*** When a data call is placed or answered manually, the following occurs:

(a) Attendant initiates or answers call.

(b) Data terminal ready (CD) lead must be positive.

(c) ***With DS 202S-L1*** (MD), the attendant depresses DATA (red) key which causes the

TABLE C

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
20	Data Terminal Ready	CD
22	Ring Indicator	CE

TABLE D

TELEPHONE INTERFACE

LEAD NO.	DESIGNATION	DESCRIPTION
1	L	Telephone set line lamp control from data set
4	LG	Telephone set line lamp ground from data set
5	TD	Talk/data control from telephone set
7	T	Telephone line tip lead
8	R	Telephone line ring lead
12	RD	Common ringer control contact to ground
14	C	Data mode contact closure to ground from set to ACU
16	D1	Data mode contact closure to ground from ACU to data set
21	T1	Telephone set tip lead
22	R1	Telephone set ring lead
23	A	A lead control: Used to provide an indication to ACU or KTU when the line is in use
24	A1	
25	TDG	Talk/data control ground lead

line to transfer to the data set, and the answer sequence consisting of 1.3 seconds of quiet and 1.9 seconds of 2017-Hz answer tone to start. After completion of answer sequence, the data-set-ready indication is sent to the customer.

(d) ***With DS 202S-L1A*** (MD) and -L1C, When the data set is used to originate a call, the attendant depresses DATA (red) key which causes the line to transfer to the data set and the data-set-ready indication to be sent to the customer immediately. When answering a call, the procedure is the same as for DS 202S-L1. On DS 202S-L1C with echo suppressor option in, the length of answer tone is reduced to 1.4 seconds.

3.02 ***Auto-Answer Data Call:*** If the auto-answer option is installed in the data set and the CD lead is positive, the set automatically answers an incoming call, and 1.3 seconds after the end of the first ringing cycle, sends the answer-tone signal (2017 Hz) for 1.9 seconds (or 1.4 seconds).

3.03 ***Data Call With Automatic Calling Unit:*** When a call is placed from an installation equipped with an ACU, the following occurs:

(a) The ACU seizes the line in response to a call request from the customer equipment.

(b) The ACU places the call and detects answer tone from the called station.

(c) At the end of answer tone, the ACU transfers the line to the data set.

TABLE E

RECOMMENDED CUSTOMER OPTIONS

OPTION	202S	202C (MD), 202D* (MD), OR 202R (MD)
Squelch Interval	156 ms	In
Clear-to-Send Interval	180 ms	200 ms
Fast Carrier Detection	Out (normal)	40 ms
Soft Turnoff Interval	24 ms	In
Clamp	In	In
Reverse Channel	Optional	Optional†
Automatic Calling Unit	Optional	Optional†
Automatic Answer	Optional	Optional†
Local Copy	Optional	Always Provided

* 202D used with 804A

† Not available with DS 202R

(d) The data set enters the data mode if CD is positive.

TEST MODE

3.04 ***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.

(b) All status indicator lamps light so that they may be checked for lamp failure.

(c) A repeating 63-bit pseudorandom word (identical to the test word in the 914 and 903 test sets) 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.

(e) If an error is detected, the TM lamp extinguishes.

Note: This test should be made with the associated telephone set on-hook.

3.05 ***Analog Loop Test:*** The data set is tested in the analog loopback mode by applying signals to the inputs at the customer interface and monitoring the outputs at the customer interface and the status lamps. When the AL button is depressed until it locks, the data set is conditioned as follows:

(a) The data set is disconnected from the line.

(b) The feedback path from the transmitter to receiver is attenuated to decrease the signal level. This applies for DS 202S-L1 but does not apply for DSs 202S-1A and -L1C.

(c) The local copy control circuit is bypassed to provide local copy.

(d) The TM indicator lights and the auto-answer feature is disabled, if installed.

(e) The data-set-ready lead is turned OFF on DS 202S-L1 only. This is optional for DSs 202S-L1A and -L1C.

Note: The data set should be idle when the AL button is depressed.

3.06 ***Remote Test:*** When the locking RT button is depressed, the data set is conditioned as follows:

(a) All customer interface leads are made inoperative and all status indicator lamps light. The data set is conditioned for automatic answer and a call is received from the data test center.

(b) A repeating 63-bit pseudorandom 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. In addition, the test word is transmitted to the data test center.

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

(e) If the reverse channel circuit pack is installed, the reverse channel will send an on-off signal at 4.3 bps simultaneously with the line signal of the 63-bit word. After detecting an error or spacing (2200 Hz), the reverse channel transmitter is turned off, and the reverse channel receiver is on. A 387-Hz tone from the data test center switches the data set output from constant spacing to marking (1200 Hz).

4. REFERENCES

SECTION	TITLE
592-028-180	Data Set 202S Transmitter-Receiver–Summarizing Specification
592-028-200	Data Set 202S Transmitter-Receiver—Installation and Connections
592-028-500	Data Set 202S Transmitter-Receiver—Test Procedures
999-100-141	Data Set 202S-How to Operate Manual