

DATAPORT CHANNEL UNITS
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 or SLC*-96 subscriber loop carrier system terminals. Figures 1 through 5 illustrate a pictorial view of the component side of each unit.

1.02 This section is reissued to describe the later versions of dataport channel units which consume less power than the earlier versions and/or have option modifications. Revision arrows are used to emphasize significant changes.

1.03 ♦This section describes the application and data transmission aspect of the dataport channel units. ♦Circuit elements that are common to all units (active filters, pulse amplitude modulators and demodulators, gates, and channel unit logic functions) are described in detail in Section 365-170-101. ♦Circuit and signaling options are given on the circuit layout record card (CLRC) or work order record details (WORD) document. The procedures for mak-

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ing option settings and adjustments are covered in Section 365-170-000 (TOP). The dataport units, their SD/CD numbers, and their functions are listed in Table A. Options for each unit are listed in Table B. ♦

2. CHANNEL UNIT DESCRIPTION

A. Application

OCU DP

2.01 ♦The OCU DP channel unit 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 to the basic DS0 rate of 64 kb/s. The office where the unit is used is called a DDS dataport office. Figure 6 shows a dataport application with an OCU unit interfacing with a DDS customer at one end and a DS0 unit interfacing the DDS network at the other end. ♦

DS0 DP

2.02 ♦The DS0 DP channel 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. This unit connects the DDS customer at the end office via T carrier facilities to the DDS network at the hub office. This is shown in Fig. 6. ♦

DSU DP

2.03 The DSU DP channel unit provides a fully synchronous data link, at speeds of 2.4, 4.8, or 9.6 kb/s, using the Electronics Industry Association (EIA) standard RS-449 electrical interface. Typical-

ly, it provides an interface 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 unit may be plugged into and used in any D4 bank digroup earmarked for DSU DP service. ♦The channel unit slot used for DSU service must have a special individual channel adapter cable attached to the backplane connector. ♦The adapter cable has an 18-pin connector which mates with the cable to the user terminal equipment (SD-3C304-01 or SD-3C304-02).

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

- ♦Synchronizes the D4 channel bank clock to the incoming bipolar line bit stream or to an externally provided 64-kHz composite clock ♦
- Provides a clock signal to all dataport channel units operational in the D4 channel bank
- ♦Provides two composite clock outputs, which may be used for externally synchronizing other D3 or D4 channel banks in the office. ♦

B. Data Transmission

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 channel unit by a 4-wire circuit at substrate speeds with bipolar signal format. See Fig. 6. The incoming serial substrate 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 substrate 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 or 1600 bytes are sent toward the network every second. ♦Two bits are added to each byte for a total of 3200 more bits every second. Each byte is repeated five 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 64 kb/s rate is achieved for the 2.4 kb/s substrate by repeating the byte 20 times and for the 4.8 kb/s substrate by repeating its byte 10 times. ♦

2.08 ♦The later version of the OCU DP (J98726DB-2) is termed as a "low power" unit. Because of this low power consumption (about 1 watt per unit), a D4 bank can accommodate up to 28 of these units with or without other types of channel units equipped. For the earlier higher power consumption OCU units (J98726DB-1), one D4 digroup can accommodate up to twelve units if it has no other channels equipped and up to six units if it has other channels equipped. When equipping a D4 bank with a mixture of high and low power OCU DP units, the following guidelines should be observed:

- (a) Each digroup may contain no more than six high power units.
- (b) Each digroup may contain any number of low power units as long as the total number of low and high power units for the bank does not exceed 28. ♦

DSØ DP

2.09 Digital Signal Zero Dataport (DSØ DP):

The DSØ 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 (DSØ-A or DSØ-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 (DSØ-A or DSØ-B) signal. The DSØ-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. Substrate 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 DS0-A or DS0-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 DS0 DP in the hub office is shown in Fig. 6.

2.10 ♦ A low power version of the DS0 DP unit (J98726DA-2) is available. There are no channel restrictions when using this unit. All 48 channels of a D4 bank may be equipped with low power DS0 DP units. ♦

56 KB DS0 DP and 56 KB OCU DP Units

2.11 ♦ The 56 kb/s dataport units are similar to the existing subrate units. These units convert 56 kb/s data to DS0 (64 kb/s) format and encode 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.

2.12 If error correction is in use, two DS0 channel time slots are used for transmission of a 16-bit code word for each eight bits of data. 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. With error correction, two time slots are used and this precludes employing the adjacent channel unit slot on the right of the 56 kb channel unit. See Fig. 9. Also, since two time slots are required to transfer data with error correction, the last unit slot (channel 24) of each digroup

cannot be used since there are no adjacent slots. A blank (ED-3C649-30, G1), may be inserted in these unused channel slots. ♦

2.13 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 DS0 DP, OCU DP, and the DSU DP are defined in Table B. The actual option setting required for a specific service will be given on the CLRC or WORD document. ♦

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
855-351-105	D4 Channel Bank Channel Units—Application Engineering

TABLE A4

D4 DATAPORT CHANNEL UNITS

EQUIPMENT	EQUIPMENT CODE	SD/CD	FUNCTION
DS0 DP (Digital Signal Zero Dataport)	J98726DA	3C336-01 3C336-02	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-1/-2	3C398-01 3C398-02	Subrate data access to local loop and DDS
	2.4 kb/s	List 1/List 4	
	4.8 kb/s	List 2/List 5	
	9.6 kb/s	List 3/List 6	
56 kb/s	J98726DE	3C447-01	56 kb data access to local loop and DDS
DSU DP (Data Service Unit Dataport)	J98726DC	3C399-01	Provide intra central office data communications

TABLE B4

DATAPORT CHANNEL UNIT OPTIONS

CHANNEL UNIT	SWITCH/OPTION	FUNCTION
DSØ DP (Gray) J98726DA SD-3C336-01 SD-3C336-02	J2/IN-OUT	IN provides error correction for unmultiplexed subrate data. OUT provides no error correction.
	J2/D4-SLC-96	This option provides for D4 or SLC subscriber loop carrier system applications of dataport. Select D4 when used in D4 banks or SLC system terminals operating in mode 3. Select SLC-96 system when used in SLC system terminals operating in mode 1 or 2.
	J3/D-T	Select D for normal use; T is for factory tests. This option is replaced by a factory-wired strap on J98726DA-2 units.
DSØ DP 56 kb J98726DD SD-3C448-01	S1/EC	IN provides error correction for 56 kb data. OUT provides no error correction.
	S2/MODE SELECT	This option selects the time slot for the parity word. It provides for D4 and SLC system applications. Decal on back of channel unit faceplate gives information for setting this option.
OCU DP (Gray) J98726DB SD-3C398-01 SD-3C398-02	J102/D4-SLC	This option provides for D4 or SLC system applications of dataport.
	J103/D-T J104/D-T	Select D for normal use; T is for factory tests. This option is replaced by a factory-wired strap on later units.
	S102/FLBO	IN provides fixed line buildout (FLBO) insertion loss. OUT removes FLBO insertion loss.
	S103/CRTC	OUT position removes customer remote test control (CRTC). IN position provides for CRTC. This option does not exist on later units.
	S103/CSU DSU	CSU is selected when the customer uses a 550-type channel service unit. This option does not exist on later units. DSU is selected when the customer uses a 500-type data service unit. This option does not exist on later units.
	Error Correction	This option is factory wired into all J98726DB-1 units. It is field removed in List WA units for use in common leg of multipoint network of the DDS system. In J98726DB-2 units, error correction is selectable by J101 option.

TABLE B4 (Contd)

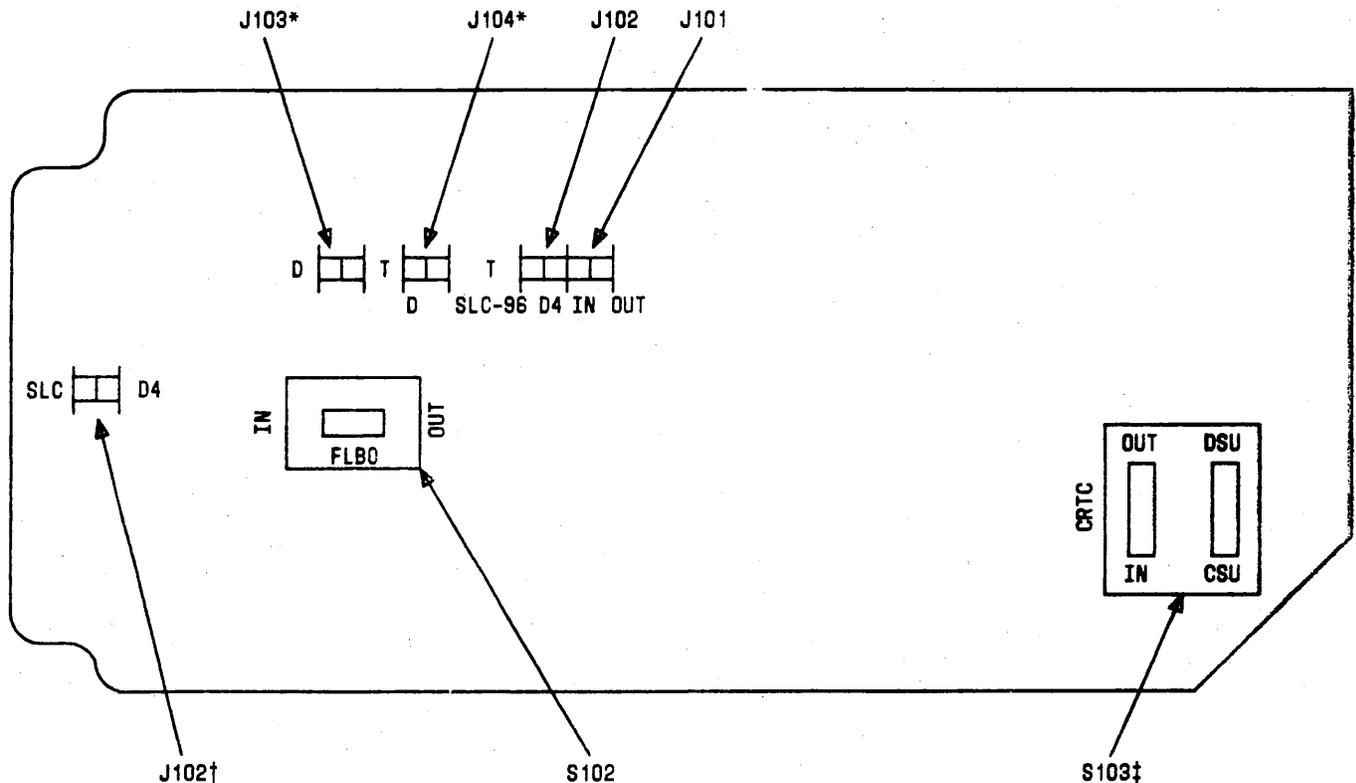
DATAPORT CHANNEL UNIT OPTIONS

CHANNEL UNIT	SWITCH/OPTION	FUNCTION								
OCU DP 56 kb J98726DE SD-3C447-01	S101/EC	IN provides error correction for 56 kb data. OUT provides no error correction.								
	S102/MODE SELECT	This option selects the time slot for the parity word. Decal on back of faceplate gives information for setting this option.								
	J101/D-T	Select D for normal use; T is for factory tests. This option is replaced by factory-wired strap on J98726DE-1, L1, A and later units.								
	S103/CRTC	OUT position removes customer remote test control (CRTC). CRTC position provides for customer remote test control. This option is replaced by factory-wired strap on J98726DE-1, L1, A and later units.								
	S103/CM OUT	CM option is for use of customer multiplex at the station equipment. This option is replaced by factory-wired strap on J98726DE-1, L1, A and later units.								
	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. This option is replaced by factory-wired strap on J98726DE-1, L1, A and later units.								
DSU DP (Gray) J98726DC SD-3C399-01	S2	Selection of the data rate is accomplished by setting rotary switch as follows: <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;"><u>Data Baud Rate</u></th> <th style="text-align: center;"><u>Switch Position</u></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>	<u>Data Baud Rate</u>	<u>Switch Position</u>	2.4 kb/s	5	4.8 kb/s	6	9.6 kb/s	8
	<u>Data Baud Rate</u>	<u>Switch Position</u>								
	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 light emitting diode (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. Also, the RR green LED should light for error free transmission.									

TABLE B (Contd)

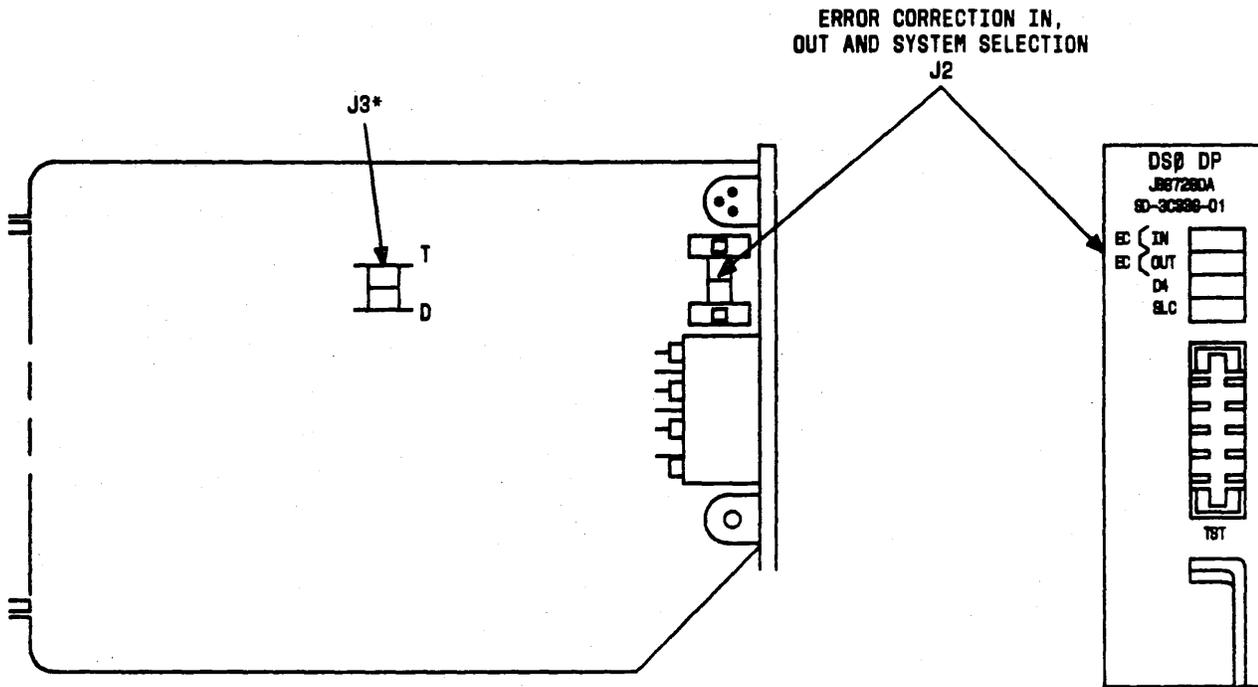
DATAPORT CHANNEL UNIT OPTIONS

CHANNEL UNIT	SWITCH/OPTION	FUNCTION
DSU DP (Gray) J98726DC SD-3C399-01 (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 and RL green LEDs lights. When errors are received, the ERR green LED will be lighted. The remote loopback test can also be initiated by the customer.



- * THIS OPTION REPLACED BY FACTORY WIRED STRAP ON LATER UNITS
- † THIS OPTION RELOCATED AND COMBINED WITH J101 ON LATER UNITS
- ‡ THIS OPTION REMOVED ON LATER UNITS

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



* THIS OPTION REPLACED BY FACTORY WIRED STRAP
ON J98726DA-2 UNITS

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

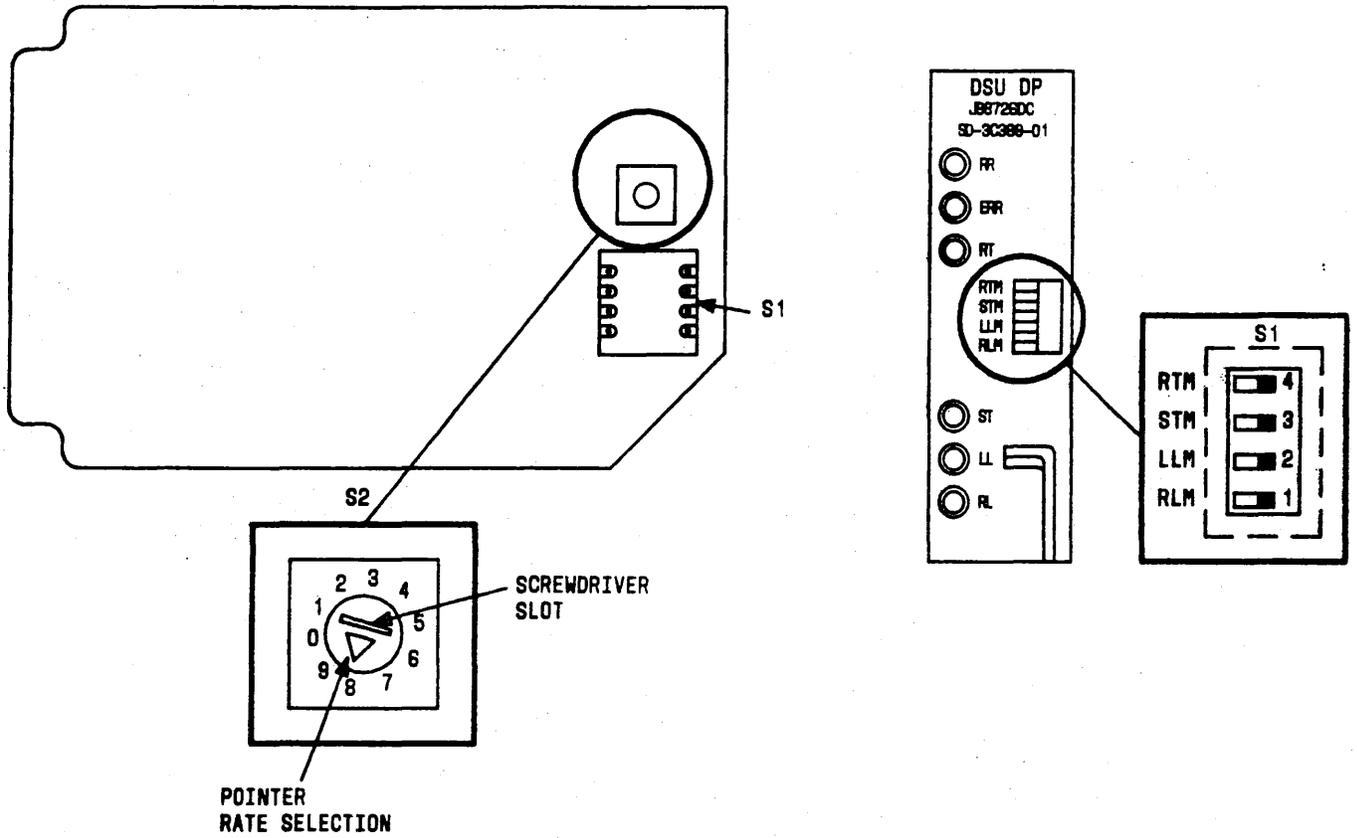


Fig. 3—DSU DP Channel Unit (J98726DC) Options

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

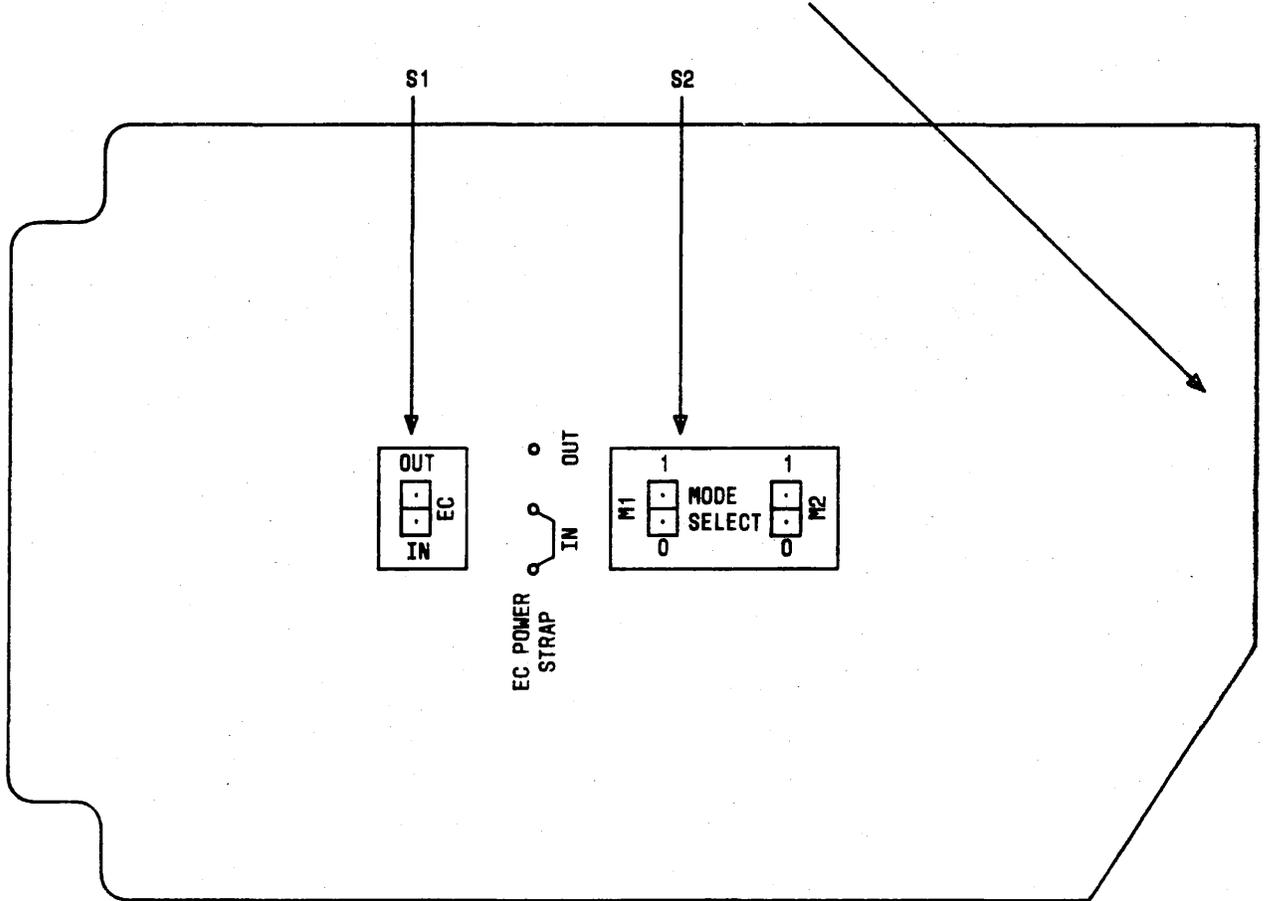


Fig. 5—DS0 DP 56 Kb Channel Unit (J98726DD) Options

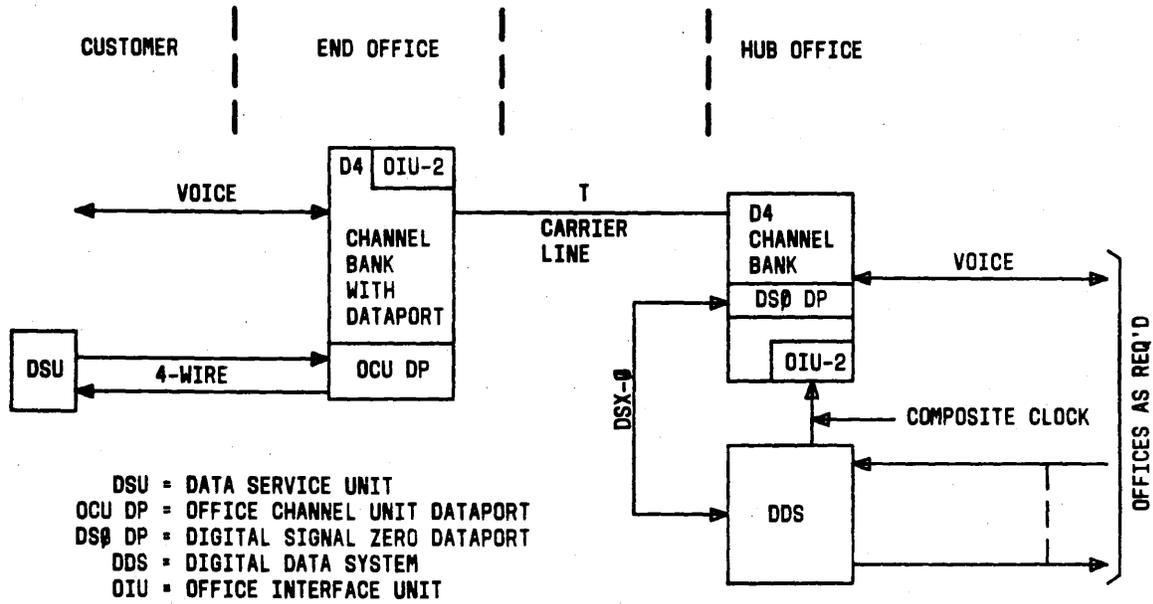


Fig. 6—Typical Dataport Application

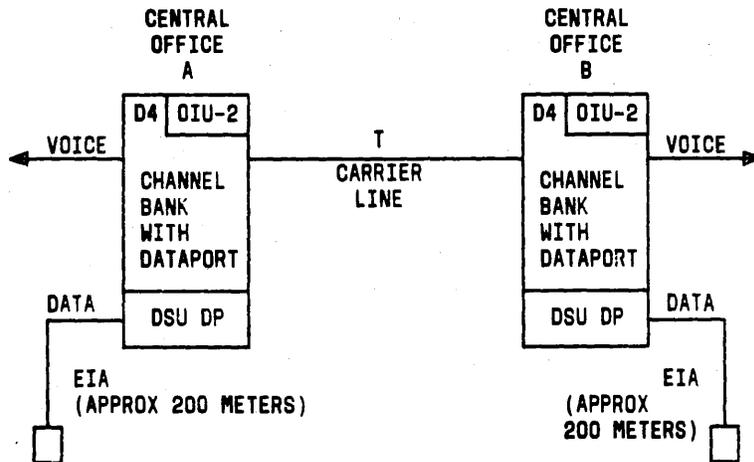


Fig. 7—Central Office Data Communications

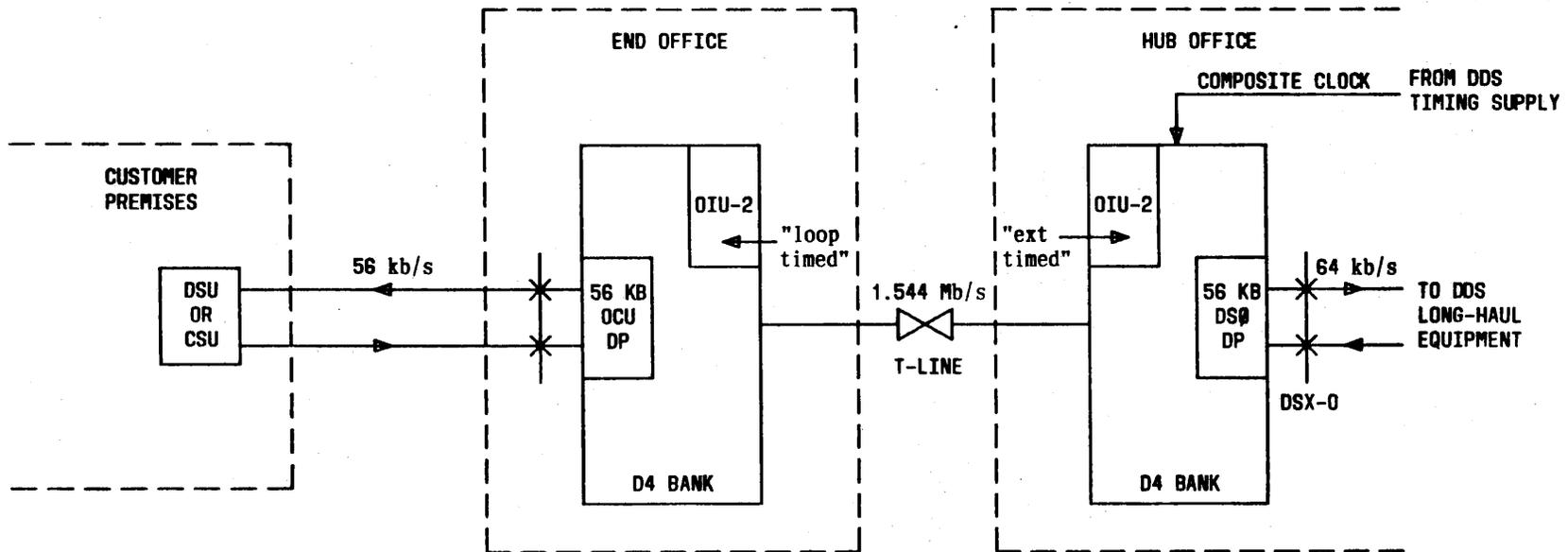
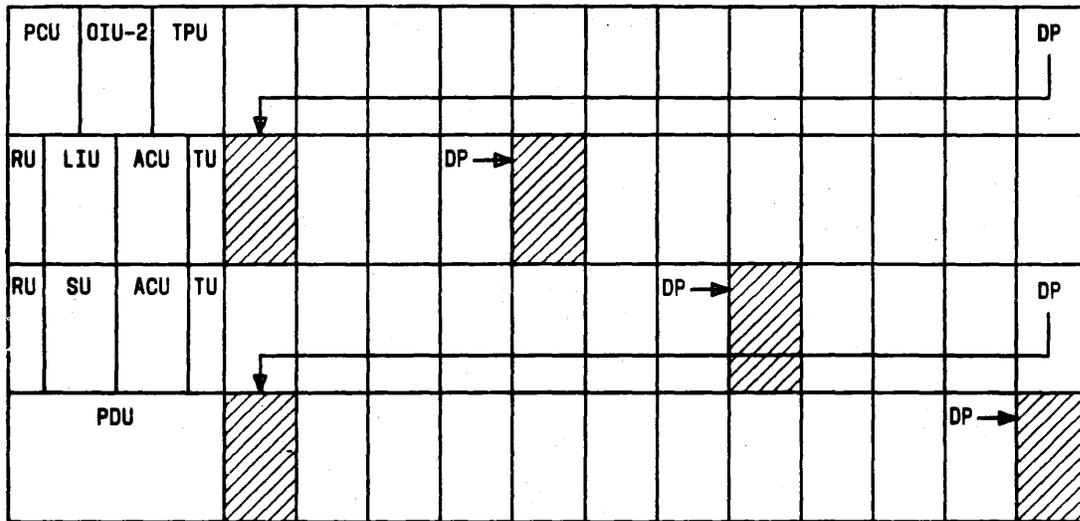


Fig. 8—Typical 56 kb/s Dataport Application



NOTE: DP REPRESENTS SLOTS CONTAINING DATAPORT CHANNEL UNITS WITH ARROW POINTING TO SHADED ADJACENT SLOTS WHICH MUST REMAIN EMPTY FOR ERROR CORRECTION

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