

DATAPORT CHANNEL UNITS
CHANNEL UNIT DESCRIPTION
D4 CHANNEL BANK
DIGITAL TRANSMISSION SYSTEMS

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1. GENERAL

1.01 This section provides a detailed description of the office channel unit dataport (OCU DP), digital signal zero dataport (DS0 DP), and the data service unit dataport (DSU DP) used in the D4 channel banks. See Fig. 1 through 5.

1.02 This section is reissued to include the application of 56 kb/s error-correcting dataport channel units. Option settings are defined along with restrictions in various configurations. Since this is a general revision, change arrows are not used.

1.03 This section provides a functional description of the channel unit(s) at a block diagram level. The transmission paths and signaling circuits that characterize the unit(s) are described herein. Circuit elements that are common to all units (active filters, pulse amplitude modulators and demodulators, gates, and channel unit logic functions) are mentioned in this section and described in detail in Section 365-170-101. Voice frequency levels, circuit and signaling options, and attenuator settings are given

on the circuit layout record card (CLRC). The procedures for making the settings and adjustments are covered in Section 365-170-000 (TOP). Plug-in units for D4 dataport operation are listed in Table A and options are listed in Table B.

2. CHANNEL UNIT DESCRIPTION

A. Application

OCU DP

2.01 The OCU DP can be used in any D4 channel position to connect customer data signals to the Digital Data System (DDS) without the need for a complete DDS multiplexer. This type of unit translates data signals of 2.4, 4.8, 9.6, or 56 kb/s first to the basic DS0 rate of 64 kb/s, and then to the DS1 rate of 1.544 Mb/s. The office where the unit is used is called a DDS dataport office. The DS0 DP unit is used in the D4 bank at the other end of the carrier system to recover the DS0 signal for further connections (Fig. 6).

DS0 DP

2.02 The DS0 DP unit provides an interface between the 1.544 Mb/s bit stream of the D4 channel bank common equipment and the DS0 64 kb/s bipolar nonreturn to zero format DDS bit stream (Fig. 6). This connects the DDS customer at the end office via T carrier facilities to the hub office and the DDS network.

DSU DP

2.03 The DSU DP channel units provide a fully synchronous data link, at speeds of 2.4, 4.8, or 9.6 kb/s, using the EIA standard RS-449 electrical interface. Typically, it provides an interface

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between telephone company data terminal equipment and a digital data link running between Central Office A and a Remote Switching System (RSS) Central Office B as shown in Fig. 7. The DSU DP may be plugged into and used in any D4 bank digroup earmarked for DSU DP service. The channel unit slot must have a special individual channel adapter cable attached to the back plane connector. One end of the adapter cable has an 18-pin connector which mates with the cable to the user terminal equipment (SD 3C304-01).

OFFICE INTERFACE UNIT-2 (OIU-2)

2.04 When dataport channel units are used in the D4 channel bank, an OIU-2 must be plugged into the designated common-unit slot (Fig. 6). The OIU-2:

- Synchronizes the D4 channel bank clock to the incoming bipolar line bit stream or to an externally provided 64-Hz clock, or allows it to free run.
- Provides a clock signal to all dataport channel units operational in the D4 channel bank.
- Provides two external composite clock outputs, each of which conveys 8 and 64 kHz timing information for synchronizing office equipment.

B. Data Transmission Paths

OCU DP 2.4 kb/s, 4.8 kb/s, 9.6 kb/s

2.05 The DDS customer is connected to the OCU DP by a 4-wire circuit at subrate speeds with bipolar signal format. See Fig. 6. The incoming serial subrate data streams are organized into 6-bit information bytes. The input to the D4 common circuits requires an 8-bit byte format. The OCU DP adds a 0 bit to the front of the byte and a 1 bit to the end to establish the 8-bit byte format.

2.06 The subrate byte is then repeated the number of times required to achieve the 64 kb/s rate. This technique is known as byte stuffing. For example, at the 9.6-kb/s data rate, 9600 customer bits are sent toward the network every second. Two bits are added to each byte, a total of 3200 more bits every second. Each byte

is repeated 5 times. Thus, the byte stuffing is: $[(9600 + 3200) \times 5 = 64 \text{ kb/s}]$. The 64-kb/s format signal is injected into the 1.544 Mb/s bit stream by the D4 common circuitry.

2.07 The byte stuffing for the 2.4 kb/s speed is achieved by repeating the byte 20 times and the 4.8 kb/s speed is repeated 10 times to achieve the 64-kb/s bit rate.

OCU DP 56 kb/s

2.08 The 56 kb/s dataport units are similar to the existing subrate units, which interface directly with the customer loop. If error correction is in use, two DS1-channel time slots effect transmission of a 16-bit code for each eight bits of data (DS0-A or DS0-B). The first eight bits of this code word are the data bits themselves, while the second eight bits are called the parity word. Without error correction, a single time slot is used, and no parity word is generated.

2.09 The OCU-DP converts 56 kb/s data to DS0-A (64 kb/s) format and encodes it for error correction if this option is selected. The resulting data and parity bytes are inserted into the PCM stream at the 1.544 Mb/s (DS1) rate. See Fig. 8. The error-corrected arrangement precludes employing the unit slot on the right of the 56 kb channel unit for an individual channel because of the two channel requirement with error correction (see paragraph 2.08). When operating with error correction see Fig. 9. Also, since two time slots are required to transfer data, the last unit slot (channel 24) cannot be used if error correction is selected. See Fig. 10. A blank may be inserted in the unused channel slot (ED 3C647-30, G1).

DS0 DP

2.10 Digital Signal Zero Dataport (DS0 DP): The DS0 DP unit provides direct digital access to T carrier via the equipment (drop) side of the D4 channel bank. The use of dataports to gain digital access to the T Carrier facility is more economical than the use of T1WB4/5 data banks. This unit interfaces with the 64 kb/s data signal in the bipolar nonreturn to zero format (DS0-A or DS0-B) and translates the signal to occupy one 8-bit time slot on the T line. Similarly, it receives one time slot (8 bits at 1.544 Mb/s) signal from the T line and translates it to a 64 kb/s (DS0-A or DS0-B) signal. The DS0-B signal cannot

be used over a dataport link unless a DSØ DP is used at both ends with error correction out.

Note: When the data stream contains data from only one customer (eg, a 2.4 kb/s rate that is repeated up through 64 kb/s), it is defined as a DSØ-A. When the data stream contains data from more than one customer (eg, 20 separate 2.4, or 10 separate 4.8, or 5 separate 9.6 kb/s customers), it is defined as a DSØ-B. Subrate multiplexing equipment is involved for DSØ-B.

The DSØ DP unit has the zero suppression code to prevent all zeros from appearing in the 64 kb/s time slot. This unit immediately transmits a "DDS-out-of-sync" code continuously during a carrier failure on the DSØ-A or DSØ-B signal if the T line loses signal. An option in the receive side of this channel unit is provided to activate the error correction scheme. An error correction code has been incorporated and if the T line error rate degrades temporarily, this code will maintain the error performance of the data signal. The scheme will keep the error rate signal at 10^{-8} even if the T line error rate degrades as much as 10^{-3} . Typical application of a DSØ DP in the hub office is shown in Fig. 6. The 56 kb DSØ DP with the error correction option selected allows use with any DSØ signal, including multiplexed subrates. A DSØ-B signal can be the drop side input for a 56 kb DSØ DP.

2.11 Data Service Unit Dataport (DSU DP):
This channel unit can provide intra-Bell

central office data communications if the central offices are connected by T carrier. A direct access to the dataport without requiring a DDS Data Service Unit can be realized. Up to 200 meters between the terminal equipment in the central office and the D4 channel bank with the DSU DP is allowable. This unit incorporates some of the features of the OCU DP as well as those of the DDS Data Service Unit necessary to interface the customer. See Fig. 7.

3. CIRCUIT OPTIONS

3.01 The circuit options for the DSØ DP, OCU DP, and the DSU DP are shown in Table B. The actual option setting will be given on the CLRC.

4. REFERENCES

4.01 The following is a list of sections associated with D4 equipment.

SECTION	TITLE
179-100-311	D4 Channel Bank - Signaling Compatibility
365-170-000	D4 Channel Bank - TOP
365-170-100	D4 Channel Bank Description
365-170-101	D4 Channel Units - General Description

TABLE A

D4 DATAPORT CHANNEL UNITS

EQUIPMENT	EQUIPMENT CODE	SD/CD	FUNCTION
DS0 DP (Digital Signal Zero Dataport)	J98726DA	3C336-01	64 kbs data access to DDS with subrate error correction option
	J98726DD	3C448-01	64 kbs data access to DDS with 56 kb DS0-A or DS0-B error correction option
OCU DP (Office Channel Unit Dataport)	J98726DB	3C398-01	Subrate data access to local loop and DDS
	2.4 kb/s	List 1	
	4.8 kb/s	List 2	
	9.6 kb/s	List 3	
56 kb/s	J98726DE	3C447-01	56 kb data access to local loop and DDS
DSU DP (Data Service Unit Dataport)	J98726DC	3C3990-01	Provide intra-Bell central office data communications

TABLE B

DATAPORT CHANNEL UNIT OPTIONS

CHANNEL UNIT	SWITCH/OPTION	FUNCTION
DSØ DP (Gray) J98726DA SD3C336-01	J2/IN-OUT	When selected, IN provides error correction for unmultiplexed subrate data; otherwise, select OUT for multiplexed data.
	J2/D4-SLC	This option provides for D4 or SLC system applications of dataport.
	J3/D-T	Select D for normal use; T is for factory tests.
DSØ DP 56 kb J98726DD SD3C448-01	S1/EC	When selected, IN provides error correction for multiplexed subrate data or 56 kb data, otherwise, select OUT.
	J2/EC	Power for error correction is selected when plug is in top position (white showing). Error correction is out when plug is in bottom position (black showing). Option is factory wired IN on early units.
	S2/MODE SELECT	This option selects the time slot for the parity word. Provides for D4 and SLC system applications.
OCU DP (Gray) J98726DB SD3C398-01	J102/D4-SLC	This option provides for D4 or SLC system applications of dataport.
	J103 J104/D-T	Select D for normal use; T is for factory tests.
	S102/FLBO	When selected, IN provides FLBO insertion loss. OUT removes FLBO insertion loss.
	S103/CRTC	Out position removes customer remote test control (CRTC). IN position provides for customer remote test control (CRTC).
	S103/CSU DSU	CSU is selected when the customer uses a 550-type channel service unit. DSU is selected when the customer uses a 500-type data service unit.

TABLE B (Contd)

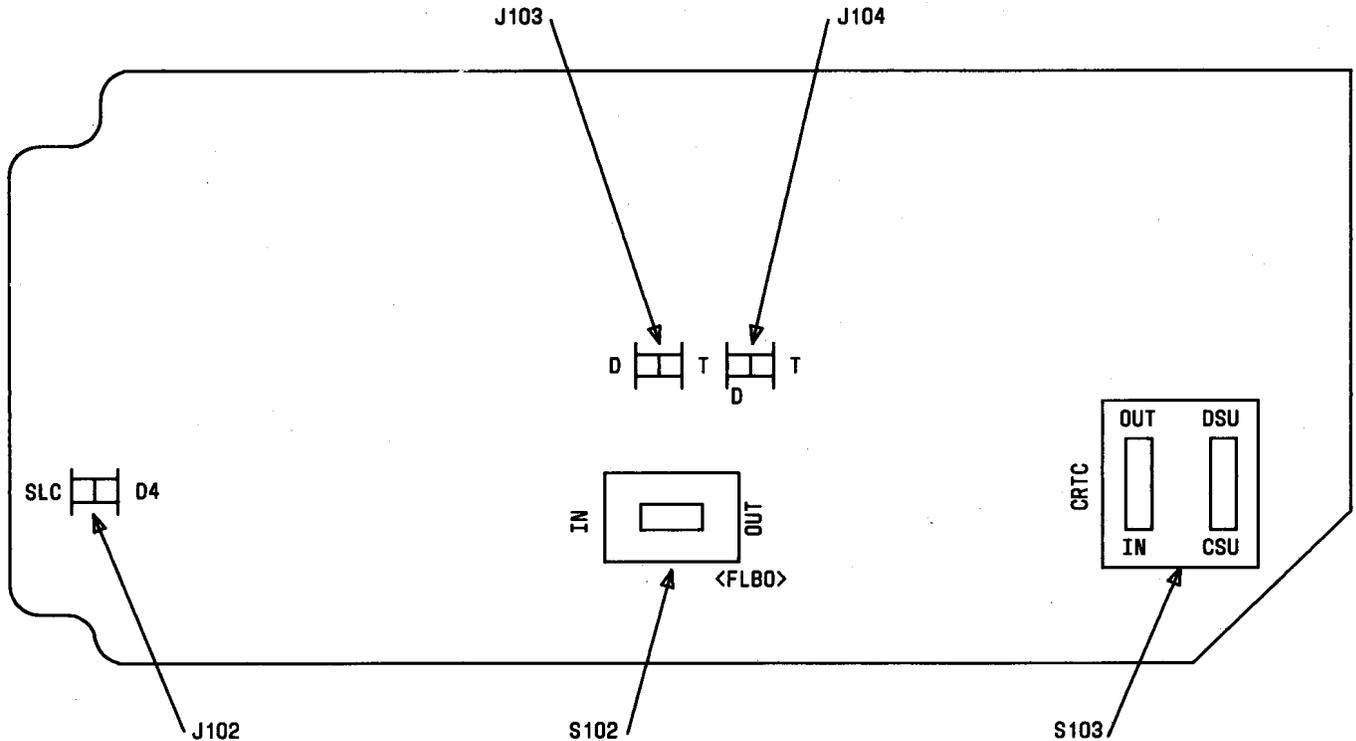
DATAPORT CHANNEL UNIT OPTIONS

CHANNEL UNIT	SWITCH/OPTION	FUNCTION								
OCU DP 56 kb J98726DE SD3C447-01	S101/EC	When selected, IN provides error correction for 56 kb data; otherwise, select OUT for uncorrected data.								
	J103/EC	When plug is inserted into IN position, power for error correction is selected. Option is factory wired IN on early units. When plug is inserted into OUT position, error correction is removed.								
	S102/MODE SELECT	This option selects the time slot for the parity word. Provides for D4 or SLC system applications.								
	J101/D-T	Select D for normal use; T is for factory tests.								
	S103/CRTC	OUT position removes customer remote test capability (CRTC). CRTC position provides for customer remote test control. (CRTC should normally be in the OUT position.)								
	S103/CM OUT	CM option is for use of customer multiplex at the station equipment. CM option should normally be in the OUT position.								
	S103/CSU DSU	CSU is selected when the customer uses a channel service unit. DSU is selected when the customer uses a data service unit.								
DSU DP (Gray) J98726DC SD3C399-01	S2	Selection of the data rate is accomplished by setting rotary switch as follows: <table border="0" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center; border-bottom: 1px solid black;">Data Baud Rate</th> <th style="text-align: center; border-bottom: 1px solid black;">Switch Position</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">2.4 kb/s</td> <td style="text-align: center;">5</td> </tr> <tr> <td style="text-align: center;">4.8 kb/s</td> <td style="text-align: center;">6</td> </tr> <tr> <td style="text-align: center;">9.6 kb/s</td> <td style="text-align: center;">8</td> </tr> </tbody> </table>	Data Baud Rate	Switch Position	2.4 kb/s	5	4.8 kb/s	6	9.6 kb/s	8
	Data Baud Rate	Switch Position								
	2.4 kb/s	5								
4.8 kb/s	6									
9.6 kb/s	8									
S1/RTM	Operation of the RTM switch initiates the remote terminal (RT) test. The RT green LED lights and the receive ready RR LED is off.									
S1/STM-RLM	Operation of the STM and RLM switches initiates the self test (ST) and the remote loopback test (RL). The ST and RL green LEDs should light.									

TABLE B (Contd)

DATAPORT CHANNEL UNIT OPTIONS

CHANNEL UNIT	SWITCH/OPTION	FUNCTION
DSU DP (Gray) J98726DC SD3C399-01 (Contd)	S1/LLM	Operation of the LLM switch establishes the local loopback (LL) test, indicated by the lighted LL and RR green LEDs. The local loopback test can also be initiated by the customer.
	S1/RLM	When only the RLM switch is activated, this initiates the remote loopback test (RL). When the code is received correctly, the RR green LED lights. When errors are received the ERR green LED will be lighted. The remote loopback test can also be initiated by the customer.



NOTE: DESIGNATION IN < > IS ONLY FOR INFORMATION AND IS NOT STAMPED

Fig. 1—OCU DP Channel Unit (J98726DB) Options

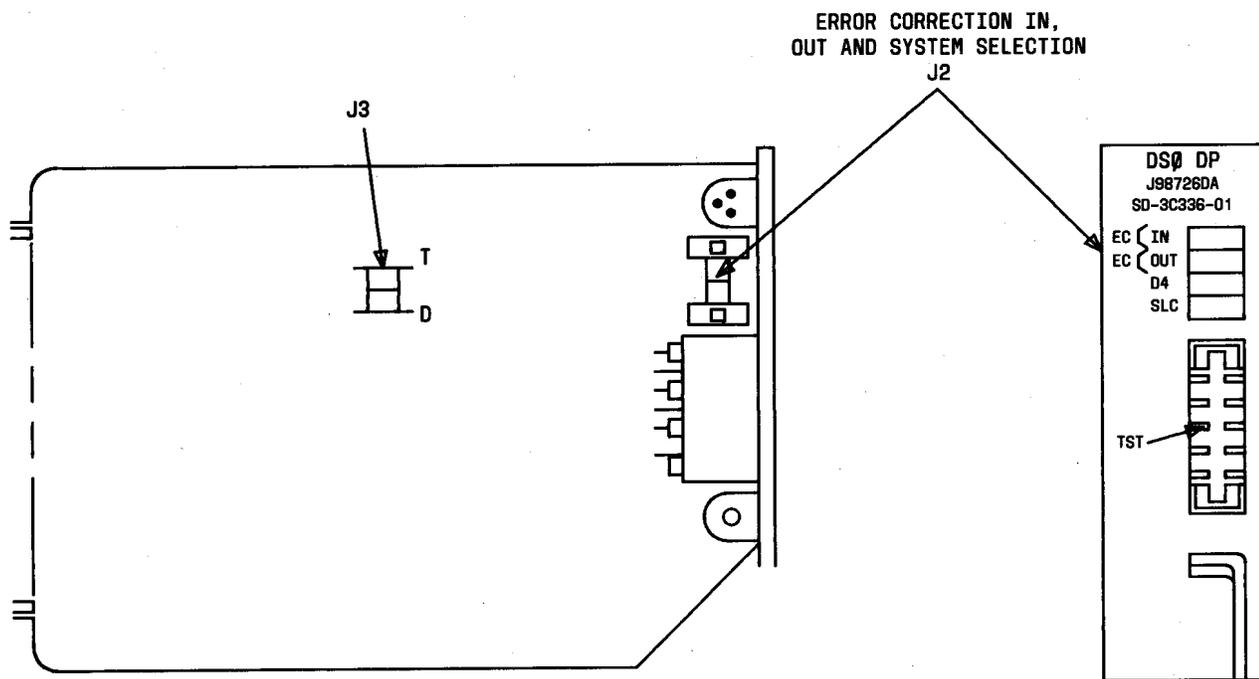


Fig. 2—DSØ DP Channel Unit (J98726DA) Options

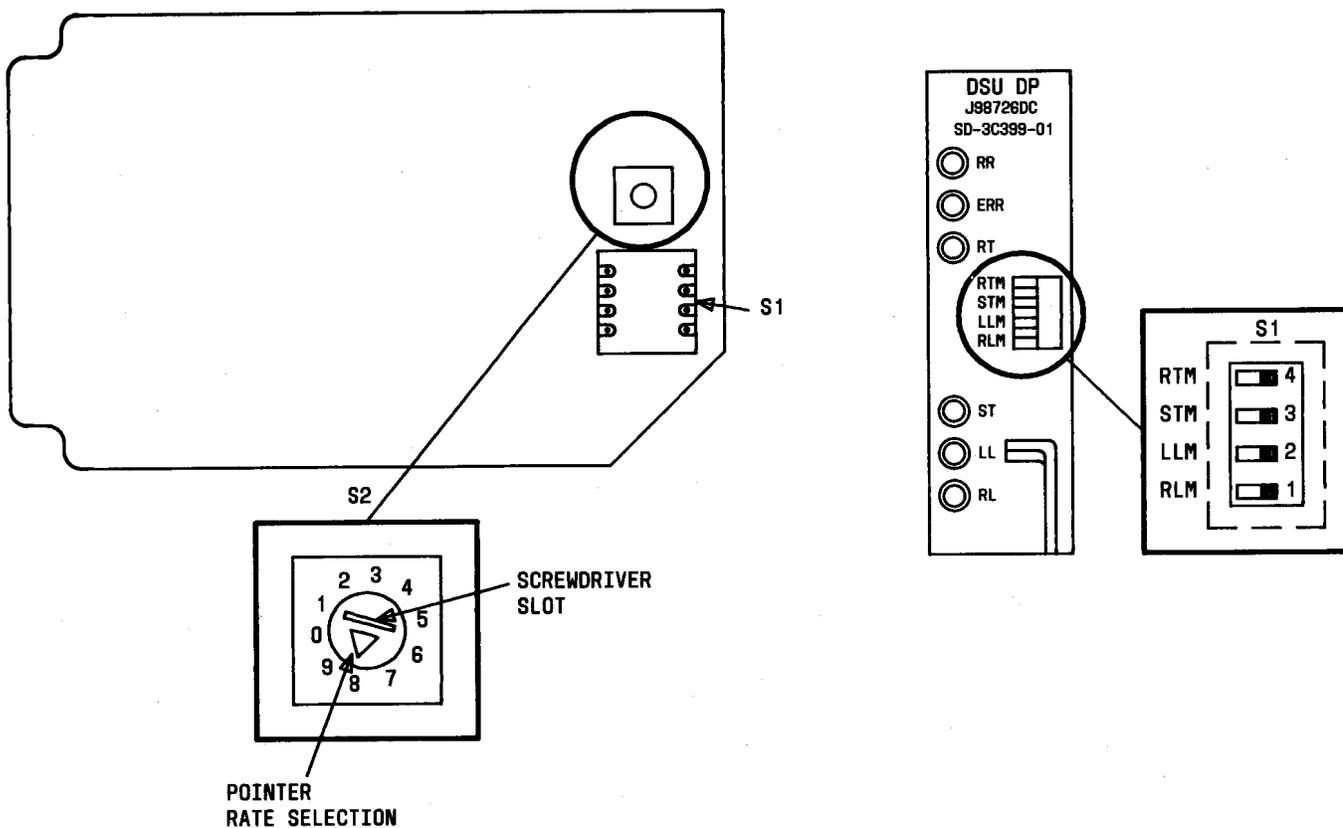
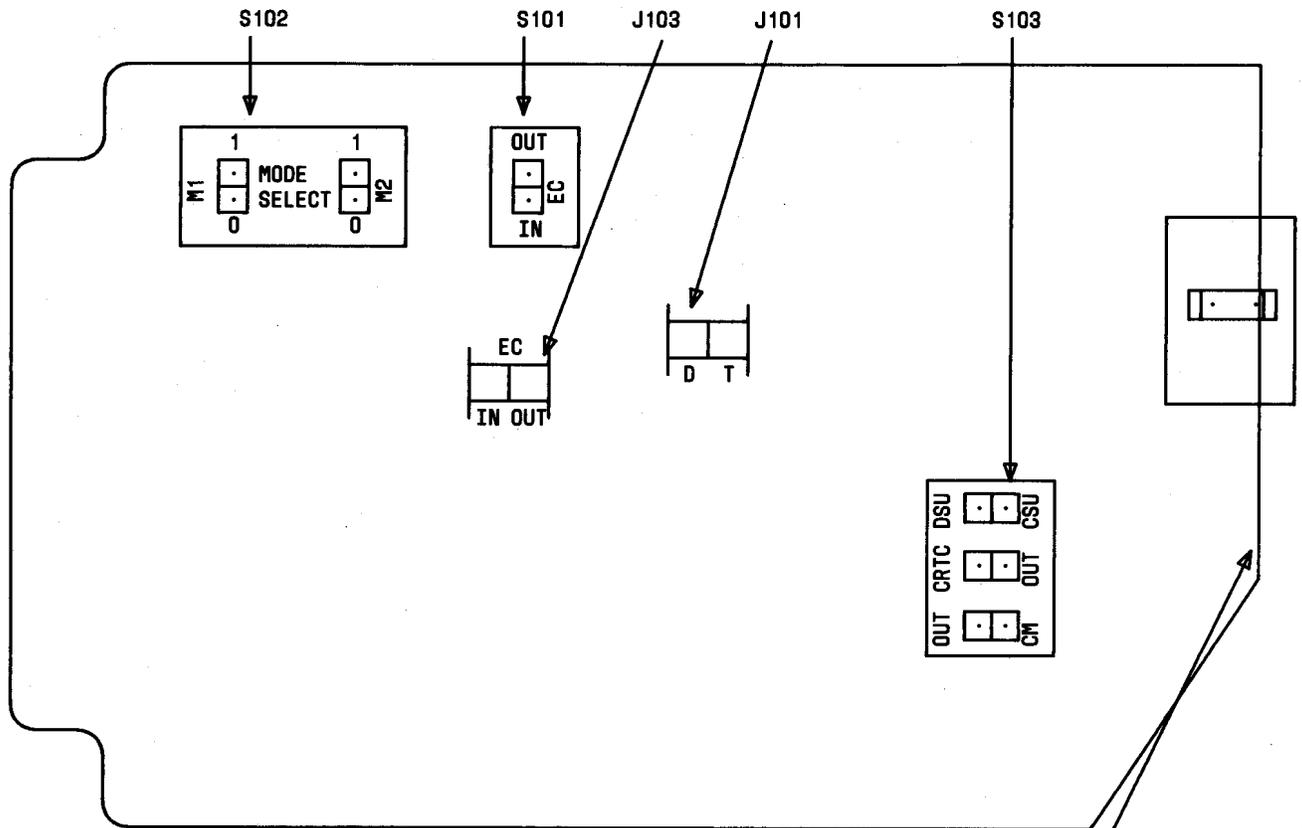


Fig. 3—DSU DP Channel Unit (J98726DC) Options



NOTE: J103/EC OPTION WILL BE FACTORY WIRED ON EARLY UNITS (NO OPTION PLUG).

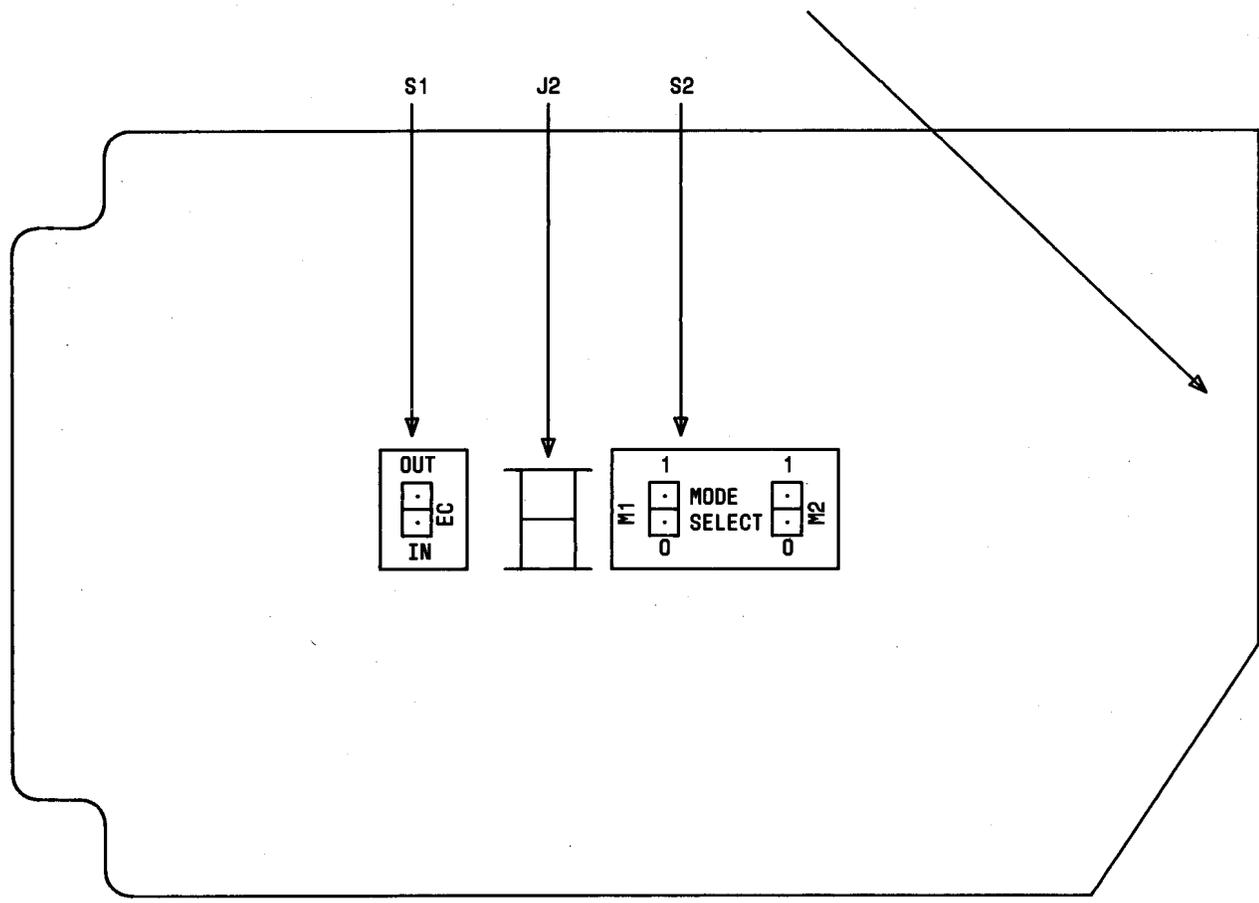
DECAL LOCATED
ON BACK OF
FACEPLATE

MODE SELECT		
M1	M2	
0	0	EC: D4
0	1	EC: SLC-96, MODE II
1	0	NON EC: D4, SLC-96 MODE I, III
1	1	EC: SLC-96, MODE I, III

Fig. 4—OCU DP 56 Kb Channel Unit (J98726DE) Options

MODE SELECT		
M1	M2	
0	0	EC: D4
0	1	EC: SLC-96, MODE II
1	0	NON EC: D4, SLC-96 MODE I, III
1	1	EC: SLC-96, MODE I, III

DECAL LOCATED ON BACK OF FACEPLATE



NOTE: J2/EC OPTION WILL BE FACTORY WIRED ON EARLY UNITS (NO OPTION PLUG).

Fig. 5—DSØ DP 56 Kb Channel Unit (J98726DD) Options

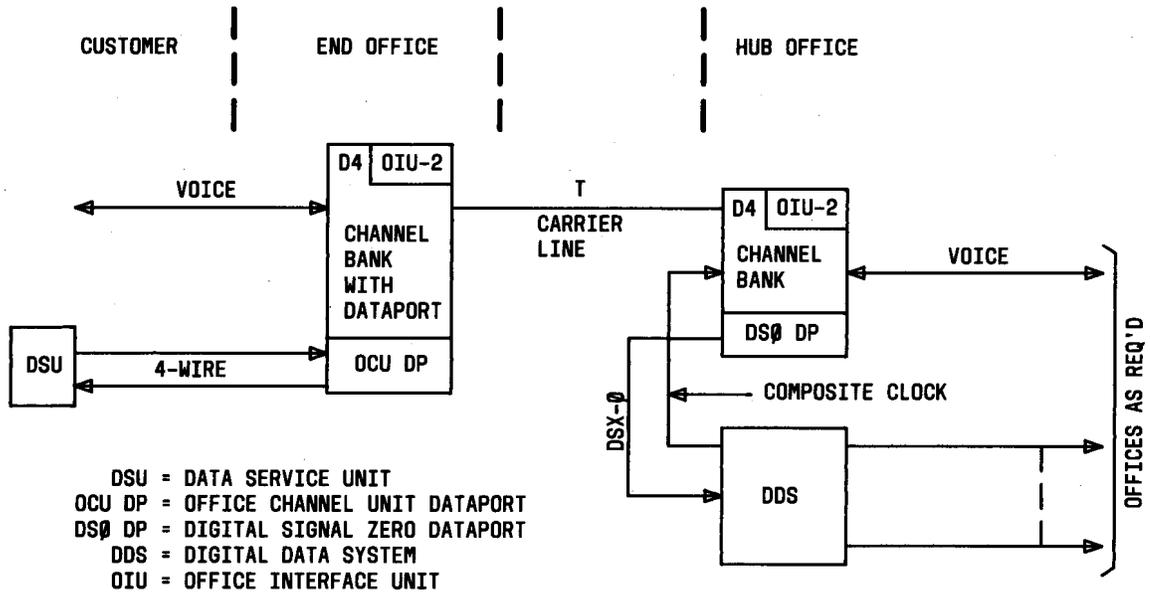


Fig. 6—Typical Dataport Application

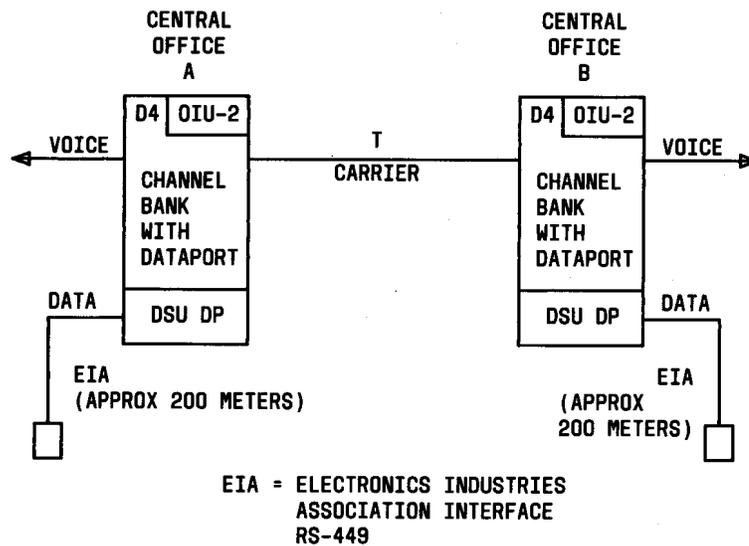
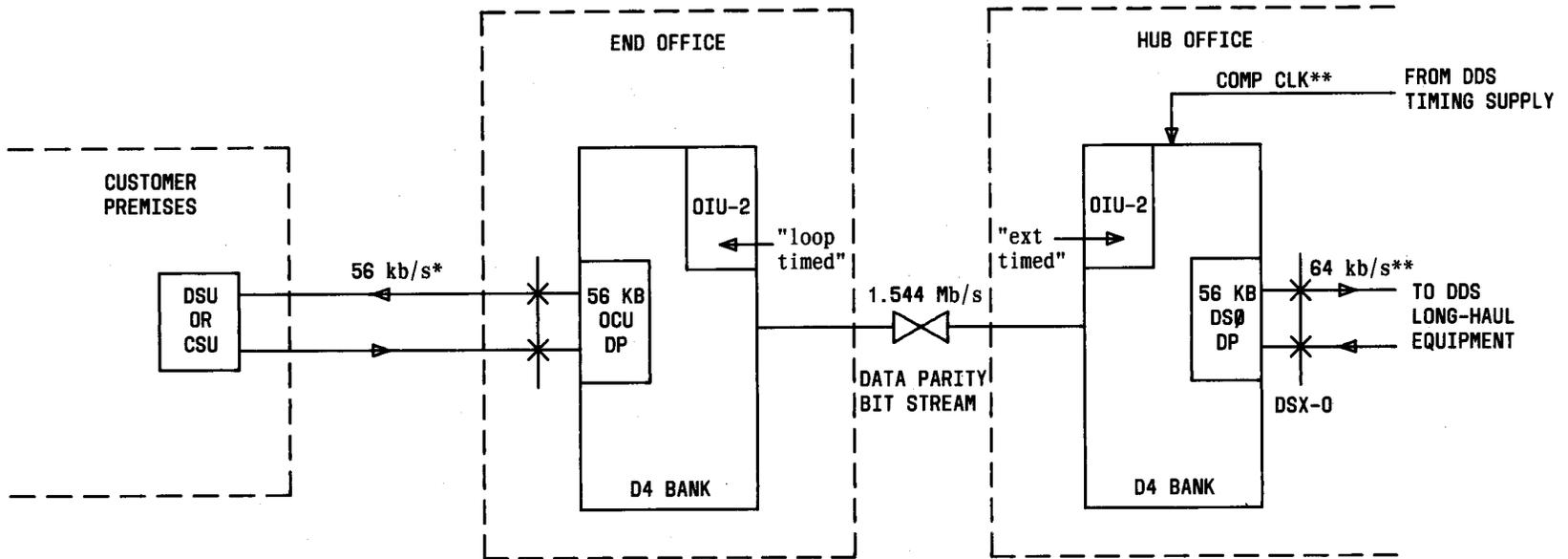


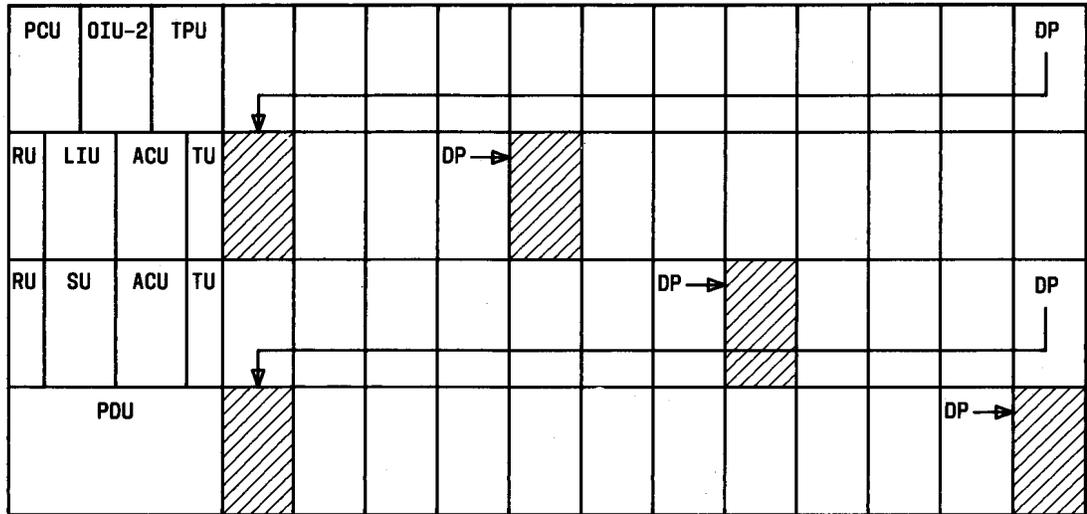
Fig. 7—Central Office Data Communications



* LOOP IS SUBJECT TO DDS 56 kb/s REQUIREMENT

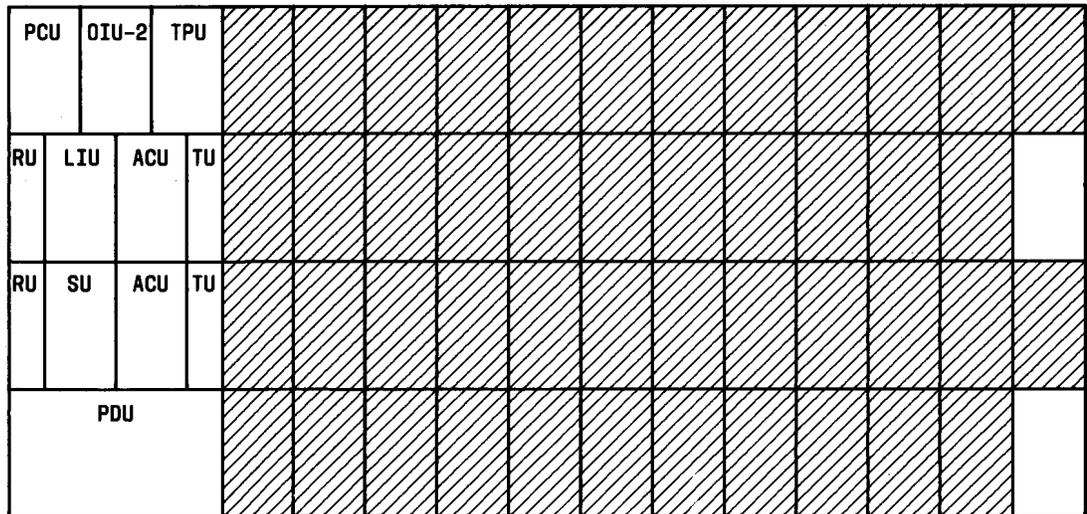
** COMP CLK AND 4-WIRE CONNECTIONS ARE SUBJECT TO THE SAME SPECS (AND 1500 FT LIMIT) AS OTHER DDS CONFIGURATIONS

Fig. 8—Typical 56 kb/s Dataport Application



NOTE:
 SHADING INDICATES 56 Kb/s DATAPORT SLOTS IN A D4 BANK WHICH MUST BE LEFT UNUSED FOR ERROR CORRECTION. DP REPRESENTS THE DATAPORT PLUG-IN WITH ARROW INDICATING ASSOCIATED EMPTY SLOT

Fig. 9—D4 Channel Bank Example of 56 kb/s Dataport Channel Unit Arrangement for Error Correction



NOTE: SHADED SLOTS CAN BE USED FOR 56 Kb/s CHANNEL UNITS.
 UNSHADED SLOTS CANNOT BE USED FOR 56 Kb/s CHANNEL UNITS.

Fig. 10—D4 Channel Bank Showing Empty Channel Unit Slots that Cannot Be Used for 56 kb/s Dataport Service