DATA SET 208A-TYPE
TRANSMITTER-RECEIVER
DESCRIPTION AND OPERATION

CONTENTS PAGE

1. GENERAL

1.01 This section contains physical and functional descriptions and operating procedures for data set (DS) 208A-type. More detailed information pertaining to DS 208A-type is contained in Section 592-027-150.

1.02 This section is reissued to add information pertaining to DS 208A-L1B.

1.03 ◗DS 208A-L1 and DS 208A-L1A are rated manufacture discontinued (MD). They are replaced by DS 208A-L1B (Fig. 1) which provides all the features of DS 208A-L1A and is electrically, but not physically, identical to DS 208A-L1A. Three circuit packs (CPs) contained in DS 208A-L1A have been consolidated into one CP for DS 208A-L1B. This CP utilizes large scale integration (LSI) technology and provides a more simplified data set. DS 208A-L1A cannot be converted to a DS 208A-L1B because of backplane wiring differences. Refer to Part 2 of this section for detailed CP information.◀

1.04 Data sets 208A-L1A and 208A-L1B have self-test capabilities that make possible data set and data channel tests without external test equipment. DS 208A-L1 (Fig. 2) may be converted to DS 208A-L1A by removing CP HG9 and replacing it with CP HG23. This CP requires a different front cover (840807655) for the data set.

1.05 The following is a technical specification summary for DS 208A-type.

Data rate: 4800 bps

Modulation: Phase shift keyed

Operation: Synchronous

Line requirements: Basic 3002-type channel

Interface voltages: Per EIA RS-232-C

Transmitter output level: 0 dBm

Receiver input level: -16 dBm

Line impedance: 600 ohms

Operating modes: Half duplex or duplex

Clocking: Internal or external.

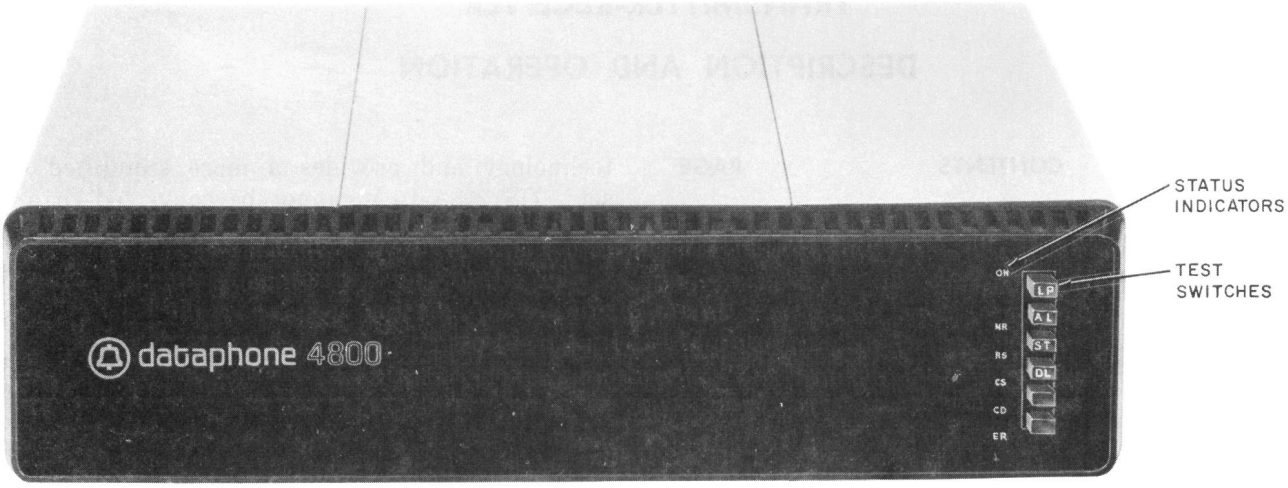


Fig. 1—Front View of DS 208-L1A or DS 208A-L1B

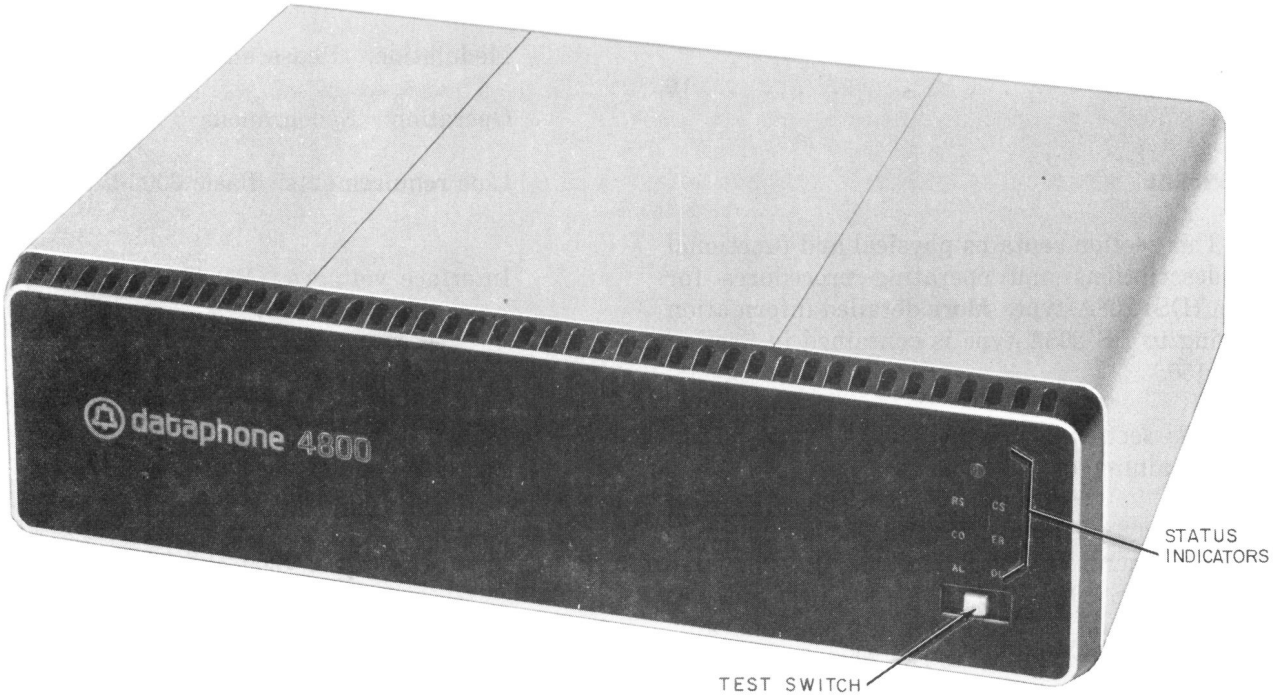


Fig. 2—Front View of DS 208A-L1

2. DESCRIPTION

PHYSICAL DESCRIPTION

2.01 DS 208A-type consists of a transmitter, receiver, and control circuits mounted on plug-in circuit boards. The exterior of the data set consists of front and rear molded black plastic covers mounted on an extruded aluminum housing. The extrusion has a brushed finish. The overall dimensions of the data set are approximately 16 inches across the front, 4-1/4 inches high, and 11-1/2 inches deep. The weight is approximately 20 pounds.

2.02 The data set is designed for shelf or desk-top installation, while mounting brackets (D180556) are available for mounting in a 19- or 23-inch relay rack.

2.03 ▶Using previously mentioned LSI circuitry, the transmitter and descrambler CP, coded HG26 for DS 208A-L1B, replaces CPs HG5, HG6, and HG17 which are used in DS 208A-L1 and DS 208A-L1A. A summary of the CPs contained in each DS 208A-type is given in Table A.

2.04 The functions of CP HG26 are electrically identical to the circuits that it replaces, but due to LSI, different terminal arrangements are required. For this reason, the backplane wiring in DS 208A-L1B is different from that of former DS 208A-types; therefore, CP HG26 is not compatible with other DS 208A-types.

2.05 DS 208A-L1B utilizes the same housing and 83A power unit as previous DS 208A-types. DS 208A-L1B is line compatible with all DS 208A types and operation is identical to DS 208A-L1A.◀

2.06 DS 208A-type has two interface connectors and a power cord connector at the rear of the set. The CUST INT connector is a KS-19087-L2 type and provides the digital interface leads for interface with the customer-provided equipment (CPE). The CPE must be equipped with a cable terminated in a Cinch or Cannon DB-19604-432 plug wired in accordance with Table B. The TEL INT connector is a KS-19088-L2 and provides the interface for connection to the 4-wire line termination via an M8K cord (or equivalent). The power cord connector is a twist-lock type to accept the KS-14532-L24 cord provided with the data set.

2.07 Data set power is provided by the internally mounted 83A power unit which provides +12, -12, +5, and -6 volts. The power unit requires 105- to 130-volts ac power at 57 to 63 Hz. Power consumption is approximately 26 watts. The power unit is provided with a self-resetting thermal overload switch that disables the power unit if the temperature rises excessively.

If for any reason the output voltages of the power unit rise excessively, the power unit will protect the data set from the overvoltage and the ON indicator will extinguish. When the cause of the overvoltage has been corrected and the power unit is operating normally, the power ON indicator will illuminate only after the data set power cord has been unplugged and plugged in again.

2.08 ▶Figure 3 shows a front view of DS 208A-L1A with the plastic cover removed, while Fig. 4 shows DS 208A-L1B.◀

2.09 The data set status indicators monitor the power unit, certain interface leads, and the test switch(es). The status indicators consist of light-emitting diodes (LEDs) which are visible through translucent designations located on the data set front cover. Refer to Table C for the status indicators present on DS 208A-L1. Refer to Table D for the status indicators present on data sets 208A-L1A and 208A-L1B.

2.10 DS 208A-L1 is provided with a 3-position loop-back test switch. In the center position, the switch allows data to proceed normally through the data set. In the digital loop-back (DL) position, the receiver is looped back to the transmitter at the customer interface. In the analog loop-back (AL) position, the transmitter is looped back to the receiver through an attenuator network on the line side. These test positions allow the data set to be tested remotely (digital loop-back) or locally (analog loop-back).

2.11 Data sets 208A-L1A and 208A-L1B are provided with four test switches which are accessible through the front cover. The switches are depress-to-operate and depress-to-release type with the exception of the LP (lamp test) switch,

→TABLE A←

CIRCUIT PACK COMPLEMENT FOR DS 208A-TYPE

DS 208A-L1 (MD)		DS 208A-L1A (MD)		DS 208A-L1B	
CIRCUIT PACK	SEE NOTE	CIRCUIT PACK	SEE NOTE	CIRCUIT PACK	SEE NOTE
HG2		HG2		HG2	
HG3		HG3		HG3	
HG4		HG4		HG4	
HG5 (A&M)		HG5 (A&M)		—	
HG6 (A&M)		HG6 (A&M)		—	
HG7		HG7		HG7	
HG8		HG8		HG8	
HG9 (MD)		—		—	
HG11		HG11		HG11	
HG12	1	HG12	1	HG12	1
HG13		HG13		HG13	
HG14 (MD)		HG14B	3	HG14B	3
HG15 (MD)		HG15B	3	HG15B	3
HG16 (MD)		HG16B	3	HG16B	3
HG17 (A&M)		HG17 (A&M)		—	
HG21	2	HG21		HG21	
—		HG23	4	HG23	4
—		—		HG26	5

Note 1: Two CPs HG12 are required in each data set.

Note 2: Early models of DS 208A-L1 may contain CP HG1.

Note 3: CPs HG14B, HG15B, and HG16B are direct replacements for CPs HG14, HG15, and HG16, respectively.

Note 4: CP HG9 is replaced by HG23 in DS 208A-L1A and DS 208A-L1B.

Note 5: CPs HG5, HG6, and HG17 are replaced by CP HG26 in DS 208A-L1B.

which is nonlocking. Test switch functions are as follows:

- ***LP (Lamp Test):*** This switch, when depressed, illuminates all status indicators with the exception of the ON indicator (which should be illuminated whenever power is applied to the data set). Depressing this switch does not affect data set operation. When the compromise equalizer test enabled option is temporarily installed during data set installation, depressing the LP switch, in addition to illuminating the LEDs, also shorts the transmitted line signal.

Note: The compromise equalizer test enabled option is ***only*** used during initial installation and should not be installed for normal operation.

- ***AL (Analog Loop-Back):*** This switch, when depressed, loops back the transmitter to the receiver through a channel simulator on the line side. This permits testing of the local data set with self-contained test

TABLE B

CUSTOMER INTERFACE

PIN NO.	FUNCTION	DATA SET MNEMONIC	EIA DESIGNATION (RS-232-C)
1	Frame Ground	FG	AA
2	Send Data	SD	BA
3	Receive Data	RD	BB
4	Request to Send	RS	CA
5	Clear to Send	CS	CB
6	Data Set Ready	DSR	CC
7	Signal Ground	SG	AB
8	Carrier On	COD	CF
9	+12V	CI9 (+12V)	Reserved for Data Set Testing
10	−12V	CI10 (−12V)	Reserved for Data Set Testing
11	Equalizer Mode	QM (Non-EIA)	Unassigned
14	New Sync	NS (Non-EIA)	SBA
15	Serial Clock Transmitter	SCT	DB
16	Divided Clock Transmitter	DCT (Non-EIA)	SBB
17	Serial Clock Receiver	SCR	DD
18	Divided Clock Receiver	DCR (Non-EIA)	Unassigned
21	Signal Quality Detector	COV	CG
24	Serial Clock Transmitter External	SCTE	DA
25	+5V	CI25 (+5V)	Unassigned

circuitry or with external test equipment through the customer interface.

- ***ST (Self-Test):*** This switch, when depressed, conditions the data set to transmit steady marks. The request-to-send interface lead is held ***on*** by this switch. The ER indicator blinks in response to the occurrence of errors in the received data. This indicator illuminates for approximately 100 ms whenever an error is detected.

- ***DL (Digital Loop-Back):*** This switch, when depressed, causes a loop-back at the data set customer interface. The received data (BB) lead is connected to the transmitted data (BA) lead; the serial clock receive (DD) lead is connected to the serial clock transmit external (DA) lead; and the signal quality detector (CG) lead is connected to the request-to-send (CA) lead. The data set functions as a regenerator. This permits testing of the facilities and both data sets

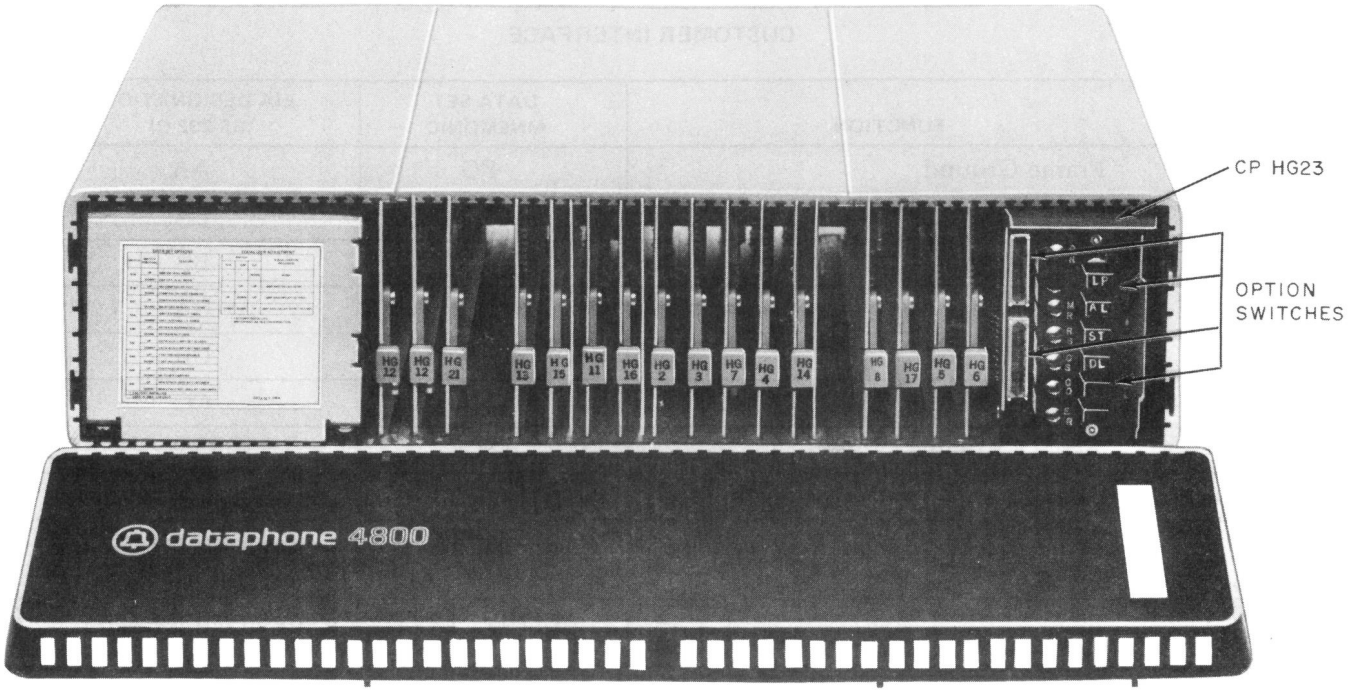


Fig. 3—DS 208A-L1A—Front View With Cover Removed

by self-contained test circuitry activated by the ST switch or with external test equipment through the data set interface.

Note: The DL and AL test switches should not be operated simultaneously.

FUNCTIONAL DESCRIPTION

2.12 This part contains information pertaining to data set test modes, interface leads, and options. Refer to Section 592-027-150 for a detailed functional description of the data set.

A. Test Modes

2.13 Data set 208A-type is equipped with two test features which enable the customer or Telco employee to test the data set in analog loop-back and digital loop-back modes.

- ***Analog Loop-Back:*** This test mode is entered by operating the AL switch on the data set. The CPE or external test equipment must be capable of duplex operation. If the CPE must have the data set ready lead ***on,*** DS 208A-L1A or 208A-L1B must be used and must have option YM installed (DSR ***on*** in AL mode). Test data is transmitted through the local data set, looped back at the telephone line interface, and received by the CPE from the local data set. There is a propagation delay of 7 ms within the data set. The analog loop-back is a test of the local data set and customer interface only and not the facilities or the remote data set.

- ***Digital Loop-Back:*** This test mode is entered by operating the DL switch located on the ***remote*** data set and conditioning the local CPE or external test equipment for duplex operation. Test data is transmitted by the ***local*** data set with the remote data set functioning as a regenerator. The digital loop-back is an inclusive test of the data sets and the channel facilities.

2.14 In addition to the preceding test modes, data sets 208A-L1A and 208A-L1B are equipped with two self tests which provide test capability independent of the CPE or external test equipment.

- ***Analog Loop-Back Self Test:*** This test mode is entered by depressing the AL and ST switches. This test allows the

TABLE C

STATUS INDICATORS ON DATA SET 208A-L1

INDICATOR	DESCRIPTION
ON	This indicator lights when the power cord is plugged into a nominal 117-Vac 60-Hz source and the power unit is operating normally.
RS	This indicator monitors the request-to-send lead and is lighted whenever that lead is in the *on* condition. When the data set is equipped for continuous request-to-send, the RS indicator is permanently lighted.
CS	This indicator monitors the clear-to-send lead and is lighted whenever that lead is in the *on* condition. This indicates that the data set is ready and will transmit the data present on the send data lead.
CO	This indicator monitors the carrier-on interface lead and is lighted whenever that lead is in the *on* condition. This indicates that the receiver has detected a signal which is within the data band.
ER	This indicator monitors the equalizer mode (QM) interface lead and is lighted whenever the CO indicator is off. During normal operation (CO indicator lighted) the ER indicator is lighted whenever the QM interface lead is in the *off* condition. This indicates marginal performance of the data set due to either excessive channel impairments or a faulty data set, and that the equalizer is retraining. Data on the receive data interface lead is not valid.
AL	This indicator monitors the test switch and is lighted whenever the data set test switch is placed in the analog loop-back test position.
DL	This indicator monitors the test switch and is lighted whenever the data set test switch is placed in the digital loop-back test position.

operation of the data set to be tested independently of options, connections to the telephone line interface, or customer interface. The AL switch disconnects the transmitter from the telephone line and loops the transmitter output back to the receiver through a channel simulator. The signal applied to the receiver is at a level of approximately -16 dBm. The ST switch causes the transmitter to transmit steady marks and conditions the ER lamp to flash when errors (spaces) are received.

- ***Digital Loop-Back Self Test:*** This test mode is entered by depressing the DL switch on the remote data set and depressing the ST switch on the local data set. Depressing the DL switch on the remote data set conditions the data set to disconnect the associated CPE and function as a regenerator. Depressing the ST switch on the local data set conditions the data set to transmit steady marks. The ER indicator flashes as errors (spaces) are received. This end-to-end self test allows inclusive testing of the data sets and channel facilities.

2.15 When DS 208A-type is used as an extension of a DS 209A-L1 multiplex system, refer to Section 592-032-200 for detailed information. Procedures used at the serving test center (STC) to maintain such systems are contained in Section 666-511-504.

2.16 When DS 208A-type is used as a subrate off-net extension of the digital data system, refer to Section 314-919-100 for more information. Procedures used at the hub office STC to maintain

TABLE D

STATUS INDICATORS ON DATA SET 208A-L1A AND DATA SET 208A-L1B

INDICATOR.	DESCRIPTION
ON	This indicator lights when the power cord is plugged into a nominal 117 Vac 60 Hz source and the power unit is operating normally.
MR	This indicator monitors the data set ready lead, and in normal operation, it is lighted whenever this lead is in the *on* condition. When DAS 828 or 829 is used and is in the test mode or when the data set is in the ST or DL test mode, the MR indicator is off. When the data set is in the AL mode, the MR indicator is extinguished except when the DSR-ON-in-AL-mode option is installed.
RS	This indicator monitors the request-to-send lead, and in normal operation, is lighted whenever the lead is in the *on* condition. When the data set is equipped for continuous request-to-send, the RS indicator is permanently lighted. It is also lighted when the data set is in the self-test mode.
CS	This indicator monitors the clear-to-send interface lead and is lighted whenever this lead is in the *on* condition. This indicates that the data set is ready and will transmit the data present on the send data lead.
CO	This indicator monitors the carrier-on interface lead and is lighted whenever this lead is in the *on* condition. This indicates that the receiver has detected a signal on the line which is in the data band.
ER	This indicator monitors the equalizer mode (QM) interface lead, and is lighted whenever the CO indicator is OFF. During normal operation (CO indicator lighted), the ER indicator is lighted whenever the QM interface lead is in the *off* condition. This indicates marginal performance of the data set due to either excessive channel impairments or a faulty data set, and that the automatic adaptive equalizer is retraining. During this time, data appearing on the receive data lead is not valid. In the self-test (ST) mode, the ER indicator is conditioned to momentarily light any time an error is detected.

the analog portion of such systems are contained in Section 666-511-503.

2.17 If the data set being used as a remote extension is DS 208A-L1A or 208A-L1B, the self-test features are restricted as follows:

(a) Analog loop-back self test cannot be performed (at a remote extension) with options as installed. If the internal timing option is temporarily installed at the remote extension, this test can be performed.

(b) Digital loop-back test cannot be performed from a remote extension in toward the DS 208A-type collocated with DS 209A-L1 (with options as installed). If the internal timing option is temporarily installed at the remote extension, this test can be performed.

(c) Digital loop-back test cannot be performed from a remote extension in toward a hub office of the digital data system with data set options as installed. If the internal timing option is temporarily installed at the remote extension, this test can be performed.

B. Customer Interface

2.18 The customer interface is accessible through the CUST INT connector at the rear of the data set. The connector pin numbers and the corresponding lead designations are shown in Table

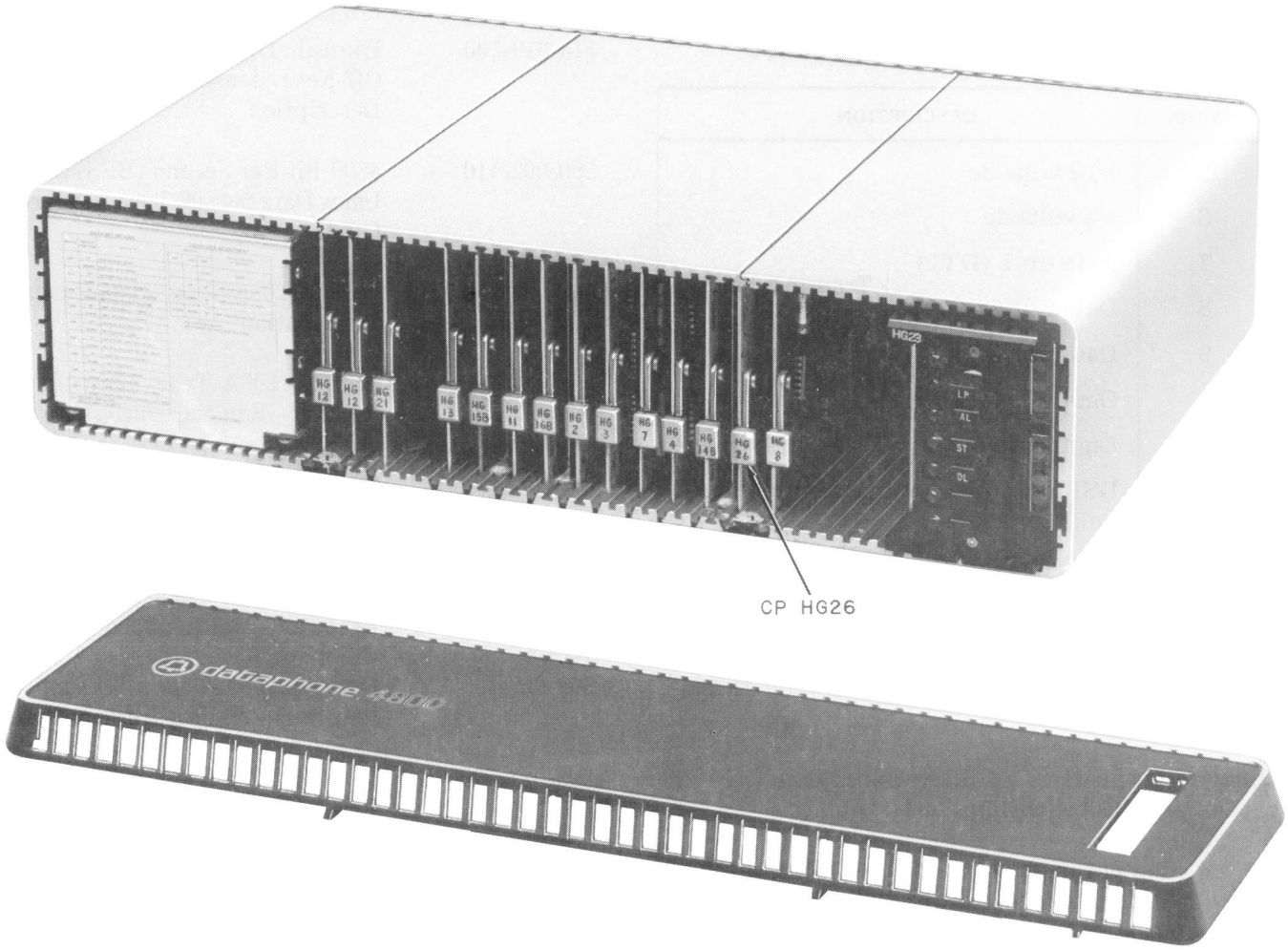


Fig. 4—DS 208A-L1B—Front View With Cover Removed

B. For a complete description of the interface leads, refer to Section 592-027-150.

C. Telephone Line Interface

2.19 The telephone line interface is accessible through the TEL INT connector at the rear of the data set. The connector pin numbers and the corresponding lead designations are shown in Table E.

D. Options

2.20 DS 208A-type is provided with a number of features or options which may be requested by the user. A detailed description of these options is given in Section 592-027-150 and 592-027-200. These options are added and removed by switches shown on Fig. 5. A summary of these options is given in the table associated with Fig. 5.

3. OPERATION

3.01 DS 208A-L1 is provided with a 3-position loop-back test switch.

- Operate the switch to the DL position to initiate a digital loop-back test.
- Operate the switch to the AL position to initiate an analog loop-back test.

TABLE E

TELEPHONE LINE INTERFACE LEADS

PIN NO.	DESCRIPTION
2	−12 volts dc
3	+5 volts dc
7	Data tip 1 (DT1) } Transmit Pair
8	Data ring 1 (DR1) } Transmit Pair
9	Data tip (DT) } Receive Pair
10	Data ring (DR) } Receive Pair
11	Digital ground
13	DSR control from line terminating units
20	+12 volts dc

- Operate the switch to the center position to allow data to proceed normally through the data set.

3.02 Data sets 208A-L1A and 208A-L1B are provided with four test switches.

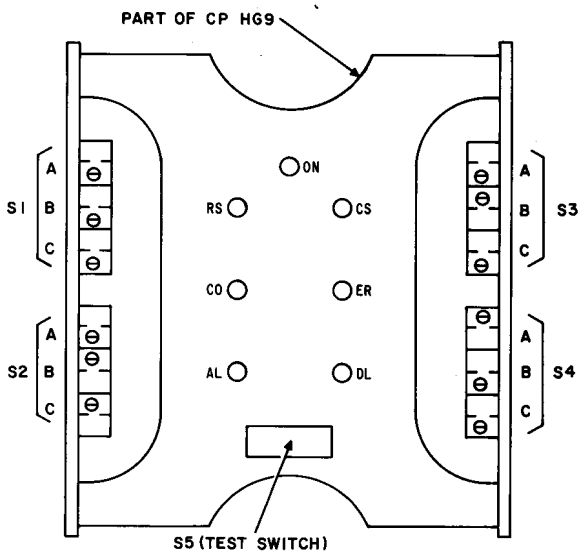
- Momentarily depress the LP switch to illuminate the status indicators for test purposes.
- Depress the DL switch to initiate a digital loop-back test.
- Depress the AL switch to initiate an analog loop-back test.
- Depress the AL and ST switches to initiate a self test of the local data set independent of external equipment.
- Depress the ST switch on the local data set and have the DL switch on the remote set depressed to initiate a self test of both data sets and the channel facility independent of external equipment.

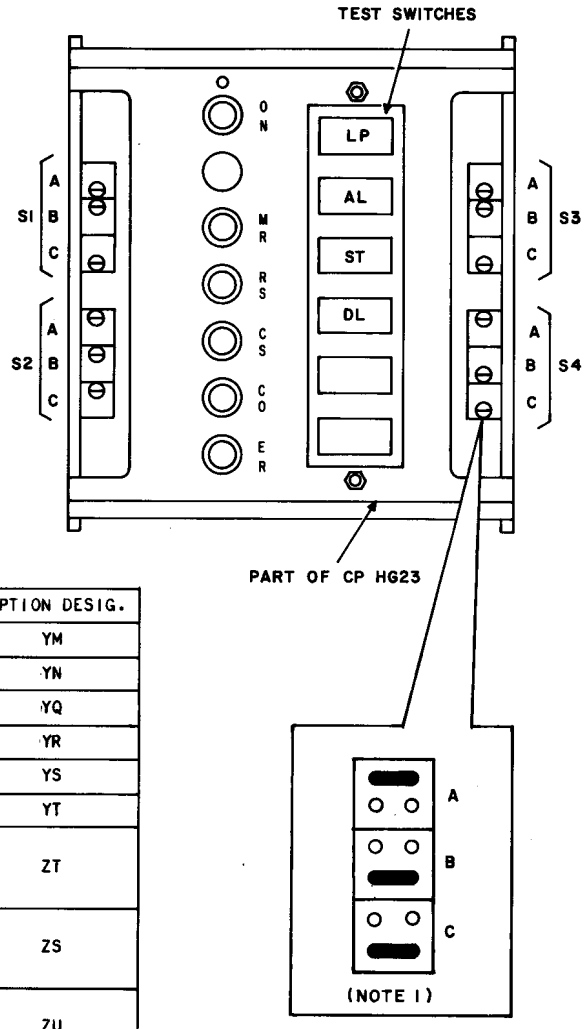
4. REFERENCES

4.01 Documents listed in this part contain information pertaining to DS 208A-type.

SECTION	TITLE
314-919-100	Digital Data System—Subrate Off-Net Extension Arrangements—Description
590-002-110	4800-Bit Per Second (BPS) Service Using Data Set 208-Type—Reference Guide
592-027-150	Data Set 208A-Type—Supplementary Information
592-027-180	Data Set 208A-Type—Transmitter-Receiver—SummarizingSpecification
592-027-200	Data Set 208A-Type—Transmitter-Receiver—Installation and Connections
592-027-300	Data Set 208A-Type—Transmitter-Receiver—Maintenance
592-027-400	Data Set 208A-Type—Transmitter-Receiver—Wiring Information
592-027-500	Data Set 208A-Type—Transmitter-Receiver—Test Procedures
592-027-501	Data Set 208A-Type—Transmitter -Receiver—Test Procedures Using 921A Data Test Set
592-032-200	Data Set 209A-L1—Transmitter-Receiver—Installation and Connections
592-032-300	Data Set 209A-L1—Transmitter-Receiver—Maintenance
666-511-503	Test of Data Services Provided by Data Set 208A-Type From a Private Line Test Room
666-511-504	Test of Data Services Provided by Data Set 209A-L1 from a Private Line Test Room
999-100-105	Data Set 208A-Type—How to Operate Manual

4.02 Detailed information pertaining to data set 208A-type is contained in CD- and SD-1D232-01.





DATA SET 208A-TYPE OPTIONS

FEATURE OR OPTION		SWITCH	SWITCH POSITION	OPTION DESIG.
DSR ON IN AL MODE		S1A (NOTE 5)	UP	YM
DSR OFF IN AL MODE			DOWN	YN
NO COMP EQUALIZER TEST		S1B (NOTE 5)	UP	YQ
COMP EQUALIZER TEST ENABLED (NOTE 7)			DOWN	YR
CONTINUOUS REQUEST-TO-SEND		S1C	UP	YS
SWITCHED REQUEST-TO-SEND			DOWN	YT
EQUALIZATION	NO EQUALIZATION	S2A, S2B, S2C (NOTE 2)	DOWN	ZT
	AMP AND DELAY (SYM) (NOTE 3)	S2A (NOTE 2) S2B S2C	UP UP	ZS
	AMP AND DELAY (HI END)	S2A S2B S2C	UP DOWN UP	ZU
	AMP AND DELAY (SYM + HI END)	S2A S2B S2C	DOWN DOWN UP	ZV
TRANSMIT EXTERNALLY TIMED		S3A	UP	YD
TRANSMIT INTERNALLY TIMED			DOWN	YC
RETRAIN AUTOMATICALLY (NOTE 4)		S3B	UP	YU
RETRAIN NOT USED			DOWN	YV
DAS IS USED		S3C	UP	YI
DAS NOT USED			DOWN	YJ
1-SEC HOLDOVER DISABLE		S4A	UP	YW
1-SEC HOLDOVER			DOWN	YX
CONTINUOUS CARRIER		S4B	UP	XB
SWITCHED CARRIER			DOWN	XA
NEW SYNC USED BY CUSTOMER (NOTE 6)		S4C	UP	YB
NEW SYNC NOT USED BY CUSTOMER			DOWN	YA

NOTES:
1. CP HG23 MAY HAVE OPTION SWITCHES AS SHOWN IN INSET. EACH SWITCH SECTION (A, B, OR C) CONSISTS OF AN UPPER AND LOWER PAIR OF TERMINALS DESIGNATED UP AND DOWN. INSTALL DESIRED OPTION BY PLACING SHORTING PLUG ACROSS RESPECTIVE TERMINALS AS SHOWN.
2. SWITCH MAY BE IN EITHER POSITION
3. ALWAYS USE WHEN OPTIONED FOR CONTINUOUS CARRIER OPERATION (S4B UP)
4. THIS OPTION MUST ALWAYS BE INSTALLED
5. THIS OPTION AVAILABLE ONLY ON DS 208A-L1A AND DS 208A-L1B
6. NOT USED WHEN FAR-END DATA SET IS OPTIONED FOR CONTINUOUS CARRIER
7. USED ONLY DURING INSTALLATION AND SHOULD NOT BE INSTALLED FOR NORMAL OPERATION.

Fig. 5—Summary of Data Set Options