D2 CHANNEL BANK
CHANNEL UNITS
APPLICATION ENGINEERING
CARRIER ENGINEERING

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Tables

1. GENERAL

1.01 This section describes the engineering considerations for the application of D2 channel units shown in Table A. Part 2 of this section provides the channel unit features. Descriptive information for the D2 channel bank is given in Section 365-400-100; application engineering information, in Section 855-351-103. The D2 channel unit descriptions are contained in Section 365-400-104. The D2 turnup and trouble analysis procedures are included in Sections 365-800-001 (TOP), 365-800-002 (TOP), and 365-800-003 (TOP).

1.02 Whenever this section is reissued, the reason(s) for reissue will be stated in this paragraph.

1.03 Since channel units serve individual circuits, the type of unit(s) is determined by the type of transmission requirements for a particular circuit. Accordingly, there are various types of channel units for different trunks and circuits. The selection of a channel unit to occupy a particular position in a channel bank depends on the requirements for the trunk or circuit. A channel bank may be partially equipped, if desired.

1.04 The D2 channel units are equipped with adjustable devices such as screw switches and slide switches. The screw switches are used for chan-

nel unit options and the slide switches are used for channel unit attenuators. Part 3 of this section describes the channel unit options.

1.05 Each channel unit contains twelve test access points on the faceplate plus jack access to the 4-wire standard level (−16 and +7 dB TLP) points of the channel. All 2-wire channel units except the E&M 2-wire have jack access to the 2-wire (T&R) leads of the channel unit. Although twelve test points are provided on each channel unit, the individual test point may or may not be in use depending on the type of channel unit involved. Refer to the particular FS and CD number of the SD-99478-01 for the channel unit listed in Table A to determine which test points are used (test points are shown as TP1, TP2, etc on the SD). The jack access labeled FAC and EQPT allows splitting access in the transmit and receive paths, looking either toward the facility (line) or the equipment (drop) side. See Section 365-400-100 for ***Restoration Patching*** information.

1.06 The channel unit must be out of the bank or inserted in a channel unit extender (ED-1C348-30, G1) when selecting the various options. The channel units equipped with double connectors require extender ED-1C348-30, G3. The screws for the options not selected should not be removed but turned counterclockwise sufficiently (about 3 or 4 turns) to avoid the screw head from making contact with either terminal.

1.07 Trunk loss associated with the channel units can be controlled by adjusting the slide switch attenuators located in the channel units. These attenuators are on the equipment side of the voice-frequency jack in the transmit and receive 4-wire circuit. Part 4 of this section describes these attenuators.

1.08 ***All D2 channel units are maintained by substitution.***

1.09 Some channel units require setting trunk conditioning options and interface with the carrier group alarm (CGA). Part 5 of this section describes the channel unit CGA interface.

2. CHANNEL UNIT FEATURES

2.01 There are five basic categories of D2 channel units: dial pulse, revertive pulse, special access, E&M, and restoration.

2.02 Each channel unit contains scanning gates, signaling converters, telephone jack access points, and transmit and receive level adjusting pads. A compromise network (CN) and network build-out capacitance (NBOC) are provided in all channel units using a built-in hybrid circuit. The special access channel units have optional access to a precision network (PN) via external connections.

2.03 Selection of a channel unit to occupy a particular position in the channel bank depends upon the requirement of the connecting circuit. The channel units are the interface between trunk circuits and the D2 common circuits. The channel units convert, where required, the 2-wire voice frequency circuit into a standard level 4-wire circuit by utilizing a built-in terminating set. Signaling and/or supervision from the near-end switching equipment is sampled by a channel unit and sent to the D2 transmitting common equipment for transmission to the far-end. Signaling and/or supervision from the far-end is sent to a channel unit from the D2 receiving common equipment. The channel unit relay(s) will operate, signaling the near-end trunk circuit corresponding to the far-end condition.

3. CHANNEL UNIT SCREW OPTIONS

A. Options A and B

3.01 The dial pulse terminating (DPT) channel units and the earlier dial pulse originating (DPO) channel units have option screws labeled A and B. These options are used to compensate for the line resistance external to the channel unit.

3.02 The A and B options on the DPO channel unit determines the amount of series resistance in the battery and ground circuits to the originatng switching circuit, thus permitting the DPO to be used with ***loop*** supervision or ***battery and ground*** supervision. When the originating switching circuit provides ***loop*** supervision both options A and B are selected. If the originating circuit provides ***battery and ground*** supervision, neither option A nor B is selected. For more specific information on pulsing capabilities, see Section 179-100-307.

> ***Note:*** Even though the recent DPO channel units do not have options A and B, they are compatible with either ***loop*** or ***battery and ground*** supervision.

3.03 The A and B options on the DPT channel unit are used to compensate for the line resistance.

These options add parallel resistors in the 2-wire voice frequency circuit. When dial pulsing is employed, options A and B are selected, depending on VF extension loop resistance, as follows:

VF EXTENSION LOOP RESISTANCE	OPTION SELECTED
0 to 200 ohms	Neither A nor B
200 to 400 ohms	B
400 to 600 ohms	A

Note: Do not select both options A and B.

When no dial pulsing is required the signaling range is extended (5000-ohms maximum) and options A and B are selected, depending on the external circuit loop resistance, as follows:

EXTERNAL CIRCUIT RESISTANCE (SUPERVISION ONLY)	OPTION SELECTED
0 to 3000 ohms	A
3000 to 4000 ohms	B
4000 to 5000 ohms	Neither A nor B

Note: Do not select both options A and B.

Refer to Section 179-100-307 for specific information on external circuit resistance and dc pulsing capabilities.

B. Option L

3.04 The special access office end (SA OFF) channel unit has a screw option labeled L. This option, when selected, compensates for the external loop resistance to the hybrid of the channel unit. The L option must be selected when the external loop resistance is 250-ohms or greater.

C. Option C for Carrier Group Alarm (CGA)

3.05 In normal operating of the CGA, a 10-second open is provided on the E-signaling lead to stop charges before providing a ground to busy out the trunk. In some applications where the E&M 4-wire channel units are used on a foreign exchange trunk, this 10-second open on the E-signaling lead would result in ringing being sent to the subscriber. This is the reason a screw option labeled C is provided on the E&M 4-wire channel units. This option C, when selected, permits the CGA to apply an immediate ground to the E-signaling lead without the normal 10-second open period. For the proper selection of CGA option C, refer to Table B.

D. Option C for Compromise Network (CN)

3.06 The E&M 2-wire and the special access channel units have a screw option labeled C which permits the CN to be inserted or removed, as required. For channel units DM39 and DM40 the built-in CN may be taken out by removing option C. A PN can be wired to the pins on the second connector on the channel unit shelf. For channel units DM41 and DM42 the PN can be wired to the pins on the primary connector.

Note: Option C must always be in place when using the E&M 2-wire DM38 channel unit.

E. Option D for Carrier Group Alarm (CGA)

3.07 The E&M 2-wire and 4-wire channel units have a screw option labeled D. When selected, this option permits the CGA to busy out a trunk during alarm conditions by providing a ground on the E-signaling lead after an initial 10-second open. For the proper selection of CGA option D, refer to Table B.

3.08 The DPO and revertive pulse originating (RPO) channel units have a screw option labeled D. When selected, this option provides a ground for the originating switching circuit through the CGA during alarm conditions. To determine when option D should be selected, refer to Table B.

F. Option E for Sleeve Ground

3.09 The sleeve dial pulse originating (SDPO) channel unit has a screw option labeled E. When selected, this option provides battery on the S lead of the 3-wire SDPO channel unit in the idle condition, instead of open. This is necessary in a 35-E97 dial office. During closed loop (or talking) conditions, ground is applied to the sleeve and remains applied for 350 to 700 ms after the loop is opened.

G. Network Build-Out Capacitance (NBOC) Options

3.10 The DPO, DPT, SDPO, all E&M 2-wire types, RPO, revertive pulse terminating (RPT), SA

OFF, and special access station (SA STA) channel units have NBOC option screws labeled 1, 2, 4, 8, 16, 32, and 64. These options are used to increase the return loss of the terminating sets by matching the impedance of the CN to the impedance of the office terminating equipment. This impedance is modified by office cable capacity. The NBOC is used to compensate for this capacity.

3.11 The NBOC options are located on the inside of the channel unit. Each option is connected to a capacitor with a value that is represented by a number located near the screw. For example, if option 4 is selected, a 0.004 μF capacitor is inserted in parallel with the CN. These options can be selected singly or in combination as required. The various values of capacitors which may be selected by the NBOC option screws are as follows:

NBOC OPTION	CAPACITOR VALUE
*1	.001μF
2	.002μF
4	.004μF
8	.008μF
16	.016μF
32	.032μF
64	.064μF

* A .001μF capacitor is not provided in the RPO, RPT, SA STA, and SA OFF channel units.

3.12 All channel units associated with any one office should have the office NBOC value. This value is determined as part of through and/or terminal balancing. It may be obtained from the terminating office balance records.

H. Option G for Crossbar Sender

3.13 The RPT channel unit has an option screw labeled G. When the RPT channel unit is operated into a crossbar No. 1 sender using U309 (GR) relays this option must be selected.

I. Option S1 for Interface Matching

3.14 Where looped E&M signaling is required by the trunk circuit, a DM67 4W/DM69 2W E&M channel unit must be provided. Option S1 should be closed for type III or open for type II interface. If the appropriate channel unit is not available, an external E&M applique circuit is required.

4. TRUNK-LOSS ADJUSTMENT ATTENUATORS

4.01 All channel units except the restoration (RESTOR), DM43, have adjustable attenuators labeled AT1 and AT2 in the transmit path and AT3 and AT4 in the receive path.

4.02 The loss-adjustment attenuators (AT1 through AT4) are variable step-type, 600-ohm balanced attenuators, adjusted by means of slide switches. The loss set in these attenuators is the sum of the numbers exposed. Attenuation is removed when the white mark is completely exposed. AT1 and AT4 have a range of 0 to 1.5 dB in binary steps of 0.1, 0.2, 0.4, and 0.8 dB. AT2 and AT3 have a range of 0 to 15.0 dB in binary steps of 1.0, 2.0, 4.0, and 8.0 dB. The loss which can be set in the transmit path is the combined loss of AT1 and AT2 (0 to 16.5 dB). The loss which can be set in the receive path is the same except AT3 and AT4 are used. This loss can be inserted in 0.1 dB steps as required. For example, to set the attennators in the transmit path for a loss of 5.4 dB, AT2 would have only the numbers 4.0 and 1.0 exposed and AT1 would have only the number 0.4 exposed (4.0 + 1.0 + 0.4 = 5.4 dB).

5. CARRIER GROUP ALARM (CGA)

A. General

5.01 Some channel units require setting trunk conditioning options and interface with the CGA. These channel units are conditioned through interface with the CGA. For more information on D2 channel bank alarm control and CGA, refer to Section 365-400-105.

B. Channel Unit Conditioning for CGA

5.02 The D2 channel units [DPO, RPO, and 2- and 4-wire E&M (except looped)] alarm circuits are conditioned through the CGA to signal when a system fails. Each of these channel units interfaces with CGA to provide supervision of system failures.

Screw options are provided on these channel units. These options are labeled C and D on the 4-wire E&M units and D on the other units. Table B provides the proper selection of CGA options C and D.

6. REFERENCES

6.01 The following sections pertain to the D2 channel units.

SECTION	TITLE
179-100-307	T-Carrier System—D2 Channel Bank Signaling Compatibility
365-010-105	Channel Unit Compatibility—D-Type Channel Banks
356-400-100	Digital Transmission Systems—D2 Channel Bank—General Description
365-800-001	D1, D2, and D3 Channel Banks—Routine, Acceptance, and Company Order Tasks (TOP)
365-800-002	T1 Line—Routine, Acceptance, Company Order, and Trouble Clearing Tasks
365-800-003	D1, D2, and D3 Channel Banks—T1 Line—Trouble Clearing Tasks (TOP)
855-351-103	D1, D2, D3, and D4 Channel Banks—Application Engineering

TABLE A

D2 CHANNEL UNITS

SD99478-01-	CODE	CHANNEL UNIT
FS2	DM30	DIAL PULSE ORIGINATING (DPO)
FS3	DM31	DIAL PULSE TERMINATING (DPT)
FS4	DM38	E&M LEAD SIGNALING — 2-WIRE (E&M2W)
FS5	DM35	E&M LEAD SIGNALING — 4-WIRE (E&M4W)
FS6	DM33	REVERTIVE PULSE ORIGINATING (RPO)
FS7	DM34	REVERTIVE PULSE TERMINATING (RPT)
FS36	DM37	E&M LEAD SIGNALING — 4-WIRE — EXTERNAL TRUNK EQUIPMENT — SWITCHED MAINTENANCE ACCESS (E&M4W+ETE+SMA)
FS37	DM36	E&M LEAD SIGNALING — 4-WIRE — EXTERNAL TRUNK EQUIPMENT (E&M4W+ETE)
FS38	DM40	E&M LEAD SIGNALING — 2-WIRE — EXTERNAL TRUNK EQUIPMENT — SWITCHED MAINTENANCE ACCESS (E&M2W+ETE+SMA)
FS39	DM39	E&M LEAD SIGNALING — 2-WIRE — EXTERNAL TRUNK EQUIPMENT (E&M2W+ETE)
FS40	DM32	SLEEVE GROUND DIAL PULSE ORIGINATING (SDP ORIG)
FS45	DM43	RESTORATION (RESTOR)
FS46	DM65	E&M LEAD SIGNALING — 4-WIRE — SWITCHED MAINTENANCE ACCESS (E&M4W+SMA)
FS47	DM67	LOOPED E&M — 4-WIRE — SWITCHED MAINTENANCE ACCESS (L-E&M4W+SMA)
FS48	DM69	LOOPED E&M — 2-WIRE (L-E&M2W)
FS49	DM41	SPECIAL ACCESS — CENTRAL OFFICE END (SA OFF)
FS50	DM42	SPECIAL ACCESS — STATION END (SA STA)

TABLE B

CHANNEL UNIT CGA OPTIONS C AND D

CHANNEL UNIT	TYPE OF SUPV.	TRUNK		OPTION SCREW	
		TYPE		C	D
E&M4W (DM35, or 36, or 37, or 65)	E&M	INTER-OFFICE	2-Way or 1-Way Outgoing	OUT	IN
			1-Way Incoming	OUT	OUT
			No. 1 ESS	OUT	OUT
			No. 5 CSBR	OUT	OUT
		FOREIGN EXCHANGE	Dial Long Line	IN	OUT
E&M2W (DM38, or 39, or 40)		INTER-OFFICE	2-Way or 1-Way Outgoing	*	IN
			1-Way Incoming	*	OUT
			No. 1 ESS	*	OUT
			No. 5 CSBR	*	OUT
DPO or RPO (DM30, or 33) SDPO	LOOP	1-WAY OUTGOING OR SELECTOR MULTIPLE	SXS	*	IN
			No. 5 CSBR	*	OUT
			Panel No. 1 CSBR or CSBR Tandem	*	IN
			No. 1 ESS	*	OUT

* Note: No entry in column C means the C option is absent or is used for compromise network, not CGA option.