



USER'S MANUAL

SMART DUAL 4-WIRE CHANNEL CARDS

For Channel Cards:

33245-101 TO
33245-103 E&M/PLR/Tandem Signaling
33245-104 E&M/PLR/Tandem Signaling
33245-107 TO with Sealing Current
33245-113 E&M/PLR/Tandem Signaling

USER'S MANUAL

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PRODUCT DESCRIPTION

Coastcom

Smart Dual 4-Wire Channel Cards

User's Manual

The Smart Dual 4-Wire Channel Cards, models 33245-101, 33245-103, 33245-104, 33245-107, and 33245-113 plug into Coastcom's D/I Mux III intelligent T1 multiplexers.

The 33245-103, 33245-104, and 33245-113 models provide toll-quality E&M and Pulse Link Repeater (PLR) interfaces to connect customer 4-Wire circuits to a T1 network. The 33245-101 and 33245-107 models provide Transmission Only (TO) interfaces. The 33245-107 model also provides sealing current.

Multiplexer Requirements

Model:	D/I Mux III
--------	-------------

Software version numbers for Control Units should be:

Common Control Unit (CCU) (30305-108)*	All
Model 33245-101	All
Models 33245-103, 33245-113	All ¹
Model 33245-104	3.9/4.5/5.3 (or above)
Model 33245-107	8.1 (or above)
Common Control Unit (CCU) (30305-110)	1.8 (or above)
ALPS CCU (30305-109)	9.8 (or above)
Multiplexer Control Unit (MCU) (40305-103)	1.3 (or above)
Advanced Multiplexer Control Unit (AMCU) (40305-104)	1.8 (or above)

*The model and revision number of the CCU is displayed either on the front panel of the CCU or remotely by querying the multiplexer with the **DC** command. If you do not have the specified (or a later) revision software, an upgrade kit is required. Contact Coastcom at 1 800 433-3433 for further information.

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All equipment specifications subject to change without notice.

¹ Some applications of the card may require higher CCU revisions. Check the *Voice Applications Guide* to determine the CCU requirements for your specific application or call a Coastcom Applications Engineer for assistance.

REGULATORY INFORMATION

FCC NOTICE

Federal Communications Commission (FCC)

Part 15 Regulation For Telephone Equipment

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy, and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

The product described herein complies with the requirements of FCC Rules Part 15, subpart B, for a Class A digital device when tested with shielded cables. Fully shielded cables are available from Coastcom. To ensure compliance with FCC rules regarding interference to radio communications, this equipment must be installed with shielded cables equivalent to those available from Coastcom.

FCC REQUIREMENTS

Note: FCC Part 68 rules require the following information to be included in this publication. Some information may not be relevant to Coastcom equipment.

General Information Regarding The Use Of Customer-Provided Telephone Equipment

FCC regulations and telephone company procedures prohibit connection of customer-provided equipment to telephone company-provided coin service central office implemented systems. Connection to party line service is subject to State tariffs.

If you have any questions about your telephone line, such as how many pieces of equipment you can connect to it, the telephone company will provide this information upon request.

INFORMATION FOR CANADIAN CUSTOMERS

Equipment Attachment Limitations

(Canada Only): CP-01, Part I, Section 10.1

NOTICE: The Canadian Department of Communications label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations. Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment. Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

CAUTION: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

CP-01, Part I, Section 10.2

NOTICE: The **Load Number (LN)** assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device, to prevent overloading. The termination on a loop may consist of any combination of devices subject only to the requirement that the total of the LN (Load Numbers) of all the devices does not exceed 100.

Chapter 1. OVERVIEW

Coastcom's Smart Dual 4-Wire channel cards plug into Coastcom's D/I Mux III intelligent multiplexers. They provide toll-quality E&M, Pulse Link Repeater (PLR), tandem signalling or Transmission Only (TO) interfaces between the T1 network and two 4-wire analog circuits.

Model Diversity

The 33245-101 offers basic TO operation.

The 33245-103 supplies E&M, PLR, and tandem signalling capabilities.

The 33245-104 is the same as 33245-103 with the addition of a fixed attenuator in the transmit path that reduces the VF level on the T1 span by 13 dB. The additional 13 dB of attenuation in the transmit path enables use in voice grade data applications (analog modem operation) such as AT&T's 3002 modem service.

The 33245-107 adds sealing current to the features of the 33245-101 model.

The 33245-113 is identical to the 33245-103 with improved tandem signalling operation.

Feature Options

The following features of the Smart Dual 4-Wire channel cards enhance the flexibility of the D/I Mux III network.

Remote or Local Provisioning

Most options on the card are remotely provisioned from a system-control terminal, including transmit and receive levels, CGA type, and direction of transmission.

Transmit and Receive Levels

Transmit and receive levels for the two channels are set independently in 0.1 dB steps over a 25.4 dB range. The transmit levels are set between -17.4 and +8.0 dBm. The receive levels are set between -16.9 and +8.5 dBm. The default setting for E&M or TO channel cards is -16.0 dBm transmit and +7.0 dBm receive. The default setting for PLR cards is +7.0 dBm transmit and -16.0 dBm receive.

Carrier Group Alarms

The Carrier Group Alarm (CGA) protocol is set on signalling models 33245-103/104/113 as follows:

- Type 1: E lead immediately idle
- Type 2: E lead immediately busy
- Type 3: E lead immediately idle followed by busy several seconds later

The CGA protocol is set by software commands. The default setting is Type 3.

T1-1 (East) or T1-2 (West) Transmission Direction

The direction of T1 transmission is set on a per-card basis using a software command or a hardware jumper. Both Channel A and Channel B must operate in the same T1 direction. The transmission direction will change automatically to conform to a map change.

E&M Signalling (models 33245-103, 33245-104, and 33245-113)

The signalling is set on a per-card basis to E&M Type I, II, III, or V, or PLR Type I, II. Signalling configuration is set by jumpers on the card.

Sealing Current (model 33245-107)

Sealing current generation or termination is selected or defeated by setting option jumpers W1/W3.

Maintenance Diagnostic Capabilities

The following features have been designed for the Smart Dual 4-Wire channel card to make maintenance and diagnostics easy to perform from a PC or network management system.

Remote Status Report

The internal status of the channel card can be queried from a network management system or an ASCII control terminal. The items reported include the status of all options as well as the card type, serial number, card revision, firmware revision, and self-check results.

Digital Loopback

The channel card performs loopbacks for maintenance testing. The digital loopback is performed on a per-channel basis (at the CODEC level). During a digital loopback, the PCM channel from the network is looped back to the network and the E-lead relay (models 33245-103, 33245-104, and 33245-113) is placed in the final CGA condition based on the CGA type in effect. The 4-Wire voice frequency path is not looped back to the customer during a digital loopback.

Channel Enable/Disable

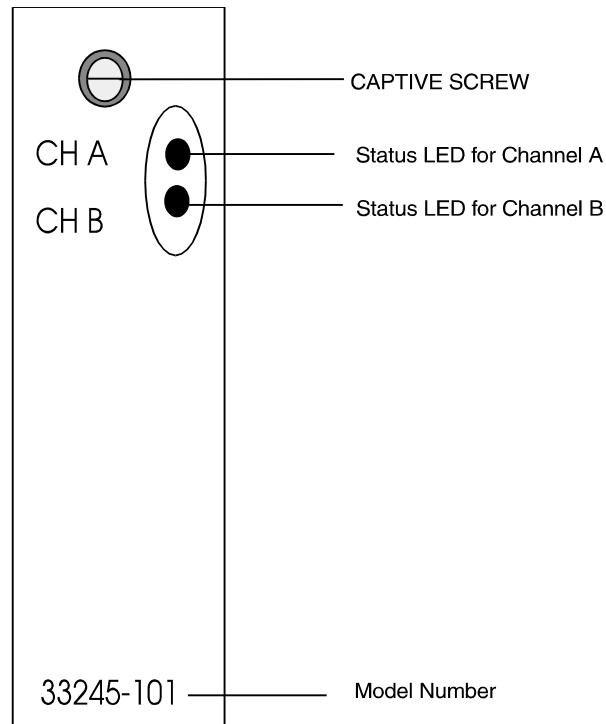
Transmission service can be denied on a per-channel basis. The channels are put out of service two ways:

- 1) the user selects the out-of-service option in the Operate Line Card procedure to put the channel out of service when the channel becomes idle, or
- 2) the user disables the channel in the installation and setup procedure, which is described in *Chapter 5. Software Configuration*, to unconditionally force the channel out-of-service.

The first option allows the channel unit to be removed from service without interrupting an active call. The second option immediately interrupts an active call. In both cases, the channel signalling is set to either busy or idle depending on the CGA protocol selected.

Front Panel Diagnostics

The status LEDs on the front panel give an indication of the activity and status of individual channels. The LED indicates when the line is out of service and when the channel becomes idle, busy ringing or busy off-hook. See Figure 1 for details.



LED SIGNAL PATTERNS
(33245-103, 33245-104, 33245-113)

1. The status LED indicates when the line is out of service, idle, busy or ringing.
2. The LED blinks in a pattern of one second on, followed by one second off when the channel is out of service.
3. The LED is continuously off when the channel is idle.
4. The LED is continuously on when the channel is busy.
5. The LED blinks in cadence with ringing (FX Tandem Mode).
6. The LED blinks five times per second when the option switches are improperly set.

LED SIGNAL PATTERNS (33245-101, 33245-107)

1. The status LED indicates whether the channel is in or out of service.
2. The LED blinks during CGA or if the card is not mapped.
3. The LED is continuously on if the card is mapped.

**Figure 1. Smart Dual 4-Wire Channel Card
Front Panel and LED Signal Pattern Description**

Chapter 2. APPLICATIONS

Typical Applications

The applications for the cards described in this section include:

- E&M Trunk
- Pulse Link Repeater (PLR)
- E&M/PLR FX Tandem Operation, Ground Start
- E&M/PLR FX Tandem Operation, Loop Start
- Transmission Only (TO)

Smart Dual 4-Wire E&M Channel Card Trunk Configuration

Figure 2 shows the Smart Dual 4-Wire E&M channel card functioning as an E&M interface for a Type I, II, III or V E&M trunk circuit. The unit will pass standard busy, idle, and dial-pulse signalling to and from the far end.

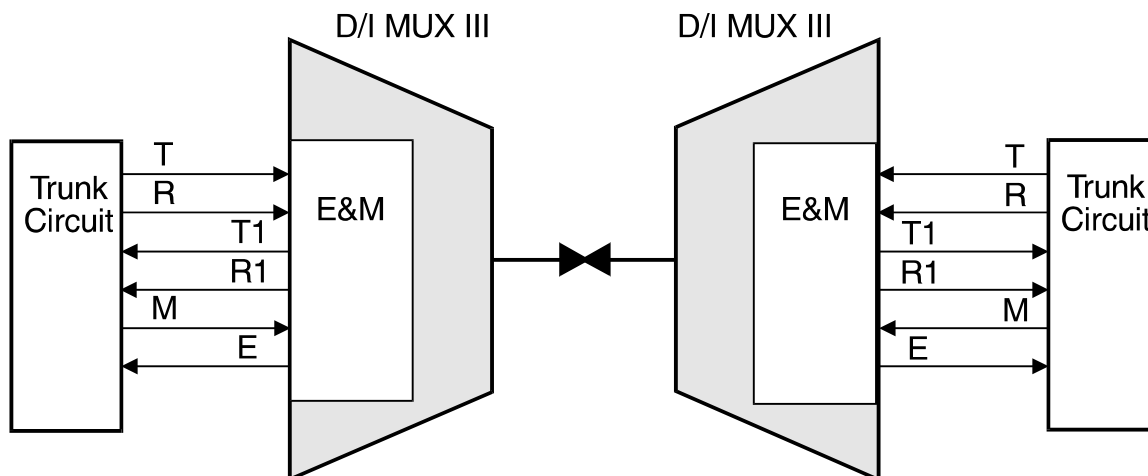


Figure 2. E&M Intertoll Trunk Configuration

Pulse Link Repeater (PLR)

In Figure 3, the 4-Wire E&M/PLR unit is being employed in the Type I or II PLR mode. A Pulse Link Repeater provides the capability to interface directly with another E&M channel unit; in this case, the channel unit is shown interfacing an E&M unit in an analog carrier system. The PLR channel unit appears to the analog carrier system to be a Type I or II 4-Wire E&M trunk circuit. Note, however, that the naming convention on the Coastcom PLR unit is reversed from a normal E&M trunk unit. See *Chapter 4. Installation and Setup* for further information.

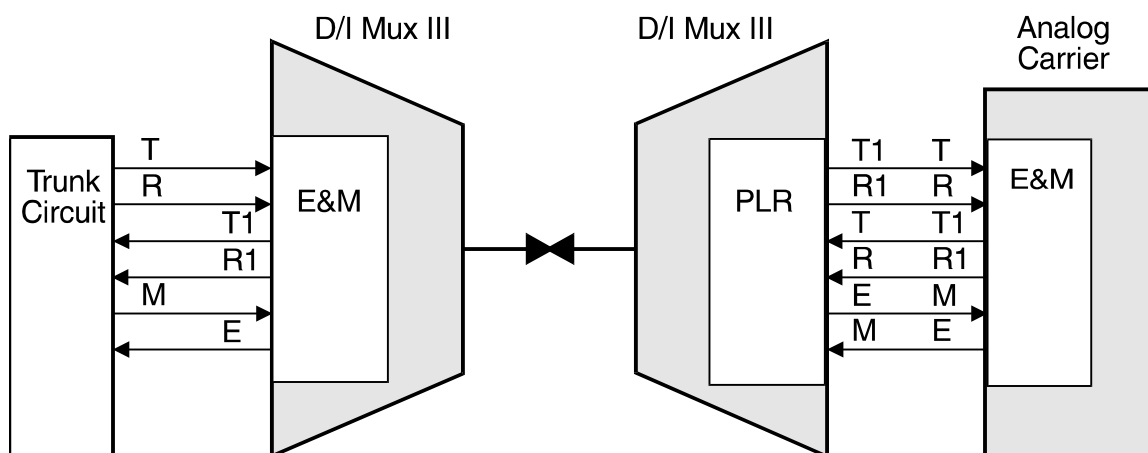


Figure 3. Pulse Link Repeater (PLR) Configuration

The 33245-113 model of the 4-Wire channel card permits ground start operation to work directly to a PBX. Special signal processing is used.

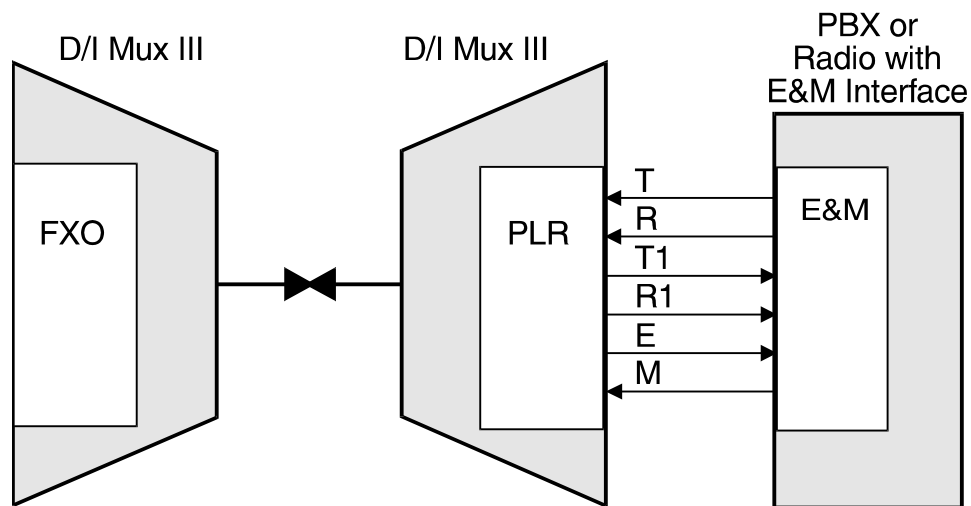


Figure 5. E&M/PLR FX Tandem Operation Ground Start with the 33245-113 Channel Card

E&M/PLR Loop Start Signalling

Since loop start signalling has only two states in either direction (FXO to FXS and vice versa), a single E&M lead connection is adequate to determine all of the signalling states. The Smart Dual Channel 4-Wire E&M unit will pass two FX loop start circuits of the type shown on Figure 6.

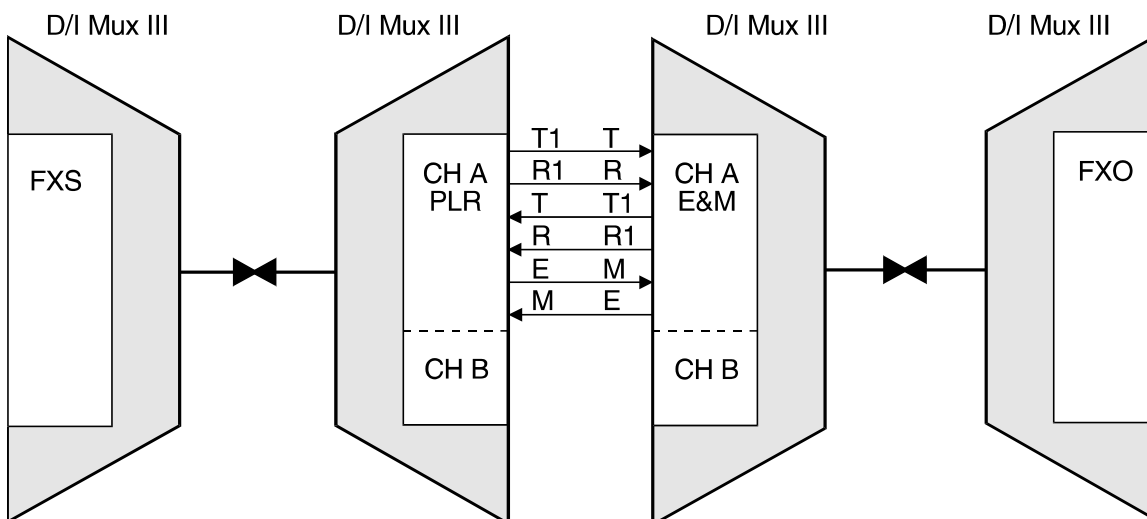


Figure 6. E&M/PLR FX Tandem Operation Loop Start

Figure 7 shows the E&M FX Tandem Operation Loop Start to a Private Branch Exchange.

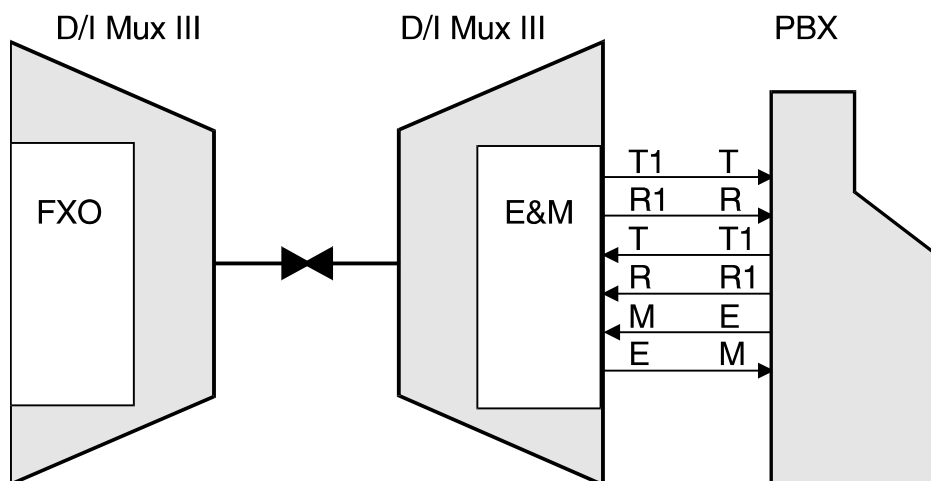


Figure 7. E&M Tandem Operation Loop Start to a PBX

Transmission Only (TO)

In 4-Wire applications where E&M signalling is not required, (typically private voice/data lines) transmission quality can be optimized by using one of Coastcom's TO channel cards (Models 33245-101 or 33245-107). Both cards provide full bandwidth transmission, that is, no robbed bit signalling is used. The two cards differ in that the 33245-101 is intended to connect to "dry" circuits (no DC current) while the 33245-107 provides sealing current.

Sealing Current

Sealing current is a continuous DC current which is intended to keep non-soldered/non-wrapped splices clean of oxides or high resistance films. Sealing current use results in avoiding the noise and/or excessive loss which can result from these impairments. The 33245-107 can be optioned to provide either sealing current generation or sealing current circuit completion. A typical application is shown below.

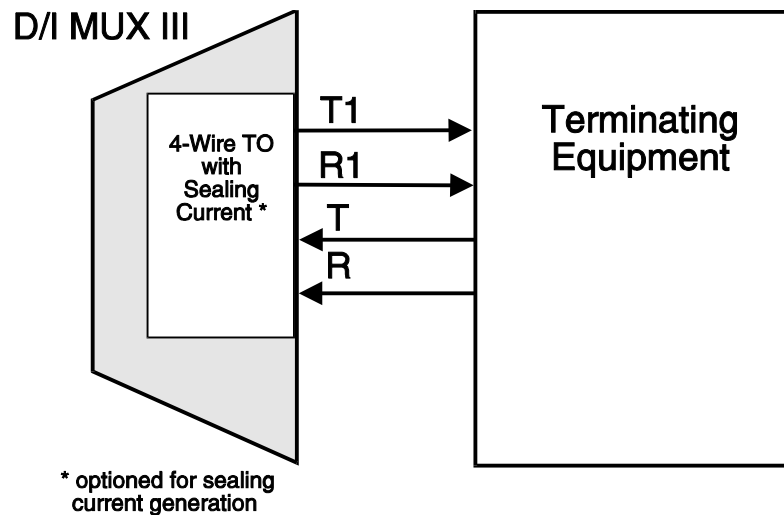


Figure 8. 4-Wire TO with Sealing Current Application

In order to create the simplex loop required to provide a closed path for the sealing current (using the 33245-107 card), the terminal equipment must be equipped to provide a DC path between the center path of the T/R and T1/R1 coupling transformers. If the terminal equipment includes a D/I Mux III, a properly configured 33245-107 card will provide the return path.

Chapter 3. CIRCUIT DESCRIPTION

The following circuit elements make up the Smart Dual 4-Wire channel card:

- Voice Frequency Transmit Interface
- The Coder/Decoder (CODEC)
- Voice Frequency Receive Interface
- E&M Interface (models 33245-103, 33245-104, and 33245-113)
- Microcontroller
- Provisioning Bus Interface
- PCM Backplane Interface
- Sealing Current (model 33245-107)

Voice Frequency Transmit Interface

The Voice Frequency (VF) interface in the transmit direction consists of a balanced input to the unit. The channel card provides circuitry for setting the absolute gain and for providing impedance matching.

Transmit Gain

The gain adjustment block provides circuitry to set the internal levels on the unit to accommodate a wide range of Transmission Level Point (TLP) requirements. The gain is adjusted in 0.1 dB steps so that any input level from +8 dBm to -17.4 dBm will result in a digital milliwatt in the PCM bit stream. This allows the trunk to maintain the lowest possible quantization noise while keeping adequate headroom. The gain is set by using the provisioning bus from the control terminal.

Note: The TLP for the transmit side of the 4-Wire E&M model 33245-104 card is relative to -13 dBm₀. With a software setting of the Transmit TLP = 0 dB there is 13 dB of attenuation in the transmit path. This change effects the initial default set up as described in this manual as well as some of the software screens. The software has not been altered to show the true TLP level. Users of model 33245-104 must make the -13 dB conversion.

The Coder/Decoder (CODEC)

The CODEC provides the A-D/D-A converters and filtering which convert the analog signal to a T1-compatible PCM bit stream and vice versa. See Figure 9.

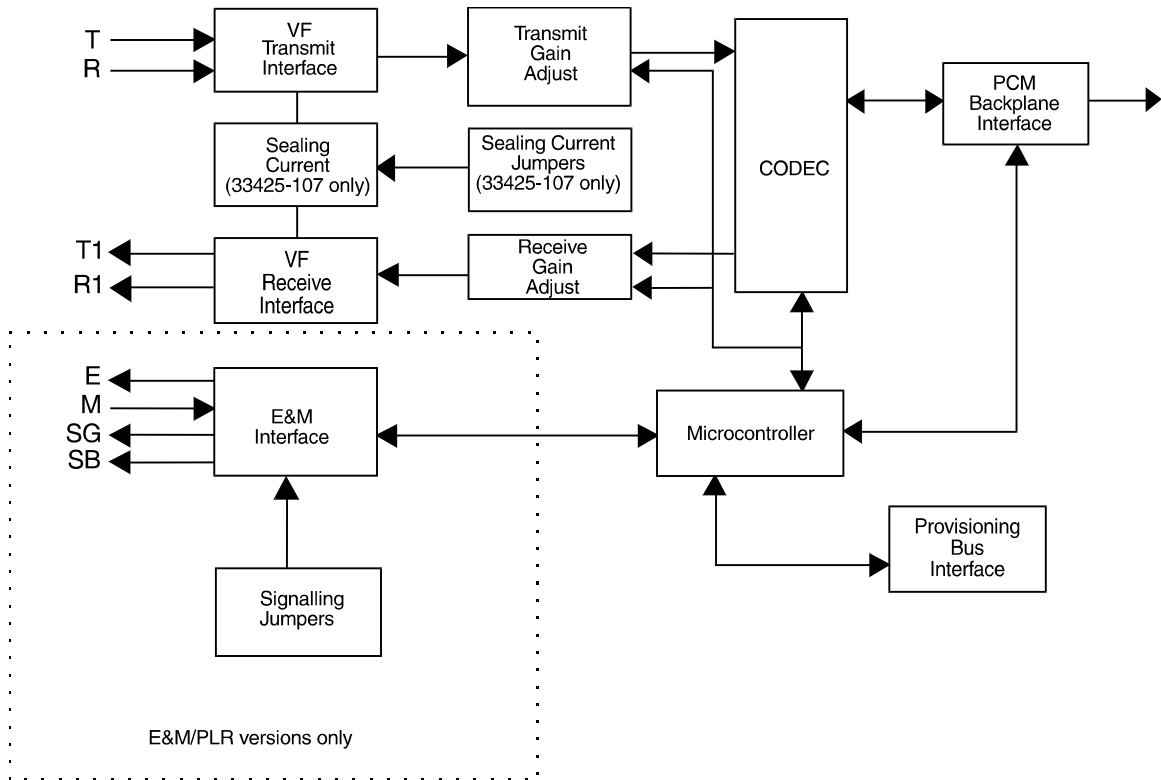


Figure 9. Smart Dual 4-Wire Channel Card Block Diagram (1 of 2 Channels Shown)

Voice Frequency Receive Interface

The Voice Frequency (VF) interface in the receive direction consists of a balanced output from the unit with circuitry for factory setting the absolute gain and providing impedance matching.

Receive Gain

The receive gain adjustment block provides circuitry to set the internal levels on the unit in order to accommodate a wide range of Transmission Level Point (TLP) requirements. The gain can be adjusted in 0.1 dB steps so that a digital milliwatt in the PCM bit stream results in an output level of from +8.5 dBm to -16.9 dBm. This allows the trunk to maintain the lowest possible quantization noise while keeping adequate headroom. The gain is set using the provisioning bus from the control terminal.

E&M Interface (models 33245-103, 33245-104, and 33245-113)

The E&M block consists of an M-lead threshold-detection circuit-level conversion circuitry for the microcontroller interface, E-lead relay and current limiter for the battery supply.

Note: The 4-Wire E&M Model 33245-104 is the same as the 4-Wire E&M Model 33245-103 except there is an additional fixed attenuator in the transmit path that reduces the level on the T1 span by 13 dB. The additional 13 dB of attenuation in the transmit path allows the 33245-104 to be used in Voice Grade Data applications (analog modem) such as AT&T's 3002 modem service.

Signalling Jumpers

The signalling type is set by the positions of four jumpers on the card (W1 through W4) or the provisioning bus. The jumpers set the same signalling type for both channels. All four jumpers must be in the proper positions for the unit to function correctly. The signalling type can be read remotely using the microcontroller and provisioning bus.

Microcontroller

Many of the unit's features, such as gain setting, health checking and channel enabling, are supervised and controlled by way of the firmware and the microcontroller.

Provisioning Bus Interface

The microcontroller and system CPU communicate over the provisioning bus interface.

PCM Backplane Interface

Synchronization channel multiplexing and A/B signalling functions are combined in the system backplane interface block.

Sealing Current (model 33245-107)

Sealing Current is applied in a simplex loop formed by the T/R and T1/R1 connections along with the return circuit provided by the terminating equipment. Sealing current is derived from the D/I Mux III -48 Volt DC source through current limiting resistors.

Chapter 4. INSTALLATION & OPERATION

The circuits of the Smart Dual 4-Wire channel cards are individually provisioned for gain through the system control terminal. The gain settings and other software provisioned items are saved in the D/I Mux III system memory. See *Chapter 5. Software Configuration* for details on software installation. Smart Dual 4-Wire channel cards are unplugged or replaced without losing the provisioned settings. Some of the Smart Dual 4-Wire channel cards' operations are controlled by jumpers and switches. Signalling type and Sealing Current mode *must be* selected with hardware jumpers. All other modes of operation are selected by either system software or hardware switches and jumpers.

Installation

The Smart Dual 4-Wire channel card is a plug-in module which slides into a D/I Mux III shelf. It requires one channel card slot. Before placing a Smart Dual 4-Wire channel card in a shelf, place jumpers and switches into their correct position.

Handling Procedures to Prevent Electrostatic Damage

Precautions should be taken to prevent electrostatic damage to plug-in units. Electrostatic damage can cause semiconductors and other static-sensitive components to fail, resulting in unexplainable test failures and degraded performance. Follow these procedures to prevent electrostatic damage. When plugging and unplugging cards into the shelf, put on a grounded wrist strap. The wrist strap should touch the skin and be grounded through a resistor (approximately one-megohm) to an unused terminal block screw labeled GND on the D/I Mux III's backplane.

Jumper Selection

The signalling jumpers must be set on the 4-Wire E&M models 33245-103/104/113. See Figure 10 for the signalling jumper locations. Table 1 shows the jumper assignment for the various signalling types.

Table 1. Signalling Option Jumper Assignment

Signalling Type	Jumper Position			
	W1	W2	W3	W4
E&M I	2	2	2	1
E&M II	2	2	2	2
E&M III	2	2	2	1
E&M V	1	2	2	1
PLR	1	1	1	1
PLR II	1	1	2	2

The 4-Wire TO, model 33245-101, has a single jumper (W5) for designating which T1 port the card will communicate on. When W5 is in the E (east) position the card communicates on the T1-2 transmission port instead of the T1-1 transmission port.

Table 2. T1 Port Selection

T1 Port	Jumper W5	33245-101
	Switch SW1	33245-103/104/113
	Jumper W2	33245-107
T1-1	W	
T1-2	E	

The 4-Wire TO with Sealing Current, model 33245-107 has a different jumper arrangement. Jumpers W1 and W3 select the sealing current function. See Table 3 for operation of the sealing current jumpers. W2 selects the T1 transmission direction. When W2 is in the E (east) position the card communicates on the T1-2 transmission port instead of the T1-1 transmission port.

Table 3. Sealing Current Mode Jumper Selection

Sealing Current	W1	W3
Generator On	2	2
Generator Off	1	2
Terminator On	1	1

Switch Selection

Switch S1 on the E&M channel cards (models 33245-103/104/113) selects tandem signalling options, TO operation, and T1 port selection. GS designates ground start tandem operation. LS designates loop start tandem operation. TO designates transmission only operation. When E is selected, the card communicates on the T1-2 transmission port instead of the T1-1 transmission port.

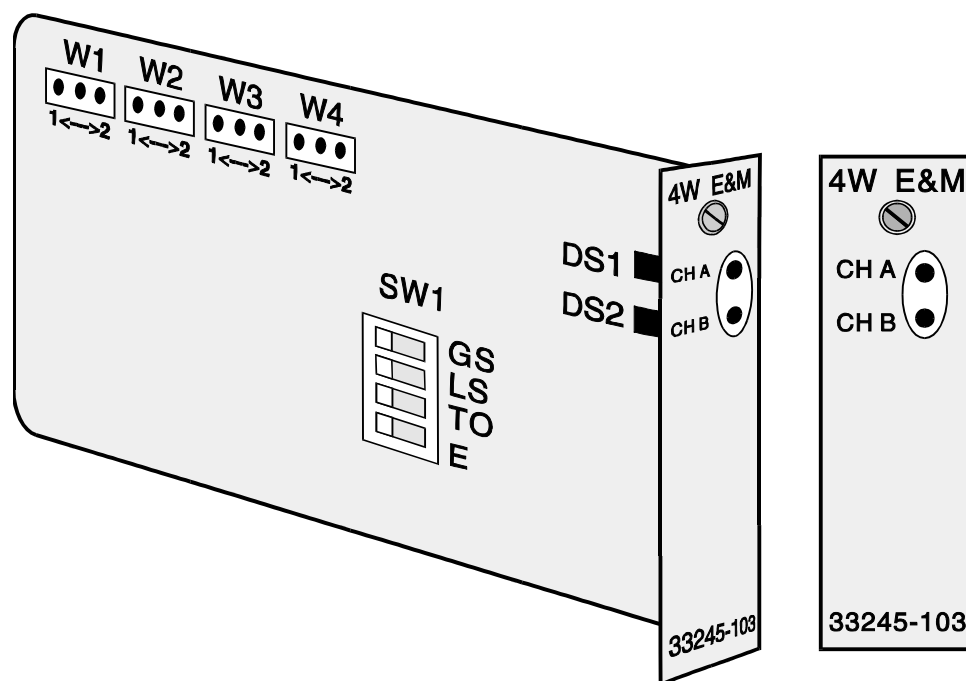


Figure 10. Smart Dual 4-Wire Channel Card, Front and Side Views (models 33245-103, 33245-104, 33245-113)

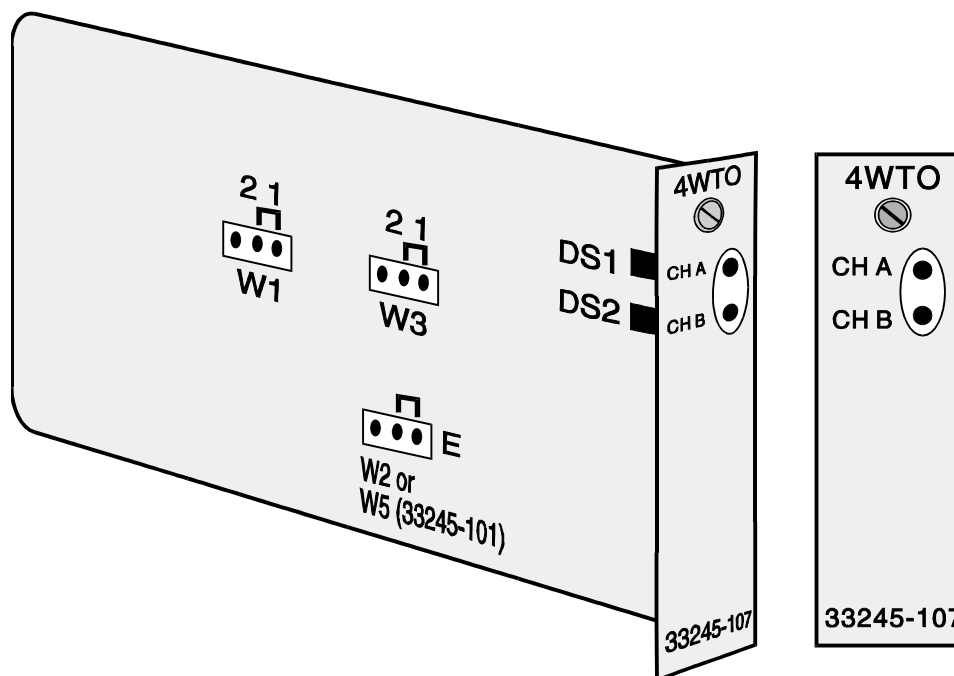


Figure 11. Smart Dual 4-Wire TO with Sealing Current, Front and Side Views (model 33245-107)

Installing Channel Card in Shelf

Set up and install the channel card according to the following procedures:

1. Place the jumpers and switches in their appropriate positions. Each jumper has two possible positions. Refer to Figures 10 and 11 for the location of the jumpers on the card. Note that position markers are visible above the jumpers on the printed circuit board. Place switches in their appropriate positions.
2. Loosen the captive screw at the top of the front panel of the channel card.
3. Pull the top of the front panel forward until it is at a right angle from its former position.
4. Slide the unit as far as it can go into the selected card slot in the D/I Mux III shelf.
5. Move the front panel to its upright position so that it is locked into the shelf and tighten the captive screw.
6. Be sure the card is securely seated in the card slot.

Signalling Types (models 33245-103, 33245-104, and 33245-113)

Refer to Tables 4 and 5 to select the signalling type. Refer to Table 1 to select the position for each of the four jumpers.

Table 4. E&M Signal States

Signalling Type	Trunk to Signalling Circuit			Signalling to Trunk Circuit			SB, SG Used
	Lead	On-Hook	Off-Hook	Lead	On-Hook	Off-Hook	
I	M	Ground	Battery	E	Open	Ground	No
II	M	Open	Battery	E	Open	Ground	Yes
III	M	Ground	Battery	E	Open	Ground	Yes
V	M	Open	Ground	E	Open	Ground	No

Table 5. PLR Signal States

Signalling Type	D/I Mux to Signalling Circuit			Signalling to D/I Mux			SB, SG Used
	Lead	On-Hook	Off-Hook	Lead	On-Hook	Off-Hook	
I	E	Ground	Battery	M	Open	Ground	No
II	E	Open	Battery	M	Open	Ground	Yes

Tandem Signalling Operation

The following tables describe the signalling operation for the various tandem signalling operation modes. E&M/PLR Tandem Loop Start signalling is implemented according to Tables 6 and 7.

Table 6. E&M/FX Loop Start Tandem Signalling

FX State	Rx from FXO		Tx to FXO		E	M	LED
	A	B	A	B			
No Ringing	0	1			Inactive (on-hook)		
	1	0					
	1	1					
Ringing	0	0			Active (off-hook)		On
Loop Open			0	1		Inactive (on-hook)	
Loop Closed			1	1		Active (off-hook)	On

Table 7. PLR/FX Loop Start Tandem Signalling

FX State	Rx from FXS		Tx to FXS		E	M	LED
	A	B	A	B			
No Ringing			0	1		Inactive (on-hook)	
Ringing			0	0		Active (off-hook)	On
Loop Open	0	1			Inactive (on-hook)		
	0	0					
Loop Closed	1	1			Active (off-hook)		On
	1	0					

E&M/PLR Tandem Ground Start Signalling is implemented according to Tables 8 and 9.

Table 8. E&M FX Ground Start Tandem Signalling

FX State	Rx from FXO		Tx to FXO		E1	E2	M1	M2	LED	
	A	B	A	B					A	B
No Tip Ground	1	X			Battery				On	Bnk
Tip Ground	0	X			Ground				On	Bnk
No Ringing	X	1							On	Bnk
Ringing	X	0			20 Hz				On	Bnk
Loop Open			0				Battery		On	Bnk
Loop Closure			1				Ground		Off	Bnk
No Ring Ground				1			Ground		Off	Bnk
Ring Ground				0			Battery		On	Bnk

Table 9. PLR/FX Ground Start Tandem Signalling

FX State	Rx*		Tx**		E1	E2	M1	M2	LED	
	A	B	A	B					A	B
No Tip Ground			1				Battery		On	Bnk
Tip Ground			0				Ground		On	Bnk
No Ringing				1			Ground	Ground	On	Bnk
Ringing				0				Ground	On	Bnk
Loop Open	0	X			Battery				On	Bnk
Loop Closure	1	X			Ground				Off	Bnk
No Ring Ground	X	1			Ground	Ground			Off	Bnk
Ring Ground	X	0			Battery	Ground			On	Bnk

* From FXS

** To FXS

The custom 33245-113 Dual 4-Wire E&M cards perform the following signalling functions in all signalling types (E&M type, I, II, III and V and PLR type I and II) when set to the tandem signalling mode.

Table 10. 33245-113 Loop Start FXO Tandem Signalling

FXO Detected State	Received from FXO		E	M	Transmit to FXO		FXO Output State
	A	B			A	B	
No Ringing	0	1	Inactive				
	1	0	Inactive				
	1	1	Inactive				
Ringing	0	0	Active				
				Inactive	0	1	Loop Open
				Active	1	1	Loop Closed

Table 11. 33245-113 Ground Start FXO Tandem Signalling*

FXO Detected State	Received from FXO		E	M	Transmit to FXO		FXO Output State
	A	B			A	B	
Idle	1	1	Inactive	Active	0	0	Ring Ground
Tip Ground	0	1	Active	Active	1	1	Loop Closed
Reverse Battery	1	0	Active	Active	1	1	Loop Closed
Ringing	0	0	20 Hz	Active	1	1	Loop Closed
				Inactive	0	1	On-hook

Note: This signalling scheme is compatible with the Xel U4532-000 2-Wire/4-Wire Termination Set or equivalent equipment. Set the Xel equipment for Ground Start, and the S2 switch for Reverse.

Carrier Group Alarm (CGA) Operation

The default settings for CGA protocol is Type III, E lead idle followed by busy after a delay of a few seconds. The CGA protocol options (Type I, II, or III) are changed using the **SL** commands.

The delay between the time the D/I Mux III declares a CGA condition and the time when the Dual 4-Wire E&M CGA protocol is initiated (Delay CGA) is set to a 2.5 second default. The Delay CGA option is changed using the **SC** command at the system control terminal. Selected channels are disabled through the system control terminal.

T1 Transmission Port Selection

Under normal software control using a terminal, the T1 port accessed by the Smart Dual 4-Wire E&M channel card is determined by the working map which assigns the time slots of the T1 ports to the various channel units installed in the shelf.

When the system auto mapper is invoked by the first-time powerup or master reset, the port direction switch on the channel unit is used by the system to determine which T1 port will be used for the timeslot assignments.

Transmission Channel Assignments

Refer to the *D/I Mux III User's Manual* for procedures to assign DS0 channels to the Smart Dual 4-Wire channel card.

Initial Default Setup

The initial default setup for the 4-Wire channel cards, in the absence of the Common Control Unit (CCU) override, is determined by the signalling jumpers, mode switches, and the east/west switch. The initial settings for the two channels are identical. The transmit and receive levels are set according to the signalling type selected.

Table 12. Default Transmit and Receive Levels by Signalling Type

Signalling Type	Analog Levels (dB) Corresponding to a Digital Milliwatt	
	Transmit	Receive
4-Wire PLR Type I or II	+7	-16
4-Wire E&M Type I, II, III or V	-16	+7
4-Wire TO	-16	+7

Removing Channel Card from Shelf

To remove the unit from the shelf, reverse the installation procedure as follows:

1. Loosen the captive screw at the top of the front panel of the channel card.
2. Pull forward the top of the front panel until it is at a right angle from its former position.
3. Slide the unit out of the card slot in the D/I Mux III shelf.
4. Move the front panel to its upright position and tighten the captive screw.

Cabling Pin Assignments

Select a channel card slot position in the D/I Mux III shelf and install the Smart Dual 4-Wire channel card. You can connect the 4-Wire channel cards by using the DB-25 connector for each card slot. Figure 12 shows the pin assignments.

CAUTION:

The function of the E, M, SG and SB leads are reversed for PLR operation. The naming convention when in the PLR mode is reversed from trunk E&M lines. In other words, connect E on the Coastcom PLR unit to M on the E&M channel unit, M to E, SG to SB, and SB to SG. Refer to Figure 3.

Use of Type II or Type V E&M signalling requires the use of the DB-25 connector for signal connections.

As an alternative, connection to the Smart Dual 4-Wire channel cards is established by using the appropriate pins on the separate 50-pin T&R connector, 50-pin T1 and R1 connector and the 50-pin E&M connector. The pin assignments are shown on Figure 13 and 14.

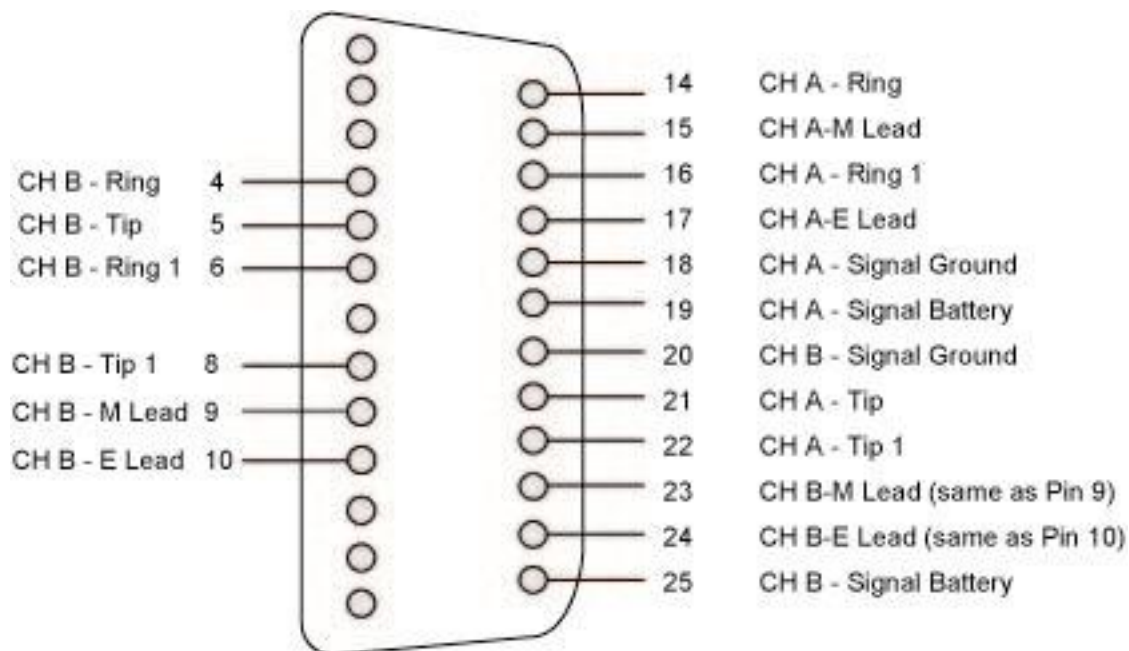
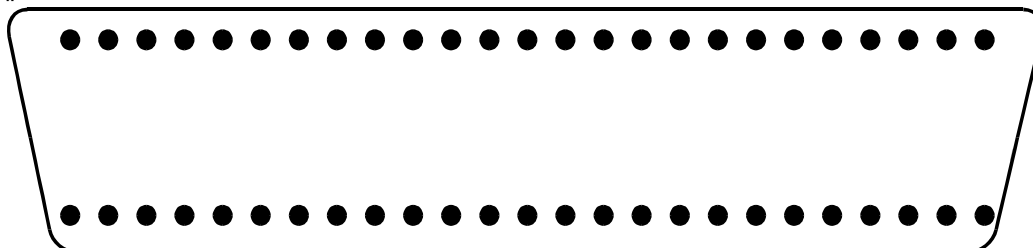


Figure 12. DB-25 Female Backplane Connector

RING

Slot	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
Ch	A	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	
Pin #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25



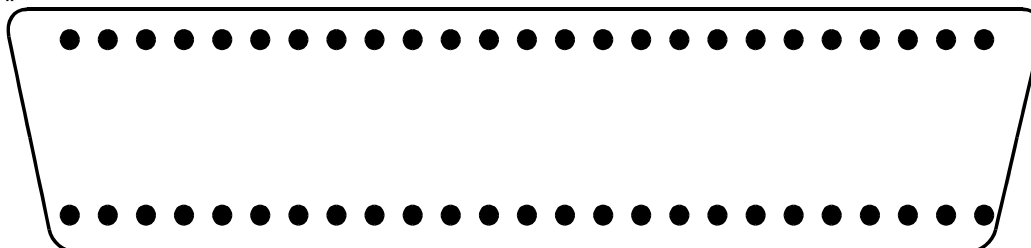
Pin #	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Ch	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B
Slot	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	

TIP

Figure 13. 50-Pin Tip and Ring Connector on 12-Slot and Lower Half of 24-Slot

RING

Slot	13	14	15	16	17	18	19	20	21	22	23	24	13	14	15	16	17	18	19	20	21	22	23	24	
Ch	A	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	
Pin #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25



Pin #	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Ch	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B
Slot	13	14	15	16	17	18	19	20	21	22	23	24	13	14	15	16	17	18	19	20	21	22	23	24	

TIP

Figure 14. 50-Pin Tip and Ring Connector on 24-Slot Upper Shelf

In order to use the 50-pin connectors, the DATA/VF jumpers on the back of the D/I Mux shelf corresponding to the slot being used must be placed in the VF position.

These DATA/VF jumpers disconnect the 50-pin VF connector wires when placed in the DATA position. This allows both voice and data circuits to be installed in a D/I Mux III shelf with voice connections on the 50-pin connectors and data connections on the DB-25s with the data isolated from the 50-pin voice cables.

Chapter 5. SOFTWARE CONFIGURATION

This chapter presents the commands necessary to configure the Smart Dual 4-Wire E&M channel cards using the software. If hardware configuration is preferred, follow the directions in *Chapter 4. Installation and Setup*. Software configuration requires the D/I Mux III to be connected to an asynchronous ASCII terminal (or equivalent). Follow the system configuration and initialization procedures detailed in the appropriate installation and maintenance manual.

The following section describes the software configuration process. Perform the steps as outlined. Settings are made using software commands. Perform the steps as outlined. Enter the commands as shown in **larger bold type** in the text and on the screens. A screen example follows each procedure description. Values shown in square brackets ([]) are default values. If the value is changed, the new value appears in the brackets the next time that parameter is edited. Press the enter key after each entry. To make corrections, simply backspace and retype entries.

Display Line Card Configuration

The **DD** command displays the configuration settings and status information for a specific line card. Perform steps 1 and 2 to display line card configuration.

1. Enter **DD**. The system prompts you to enter the slot number of the Smart Dual 4-Wire E&M card.

```
]DD
Slot Number
[10] 22
```

2. Enter the number of the slot where the card resides. The system displays the current configuration data:

```
10:00:51 -----[ Slot 11 : D4W] -----09/20/42
```

Current Status

Ch. A : Not Mapped

Ch. B : Not Mapped

Direction : T1-1 Loopback : Not Active

Signalling Type : E&M Type 1&3 CGA : Type-3

Signalling Mode : Normal E&M

Chan. Label Tx Level: Rx Level:

```
-----              -----              -----
A                      -16.0 dBm      +7.0 dBm
B                      -16.0 dBm      +7.0 dBm
```

```
-----Hardware-----      Serial              Software
Card Type      Part Number Rev      Number              Revision
```

```
-----
D4W              33245-101      L      111111-1111              E      06/18/92
-----
```

```
]

```

Set Line Card Configuration

The **SL** command is used to set the line card operating parameters.

1. Enter **SL** to set the card configuration.
2. Enter the slot number.

```
] SL
```

Enter Shelf Configuration Information

Slot Number

```
[22]
```

Set D 4-W Line Card Configuration

Label for Slot 22 Channel A (up to 10 Characters).

Label for Slot 22 Channel B (up to 10 Characters).

```
[ ]
```

3. Enter a label for the card slot or **[CR]** for no label.
4. Enter **N** or **O** to select the source of configuration settings after a power cycle; either non-volatile random access memory (NVRAM) or manual option switches. If you select **N** (NVRAM), progress through the subsequent screens. If you choose **O**, for Option Switches, go to step 12.

Source of Configuration Settings after a Power Cycle

- N) NVRAM**
 - O) Option Switches**
- [N]**

5. Enter **1**, **2**, or **3** to select signalling mode. For selection **2**, complete steps 6 and 7 then proceed to step 10. If the card is a 33245-101 or 33245-107 version, these options are not provided.

Signalling Mode

- 1) Normal E&M**
 - 2) Ground Start E&M Tandem**
 - 3) Loop Start E&M Tandem**
- [3]**

6. Channel A Screen appears. Select **1** or **2**.

Channel A

- Enable/Disable Channel**
 - 1) Enable When Mapped**
 - 2) Disable Permanently**
- [1]**

7. Specify Analog Tx and Rx levels.

Analog Tx Level (-17.4..8.0 dBm)

[-16.0]

Analog Rx Level (-16.9..8.5 dBm)

[+7.03]

8. Channel B Screen appears. Select **1** or **2**.

9. Specify Analog Tx and Rx levels.

Channel B
Enable/Disable Channel
1) **Enable When Mapped**
2) **Disable Permanently**
[1]
Analog Tx Level (-17.4..8.0 dBm)
[-16.0]
Analog Rx Level (-16.9..8.5 dBm)
[+7.0]

10. Specify CGA type. Select **1**, **2** or **3**. (This option is not provided on the 33245-101 or 33245-107 versions of the card).

CGA Type
1) **Type-1**
2) **Type-2**
3) **Type-3**

11. Select **Y** or **N** to Apply Changes. After you choose, the configuration is complete.

[3]
Apply Changes
Y) **Yes**
N) **No**
[Y]

12. If you have changed from **N**, NVRAM, to **O**, Option Switches in Step 4, you will see this screen which asks you to confirm changes:

Are you sure?
Y) **Yes**
N) **No**

13. Once you have answered this question, **Y** or **N**, configuration is complete.

Chapter 6. DIAGNOSTICS

The system control terminal provides access to the internal self-check capabilities of the channel card. With a system control terminal the network manager can request: gain setting status, channel-enable status, channel card status, card type, card serial number, card revision, firmware revision, and a general health check. The health check reports on the status of various parts accessed by the channel card's microcontroller.

Status LED Indicators

The status LEDs on the front panel give an indication of the activity and status of the individual channels. See Table 13.

Table 13. LED Indicator Operation

LED Status	Channel Status
Steady OFF	Idle
Steady ON	Busy
1 second ON/1 second OFF ON	Not Mapped
100 ms ON/100 ms OFF	Improper Jumper Selection

Diagnostic Functions

The following diagnostic and test features are available on the various Dual 4-Wire channel cards.

Disable Channels on Next Idle

This feature allows channels to be removed from service without cutting off active calls.

Disable Channels Immediately

This option has the same result as disabling channels using the **SL** command.

Set/Clear Digital Loopback

The Set/Clear digital loopback allows the receive digital voice and signalling data to be transmitted back on the digital span. Voice data is looped back in the CODECs and signalling bits are looped back in the microcontroller.

Report Signalling Bits Status

Report signalling bits status allows non-intrusive examination of the transmitted and received signalling bits. (This option does not apply to the 33245-101 or 33245-107 versions, as these versions are transmission only).

Enable Channels

This feature has the same result as enabling channels using the **SL** command.

Reset Card

This performs a software restart of the channel card resulting in a momentary interruption of service while the system reconfigures the card.

Software Diagnostic Operation

The operate line card (**OL**) command allows access to the channel card's maintenance and diagnostic capabilities. Enter **OL** to access the operate line card screen. Select the channel card slot the Dual 4-Wire occupies.

```

] OL
Slot Number
[11]

10:00:51-----[Slot 11 D4W] -----09/24/42

Current Channel Status
  Ch A : Enabled
  Ch B : Enabled

1) Disable channels on next idle
2) Disable channels immediately
3) Set/Clear digital loopback

5) Report signalling bits status
6) Enable channels

R) Reset card
Q) Quit

]Q

```

Channels are enabled or disabled on the **OL** screen.

Digital loopback can be set or cleared. The channel is looped back toward the T1 side in the digital section of the CODEC.

If in one of the E&M signalling modes, signalling bit status can be monitored.

Software Statements

If "Improper Jumper Selection" is indicated, check both the signalling type jumpers and the signalling mode option switches.

If the "Voice Transmission Only" control switch is on, none of the other signalling modes can be selected from the system terminal.

Note: Proper placement of the "Voice Transmission Only" switch during the installation process is critical.

Repair Services

Field repair of the channel cards is not recommended. Return defective units to Coastcom for prompt repair.

Chapter 7. SPECIFICATIONS

The specifications for the 4-Wire Channel Card are presented below.

Table 14. Specifications (Page 1 of 3)

PARAMETER	PERFORMANCE	
Nominal Transmission Levels		
Transmit	-17.4 to 8.0 dBm	
Receive	-16.9 to +8.5 dBm	
Adjustability	0.1 dB steps	
Accuracy	± 0.25 dB	
Frequency Response (expressed as level in dB with respect to level at 1,004 Hz)	Tx (dB)	Rx (dB)
60	£ 14	NA
200	+0.15, -2	+0.15, -1
300 - 3,000	+0.15, -0.15	+0.15, -0.15
3,200	+0.15, -0.75	+0.15, -0.75
3,400	+0.15, -1.5	+0.15, -0.15
4,000	£-14	£14
4-Wire Impedance	600 ohms	
Return Loss		
1,000 Hz	>28 dB	
300 - 3000 Hz	>23 dB	
Longitudinal Balance (measured according to IEEE 455 -1976)		
Frequency (Hz)	Balance (dB)	
200	74	
500	74	
1,000	74	
3,000	69	
Idle Channel Noise (end-to-end)	<20 dB _{rnCo}	

Table 14. Specifications (Page 2 of 3)

PARAMETER	PERFORMANCE
Crosstalk (loss at 200 to 3,400 Hz)	>65 dB
Signal to Distortion	
Input Level (dBm0)	Overall (dB)
0 to -30	33
-40	27
-45	22
Tracking Error	
Input Level (dBm0)	Overall (dB)
+3 to -37	0.5
-37 to -50	1.0
-50 to -55	3.0
Out-of-Frame Conditioning (33245-103, 33245-113, 33245-104 only)	The A signalling channel is frozen until resynchronization or CGA takes over control
Dial Pulse Distortion (33245-103, 33245-113, 33245-104 only)	At 12 PPS with 30 to 90% break, the end-to-end distortion is less than 4%
CGA Types (33245-103, 33245-113, 33245-104 only)	
I	E lead idle immediately
II	E lead busy immediately
III	E lead idle immediately followed by busy after several second delay
Signalling Types (33245-103, 33245-113, 33245-104 only)	
	Normal E&M
	E&M Tandem Loop Start
	E&M Tandem Ground Start
	E&M Types I, II, III, V
	PLR Types I, II

Table 14. Specifications (Page 3 of 3)

PARAMETER	PERFORMANCE
Type I E&M Lead Requirements (33245-103, 33245-113, 33245-104 only)	
E Lead	
Open Circuit Voltage	< 1 volt
Leakage	> 100K
Voltage Drop to Ground	< 1 volt at 50 mA
M Lead	
Open Circuit Voltage	< 1 volt
Must Detect On-Hook	<150 ohms to ground or 5 V AC on -56.5 V DC through 20K
Must Detect Off-Hook	<150 ohms to -36.5 V DC
Current	>2 mA with 140 ohms to -35.5 V DC
Sealing Current (33245-107 only)	
DC Current	12 to 23 mA
Loop Resistance	1250 ohms maximum
Allowable Current Imbalance	10%
Intended Application	Terminal Interface per Bellcore #TR-NWT-00057
Operating Environment	
Temperature	0° to 50° C
Humidity	0 to 95% noncondensing

Hardware Warranty and 90-Day Support Agreement

Coastcom warrants that hardware products of its own manufacture shall, at date of shipment and for 24* months from said date, be free from defect in materials. These products will perform substantially as described in applicable Coastcom written materials and support services shall be substantially as described in applicable Coastcom written materials.

*Please note the following exceptions:

- Any product that reaches end of life (is no longer being manufactured) shall be subject to a 90-day warranty period.
- Any product, part or assembly not manufactured by Coastcom is subject to such warranty of the original manufacturer as negotiated by Coastcom.

If any Coastcom product shall be determined by Coastcom to be defective in material or workmanship under normal intended usage and maintenance during the warranty period, then Coastcom shall repair or replace, with substantially equivalent product, at Coastcom's sole discretion, such defective product. Such replacement shall not include the cost of labor by Buyer's own employees, agents or contractors in identifying, removing or replacing the defective product. Coastcom's liability for breach of any and all warranties hereunder is expressly limited to the repair or replacement of defective products as set forth in this section. In no event shall Coastcom be liable for special, incidental or consequential damages by reason of any breach of warranty or defect in material or workmanship. Coastcom shall not be responsible for the repair or replacement of products which have been subjected to neglect, accident or improper use or installation, acts of God, or which have been altered by other than authorized Coastcom personnel. This warranty is not transferable except from a VAR or Distributor to an end-user.

Coastcom's Technical Support Department will provide phone assistance for a period of **90 days** from the day of product shipment from Coastcom. Coastcom will provide product upgrades free of charge only as such upgrades fall within that 90-day period. After 90 days, Coastcom will provide telephone consultation and other customer services per a **written service agreement** providing such agreement has been executed and authorized by the customer.

Return Policy: An item may only be returned with prior written approval of an authorized Coastcom representative. Any such approval shall reference a return material authorization number issued by said Coastcom representative. Shipping costs, if any, incurred in connection with the return of a defective item to Coastcom will be paid by Customer. Any shipping costs incurred in connection with the return of a repaired or replaced item shall be the responsibility of Coastcom. However, such costs shall be the responsibility of the Customer if Coastcom determines that the item is NOT defective. If Coastcom determines, at its sole discretion, that the allegedly defective item is not covered by the terms of the warranty provided hereunder or that the warranty claim is made after the warranty period, the cost of repair at Coastcom's option, including all shipping expenses, shall be reimbursed by the customer. If the returned material is improperly packaged for shipment thereby resulting in further damage the Customer is responsible for the additional repair cost. Coastcom will have no liability with respect to any data contained in any system returned to Coastcom. Coastcom will make every reasonable effort to repair or replace and ship replacement products in warranty within thirty (30) calendar days. Coastcom will make every reasonable effort to repair or replace out of warranty products.

THIS EXPRESS WARRANTY SHALL EXTEND TO THE BUYER AND ITS END-USER CUSTOMER ONLY, AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED INCLUDING IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE AND MERCHANTABILITY. THERE ARE NO OTHER WARRANTIES EXCEPT AS APPEAR ON THE FACE HERE OF.

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