IMACS Integrated Access System Voice Cards Reference Guide

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Z H O N E ™

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Product Description

The Voice Cards provide an interface between voice circuits and a digital network.Voice interface cards are intended for short loop applications that require high port densities.

This integrated access system offers voice cards that support E&M, FXS, FXO, FXS Coin, FXO Coin and P-Phone interfaces.

Voice Cards

- **E&M**   **E&M 2W*8 (8108), E&M 2713Hz (8117), E&M 4W*8ER (8119)**

  *E&M 2W*4-6 (8104), E&M 4W*2-6 (8812), E&M Wx2ER (8113)*

  *E&M 4W*4-6 (8114), E&M 4W*ER (8115), E&M 4W*8-6 (8118)*

- **FXS**   **FXS 2W*4-6 (8125), FXS 2W*8-6 (8129)**

  *FXS 2W*2-9 (8122), FXS 2W*2-6 (8123), FXS 2W*4-9 (8124)*

  *FXS 2W*8-9 (8128)*

- **FXO**   **FXO 2W*8-6 (8139)**

  *FXO 2W*2-9 (8132), FXO 2W*2-6 (8133),*

  *FXO 2W*4-9 (8134), FXO 2W*4-6 (8135),*

  *FXO 2W*8-9 (8138)*

- **iFXO**   **FXO 2W*8-6 (8150)**

  *FXO 2W*8-9 (815060)*

- **FXS-C**   **FXS-C 2W*8-6 (8149)**

  FXS-C 6-900 (8148)

- **FXO-C**   **FXO-C 2W*8-6 (8159)**

  FXO-C 8-900 (8158)

- **LBRV**   **LBRV-8 FAX (8830), LBRV-16 FAX (8831)**

- **P-Phone**   **PPO (8131), PPS (8121)**

- **Analog Bridge DSP BRDG-8 (832060)**

Note: *Cards listed in italics have been Manufacturing Discontinued (MD), but are supported under this product host code for backward compatibility.*

Using this Voice Card Reference Guide

This Voice Card Reference Guide provides technicians with switch settings, connector pinouts, configuration, and troubleshooting information for the voice cards.

Chapter 1. *E&M Card*

Chapter 2. *FXS Card*

Chapter 3. *FXO Card*

Chapter 4. iFXO Card

Chapter 5. *FXS Coin Card*

Chapter 6. *FXO Coin Card*

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Chapter 8. *P-Phone (PPO/PPS) Cards*

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Chapter 1
E&M Card

1.1   Introduction

This chapter provides switch settings, connector pinouts, configuration, and troubleshooting information for the E&M Voice Cards. These cards are identified as the E&M 2W*8 (8108), E&M 2713 Hz (8117), E&M 4W*8 (8118), E&M 4W*8ER (8119), and on their faceplate ejectors.

The E&M cards manage the flow of toll-grade voice traffic through the integrated access system. Each card encodes an analog (voice, VF) signal to a digital bitstream at the local integrated access system for transmission over a T1 or E1 network. Each card also decodes the digital signal to analog at the remote system. Both cards support E&M signaling types I, II, IV, and V.

Each card connects to eight CPE voice circuits from a PBX or other user facility. Normal E&M, Transmission-Only, and E&M R2 signaling are supported. The E&M cards also can use the voice compression features of an ADPCM card.

1.2   E&M Card Descriptions

1.2.1   E&M 2W*8 Card Description (8108)

The E&M 2W*8 card has eight voice ports, each with 600-ohm terminating impedance.

Notice!

UL STATEMENT

OPERATION OF THIS INTERFACE IS LIMITED TO INTRA-BUILDING CONNECTIONS ONLY

1.2.1.1   Card Jumper/Switch Settings

The E&M 2W*8 card has four switches (S1 through S4) that you must set before inserting the card into the chassis. These switches establish the type of E&M the card will use on all eight ports. Figure 1-1 shows these switches, Table 1-1 defines their purposes, and Table 1-2 lists the settings for each signaling type.
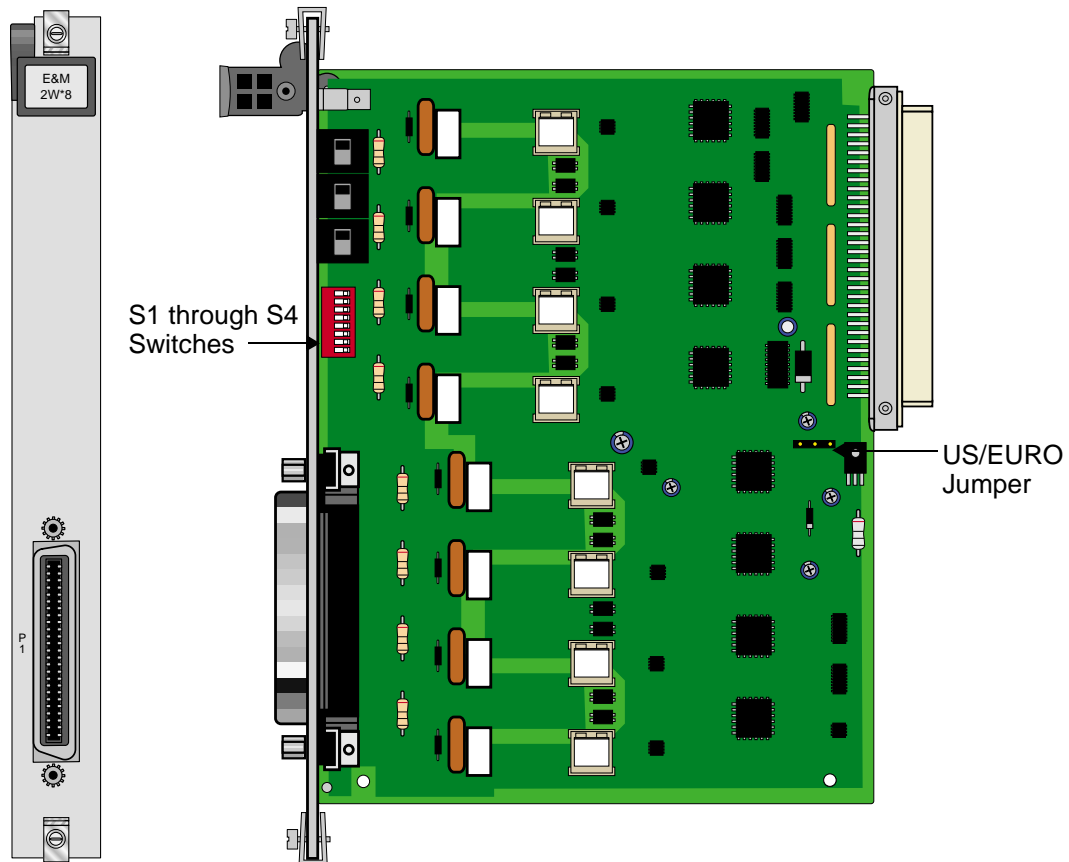
Figure 1-1.Typical E&M Card Switches

Table 1-1. Typical E&M Card Switch Definitions

Switch	Definition
S1	Source of the E (recEive or Earth) lead; can be internal (INT) or external (EXT).
S2	Type of internal source for the E lead; either battery (-48 VDC) or ground (GND).
S3	Type of internal source for the M (transMit or Magnetic) lead; either battery (-48 VDC) or ground (GND).
S4	Normal state of the E lead; either grounded (ON) or open (OFF). Each card port number is designated on the eight-position DIP switch. All eight switches must be set to the same position (all ON or all OFF).

Table 1-2. Typical E&M Card Switch Settings

E&M Type	Direction	S1	S2	S3	S4 (all switches)
I	Normal E&M*	INT	GND	GND	OFF
	Trunk**	INT	BAT	BAT	ON
II	Normal E&M*	EXT	BAT	GND	OFF
	Trunk**	EXT	GND	BAT	OFF
IV	Normal E&M*	EXT	GND	BAT	OFF
	Trunk**	EXT	GND	BAT	OFF
V	Normal E&M*	INT	GND	BAT	OFF
	Trunk**	INT	GND	BAT	OFF
Factory Settings (default)		INT	GND	GND	OFF

*Indicates that the port is attached to a device that generates signaling, such as a PBX.

**Indicates that the port is attached to a device that does not generate signaling, such as a channel bank. In this case, the integrated access system emulates a PBX and generates signaling. This configuration is also known as a Tandem E&M or Pulse Link Repeater (PLR) application.

1.2.1.2   Installing the E&M 2W*8 Card

Insert the E&M 2W*8 card into any user card slot. These slots are U1 to U8 on the two-sided chassis or the front-loading chassis with power supplies on top or P1 to P4 and W1-W4 on the front-loading chassis with power supplies on the side. This card allows you to connect the system to eight 2-wire voice circuits with E&M signaling.

1.2.2   E&M 2713 Hz Card Description (8117)

The E&M 2713 Hz Card provides digital loopback (both audio and signaling) when activated by a 2713 Hz tone of specified level and duration.

1.2.2.1   Card Jumper/Switch Settings

The E&M 2713 Hz card has four switches (S1 through S4) that you must set before inserting the card into the chassis. These switches establish the type of E&M signaling the card will use on all eight ports. Figure 1-1 shows these switches, Table 1-1 defines their purposes, and Table 1-2 lists the settings for each signaling type.

1.2.2.2   Installing the E&M 2713 Hz Card

Insert the E&M 2713 Hz card into any user card slot. These slots are U1 to U8 on the two-sided chassis or the front-loading chassis with power supplies on top or P1 to P4 and W1-W4 on the front-loading chassis with power supplies on the side. This card allows you to connect the system to eight 4-wire voice circuits with E&M signaling.

1.2.3   E&M 4W*8 Card Description (8118)

The E&M 4W*8 card has eight voice ports, each with a 600-ohm terminating impedance.

1.2.3.1   Card Jumper/Switch Settings

The E&M 4W*8 card has four switches (S1 through S4) that you must set before inserting the card into the chassis. These switches establish the type of E&M the card will use on all eight ports. Figure 1-1 shows these switches, Table 1-1 defines their purposes, and Table 1-2 lists the settings for each signaling type.

1.2.3.2   Installing the E&M 4W*8 Card

Insert the E&M 4W*8 card into any user card slot. These slots are U1 to U8 on the two-sided chassis or the front-loading chassis with power supplies on top or P1 to P4 and W1-W4 on the front-loading chassis with power supplies on the side. This card allows you to connect the system to eight 4-wire voice circuits with E&M signaling.

1.2.4   E&M 4W*8 ER Card Description (8119)

The E&M 4W*8 ER card is functionally similar to the E&M 4W*8 card. Unlike that card, though, the ER-type card provides an extended transmit TLP range (-17.5 to +14.5 dB) for dedicated 4-wire modem applications. This range is required for data speeds of 19.2 kbps and higher.

Notice!

UL STATEMENT

OPERATION OF THIS INTERFACE IS LIMITED TO INTRA-BUILDING CONNECTIONS ONLY

1.2.4.1   Card Jumper/Switch Settings

The E&M 4W*8 ER card has four switches (S1 through S4) that you must set before inserting the card into the chassis. These switches establish the type of E&M signaling the card will use on all eight ports. Figure 1-1 shows these switches, Table 1-1 defines their purposes, and Table 1-2 lists the settings for each signaling type.

1.2.4.2   Installing the E&M 4W*8 ER Card

Insert the E&M 4W*8 ER card into any user card slot. These slots are U1 to U8 on the two-sided chassis or the front-loading chassis with power supplies on top or P1 to P4 and W1-W4 on the front-loading chassis with power supplies on the side. This card allows you to connect the system to eight 4-wire voice circuits with E&M signaling.

1.3 E&M Card User Screens and Settings

1.3.1 E&M Card Main Screen

You must configure the E&M card for operation after installing it in the system chassis. This is done from the E&M Main Card Screen, which is shown in Figure 1-2. To go to that screen, highlight the desired card on the System Main Screen, then press <Enter>. The E&M Card Main Screen shows numerous columns of settings, each for one port of the card.
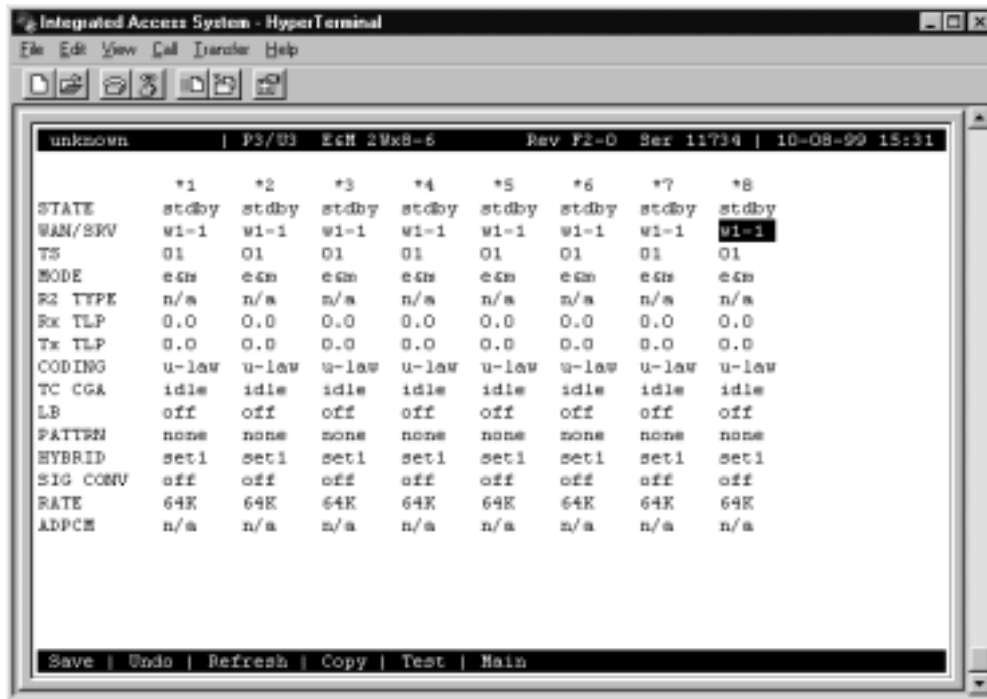
Figure 1-2.Typical E&M Card Main Screen

The bottom highlighted line of this screen shows various actions that you can perform from this screen. You perform the desired action by pressing the associated uppercase letter key. Table 1-3 summarizes these actions. For example, after you configure the E&M card ports, press "**s**" to save your settings.

Table 1-3. Main Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e., test status).
Copy	Copies the contents of the current column to the next column. Useful if you change a lot of entries in one column and wants to repeat those changes in subsequent columns.
Test	Goes to the Test Screen, from which you can test the E&M card ports. Refer to the Test section of this chapter.
Main	Returns to the System Main Screen. If you make changes to settings and do not save them, you will be prompted to save or lose changes.

Table 1-4 summarizes the configuration settings for the E&M card, along with the available and factory-default option settings. The parameters and settings are also described in the following paragraphs.

Table 1-4. Main Screen Option Settings and Defaults

Parameter	User Options	Notes	Default
STATE	stdby actv		stdby
WAN/SRV	none wan serv user	1	w1-1
TS	01-24 01-31	2	01
MODE	e&m to e&mR2 R2mod		e&m
R2 TYPE	n/a (when MODE is set to e&mR2 or R2mod the default is s1-1)	3	n/a
Rx TLP	-16.3 dB to +7.5 dB		0
Tx TLP	-16.3 dB to +7.5 dB	4	0
CODING	u-law a-law a-inv	5	u-law
TC CGA	idle busy		idle
LB	off dgtl anlg		off
PATTRN	none D-mW quiet		none
HYBRID	n/a set1 to set8 user		n/a
SIG CONV	off on		off
RATE	64K 24K,1 32K,1 40K,1 24K,2 32K,2 40K,2		64K
ADPCM	n/a P1 P2 P3		n/a

Notes:

1. Choosing **wan** allows you to choose a WAN port (w1-1 through w4-2). Choosing **serv** lets you choose an ATM or FRS server card in slot P1, P2, or P3, followed by a logical port on that card. The **user** option is not used. See the WAN/SRV paragraph that follows.

2. Time slot 16 is not available if the port is assigned to an E1 WAN link whose time slot 16 is programmed for **cas** or **ccs**.

3. The default is **sl-1** if the Mode is set to **e&mR2** or **R2mod**.

4. The extended setting range for the 8119 card is from **-16.3** to **+7.5 dB**.

5. The default coding is **a-inv** for E1 and **u-law** for T1.

Choosing a Rate other than **64K** allows you to select an ADPCM slot.

STATE

The State setting determines whether the port is active or inactive. An inactive port does not occupy a time slot on a WAN link. Set this field to **stdby** (standby) for ports that will not be used or that are not yet configured. Or, set it to **actv** (active) for ports that are ready for use.

WAN/SRV

The WAN/SRV setting identifies the WAN link or server card assigned to this port. If you choose **wan**, you also must select the desired port (w1-1 through w4-2) of a WAN card for transmission over a T1 or E1 link. Or, choose **serv** to assign the card port to a server card in the system. This can be an ATM or FRS card, which resides in chassis slot P1, P2, or P3. You must then choose a logical port on that card. The **user** option is not used.

It is not necessary to assign all ports of the same E&M card to the same WAN link or server card, or to contiguous time slots on a WAN link.

TS

The TS setting identifies the time slot on the WAN link to which this port is assigned. This value is from **1** to **24** for T1 links and **1** to **31** for E1 links. However, time slot 16 is not available for E1 links that are programmed for CAS or CCS signaling. For a display of available time slots, refer to the cross-connect map for the WAN link selected.

MODE

The Mode setting specifies whether or not a port uses E&M signaling, or if it operates in the Transmission-Only (TO) mode. Use the **to** mode if you are connecting the port to a four-wire, dedicated-line modem that does not require E&M signaling. The signaling type for all eight ports of an E&M card is defined by setting hardware switches S1 through S4 as described earlier in this chapter. Select **e&m** for standard Type I, II, IV, or V signaling. Select **e&mR2** for symmetrical R2 signaling for calls originating from either the digital or analog side. The **R2mod** setting provides modified R2 signaling for Motorola paging terminal equipment.

R2 TYPE

The R2 Type setting is reserved for future use; its setting is always set to **n/a** and cannot be changed. when the Mode is set to **e&m** or **to**. The signaling type for all eight E&M ports is established by setting hardware switches S1 through S4 as described earlier. If the Mode selected for the port is **e&mR2 or R2mod**, the R2 Type automatically defaults to **sl-1**.

Rx TLP

The Receive Transmission Level Point (TLP) setting controls the amount of gain or loss added to a signal after it is decoded to analog. To increase the signal level, set the Rx TLP field to a positive number (i.e., the larger the number, the more gain is added). To decrease the signal level, set the Rx TLP field to a negative number (i.e., the more negative the number, the more the signal level is decreased). For example, an incoming signal at -5 dBm can be increased to -2 dBm by setting Rx TLP to **+3 dB**. The Rx TLP range is **-16.3 dB** to **+7.5 dB**.

Tx TLP

The Transmit TLP setting controls the amount of gain or loss added to the voice signal coming in from the local CPE before it is encoded to digital PCM. To increase the incoming signal level, set the Tx TLP field to a negative value (i.e., the more negative the number, the more gain is added). To decrease the signal level, set the Tx TLP setting to a positive number (i.e., the more positive the number, more the signal level is decreased). For example, an incoming signal at -16 dBm can be increased to 0 dBm by setting Tx TLP to **-16 dB**. For the E&M 4W*8 Card, the Tx TLP range is **-16.5 dB** to **+7.3 dB**. For the E&M 4W*8 ER E&M Card, this range is **-17.5 dB** to **+14.5 dB**.

CODING

The Coding field sets the PCM companding (coding) method used for a port. Generally, the North American T1 environment uses **u-law** (mu-law) coding, and the International E1 environment uses either **a-law** or **a-inv** (inverted A-law) coding. The **a-inv** setting provides a higher ones density on an E1 line than **a-law**. The coding default setting is defined by the type of associated WAN card.

TC CGA

The Trunk Conditioning during Carrier Group Alarm setting defines whether the E&M card port should be placed in the **idle** or **busy** mode upon declaration of a Carrier Group Alarm (CGA) on the WAN link to which the port is assigned. The TC CGA setting has no effect on Transmission-Only circuits, for which the **to** signaling mode is used.

In most cases, you should set this parameter to **busy**. If a call is in progress when the CGA alarm is received, the system holds the call for two seconds, drops it, and then busies out the port to the attached PBX for the duration of the alarm. Once the alarm clears, the system automatically places the port back in the **idle** mode, thereby making it available to the attached PBX.

LB

The LB setting allows you to loop a port back toward the network and far end for testing and troubleshooting. Figure 1-3 shows the available loopbacks. The **dgtl** (digital) loopback sends the incoming digital signal from the network back toward the far end, without decoding it. The **anlg** (analog) loopback sends the decoded analog signal back to the far end. To disable either loopback after testing, set this field to **off**.
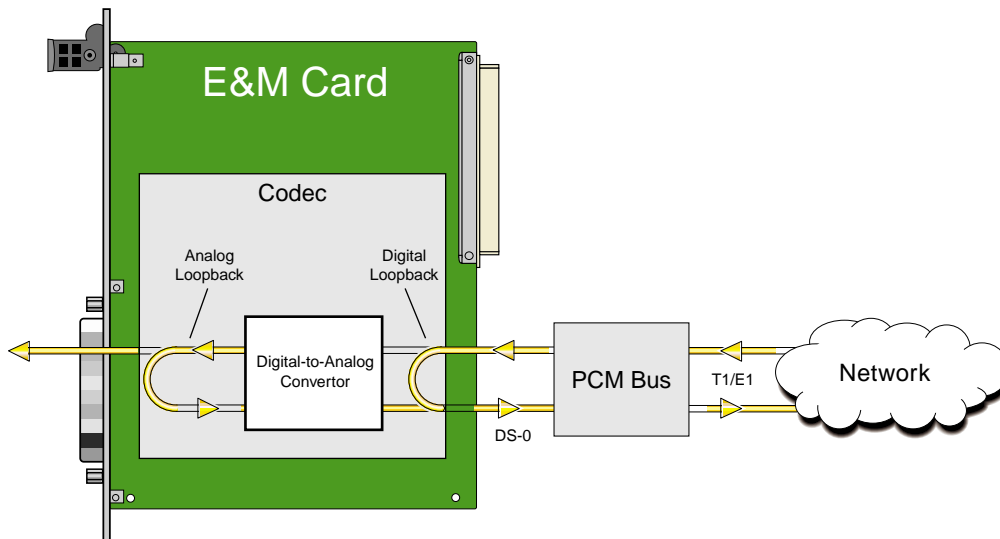
Figure 1-3.E&M Card Loopbacks

PATTRN

The Pattern is the outgoing test pattern to be sent to the selected port by the system. You can send a different pattern to each port. The **none** setting disables the test pattern. The **D-mW** (Digital milliwatt) option sends a 1 kHz tone at 0.0 dBm. The setting of the Rx TLP field adjusts the D-mW signal level before sending the signal to the CPE. The **quiet** option places a 600-ohm termination on the line so that no analog signal is sent (idle mode).

HYBRID

Available for the two-wire 8108 E&M card only, the Hybrid option assigns a three byte pattern to define the adjustment for return loss (similar to Build Out Capacitors). The default, **set1**, balances to the ideal termination of 900Ω @ 2.15mF. The other settings are reserved for future use.

SIG CONV

The Signaling Conversion parameter allows you to change the transmit ABCD signaling bits from ITU (E1) to ANSI (T1) standards. This conversion is completed regardless of the associated type of WAN (CSU/DSX or CEPT).

Select **off** if ANSI signaling is used, or select **on** to convert the transmit signaling from ANSI to ITU according to the Interface Card Conversion Table for E&M signaling. This setting also converts the receive signaling from ITU to ANSI format.

RATE

The Rate parameter allows you to use the voice compression capabilities of an ADPCM card. If that card is not present in the system, the Rate is set to **64k** and cannot be changed. The **64k** setting (default) is the normal encoding/decoding rate for voice circuits.

ADPCM voice channels are assigned in pairs by designating two voice ports (E&M, FXO or FXS) to the same WAN link and time slot, and then selecting rate settings for the pair that add up to 64 kbps. The following pairing combinations are possible:

24K,1+40K,2 (24 kb coding on one side of the time slot and 40 kb coding on the other side of the same time slot)

32K,1+32K,2 (32 kb encoding on each side of a time slot)

40K,1+24K,2 (40 kb coding on one side of the time slot and 24 kb coding on the other side)

Number **1** after the rate setting assigns that portion of the voice port pair to the odd side of the ADPCM pair. Number **2** after the rate setting assigns that portion of the voice port pair to the even side of the ADPCM pair.

For more information about voice port assignments to a time slot and ADPCM card.

ADPCM

The ADPCM parameter lets you assign the current port to an ADPCM card in the system. The default setting is **n/a** and only changes when a Rate smaller than **64k** is selected (see above). You can then select which ADPCM card to use for the port (this assignment is made by chassis slot number). The options are slots **P1**, **P2**, and **P3**.

1.3.2 Test Screen

The Test Screen (Figure 1-4) facilitates testing and maintenance by allowing you to monitor and set the status of the analog signals and/or the A, B, C, and D signaling bits of all E&M circuits on the card. In cross-connect systems, the test option can also send test patterns and tones towards the CPE and network sides of the system.

The Test Screen also shows the signaling type assigned to the card via the switch settings described earlier.
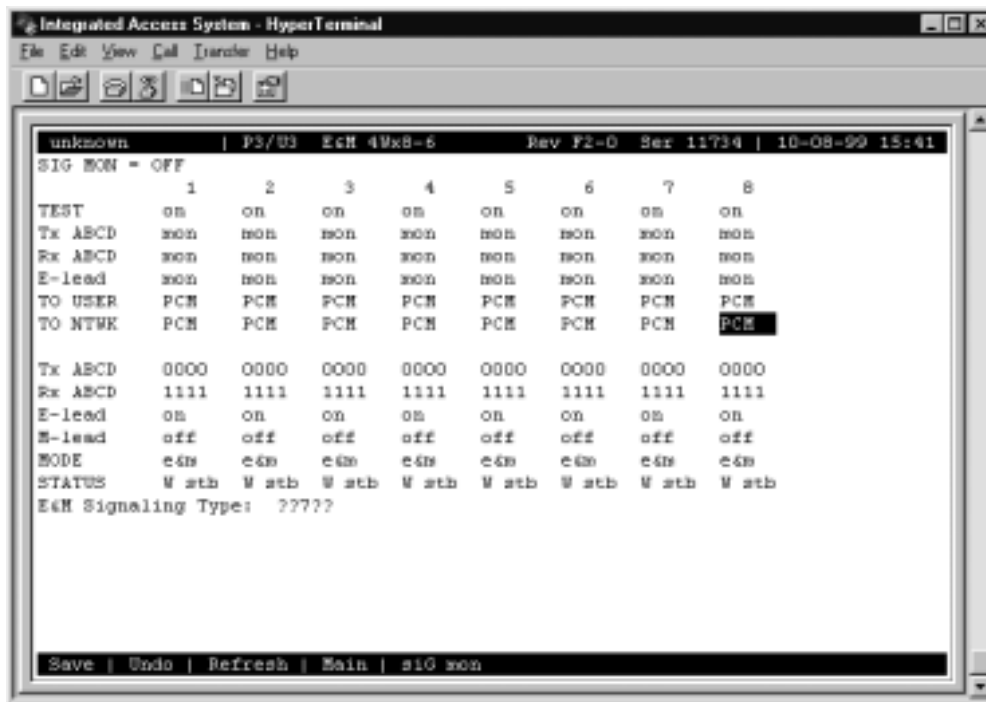
Figure 1-4. Typical E&M Card Test Screen

Table 1-6 lists various operations you can perform from this screen. These appear in the bottom highlighted line of the Test Screen.

Table 1-5. Test Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e., test status).
Copy	Copies the settings of one port to another port that requires the same settings.
Main	Returns to the E&M Card Main Screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Table 1-6 summarizes the available test parameters and option settings. The following paragraphs also describe these parameters and settings in detail.

Table 1-6. Test Screen Option Settings and Defaults

Parameter	User Options	Default
TEST	off on	off
Tx ABCD	mon set	mon
Rx ABCD	mon set	mon
E-lead	mon set	mon
TO USER	PCM 300Hz 1kHz 3kHz quiet	PCM
TO NTWK	PCM 300Hz 1kHz 3kHz quiet	PCM
Tx ABCD	Status information only; not user-editable	n/a
Rx ABCD	Status information only; not user-editable	n/a
E-lead	Status information only; not user-editable	n/a
M-lead	Status information only; not user-editable	n/a
MODE	Status information only; not user-editable	n/a
STATUS	Status information only; not user-editable	n/a

SIG MON

The Signaling Monitor feature works with the user card alarm system to detect excessive signaling bit transitions. The system will generate alarms if the number of transitions of any signaling bit in transmit or receive direction for an active port exceeds 255 in any four second interval. The options are **off** and **on**, and they are toggled by pressing "**g**".

TEST

The Test parameter shows if the port is in test mode or not. Inactive ports and ports that are assigned to inactive WANs will show a test status of **n/a**. The test status options for active ports are **off** and **on**.

Tx ABCD

The Transmit ABCD setting allows you to either monitor the status of the ABCD signaling bits being transmitted towards the network or set a specific ABCD pattern for testing the transmit side of the circuit. The options for this field are **mon** (monitor) or **set**. Choosing **set** will bring up a four digit field for users to input the ABCD pattern they want to transmit. Any four digit combination of ones and zeros is acceptable for this setting.

Rx ABCD

The Receive ABCD setting allows users either to monitor the status of the ABCD signaling bits being received from the network or to set a specific ABCD pattern for testing the receive side of the circuit.

The options for this field are **mon** (monitor) or **set**. Choosing **set** will bring up a four-digit field for you to specify the ABCD pattern you want to receive. Any four digit combination of ones and zeros is acceptable in this field. The Rx ABCD bits cannot be set in bus-connect systems and the only option is **mon** (monitor).

E LEAD

The E-lead setting allows you to either monitor or set the E-lead state. The options for this field are **mon** (monitor) or **set**. Choosing **set** will bring up the options **off** (which drops the E lead) and **on** (which raises the E lead).

TO USER

In cross-connect systems only, the **To User** parameter allows you to break the circuit and send a test tone toward the user side of the system. The options for this field are **PCM**, **300Hz**, **1 kHz**, **3 kHz** and **quiet**. Selecting **PCM** causes the PCM signal received from the network to continue to be sent to the user port in the normal manner.

This parameter is not supported in bus-connect systems and will always appear as **n/a**.

TO NTWK

In cross-connect systems only, the **To Network** parameter allows you to break the circuit and send a test tone toward the network side of the system. The options for this field are **PCM**, **300Hz**, **1 kHz**, **3 kHz** and **quiet**. Selecting **PCM** causes the PCM signal received from the user port to continue to be sent to the network in the normal manner.

This parameter is not supported in bus-connect systems and will always appear as **n/a**.

Tx ABCD

The Transmit ABCD information field shows the current values of the ABCD bits that are being transmitted to the network. If TX ABCD in the top half of the screen is changed via the **set** function mentioned above, and the settings are saved by the **Save** command in the Test Screen, the new bit pattern chosen will be reflected here.

Rx ABCD

The Receive ABCD information field shows the current values of the ABCD signaling bits that are received from the network. If RX ABCD in the top half of the screen is changed via the **set** function mentioned above, and the settings are saved by the **Save** command in the Test Screen, the new bit pattern chosen will be reflected here.

E-Lead

The E-lead information field shows the current status of the E-lead of this port. The settings are either **on** or **off**.

M-Lead

The M-lead information field shows the current status of the M-lead of this port. The settings are either **on** or **off**.

MODE

The Mode informational field shows the current mode of the port that was selected on the main E&M card screen. Valid settings are **e&m**, **to**, **e&mR2,** and **R2mod**.

STATUS

The Status information field shows the current status of the port. Table 1-7 describes the conditions reported by this field.

Table 1-7. Status Information Field Settings

Setting	Meaning
stdby	The E&M port is in standby.
W stb	The WAN card to which the E&M port is assigned is in standby.
W tst	The WAN card to which the E&M port is assigned is under test.
W OOS	The WAN card to which the E&M port is assigned is Out Of Service.
noWAN	No WAN card is configured in the slot to which the E&M port is assigned.
OOS	The E&M card is out of service.
call	Call set-up is in progress.
busy	Call is in progress.
idle	No call is in progress; circuit is available.
TC	The E&M circuit is undergoing Trunk Conditioning because a CGA alarm is in progress on the associated WAN port.
test	The port is under test (i.e., you are actively controlling the circuit by setting values for Tx ABCD, Rx ABCD, or E-lead).
maint	Maint is a status that tells that a specific port is under maintenance.

E&M Signaling Type

This field shows the card's current on-board switch settings, which define the type of E&M signaling used on each port. If necessary, remove the card and reset the switches as previously described until the desired signaling type appears in the screen. The E&M Signaling types are I, II, IV, and V, followed by a "**-t**" if the card is optioned to provide trunk signaling.

1.3.3   E&M 2713 Hz Card Main Screen

Figure 1-5 below shows the Main E&M Card screen with Loopback option displayed at the bottom of the screen. *The Loopback option will display when commissioning the 811760 E&M card ONLY. No other E&M card has this feature.*
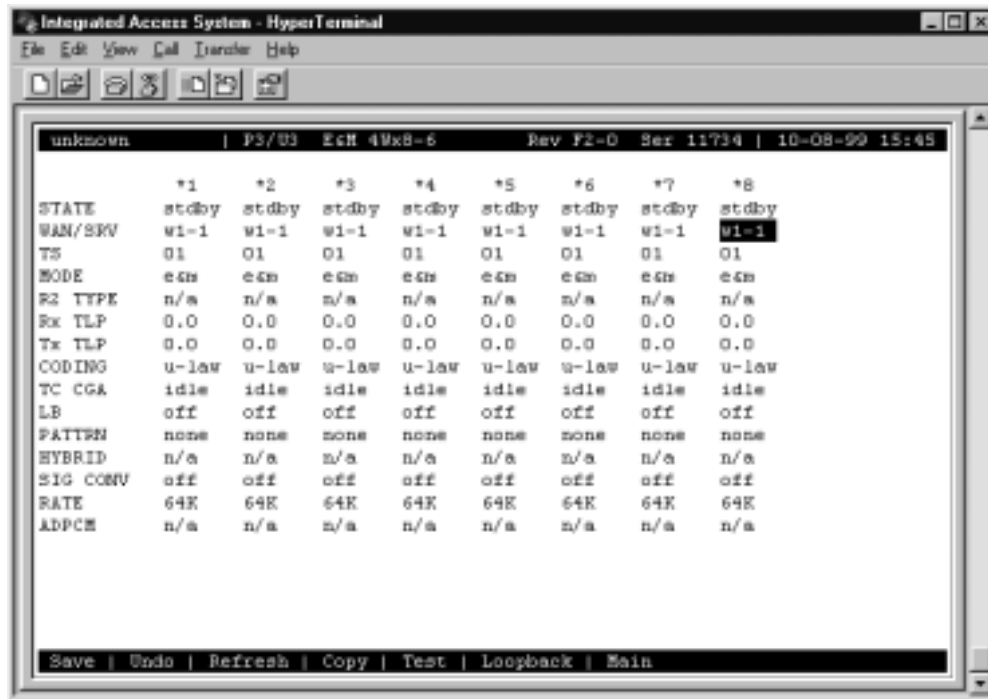
Figure 1-5.E&M Card Main Screen with Loopback

1.3.4   Loopback Screen

The Loopback (Figure 1-6) facilitates loopback detection by allowing the user to enable/disable automatic time out and also get the loopback status of the channel. This feature will provide the digital loopback (both audio and signaling) when activated by a 2713 Hz tone level and duration. When a validated tone is detected the channel disconnects the user and provides loopback of signals received from the network. This loopback is performed at "equal level" without inserting any gain or loss in the path. In addition a "make busy" signal is be applied toward the user. Table 1-8 shows the Loopback screen of actions.

Figure 1-6.Typical E&M Loopback Screen

Table 1-8. Loopback Screen of Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e., loopback status).
Main	Returns to the E&M Card Main Screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Table 1-9 summarizes the available loopback parameters and option settings. The following paragraphs also describe these parameters and settings in detail.

Table 1-9. Loopback Screen Option Settings and Defaults

Parameter	User Options	Default
LB DET	w/to on off	w/to
LB STAT	This is information only - no user input is allowed	

LB DET

The user can either enable or disable the loopback detection. The options available are **w/to**, **on** and **off**. The **w/to** option indicates the loopback detection is ON and 20 minute timeout is enabled. The **on** option indicates the loopback detection is ON and timeout is disabled. The **off** option is used for loopback detection is disabled. The default setting is **w/to**.

LB STAT

This is information only - no user input is allowed. This tells the user if a particular port is in loopback state or not.

1.4　E&M Card Error Messages

Refer to Appendix B in the System Reference Guide for further information on Error Messages regarding this card.

1.4.1　E&M Card Troubleshooting

The E&M card may be faulty if a voice signal is not received at one end of a circuit, or if E&M signaling is not detected. The following are possible causes:

- Faulty receiving CPE at the near end (where the problem was first noticed)
- Faulty transmitting CPE at the far (opposite) end
- Faulty cabling between the CPE and E&M card at either end
- Faulty E&M card at either end
- T1 or E1 network failure
- Improper card configuration at either end (e.g., time slot and/or WAN assignments)

First, verify that the T1 or E1 network has not failed. Check for a CGA-Red alarm on the associated WAN port at the end where the incoming VF signal loss is first noticed. The CGA indicates that the incoming network signal was lost (or that the receiving WAN port is out of frame). During the CGA, all voice ports with time slots on that WAN port will also be disabled, and the associated far-end WAN port will be in a CGA-Yellow alarm state. If the network is faulty, you must clear that trouble to restore your circuits.

If the network is okay, verify that the proper WAN ports and time slots are assigned to the associated E&M voice ports at both ends, as previously outlined in this chapter. In a point-to-point network, the near-end and far-end E&M ports should both be assigned the same WAN port and time slot number. Also make sure the other parameters (such as the transmit and receive TLPs) are set properly at both ends.

If the E&M card port parameters are correct at both ends, and if the network is okay, the trouble is isolated to the E&M card or the associated port. Proceed as follows:

1. At the far end, activate an analog loopback on the E&M card port.

2. Send a 0 dBm (digital milliwatt) test signal toward the CPE at that end. That signal will be substituted for the normal signal coming from the far-end CPE; it will be sent back to the CPE at your end via the loopback path.

3. Check your CPE for this signal. If it is present, the far-end CPE or cabling to the far-end E&M card is probably faulty. Disable the loopback and test signal there, and fix the problem. If you still don't receive a signal, go to step 4.

4. At your end, go to the E&M Card's Main Screen and send a digital milliwatt test tone (0 dBm) toward the CPE. If you still don't receive a signal, check the cabling from the E&M card to your CPE, and check the CPE itself. If those items are okay, replace the E&M card at your end.

5. If the E&M card is determined to be faulty, replace it and return the faulty unit for repair to the location specified by your distributor.

1.5   E&M Card Specifications

E&M Cards (8108, 8115 and 8119)	
Physical Interface (Model 8115)	
Number of Ports	4
Connectors	1 female 50-pin telco connector
Physical Interface (Models 8108 and 8119)	
Number of Ports	8
Connectors	1 female 50-pin telco connector
Transmission Performance	
Performance	Exceeds requirements of ITU-T G.712 (4-wire) and IT-T G.713 (2-wire)
Signaling	
Signaling Types	Switch selectable per card
	Types I, II, IV and V
	Normal (toward user) and Trunk/Tandem (toward CO)
Signal Modes	Software selectable per port
	Trasmit Only (to)
	Standard Type I, II, IV or V E&M (e&m)
	Symmetrical R2 signaling (e&mr2)
	Modified R2 (r2mod)
VF Transmission Characteristics	
Nominal Transmit TLP	Software selectable
	Model 8108 -16.5 dB to +7.3 dB in steps of 0.1 dB
	Model 8115 and 8119 -17.5 dB to +14.5 dB in steps of 0.1 dB
Nominal Receive TLP	Software selectable
	All Models -16.3 dB to +7.5 dB in steps of 0.1 dB
Termination Impedance	with 2.16 µf capacitor in series 600 Ohms
PCM Encoding	Software selectable
	µ-law
	A-law
	A-law bit inverted

Attenuation Versus Frequency as per AT&T TR43801 - Relative to 1 kHz with 0 dBm0 input

Frequency	Transmit (A to D)	Receive (D to A)
200 Hz	-0.25 to +3.0 dB	-0.25 to +2.0 dB
300 to 3000 Hz	-0.25 to +0.5 dB	-0.25 to +0.5 dB
3200 Hz	0.25 to +0.75 dB	-0.25 to +0.75 dB
3400 Hz	-0.25 to +1.5 dB	-0.25 to +1.5 dB

Return Loss	Against 600 Ohms, in series with 2.6 µf with additional 25 Ohms resistor between the channel unit and the return loss measurement set.
Model 8108 2-wire	Echo 28dB min.
	Singing 20dB min.
Model 8119 4-wire	1kHz 28dB min.
	300 to 3000 Hz 23dB min.
4W Return Loss (at 1 kHz)	>20dB Typ > 27dB
2W Return Loss (at 1 kHz)	>15dB Typ> 20dB

Relative Transhybrid Loss	Against 600 Ohms, in series with 2.16 µf termination.
Model 8108	Echo 34dB
	Singing 20dB
Idle Channel Noise (rcv and xmt)	< -65Bm0p. Typically < -70 dBm0p or < 20 dBrnc0 <20dBBrnc0
Interchannel Crosstalk	Typ < -75 dBm0 using 7 adjacent channels being distributed with a signal of 0.0 dBm0.

Total Distoration including Quantization (Signal to Distortion Ratio) Input Frequencies 1004-1020 Hz

Input Level	Rcv or Xmt	Overall
-30 to 0 dBm0	$\geq$35 dB	$\geq$33.9 dB
-40 dBm0	$\geq$20 dB	$\geq$27.6 dB
-45 dBm0	$\geq$25dB	$\geq$23 dB

Absolute group delay	< 600 microseconds
Group Delay Distortion vs. frequency	within boundaries of ITU-T Rec. G.712 Figure 2
Longitudinal Balance	>46 dB Typ > 50 dB
Variation of Gain with Input Level	within boundaries of ITU-T Rec. G.713 Figure 7 (2 wire)
	within boundaries of ITU-T Rec. G.712 Figure 7 (4 wire)
	Typical gain variation is within $\pm$ 0.25 dB from +3 to -50 dBm0

Diagnostic Capabilities

Diagnostics	Analog loopback
	Digital loopback
	"Make Busy" signaling control

Standards Compatibility

Bell System	TR43801
ITU-T	Recommendations G.711, G.712 and G.714
FCC Rules and Regulations	Part 68, and Part 15 - Subpart J

Chapter 2
FXS Card

2.1   Introduction

This chapter provides connector pinout, configuration, and troubleshooting information for the Foreign Exchange - Station (FXS) Voice Cards. These are labeled as the FXS 2W*4-6 and FXS 2W*8-6 cards on their faceplate ejectors.

These cards manage the flow of FXS voice traffic over the network. Each card encodes analog (voice, VF) signals to a digital bitstream at the local system for transmission over a T1 or E1 network. It also decodes the digital signals to analog at the remote system.

Each FXS card has two-wires interfaces that support FXS, Private Line Automatic Ringdown (PLAR), Foreign Exchange Station Defined Network (FXSDN), Dial-Pulse Originating (DPO), and Wink-start operations. The FXS cards also can use the voice-compression features of an ADPCM card.

2.2   FXS Card Descriptions

2.2.1   FXS 2W*4-6 Card Description (8125)

The FXS 2W*4-6 Card has four voice ports and provides a 600-ohm terminating impedance on each port. All FXS features are supported by this card.

Notice!
UL STATEMENT

OPERATION OF THIS INTERFACE IS LIMITED TO INTRA-BUILDING CONNECTIONS ONLY

2.2.1.1   Card Jumper/Switch Settings

The FXS 2W*4-6 Card doesn't have any jumpers or switches on its mainboard.

2.2.1.2   Installing the FXS 2W*4-6 Card

Install the FXS 2W*4-6 Card in any user card slot. These slots are U1 to U8 on the two-sided chassis and front-loading chassis with power supplies on top, or P1 to P4 and W1 to W4 on the front-loading chassis with power supplies on the side.

2.2.2   FXS 2W*8-6 Card Description (8129)

The FXS 2W*8-6 Card has eight ports and provides a 600-ohm terminating impedance on each port. All FXS features are supported by this card.

2.2.2.1   Card Jumper/Switch Settings

The FXS 2W*8-6 Card has two sets of jumpers on the motherboard. The jumper JP1 (US/EUR) has two settings. One set is for US domestic applications and the other is for European applications. The default position is U.S.

JP2 (LL/SL) has two settings. One position should be set to SL (Short Loop) for loops not exceeding 700 Ohms, and the other position should be set to LL (Long Loop) for loops comprised between 700 and 1800 Ohms. The default position is LL.

Note: *Tip to Ring voltage on short loop option is -33 volts, while the long loop option is -48 volts.*
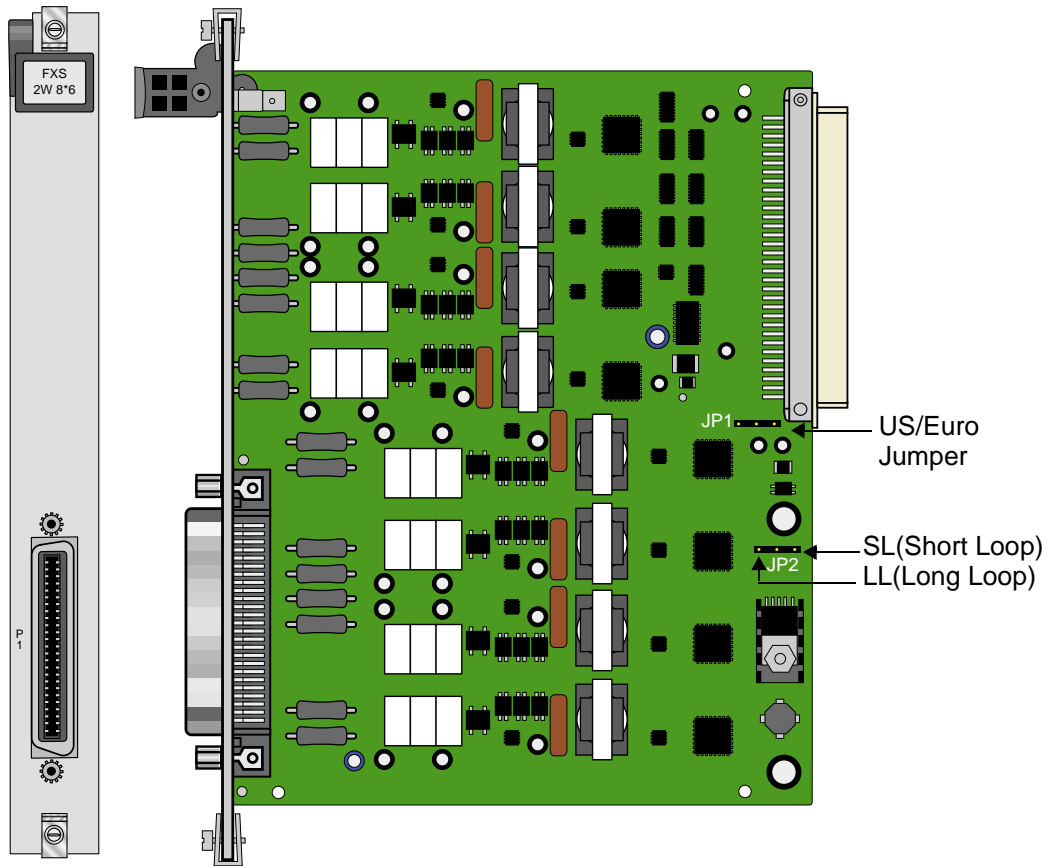
Figure 2-1.FXS 2W*8-6 Card Jumpers Settings

2.2.2.2   Installing the FXS 2W*8-6 Card

Install the FXS 2W*8-6 Card in any user card slot. These slots are U1 to U8 on the two-sided chassis and front-loading chassis with power supplies on top, or P1 to P4 and W1 to W4 on the front-loading chassis with power supplies on the side.

2.3   FXS Card User Screens and Settings

2.3.1   FXS Card Main Screen

You must configure the FXS card for operation after installing it into the system chassis. This is done from the FXS Card Main Screen (see Figure 2-2). To go to that screen, highlight the desired card in the System Main Screen and press <Enter>. This screen shows one configuration column for each port on the card.
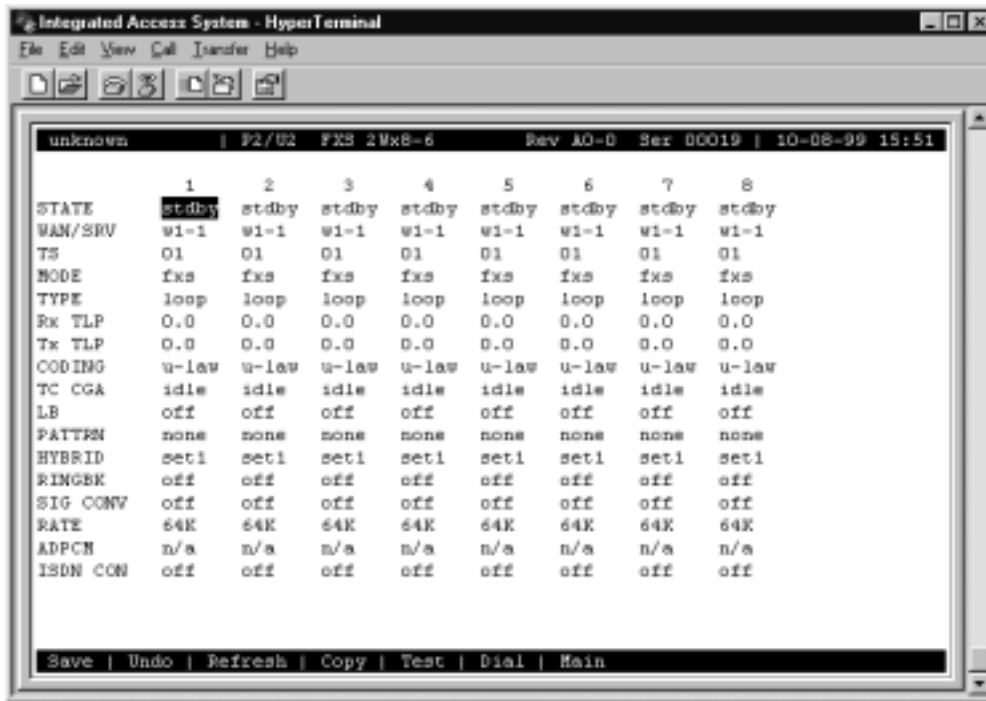
Figure 2-2.Typical FXS Card Main Screen

The bottom highlighted line of this screen shows various actions that you can perform from this screen. You perform the desired action by pressing the associated uppercase letter key. Table 2-1 summarizes these actions. For example, after you configure the FXS card ports, press "**s**" to save your settings.

Table 2-1. Main Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e., test status).
Copy	Copies the contents of the current column to the next column. Useful if you change a lot of entries in one column and want to repeat those changes in subsequent columns.
Test	Initiates and monitors testing of all FXS card ports. Refer to the Test section of this chapter.
Dial	Primary or Hunt Group telephone number entry menu.
Main	Returns to the System Main Screen. If changes are made to settings and not saved, you will be prompted to either save or lose your changes.

Table 2-2 summarizes the configuration settings for the FXS cards, along with the available and factory-default option settings. The parameters and settings are also described in the following paragraphs.

Table 2-2. Main Screen Option Settings and Defaults

Parameter	User Options	Notes	Default
STATE	stdby actv		stdby
WAN/SRV	none wan serv user	1	w1-1
TS	01-24 01-31	2	01
MODE	fxs fxsdn wink plar dpo slc96		fxs
TYPE	loop lp-fd gs gs-i gs-a 1s-R2 1sR2e R1.5i R1.50 sp	3	loop
Rx TLP	-10.0 dB to +2.0 dB		0.0
Tx TLP	-10.0 dB to +5.0 dB		0.0
CODING	u-law a-law a-inv	4	u-law
TC CGA	idle busy		idle
LB	off dgtl anlg		off
PATTERN	none D-mW quiet		none
HYBRID	set1 to set8 user	5	set1
RINGBK	off on		off
SIG CONV	off on		off
RATE	64K 24K,1 32K,1 40K,1 24K,2 32K,2 40K,2	6	64K
ADPCM	n/a P1 P2 P3		n/a
ISDN CON	off on		off

Notes:

1. Choosing **wan** allows you to choose a WAN port (w1-1 through w4-2). Choosing **serv** lets you choose an ATM or FRS server card in slot P1, P2, or P3, followed by a logical port on that card. *If your system has the FRS card installed and you want to use voice compression you need to install the Low Bit Rate Voice (LBRV) card. However, if your*

system has the ATM card installed you can proceed directly with voice compression (there is no need for the LBRV Card to be installed.) The **user** option is not used. See the WAN/SRV paragraph that follows.

2. Time slot 16 is not available if the port is assigned to an E1 WAN link whose time slot 16 is programmed for CAS or CCS.

3. These options are only valid if the Mode is set to **fxs**. If the Mode is **fxsdn**, the Type options are the same as above with the addition of **fgd, boa,** and **lp-sr**. If the Mode is **plar**, the Type options are **d3** or **d4**. If the Mode is **dpo**, the Type setting will automatically default to **dpo**. If the Mode is **wink**, the Type options are **loop, lp-fd, gs, gs-i,** and **gs-a**.

4. The default is **a-inv** for E1 and **m-law** for T1. These values will change depending upon the WAN link selected.

5. The default (**set1**) is the only active option. It balances to the ideal termination of 600 ohms + 2.15 uF. The other settings are reserved for future use.

6. Choosing a Rate other than 64K allows you to select an ADPCM.

STATE

The State setting determines whether the port is active or inactive. An inactive port does not occupy a time slot on a WAN link. Set the State setting to **stdby** (standby) for ports that are not to be used or that have not yet been configured. Set it to **actv** (active) for ports that are ready for use.

WAN/SRV

The WAN/SRV setting identifies the WAN link or server card assigned to this port. If you choose **wan**, you also must select the desired port (w1-1 through w4-2) of a WAN card for transmission over a T1 or E1 link. Or, choose **serv** to assign the card port to a server card in the system. This is an ATM or FRS card, which resides in chassis slot P1, P2, or P3. You must then choose a logical port on that card. The **user** option is not used.

It is not necessary to assign all ports of the same FXS card to the same WAN link or server card, or to contiguous time slots on a WAN link.

TS

The TS setting identifies the time slot on the WAN link to which this port is assigned. Values range from **1** to **24** for T1 links and **1** to **31** for E1 links. Time slot 16 is not available on E1 links that are programmed for **cas** or **ccs** signaling. For a display of the available time slots, refer to the cross-connect map for the WAN link; see Chapter 4, *System Configuration and Operation* in the System Reference Guide for information about viewing cross-connect maps.

MODE

The Mode setting should be determined by the type of equipment to which the user is connecting the port. All options use two-wire balanced connections. The **fxs** (Foreign Exchange Station) option allows users to connect the system to a two-way (both inbound and outbound calls) PBX trunk or a key system trunk. The system requires a ringing generator for this option. The **fxsdn** (Foreign Exchange Station-Defined Network) option provides access to new services offered by advanced networks from many major carriers. The system requires a ringing generator for this option. The **wink** option uses the same type of signaling as **fxsdn** and provides a 150-millisecond delay, then a 200-millisecond "wink" back to the central office when the FXS card sees an off-hook condition from the central office. The system requires a ringing generator for this option.

The **plar** (private line automatic ringdown) option provides point-to-point unswitched connections between two telephone sets. This configuration is usually not attached to an exchange or switch; rather it provides a "hot line" between two locations. The unit requires a ringing generator for this option.

The **dpo** (Dial Pulse Originating) option allows the unit to attach to out-going one-way trunks from a PBX, key system, or a telephone set. This option is very similar to the **fxs** option; however, the system does not require a ringing generator.

The **slc96** (Subscriber Loop Carrier 96) option connects the card to one-way outgoing trunks from a PBX, CENTREX, key system, or telephone set to an SLC$^{®}$-96 channel. The **slc96** mode also must be active on the associated WAN card.

TYPE

The Type setting matches the signaling behavior of the FXS equipment to the remote switch. Use the **loop** (loop-start) option with POTS stations and simple PBX trunks. Use the **lp-fd** (loop-start with Forward Disconnect) option when connecting to automated answering equipment. Use the **gs** (ground-start) option with two-way PBX trunks. This setting helps prevent glaring and call collisions. Use **gs-i** (ground-start immediate) for equipment requiring a fast response time to the station or PBX. Use **gs-a** (ground-start automatic) for equipment requiring fast-response time to the central office. Use **ls-R2** for CCITT signaling used internationally (immediate R2) which provides immediate seizure acknowledgment to the network. Your selection must match the behavior of both the station equipment and remote central office or PBX.

The **lsR2e** R2 Signaling for Ericsson switch for incoming and outgoing call modes. The tables below represent FXS **ls-R23** signaling modes.

FXS-LS-R2E Office Originate - Incoming Calls (ls-R2e)

In this case, RxAB is Forward signaling. TxAB is Backward signaling. See Table 2-3.

Table 2-3. Incoming Calls (ls-R2e)

State	T/R Stat	T/R Cntl	TxAB	RxAB	Note
Idle/Released	Open	TgRb	10	10	
Seized	Open	Ringer	10	00*	Ringer 2s on, 4s off
Seizure Ack	Open or Loop		10	00	N/A
Answered	Loop*	TbRb	00	00	
Clear Forward	Loop	TgRb	00	10*	No action
Idle/Released	Open*	TgRb	10	10	
Clear Back	Open*	TgRb	10	00	
Idle/Released	Open	TgRb	10	10*	
Blocked	Open or Loop		11	10	N/A

FXS-LS-R2E Station Originate - Outgoing Calls (ls-R2e)

In this case, RxAB is forward signaling, RxAB is Backward signaling. See Table 2-4.

Table 2-4. Outgoing Calls (ls-R2e)

State	T/R Stat	T/R Cntl	TxAB	RxAB	Note
Idle/Released	Open	TgRb	10	10	
Seized	Loop*	TgRb	00	10	
Seizure Ack.	Loop	TgRb	00	10	N/A
Answered	Loop	TbRg	00	00*	Battery Reversal
Clear Forward	Open*	TbRg	10	00	
Idle/Released	Open	TgRb	10	10*	
Clear Bcak	Loop	TgRb	00	10*	Battery Normal
Idle/Released	Open*	TgRb	10	10	
Blocked			10	11	N/A

The **R1.5 Signaling** is a special state machine for Russia to support **R1.5** signaling. The IDLE signaling is asymmetrical which means that the state machines have to distinguish the direction of a call. Therefore there are different modes for incoming and outgoing calls that can be used for a call in one direction. The two new types are supported in FXS Mode only

and the types are **R1.5i** and **R1.5o**. **R1.5i** is for incoming calls (Office Originate) and **R1.5o** is for outgoing calls (Station Originate). The following tables below represent the FXS R1.5i and R1.5o signaling.

FXS-LS-R1.5 Office Originate - Incoming Calls (R1.5i)

In this case calls can only be originated from the network (incoming calls) RxAB is Forward signaling. TxAB is Backward signaling. See Table 2-5.

Table 2-5. Incoming Calls (R1.5i)

State	T/R Stat	T/R Cntl	TxAB	RxAB	Note
Idle/Released	Open	TgRb	01	11	
Seized	Open	Ringer	01	10*	Ringer 2s on, 4s off
SeizureAck	Open or Loop		11*	10	Automatic Ack. (200ms min)
Answered	Loop*	TgRb	10	10	
Clear Forward	Loop	TgRb	10	11 or 00*	
Released	Open*	TgRb	00	11	For 200 ms
Idle	Open	TgRb	01	11	Automatic in 200 ms
Clear Back	Open*		00	10	
Idle/Release	Open	TgRb	01	11*	
Blocked	Open or Loop		11*	11	Test mode

FXS-LS-R1.5 Station Originate - Outgoing Calls (R1.5o)

In this case calls can only be originated from the station or PBX ports (outgoing calls), TxAB is Forward signaling, RxAB is Backward Signaling. See Table 2-6.

Table 2-6. Outgoing Calls (R1.5o)

State	T/R Stat	T/R Cntl	TxAB	RxAB	Note
Idle/Released	Open	TgRb	11	01	
Seized	Loop*	TgRb	10	01	
Seizure Ack.	Loop	TgRb	10	11*	CO Ack.
Pulse Dial Break	Break*	TgRb	00	11	
Answered	Loop	TgRb	10	10*	
Busy	Loop	TgRb	10	00*	
Clear Forward	Open*	TgRb	11	10 or 00	
Clear Back	Open	TgRb	11	00*	Optional
Idle/Released	Open	TgRb	11	01 or 10 or 11*	
Clear Back	Loop	TgRb	10	00*	
Clear Forward	Open*	TgRb	11	00	Optional
Idle/Released	Open*	TgRb	11	01*	
Blocked		TgRb	11	11*	Blocked at CO

Use **sp** for Single Party signaling in an ESF (Extended SuperFrame) mode along with Feature Group "D" high-speed modem services that require special software. The choice of **boa** (bill on answer) sends a signal back to the office when the customer answers the phone, to start billing for the call. An additional choice of **lp-sr** (loop-start short ring). Same as loop option except the ringing time is 1 second ON and 2 second OFF instead of 2 second ON and 4 second OFF (using existing option **loop/lp-fd**).

Selecting the **plar** option for the Mode of this port causes the system to offer **d3** and **d4**, which are the two common PLAR types. Both of these meet the pre-1988 and post-1988 specifications for PLAR circuits. If you select **dpo** as the Mode, the Type automatically defaults to **dpo**.

If **slc96** is selected for Mode, the two options supported are **sp** (single-party POTS) and **uvg** (universal voice-grade).

CAUTION!

Before activating this port, verify the behavior expected by both the station equipment and remote central office equipment, and be sure the systems are properly configured.

Rx TLP

The Receive Transmission Level Point (TLP) setting controls the amount of gain or loss added to the incoming signal after it is decoded to analog. To increase the signal level, set the Rx TLP setting to a positive value (i.e., the larger the number, the more gain is added). To decrease the signal level, set the Rx TLP setting to a negative value (i.e., the more negative the number, the more the signal level is decreased). For example, an incoming signal at -5 dBm can be increased to -3 dBm by setting Rx TLP to **+2 dB**. The Rx TLP range is **-10.0 dB** to **+2.0 dB**.

Tx TLP

The Transmit TLP setting controls the amount of gain or loss added to a voice signal from the CPE before it is encoded to digital PCM. To increase the signal level, set the Tx TLP setting to a negative value (i.e., the more negative the number, the more gain is added). To decrease the signal level, set the Tx TLP setting to a positive value (i.e., the more positive the number, the more the signal level is decreased). For example, an incoming signal at -5 dBm can be increased to -2 dBm by setting the Tx TLP to **-3 dB**. The Tx TLP range is **-10.0 dB** to **+5.0 dB**.

CODING

The Coding setting sets the PCM companding method used for a port. Generally, the North American T1 environment uses **m-law** coding, and the International E1 environment uses **a-law** or **a-inv** (inverted A-law) coding. The **a-inv** setting provides a higher ones density than **a-law**. The default coding setting is determined by the type of associated WAN card.

TC CGA

The Trunk Conditioning during Carrier Group Alarm setting defines whether the FXS port should be forced **idle** or **busy** upon declaration of a Carrier Group Alarm (CGA) on the WAN link to which the port is assigned. In most cases, you should set this parameter to **busy**. If a call is in progress when the CGA alarm is received, the system will hold the call for two seconds, drop it, and then busy out the port to the attached PBX for the duration of the alarm. Once the alarm clears, the system will automatically place the port back in the **idle** mode, making it available to the PBX.

LB

The Loopback field lets you loop the port back toward the network and far end. The **dgtl** (digital) loopback sends the incoming digital DS0 signal back to the far end without decoding it. The **anlg** (analog) loopback sends the decoded analog signal back to the far end after decoding and then re-encoding it. Figure 2-3 shows the loopback options, which allow you to test and troubleshoot the FXS card. To disable a loopback, set this field to **off**.
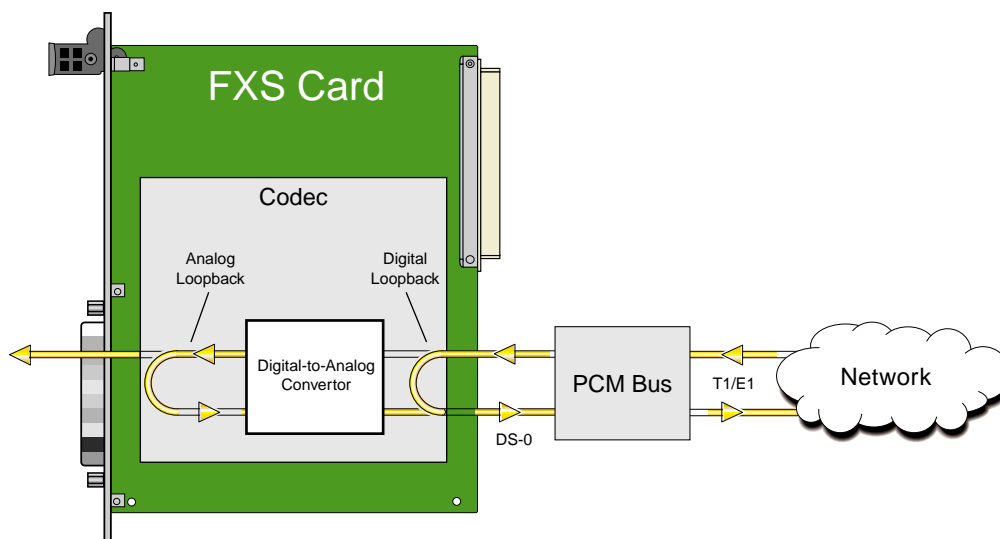
Figure 2-3. FXS Card Loopbacks

PATTRN

The Pattern field selects an outgoing test pattern for the current card port. The test pattern is generated by the system and sent to the selected port. You can select a different pattern for each port. The **none** option disables the test pattern. The **D-mW** (Digital milliwatt) option sends a 1 kHz tone at 0.0 dBm. The setting of the Rx TLP setting affects the D-mW signal level. The **quiet** option places a 600-ohm termination on the line so that no analog signal is sent (idle mode).

HYBRID

The Hybrid option assigns a three byte pattern to define the adjustment for return loss (similar to Build Out Capacitors). The default, **set1**, balances to the ideal termination of 600 ohms + 2.15 uF. The other settings are reserved for future use.

RINGBK

The ringback setting specifies whether a ringback tone is generated by the system and sent towards the network. Turn this option **off** when the network service does not provide an audible ringing tone to the calling party.

SIG CONV

The Signaling Conversion parameter allows you to change the transmit ABCD signaling bits from CCITT (E1) to ANSI (T1) standards. This conversion is completed regardless of the type of WAN card (CSU/DSX *or* CEPT) to which the FXS card is attached.

The options are **off** if ANSI signaling is used and **on** to convert transmit signaling from ANSI to CCITT format according to the Interface Card Conversion Table for FXS signaling. This setting also converts receive signaling from CCITT to ANSI.

RATE

The Rate parameter allows you to use the voice compression capabilities of an ADPCM card. If that card is not present in the system, the Rate stays at **64k** and cannot be changed. The **64k** option is the normal encoding/decoding rate for voice circuits.

ADPCM voice channels are assigned in pairs by designating two voice ports (E&M, FXO, or FXS) to the same WAN link and time slot, and selecting rate settings for the pair that add up to 64 kbps. The following combinations are possible:

*   **24K,1**+**40K,2** (24 kb coding on one side of the time slot and 40 kb coding on the other side of the same time slot)

*   **32K,1**+**32K,2** (32 kb encoding on each side of a time slot)

*   **40K,1**+**24K,2** (40 kb coding on one side of the time slot and 24 kb coding on the other side)

Number **1** after the rate setting assigns that portion of the voice port pair to the odd side of the ADPCM pair. Number **2** after the rate setting assigns that portion of the voice port pair to the even side of the ADPCM pair.

The number **1** after the rate setting assigns that portion of the voice port pair to the odd side of the ADPCM pair. The number **2** after the rate setting assigns that portion of the voice port pair to the even side of the ADPCM pair.

For more information about voice port assignments to the ADPCM card, please consult the ADPCM section of the *Server Card Reference Guide*.

ADPCM

The ADPCM parameter lets the user choose which ADPCM card to place this E&M port. The default setting is **n/a** and only changes when a Rate smaller than **64k** is selected (see above). The user is then allowed to select which ADPCM card to use for the port (this assignment is made by chassis slot number). The options are slots **P1**, **P2**, and **P3**.

ISDN CON

The ISDN Connect parameter displays whether the ISDN connection is on or off. The default setting is always off.

2.3.2   Test Screen

The Test option facilitates testing and maintenance by allowing you to monitor and set the status of the analog interface leads, and to monitor or set the value of the A, B, C, and D signaling bits of all FXS circuits on that card. In cross-connect systems, the test option also allows you to apply test patterns and tones towards the user and network sides of the system.

Figure 2-4 shows the FXS Card Test Screen parameters, Table 2-7 lists some actions you can perform from this screen, and Table 2-8 shows the settings for each parameter.
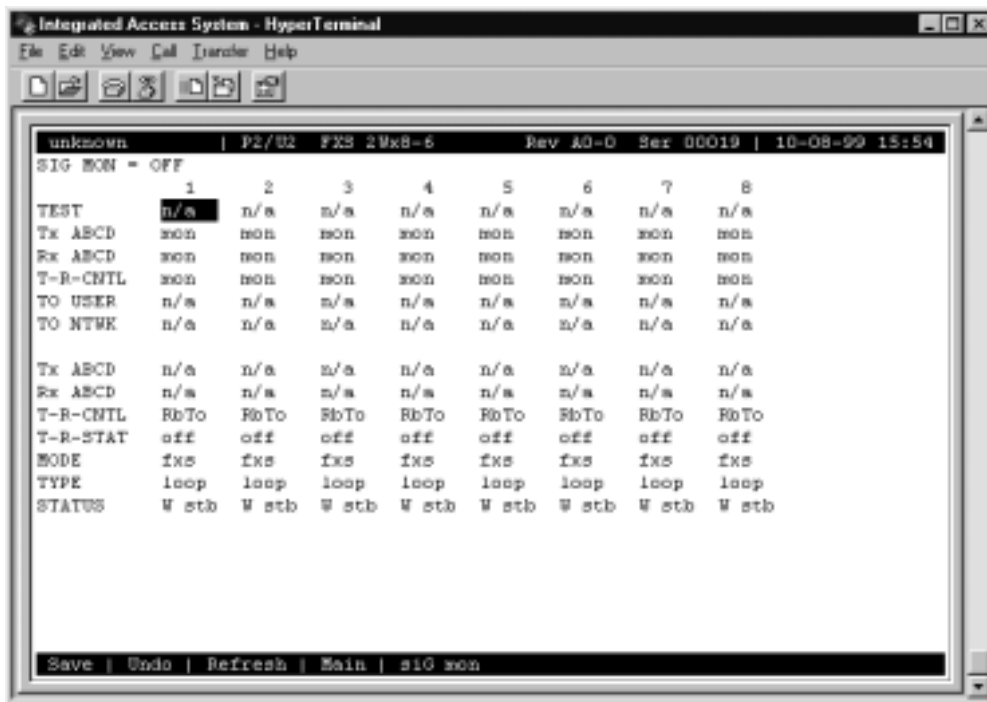
Figure 2-4.Typical FXS Card Test Screen

Table 2-7. Test Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e. performance and test data).
Main	Returns to the FXS Card Main Screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.
siGmon	Used with the user card alarm system to notify you of excessive signaling bit transitions.

Table 2-8. Test Screen Option Settings and Defaults

Parameter	User Options	Default
SIG MON	off on	off
TEST	off on	off
Tx ABCD	mon set	mon
Rx ABCD	mon set	mon
T-R-CNTL	mon set	mon
TO USER	PCM 300Hz 1kHz 3kHz quiet	PCM
TO NTWK	PCM 300Hz 1kHz 3kHz quiet	PCM
Tx ABCD	Status information only; not editable	n/a
Rx ABCD	Status information only; not editable	n/a
T-R-CNTL	Status information only; not editable	n/a
T-R-STAT	Status information only; not editable	n/a
MODE	Status information only; not editable	n/a
TYPE	Status information only; not editable	n/a
STATUS	Status information only; not editable	n/a

SIG MON

The Signaling Monitor feature works with the user card alarm system to detect excessive signaling bit transitions. The system will generate alarms if the number of transitions of any signaling bit in transmit or receive direction for an active port exceeds 255 in any four second interval. The options are **off** and **on**, and they are toggled by pressing "**g**" (**siGmon** command) in the Test Screen.

TEST

The Test parameter shows if the port is in test mode or not. Inactive ports and ports that are assigned to inactive WANs will show a test status of **n/a**. The test status options for active ports are **off** and **on**.

Tx ABCD

The Transmit ABCD setting allows the user to either monitor the status of the ABCD signaling bits being transmitted towards the network or set a specific ABCD pattern for testing the transmit side of the circuit. The options for this field are **mon** (monitor) or **set**. Choosing **set** will bring up a four digit field for users to input the ABCD pattern they want to transmit. Any four-digit combination of ones and zeros is acceptable for this setting.

Rx ABCD

The Receive ABCD setting allows the user to either monitor the status of the ABCD signaling bits being received from the network or set a specific ABCD pattern for testing the receive side of the circuit. The options for this field are **mon** (monitor) or **set**. Choosing **set** will bring up a four digit field for users to input the ABCD pattern they want to receive. Any four digit combination of ones and zeros is acceptable.

T-R-CNTL

The Tip and Ring Control setting allows you to either **mon** (monitor) or **set** (set) the state of the Tip and Ring leads of an FXS port. Choosing **set** will display the following options (**b** = battery, **o** = open, **g** = ground):

- **RbTo** (-48V is applied to the Ring lead and the Tip lead is open)
- **TbRo** (-48V is applied to the Tip lead and the Ring lead is open)
- **RbTg** (-48V is applied to the Ring lead and the Tip lead is grounded)
- **TbRg** (-48V is applied to the Tip lead and the Ring lead is grounded)

TO USER

In cross-connect systems only, the To User parameter allows you to break the circuit and send a test tone on the user side of the system. The options for this field are **PCM**, **300Hz**, **1kHz**, **3kHz,** and **quiet**. Choose **PCM** if you do not want to inject a tone toward the CPE. In this case, the PCM signal received from the network is still sent to the CPE in the normal manner.

TO NTWK

In cross-connect systems only, the To Network parameter allows you to break the circuit and send a test tone on the network side of the system. The options for this field are **PCM**, **300Hz**, **1kHz**, **3kHz,** and **quiet**. Choose **PCM** if you do not want to inject a tone toward the network. In this case, the PCM signal received from the CPE is still sent to the network in the normal manner.

Tx ABCD

The Transmit ABCD informational field shows the current values of the ABCD bits that are being transmitted to the network. If TX ABCD in the top half of the screen is changed via the **set** function mentioned above, and the settings are saved by the Save command in the Menu of Actions, the new bit pattern chosen will be reflected here.

Rx ABCD

The Receive ABCD informational field shows the current values of the ABCD signaling bits that are received from the network. If RX ABCD in the top half of the screen is changed via the **set** function mentioned above, and the settings are saved by the Save command in the Menu of Actions, the new bit pattern chosen will be reflected here.

T-R-CNTL

The Tip and Ring Control informational field shows the current status of the Tip and Ring leads of the FXS port from the perspective of the system. The possible values are as follows (**b** = battery, **o** = open, **g** = ground):

• **RbTo** (-48V is applied to the Ring lead and the Tip lead is open)

• **TbRo** (-48V is applied to the Tip lead and the Ring lead is open)

• **RbTg** (-48V is applied to the Ring lead and the Tip lead is grounded)

• **TbRg** (-48V is applied to the Tip lead and the Ring lead is grounded)

• **ring** (the ringing voltage is applied between Tip and Ring)

T-R-STAT

The Tip and Ring Status informational field describes what the attached device is doing with the Tip and Ring leads of the FXS port. The possible values are:

• **loop** (attached device is connecting Tip and Ring together)

• **rgnd** (the Ring lead is grounded by the attached device)

• **open** (Ring lead is not connected to either the Tip lead or to ground)

MODE

The Mode informational field shows the current mode of the port that was selected on the main FXS card Screen. Valid settings are **fxs**, **fxsdn**, **wink**, **plar, dpo,** or **slc96**.

TYPE

The Type informational field shows the current status of the signal field selected on the main FXS card screen for this port. Valid settings for **fxs** and **wink** modes are **loop** (loop start), **lp-fd** (loop start–forward disconnect), **gs** (ground start), **gs-i** (ground start immediate) and **gs-a** (ground start automatic). Valid settings for **fxsdn** modes are **loop** (loop start), **lp-fd** (loop start–forward disconnect), **gs** (ground start), **gs-i** (ground start immediate), **gs-a** (ground start automatic) and **fgd** (Feature Group "D"). Valid settings for the **plar** mode are **d3** and **d4**. The only valid setting for the **dpo** mode is **dpo** (dial pulse originating).

STATUS

The Status field shows the current status of the port. Table 2-9 lists and describes all of the possible conditions reported by this field.

Table 2-9. Status Information Field Settings

Setting	Meaning
stdby	The FXS port is in standby.
W stb	WAN card to which the FXS port is assigned is in standby.
W tst	WAN card to which the FXS port is assigned is under test.
W OOS	WAN card to which the FXS port is assigned is out of service.
noWAN	There is no WAN card configured in the slot to which the FXS port is assigned.
call	Call set-up is in progress.
busy	Call is in progress.
idle	No call is in progress (port is available for a call).
TC	The port is in Trunk Conditioning because a CGA alarm occurred on the associated WAN port.
test	A test is in progress on the port (i.e., you are actively controlling the circuit by setting values for Tx ABCD or Rx ABCD).
maint	The port is in a maintenance condition.

2.4   FXS Error Messages

Refer to Appendix B in the System Reference Guide for further information on Error
Messages regarding this card.

2.5   FXS Card Troubleshooting

The FXS card may be faulty if a voice signal is not received at one end of a circuit, or if
signaling is not detected. The following are possible causes:

•   Faulty receiving CPE at the near end (where the problem was first noticed)

•   Faulty transmitting CPE at the far (opposite) end

•   Faulty cabling between the CPE and FXS card at the near end

•   Faulty cabling between the CPE and FXS or FXO card at the far end

•   T1 or E1 network failure

•   Improper card configuration at either end (e.g., time slot and/or WAN port assignments)

First, verify that the T1 or E1 network has not failed. Check for a CGA-Red alarm on the
associated WAN port at the end where the incoming VF signal loss is first noticed. The CGA
indicates that the incoming network signal was lost (or that the receiving WAN port is out of
frame). During the CGA, all voice ports with time slots on that WAN port will also be
disabled, and the associated far-end WAN port will be in a CGA-Yellow alarm state. If the
network is faulty, you must clear that trouble to restore your circuits.

If the network is okay, verify that the proper WAN ports and time slots are assigned to the
associated FXS and FXO voice ports at both ends, as previously outlined in this chapter. In a
point-to-point network, the near-end and far-end FX card ports should both be assigned the
same WAN port and time slot number. Also make sure the other parameters (such as the
transmit and receive TLPs) are set properly at both ends.

If the FX card port parameters are correct at both ends, and if the network is okay, the trouble
is isolated to the FXS card or the associated port. Proceed as follows:

   1. At the far end, activate an analog loopback on the FX card port.

   2. Send a 0 dBm (digital milliwatt) test signal toward the CPE at that end. That signal will
   be substituted for the normal signal coming from the far-end CPE; it will be sent back to
   the CPE at your end via the loopback path.

   3. Check your CPE for this signal. If it is present, the far-end CPE or cabling to the far-end
   FX card is probably faulty. Disable the loopback and test signal there, and fix the problem.
   If you still don't receive a signal, go to step 4.

4. At your end, go to the FXS Card Main Screen and send a digital milliwatt test tone (0 dBm) toward the CPE. If you still don't receive a signal, check the cabling from the FXS card to your CPE, and check the CPE itself. If those items are okay, replace the FXS card at your end.

5. If the FXS card is determined to be faulty, replace it and return the faulty unit for repair to the location specified by your distributor.

2.6   FXS Card Specifications

FXS Cards (8124, 8125, 8128 and 8129 2-wire)

Number of Ports

Models 8124 and 8125	4 ports
Models 8128 and 8129	8 ports

Physical Interface

Connector	1 female 50-pin telco connector

Transmission Performance

Performance	Exceeds requirements of ITU-T Rec. G.713

Signaling Modes

Model 812X Signaling Modes	Software selectable on a per port basis
	Foreign Exchange Station (FXS)
	Loop Start and Ground Start
	Foreign Exchange Station - Defined Network (FXSDN)
	Private Line Automatic Ringdown (PLAR)
	Dial Pulse Originating (DPO)

Termination Impedance

Model 8124 and 8128	900 Ohms with 2.16 µF
Model 8125 and 8129	600 Ohms with 2.16 µF

VF Transmission Characteristics

Nominal Transmit TLP	-10.0 dB to +5.0 dB in steps of 0.1 dB
Nominal Receive TLP	-10.0 dB to +2.0 dB in steps of 0.1 dB
PCM Encoding	Software selectable on a per port basis

Attenuation Versus Frequency Relative to 1 kHz with 0 dBm0 input

Frequency	Transmit (A to D)	Receive (D to A)
200 Hz	-0.25 to +3.0 dB	-0.25 to +2.0 dB
300 to 3000 Hz	-0.25 to +0.5 dB	-0.25 to +0.5 dB
3200 Hz	0.25 to +0.75 dB	-0.25 to +0.75 dB
3400 Hz	-0.25 to +1.5 dB	-0.25 to +1.5 dB

Return Loss (at 1 kHz)	$\geq$28 dB
Transhybrid Loss	34dB
Idle Channel Noise (rcv and xmt)	< -65 dBm0p Typ < -70 dBmop or < 20 dBrnc0
Interchannel Crosstalk	Typ < -75 dBm0 using 7 adjacent channels being disturbed with a signal of 0.0 dBm0

Total Distortion including Quantization (Signal to Distortion Ratio) Input Frequencies 1004-1020 Hz

Input Level	Rcv or Xmt	Overall
-30 to 0 dBm0	$\geq$35 dB	$\geq$33 dB
-40 dBm0	$\geq$29 dB	$\geq$27 dB
-45 dBm0	$\geq$25dB	$\geq$22 dB

Absolute group delay	< 750 microseconds
Group Delay Distortion vs. frequency	within boundaries of ITU-T Rec. G.713 Figure 2
Longitudinal Balance	Nom > 46 dB
	Typ > 50 dB
Variation of Gain with Input Level	within boundaries of ITU-T Rec. G.713 Figure 7

Chapter 3
FXO Card

3.1   Introduction

This chapter provides installation, configuration, and troubleshooting information for the Foreign Exchange - Office (FXO) Card, which is identified as a FXO 2W*8-6 card on its faceplate ejector.

The FXO 2W*8-6 Card manages the flow of FXO voice traffic through the integrated access system. Each card encodes analog (voice, VF) signals to a digital bitstream at the local system for transmission over a T1 or E1 network. It also decodes the digital signals to analog at the remote system.

The card has a two-wire interface and supports Foreign Exchange - Office (FXO), Manual Ringdown (MRD), Foreign Exchange Office-Defined Network (FXODN), and Dial-Pulse Terminating (DPT) operations.

The FXO card also can use the voice compression features of an ADPCM card.

3.2   FXO Card Descriptions

3.2.1   FXO 2W*8-6 Card Description (8139)

The FXO 2W*8-6 Card is a eight-port voice card with a 600-ohm terminating impedance on each port. All FXO features are supported by this card.

Notice!
UL STATEMENT

OPERATION OF THIS INTERFACE IS LIMITED TO INTRA-BUILDING CONNECTIONS ONLY

3.2.1.1   Card Jumper/Switch Settings

The FXO 2W*8-6 Card has eight sets of jumpers that you must set before inserting the card into a system chassis. Figure 3-1 shows these jumpers, which allow you to configure individual ports of the card for either FXO or MRD operation.

To set up a port for MRD operation, insert shorting jumpers vertically between pins 1 and 2 for that port, as shown. Each port has two associated jumpers. To use FXO operation on any port, remove its associated jumpers.

Note that jumper position numbers 1 and 2 are not marked on the card. They are shown in Figure 3-1 for your convenience.
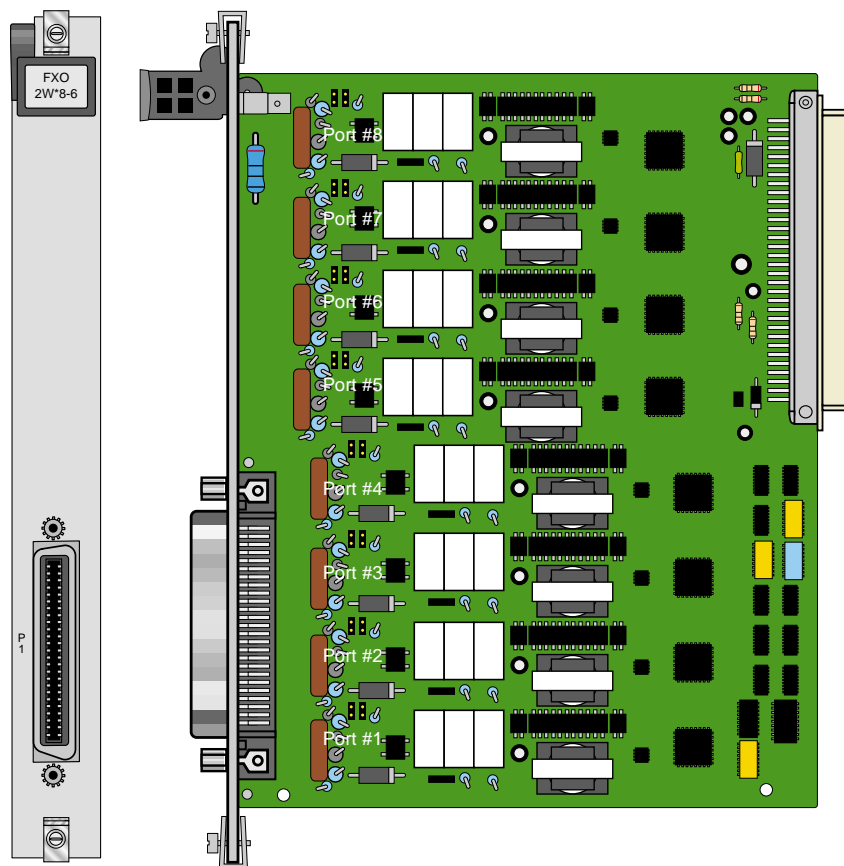
Figure 3-1.FXO 2W*8-6 Card Jumper Settings

3.2.1.2   Installing the FXO 2W*8-6 Card

Install the FXO 2W*8-6 card in any user card slot. These slots are U1 to U8 on the two-sided chassis and front-loading chassis with power supplies on top, or P1 to P4 and W1 to W4 on the front-loading chassis with power supplies on the side.

3.3   FXO Card User Screens and Settings

3.3.1   FXO Card Main Screen

The FXO Card must be configured for operation after installing it into the system chassis. This is done from the FXO Card Main Screen (see Figure 3-2). To go to that screen, highlight the desired card in the System Main Screen and press <Enter>. This screen shows one configuration column for each port on the card.
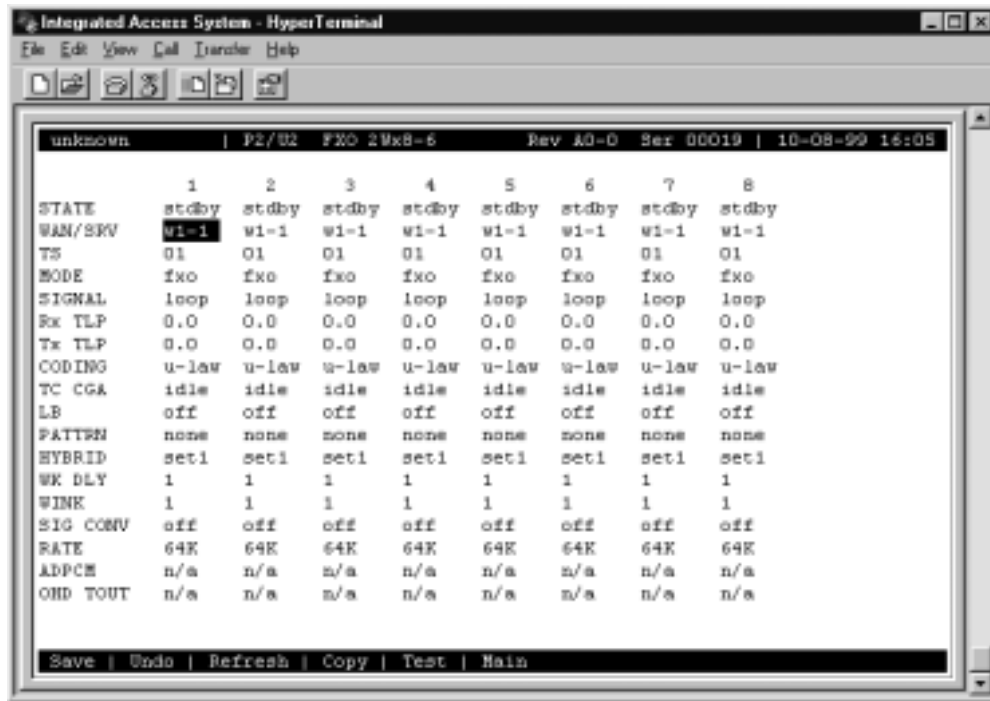
Figure 3-2.Typical FXO Card Main Screen

The bottom highlighted line of this screen shows various actions that you can perform from the screen. You perform the desired action by pressing the associated uppercase letter key. Table 3-1 summarizes these actions. For example, after you configure the FXO card ports, press "**s"** to save your settings.

Table 3-1. Main Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e., test status).
Copy	Copies the contents of the current column to the next column. Useful if you change a lot of entries in one column and want to repeat those changes in subsequent columns.
Test	Initiates and monitors testing of all FXO card ports. Refer to the Test section of this chapter.
Main	Returns to the System Main Screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Table 3-2 summarizes the configuration settings for the FXO card, along with the available and factory-default option settings. The parameters and settings are also described in the following paragraphs.

Table 3-2. Main Screen Option Settings and Defaults

Parameter	User Options	Notes	Default
STATE	stdby actv		stdby
WAN/SRV	none wan serv user	1	w1-1
TS	01-24 01-31	2	01
MODE	fxo fxodn dpt mrd		fxo
SIGNAL	loop gs lp-fd 1s-R2 gs-a lp-em	3	loop
Rx TLP	-10.0 dB to +2.0 dB		0.0
Tx TLP	-10.0 dB to +5.0 dB		0.0
CODING	u-law a-law a-inv	4	u-law
TC CGA	idle busy		idle
LB	off dgtl anlg		off
PATTERN	none D-mW quiet		none
HYBRID	set1 to set8 user	5	set1
WK DLY	00-99	6	0
WINK	00-199	6	0
SIG CONV	off on		off
RATE	64K 24K,1 32K,1 40K,1 24K,2 32K,2 40K,2	7	64K
ADPCM	n/a P1 P2 P3		n/a
OHD TOUT	1600ms - 3700ms	8	3700ms

Notes:

1. Choosing **wan** allows you to choose a WAN port (w1-1 through w4-2). Choosing **serv** lets you choose an ADPCM server card in slot P1, P2, or P3, followed by a logical port on that card. *If your system has the FRS card installed and you want to use voice compression you need to install the Low Bit Rate Voice (LBRV) card. However, if your system has the ATM card installed you can proceed directly with voice compression (there is no need for the LBRV Card to be installed.)* The **user** option is not used. See the WAN/SRV paragraph that follows.

2. Time slot 16 is not available if the port is assigned to an E1 WAN link whose time slot 16 is programmed for **CAS** or **CCS**.

3. These options are only valid if the Mode selected is **fxo**, or **fxodn**. If the mode is **dpt**, then the Signal options are **dpt** (default), **R2, i-R2** or **dp-em**. If the Mode is **mrd**, then the Signal setting will automatically default to **mrd**.CallerID can be activated or deactivated using the SIGNAL configuration for each port. For more information on CallerID, refer to "SIGNAL" on page 6.

4. The default is **a-inv** for E1 and **m-law** for T1. These values will change depending upon the WAN link selected.

5. The default, **set1**, is the only active option. It balances to the ideal termination of 600 ohms + 2.15 uF. The other settings are reserved for future use.

6. These settings should be used with **fxodn** and **dpt** modes only.

7. Choosing a Rate other than **64K** allows you to select an ADPCM slot.

8. This option can be edited only when OHD signal type is selected. This value can have a range of 1600ms - 3700ms. This value tells how long the system should be in ONHOOKDATA state. This is a user-defined value to accommodate different ring cadence. The default value is **3700ms**.

STATE

The State setting determines whether the port is active or inactive. An inactive port does not occupy a time slot on a WAN link. Set the State setting to standby (**stdby**) for ports you are not using or have not yet configured. Set it to active (**actv**) for ports that are ready for use.

WAN/SRV

The WAN/SRV setting identifies the WAN link or server card assigned to this port. If you choose **wan**, you also must select the desired port (w1-1 through w4-2) of a WAN card for transmission over a T1 or E1 link. Or, choose **serv** to assign the card port to a server card in the system. This can be an ATM or FRS card, which resides in chassis slot P1, P2, or P3. You must then choose a logical port on that card. The **user** option is not used.

It is not necessary to assign all ports of the same FXO card to the same WAN link or server card, or to contiguous time slots on a WAN link.

TS

The TS setting identifies the time slot on the WAN link to which this port is assigned. Values range from **1-24** for T1 links and **1-31** for E1 links. Time slot 16 is not available on E1 links that are programmed for **cas** or **ccs** signaling. For a display of the available time slots, refer to your cross-connect map for the WAN link.

MODE

The Mode setting should be determined by the type of equipment to which you connect the port. All options use two-wire balanced connections. The **fxo** (Foreign Exchange Office) option allows you to connect the system to a 2 way PBX trunk (both inbound and outbound calls) or a key system trunk. The **fxodn** (Foreign Exchange Office-Defined Network) option provides access to new services offered by advanced networks from many major carriers. The **dpt** (Dial Pulse Terminating) option allows the unit to attach to incoming one-way trunks from a PBX, key system, or a telephone set. This option is similar to the **fxo** option.

The **mrd** (manual ringdown) option provides point-to-point unswitched connections between two telephone sets. This configuration is usually not attached to an exchange or switch; rather it provides a "hot line" between two locations. *The system requires hardware changes and a ringing generator for this option (see instructions later in this chapter).*

SIGNAL

The Signal setting matches the signaling behavior of the FXO equipment and the remote switch. Use the **loop** (Loop Start) option with telephone sets and simple PBX trunks. Use the **gs** (Ground Start) option with two-way PBX trunks because it helps to prevent glaring or call collisions. Use the **lp-fd** (Loop Start–Forward Disconnect) option with automated answering equipment. The **R2** option is provided for a CCITT R2 interface. The selection you choose must match the behavior of the station equipment and the remote central office or PBX equipment. Use **gs-a** (ground-start automatic) for equipment requiring fast-response time to the central office. Use the **lp-em** option for (Loop Start). Use the **ohd** option for On-Hook Data Data Transmission between first and second ring (example: CallerID). The selection must match the behavior of both the station equipment and remote central office or PBX. The **ohd** option is limited in it's capabilities. If the line goes off-hook before or during the data transmission, data transmission shall be pre-empted or stopped and normal call completion treatment shall be provided. There should be at least a 5 second delay between two different phone calls so that the integrated access system can distinguish between 2 different phone calls and silence between ringing pattern of one call.

If you selected the **dpt** option for the Mode of any port, then the three options that are supported under Signal are **dpt** for standard Dial Pulse Termination signaling used in North America, **R2** for CCITT signaling used internationally, **i-R2** (immediate R2) which provides immediate seizure acknowledgment to the network and **dp-em** (Dial Pulse

Electromechanical) used for timing relays that are specific to Russia. If you selected **mrd** as the Mode, then Signal will automatically default to **mrd**. If you select **fxodn** in Mode the options are **loop, gs, lp-fd, R2, gs-a** and **lp-em.** For **fxo** the additional option is **ls-R2.**

CAUTION!

Before activating a port, verify the behavior expected by both the station equipment and the remote central office equipment and ensure that you have the system properly configured.

Rx TLP

The Receive Transmission Level Point setting controls the amount of gain or attenuation added to signals after they are decoded to analog signals. To increase the signal level, set the Rx TLP setting to a positive number (i.e., the larger the number, the more gain is added). To decrease the signal level, set the Rx TLP setting to a negative number (i.e., the more negative the number, the more the signal level is decreased). For example, an incoming signal at -5 dBm can be increased to -3 dBm by setting Rx TLP to +2 dB. Acceptable values range from **-10.0 dB to +2.0 dB**.

Tx TLP

The Transmit Transmission Level Point setting controls the amount of gain or attenuation added to signals after they are received from the local analog port and before they are encoded to digital PCM signals. To increase the signal level, set the Tx TLP setting to a negative number (i.e., the more negative the number, the more gain is added). To decrease the signal level, set the Tx TLP setting to a positive number (i.e., the more positive the number, the more the signal level is decreased). For example, an incoming signal at -5 dBm can be increased to -2 dBm by setting Tx TLP to -3 dB. Acceptable values range from **-10.0 dB to +5.0 dB**.

CODING

The Coding setting sets the PCM companding method used for a port. Generally, the North American T1 environment uses **m-law** coding. The International E1 environment uses **a-law** or **a-inv** (inverted A-law) coding, and **a-inv** provides a higher ones density than **a-law**. The coding default is determined by the type of card in the WAN port you select.

TC CGA

The Trunk Conditioning during Carrier Group Alarm setting defines whether the FXO port should be placed in **idle** or **busy** mode upon declaration of a Carrier Group Alarm (CGA) on the WAN link to which the port is assigned. In most cases, you should set this parameter to

busy. If a call is in progress when the CGA alarm is received, the system will hold the call for two seconds, drop it and then busy out the port to the attached PBX for the duration of the alarm. Once the alarm clears, the system will automatically place the port back in **idle** mode thereby making it available to the attached PBX.

LB

The Loopback field lets you loop the port back toward the network and far end. The **dgtl** (digital) loopback sends the incoming digital DS0 signal back to the far end without decoding it. The **anlg** (analog) loopback sends the decoded analog signal back to the far end after decoding and then re-encoding it. Figure 3-3 shows the loopback options, which allow you to test and troubleshoot the FXS card. To disable a loopback, set this field to **off**.
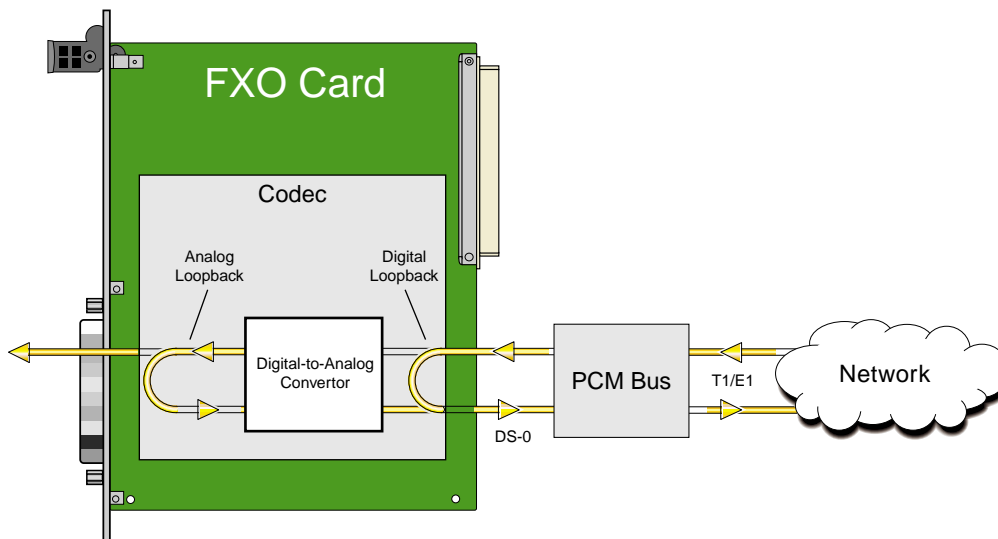
Figure 3-3. FXO Card Loopbacks

PATTRN

The Pattern setting sets the outgoing test pattern for this analog port. The pattern, generated by the system, is sent only to the currently selected port. The **none** option disables sending a test pattern. The **D-mW** (Digital milliwatt) option sends a 1 kHz tone at 0.0 dBm. The Rx TLP setting affects the D-mW signal level. The **quiet** option places a termination on the line so that no analog signal is sent.

HYBRID

The Hybrid option assigns a three-byte pattern to define the adjustment for return loss (similar to Build-Out Capacitors). The default, **set1**, balances to the ideal termination of 600 ohms + 2.15 uF. The other settings are reserved for future use.

WK DLY

The Wink Delay setting allows you to set the wink delay time. The options are units of 100 milliseconds. Settings are **1-99** (100 milliseconds to 9.9 seconds). The Wink Delay and Wink options are applicable to CCITT systems for determining the delay of the R2 state machine. They should only be used with modes **fxodn** and **dpt** (**R2** and **i-R2**).

WINK

The Wink setting allows you to set the wink duration time. The options are units of 100 milliseconds. Settings are **1-99** (100 milliseconds to 9.9 seconds). This option is only applicable with modes **fxodn** and **dpt** (**R2** and **i-R2**).

SIG CONV

The Signaling Conversion parameter allows you to change the ABCD signaling bits from CCITT (E1) to ANSI (T1) standards. This conversion is completed regardless of the type of WAN aggregate (CSU/DSX **or** CEPT) to which it is attached. The options are **off** (which means that ANSI signaling is used) and **on** (which converts transmit signaling from ANSI to CCITT format according to the Interface Card Conversion Table for FXO signaling, and also converts receive signaling from CCITT to ANSI).

RATE

The Rate parameter allows you to use the voice compression capabilities of the ADPCM resource card. If that card is not present in the system, changes cannot be made to this setting. The **64K** option (default) does not use ADPCM resources (it is the normal operation rate for voice circuits).

ADPCM voice channels are assigned in pairs by designating two voice ports (E&M, FXO or FXS) to the same WAN link and time slot and selecting rate settings for the pair that add up to 64kbps (i.e. [24K,1+40K,2],[32K,1+32K,2] and [40K,1+24K,2]). The numeral 1 after the rate setting assigns that portion of the voice port pair to the odd side of the ADPCM pair. The numeral 2 after the rate setting assigns that portion of the voice port pair to the even side of the ADPCM pair.

For more information about voice port assignments to the ADPCM card, please consult the ADPCM section of the manual.

ADPCM

The ADPCM parameter lets you choose the ADPCM card on which to place this FXO port. The default setting is **n/a** and only changes when a Rate smaller than **64k** is selected (see above). You can then select which ADPCM card to use for the port (assignment is made by chassis slot number). The options are **P1**, **P2,** and **P3**.

OHD TOUT

The On-Hook Data Timeout parameter lets you choose a value range of 1600ms - 3700ms. This value tells how long the system should be in ONHOOKDATA state. The default value is **3700ms**.

3.3.2   Test Screen

The Test option facilitates testing and maintenance by allowing you to monitor and set the status of the analog interface leads as well as monitoring and setting the value of the A, B, C and D signaling bits of all FXO circuits on that card. In cross-connect systems only, the test option also allows you to apply test patterns and tones towards the user and network sides of the system.

Figure 3-4 shows a typical FXS Card Test Screen, Table 3-3 lists some actions you can perform from this screen, and Table 3-4 shows the option settings and defaults for each parameter.
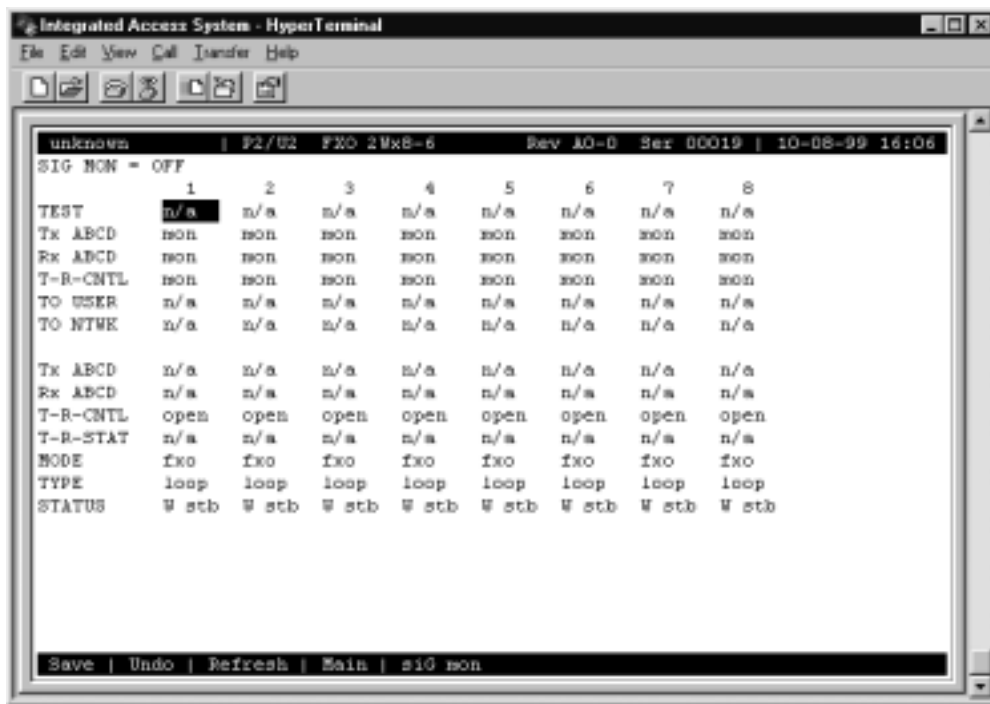
Figure 3-4.Typical FXO Card Test Screen

Table 3-3. Test Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e., test data).
Main	Returns to the FXO Card Main Screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.
siG mon	Used with the user card alarm system to notify you of excessive transitions of signaling bits.

Table 3-4. Test Screen Option Settings and Defaults

Parameter	User Options	Default
SIG MON	off on	off
TEST	off on	off
Tx ABCD	mon set	mon
Rx ABCD	mon set	mon
T-R-CNTL	mon set	mon
TO USER	PCM 300Hz 1kHz 3kHz quiet	PCM
TO NTWK	PCM 300Hz 1kHz 3kHz quiet	PCM
Tx ABCD	Status information only; not editable	n/a
Rx ABCD	Status information only; not editable	n/a
T-R-CNTL	Status information only; not editable	n/a
T-R-STAT	Status information only; not editable	n/a
MODE	Status information only; not editable	n/a
TYPE	Status information only; not editable	n/a
STATUS	Status information only; not editable	n/a

SIG MON

The Signaling Monitor feature works with the user card alarm system to detect excessive signaling bit transitions. The system will generate alarms if the number of transitions of any signaling bit in transmit or receive direction for an active port exceeds 255 in any four second interval. The options are **off** and **on**, and they are toggled by pressing "**g**" (**siGmon** command) in the Test Screen.

TEST

The Test Parameter shows if the port is in the test mode or not. Inactive ports and ports that are assigned to inactive WANs will show a test status of **n/a**. The test status options for active ports are **off** and **on**.

Tx ABCD

The Transmit ABCD setting allows you to either monitor the status of the ABCD signaling bits being transmitted towards the network or set a specific ABCD pattern for testing the transmit side of the circuit. The options for this field are **mon** (monitor) or **set**. Choosing **set** will bring up a four digit field for you to input the ABCD pattern you want to transmit. Any four digit combination of ones and zeros is acceptable for this setting.

Rx ABCD

The Receive ABCD setting allows you to either monitor the status of the ABCD signaling bits being received from the network or set a specific ABCD pattern for testing the receive side of the circuit. The options for this field are **mon** (monitor) or **set**. Choosing **set** will bring up a four-digit field for you to input the ABCD pattern you want to receive. Any four digit combination of ones and zeros is acceptable for this setting.

T-R-CNTL

The Tip and Ring Control setting allows you to either monitor (**mon**) or set (**set**) the state of the Tip and Ring leads of an FXO port. Choosing **set** will bring up the following options:

- **loop** (the Tip and Ring leads are tied together)
- **open** (the Ring lead is not connected to either Tip or ground)

TO USER

In cross-connect systems only, the To User parameter allows you to break the circuit and send a test tone toward the user side of the system. The options for this field are **PCM**, **300Hz**, **1 kHz**, **3 kHz** and **quiet**. Selecting **PCM** means that you do not want to inject a tone toward the user and that the PCM signal received from the network should continue to be sent to the user port in the normal manner.

TO NTWK

In cross-connect systems only, the To Network parameter allows you to break the circuit and send a test tone toward the network side of the system. The options for this field are **PCM**, **300Hz**, **1 kHz**, **3 kHz** and **quiet**. Selecting **PCM** means that you do not want to inject a tone toward the network and that the PCM signal received from the user port should continue to be sent to the network in the normal manner.

Tx ABCD

The Transmit ABCD information field shows the current values of the ABCD bits that are being transmitted to the network. If TX ABCD in the top half of the screen is changed via the **set** function mentioned above, and the settings are saved by the Save command in the Menu of Actions, the new bit pattern chosen will be reflected here.

Rx ABCD

The Receive ABCD information field shows the current values of the ABCD signaling bits that are received from the network. If RX ABCD in the top half of the screen is changed via the **set** function mentioned above, and the settings are saved by the Save command in the Menu of Actions, the new bit pattern chosen will be reflected here.

T-R-CNTL

The Tip and Ring Control information field shows the current status of the Tip and Ring leads of the FXO port from the perspective of the system. The possible values are:

- **loop** (the Tip and Ring leads are tied together)
- **open** (the Ring lead is not connected to either the Tip or to ground)
- **rgnd** (the Ring lead is grounded)
- **lpgnd** (the Tip and Ring leads are tied together and the Tip is grounded)
- **ring** (ringing voltage is being applied between the Tip and Ring)

T-R-STAT

The Tip and Ring Status information field describes what the attached device is doing with the Tip and Ring leads of the FXO port. The possible values are:

- **ring** (attached device is applying ringing voltage between Tip and Ring)
- **TbRg** (attached device is applying -48V battery to Tip and grounding Ring)
- **ToRo** (attached device is leaving both the Tip and Ring leads open)
- **TgRo** (attached device is grounding the Tip lead and is leaving the Ring lead open)
- **RbTg** (attached device is applying -48V battery to Ring and grounding Tip)
- **RbTo** (attached device is applying -48V battery to Ring and leaving Tip open)
- **TgR*** (attached device is grounding Tip, and the Ring lead state is unknown)
- **ToR*** (attached device is leaving Tip open, and the Ring lead state is unknown)
- **RoT*** (attached device is leaving Ring open, and the Tip lead state is unknown)
- **n/a** (information is not available)

MODE

The Mode information field shows the current mode of the port that was selected on the main FXO card Screen. Valid settings are **fxo**, **fxodn**, **dpt** or **mrd**.

TYPE

The Type information field shows the current status of the signal field selected on the main FXO card screen for this port. Valid settings for both **fxo** and **fxodn** modes are **loop** (loop), **gs** (ground start), **lp-fd** (loop start-forward disconnect) and **R2** (R2). Valid settings for the **dpt** mode are **dpt** (dial pulse terminating), **R2** (R2), **i-R2** (immediate R2), and **dp-em** (Dial Pulse Electromechanical). The only valid setting for the **mrd** mode is **mrd** (manual ringdown).

STATUS

The Status information field shows the current status of the port Table 3-5 lists and describes all of the possible conditions that are reported in this field.

Table 3-5. Status Information Field Settings

Setting	Meaning
stdby	The FXO port is in standby.
W stb	The WAN card to which the FXO port is assigned is in standby.
W tst	The WAN card to which the FXO port is assigned is under test.
W OOS	The WAN card to which the FXO port is assigned is out of service.
noWAN	No WAN card is configured in the slot to which the FXO port is assigned.
call	Call setup is in progress.
busy	Call is in progress.
idle	No call in progress (port is available for a call).
TC	Port is in Trunk Conditioning because a CGA alarm occurred on the associated WAN port.
test	Port is under test (i.e., you are actively controlling the circuit by setting values for Tx ABCD or Rx ABCD).
maint	The port is in a maintenance condition.

3.4   FXO Card Error Messages

Refer to Appendix B in the System Reference Guide for further information on Error Messages regarding this card.

3.5   FXO Card Troubleshooting

The FXO card may be faulty if a voice signal is not received at one end of a circuit, or if signaling is not detected. The following are possible causes:

• Faulty receiving CPE at the near end (where the problem was first noticed)

• Faulty transmitting CPE at the far (opposite) end

• Faulty cabling between the CPE and FXO card at the near end

• Faulty cabling between the CPE and FXO or FXS card at the far end

• T1 or E1 network failure

• Improper card configuration at either end (e.g., time slot and/or WAN port assignments)

First, verify that the T1 or E1 network has not failed. Check for a CGA-Red alarm on the associated WAN port at the end where the incoming VF signal loss is first noticed. The CGA indicates that the incoming network signal was lost (or that the receiving WAN port is out of frame). During the CGA, all voice ports with time slots on that WAN port will also be disabled, and the associated far-end WAN port will be in a CGA-Yellow alarm state. If the network is faulty, you must clear that trouble to restore your circuits.

If the network is okay, verify that the proper WAN ports and time slots are assigned to the associated FXO and FXS voice ports at both ends, as previously outlined in this chapter. In a point-to-point network, the near-end and far-end FX card ports should both be assigned the same WAN port and time slot number. Also make sure the other parameters (such as the transmit and receive TLPs) are set properly at both ends.

If the FX card port parameters are correct at both ends, and if the network is okay, the trouble is isolated to the FXO card or the associated port. Proceed as follows:

1. At the far end, activate an analog loopback on the FX card port.

2. Send a 0 dBm (digital milliwatt) test signal toward the CPE at that end. That signal will be substituted for the normal signal coming from the far-end CPE; it will be sent back to the CPE at your end via the loopback path.

3. Check your CPE for this signal. If it is present, the far-end CPE or cabling to the far-end FX card is probably faulty. Disable the loopback and test signal there, and fix the problem. If you still don't receive a signal, go to step 4.

4. At your end, go to the FXO Card Main Screen and send a digital milliwatt test tone (0 dBm) toward the CPE. If you still don't receive a signal, check the cabling from the FXO card to your CPE, and check the CPE itself. If those items are okay, replace the FXO card at your end.

5. If the FXO card is determined to be faulty, replace it and return the faulty unit for repair to the location specified by your distributor.

3.6   FXO Card Specifications

FXO Cards (8134, 8135, 8138 and 8139 2-wire)	
Number of Ports	
Models 8134 and 8135	4 ports
Models 8138 and 8139	8 ports
Physical Interface	
Connector	1 female 50-pin telco connector
Transmission Performance	
Performance	Exceeds requirements of ITU-T Rec. G.713
Signaling Modes	
Model 813X Signaling Modes	Software selectable on a per port basis
	Foreign Exchange Office (FXO)
	Ground Start
	Foreign Exchange Office- Defined Network (FXSDN)
	Manual Ringdown (MRD)
	Dial Pulse Termination (DPT)
Termination Impedance	
Model 8134 and 8138	900 Ohms with 2.16 µF
Model 8135 and 8139	600 Ohms with 2.16 µF
VF Transmission Characteristics	
Nominal Transmit TLP	-10.0 dB to +5.0 dB in steps of 0.1 dB
Nominal Receive TLP	-10.0 dB to +2.0 dB in steps of 0.1 dB
PCM Encoding	Software selectable on a per port basis

Attenuation Versus Frequency Relative to 1 kHz with 0 dBm0 input		
Frequency	**Transmit (A to D)**	**Receive (D to A)**
200 Hz	-0.25 to +3.0 dB	-0.25 to +2.0 dB
300 to 3000 Hz	-0.25 to +0.5 dB	-0.25 to +0.5 dB
3200 Hz	0.25 to +0.75 dB	-0.25 to +0.75 dB
3400 Hz	-0.25 to +1.5 dB	-0.25 to +1.5 dB

Return Loss (at 1 kHz)	$\geq$28 dB
Transhybrid Loss	34dB
Idle Channel Noise (rcv and xmt)	< -65 dBm0p Typ < -70 dBmop or < 20 dBrnc0
Interchannel Crosstalk	Typ < -75 dBm0 using 7 adjacent channels being disturbed with a signal of 0.0 dBm0

Total Distortion including Quantization (Signal to Distortion Ratio) Input Frequencies 1004-1020 Hz

Input Level	**Rcv or Xmt**	**Overall**
-30 to 0 dBm0	$\geq$35 dB	$\geq$33 dB
-40 dBm0	$\geq$29 dB	$\geq$27 dB
-45 dBm0	$\geq$25dB	$\geq$22 dB

Absolute group delay	< 750 microseconds
Group Delay Distortion vs. frequency	within boundaries of ITU-T Rec. G.713 Figure 2
Longitudinal Balance	Nom > 46 dB
	Typ > 50 dB
Variation of Gain with Input Level	within boundaries of ITU-T Rec. G.713 Figure 7

Chapter 4
iFXO Card

4.1   Introduction

This chapter provides installation, configuration, and troubleshooting information for the international Foreign Exchange - Office (iFXO) Card, which is identified as a iFXO 2W*8-6 card on its faceplate ejector.

The iFXO 2W*8-6 Card manages the flow of iFXO voice traffic through the integrated access system. Each card encodes analog (voice, VF) signals to a digital bitstream at the local system for transmission over a T1 or E1 network. It also decodes the digital signals to analog at the remote system. During loop start mode, a special DTMF mode allows the transmission of caller ID signals before ringing. This card also supports ETSI TBR21 DC termination.

The card has a two-wire interface and supports Foreign Exchange Office-Defined Network (FXODN), and Dial-Pulse Terminating (DPT) operations.

The iFXO card also can use the voice compression features of an ADPCM card.

4.2   iFXO Card Descriptions

4.2.1   iFXO 2W*8-6 Card Description (815060)

The iFXO 2W*8-6 Card is a eight-port voice card with a 600-ohm terminating impedance on each port. All FXO features are supported by this card, except Manual Ring Down (MRD).

Notice!
UL STATEMENT

OPERATION OF THIS INTERFACE IS LIMITED TO INTRA-BUILDING CONNECTIONS ONLY

4.2.1.1 Card Jumper/Switch Settings

The iFXO 2W*8-6 Card has one set of jumpers that you must set before inserting the card into a system chassis. This jumper (JP1) allows you to configure the +12V source from the backplane.

Note that jumper positions are marked on the card as US/Europe. They are shown in Figure 4-1 for your convenience.
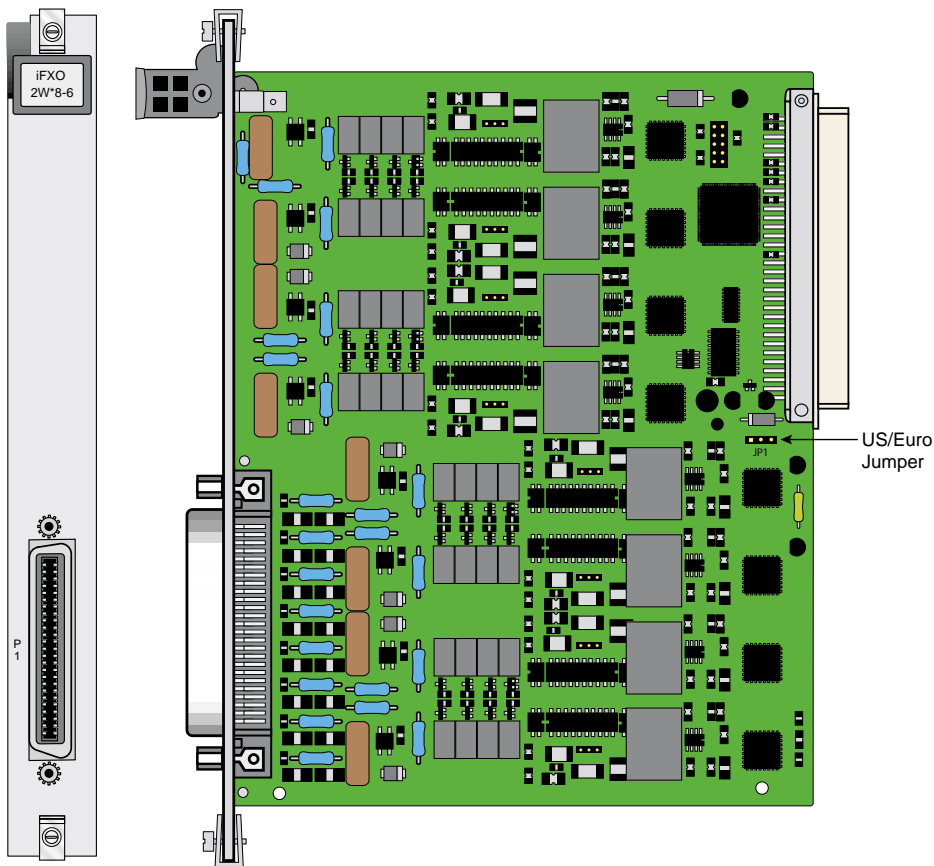
Figure 4-1.iFXO 2W*8-6 Card Jumper Settings

4.2.1.2 Installing the iFXO 2W*8-6 Card

Install the iFXO 2W*8-6 card in any user card slot. These slots are U1 to U8 on the two-sided chassis and front-loading chassis with power supplies on top, or P1 to P4 and W1 to W4 on the front-loading chassis with power supplies on the side.

4.3   ᵢ**FXO Card User Screens and Settings**

4.3.1   **iFXO Card Main Screen**

The iFXO Card must be configured for operation after installing it into the system chassis. This is done from the iFXO Card Main Screen (see Figure 4-2). To go to that screen, highlight the desired card in the System Main Screen and press <Enter>. This screen shows one configuration column for each port on the card.
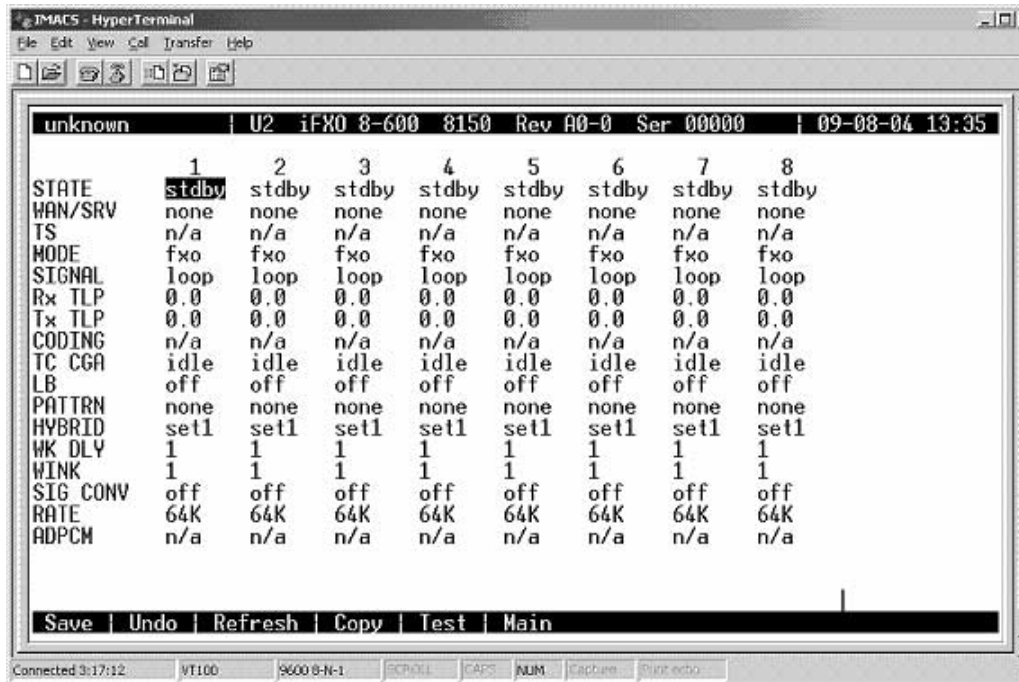
Figure 4-2.Typical iFXO Card Main Screen

The bottom highlighted line of this screen shows various actions that you can perform from the screen. You perform the desired action by pressing the associated uppercase letter key. Table 4-1 summarizes these actions. For example, after you configure the iFXO card ports, press "**s"** to save your settings.

Table 4-1. Main Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e., test status).
Copy	Copies the contents of the current column to the next column. Useful if you change a lot of entries in one column and want to repeat those changes in subsequent columns.
Test	Initiates and monitors testing of all iFXO card ports. Refer to the Test section of this chapter.
Main	Returns to the System Main Screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Table 4-2 summarizes the configuration settings for the iFXO card, along with the available and factory-default option settings. The parameters and settings are also described in the following paragraphs.

Table 4-2. Main Screen Option Settings and Defaults

Parameter	User Options	Notes	Default
STATE	stdby actv		stdby
WAN/SRV	none wan serv user	1	w1-1
TS	01-24 01-31	2	01
MODE	fxo fxodn dpt		fxo
SIGNAL	loop gs lp-dc 1s-R2 gs-a lp-em lp-dc	3	loop
Rx TLP	-10.0 dB to +2.0 dB		0.0
Tx TLP	-10.0 dB to +5.0 dB		0.0
CODING	u-law a-law a-inv	4	u-law
TC CGA	idle busy		idle
LB	off dgtl anlg		off
PATTERN	none D-mW quiet		none
HYBRID	set1 to set8 user	5	set1
WK DLY	00-99	6	0
WINK	00-199	6	0
SIG CONV	off on		off
RATE	64K 24K,1 32K,1 40K,1 24K,2 32K,2 40K,2	7	64K
ADPCM	n/a P1 P2 P3		n/a
OHD TOUT	1600ms - 3700ms	8	3700ms

Notes:

1. Choosing **wan** allows you to choose a WAN port (w1-1 through w4-2). Choosing **serv** lets you choose an ADPCM server card in slot P1, P2, or P3, followed by a logical port on that card. *If your system has the FRS card installed and you want to use voice compression you need to install the Low Bit Rate Voice (LBRV) card. However, if your system has the ATM card installed you can proceed directly with voice compression (there is no need for the LBRV Card to be installed.)* The **user** option is not used. See the WAN/SRV paragraph that follows.

2. Time slot 16 is not available if the port is assigned to an E1 WAN link whose time slot 16 is programmed for **CAS** or **CCS**.

3. These options are only valid if the Mode selected is **fxo**, or **fxodn**. If the mode is **dpt**, then the Signal options are **dpt** (default), **R2, i-R2** or **dp-em**.

4. The default is **a-inv** for E1 and **m-law** for T1. These values will change depending upon the WAN link selected.

5. The default, **set1**, is the only active option. It balances to the ideal termination of 600 ohms + 2.15 uF. The other settings are reserved for future use.

6. These settings should be used with **fxodn** and **dpt** modes only.

7. Choosing a Rate other than **64K** allows you to select an ADPCM slot.

8. This option can be edited only when OHD signal type is selected. This value can have a range of 1600ms - 3700ms. This value tells how long the system should be in ONHOOKDATA state. This is a user-defined value to accommodate different ring cadence. The default value is **3700ms**.

STATE

The State setting determines whether the port is active or inactive. An inactive port does not occupy a time slot on a WAN link. Set the State setting to standby (**stdby**) for ports you are not using or have not yet configured. Set it to active (**actv**) for ports that are ready for use.

WAN/SRV

The WAN/SRV setting identifies the WAN link or server card assigned to this port. If you choose **wan**, you also must select the desired port (w1-1 through w4-2) of a WAN card for transmission over a T1 or E1 link. Or, choose **serv** to assign the card port to a server card in the system. This can be an ATM or FRS card, which resides in chassis slot P1, P2, or P3. You must then choose a logical port on that card. The **user** option is not used.

It is not necessary to assign all ports of the same iFXO card to the same WAN link or server card, or to contiguous time slots on a WAN link.

TS

The TS setting identifies the time slot on the WAN link to which this port is assigned. Values range from **1-24** for T1 links and **1-31** for E1 links. Time slot 16 is not available on E1 links that are programmed for **cas** or **ccs** signaling. For a display of the available time slots, refer to your cross-connect map for the WAN link.

MODE

The Mode setting should be determined by the type of equipment to which you connect the port. All options use two-wire balanced connections. The **fxo** (Foreign Exchange Office) option allows you to connect the system to a 2 way PBX trunk (both inbound and outbound calls) or a key system trunk. The **fxodn** (Foreign Exchange Office-Defined Network) option provides access to new services offered by advanced networks from many major carriers. The **dpt** (Dial Pulse Terminating) option allows the unit to attach to incoming one-way trunks from a PBX, key system, or a telephone set. This option is similar to the **fxo** option.

SIGNAL

The Signal setting matches the signaling behavior of the FXO equipment and the remote switch. Use the **loop** (Loop Start) option with telephone sets and simple PBX trunks. Use the **gs** (Ground Start) option with two-way PBX trunks because it helps to prevent glaring or call collisions. Use the **lp-dc** (Loop Start–Forward Disconnect) option with automated answering equipment. The **R2** option is provided for a CCITT R2 interface. The selection you choose must match the behavior of the station equipment and the remote central office or PBX equipment. Use **gs-a** (ground-start automatic) for equipment requiring fast-response time to the central office. Use the **lp-em** option for (Loop Start). Use the **ohd** option for On-Hook Data Data Transmission between first and second ring (example: CallerID). The selection must match the behavior of both the station equipment and remote central office or PBX. The **ohd** option is limited in it's capabilities. If the line goes off-hook before or during the data transmission, data transmission shall be pre-empted or stopped and normal call completion treatment shall be provided. There should be at least a 5 second delay between two different phone calls so that the integrated access system can distinguish between 2 different phone calls and silence between ringing pattern of one call.

If you selected the **dpt** option for the Mode of any port, then the three options that are supported under Signal are **dpt** for standard Dial Pulse Termination signaling used in North America, **R2** for CCITT signaling used internationally, **i-R2** (immediate R2) which provides immediate seizure acknowledgment to the network and **dp-em** (Dial Pulse Electromechanical) used for timing relays that are specific to Russia. If you select **fxodn** in Mode the options are **loop, gs, lp-fd, R2, gs-a** and **lp-em.** For **fxo** the additional option is **ls-R2.**

The **lp-dc** signal is a new feature for this card. Setting this signaling mode allows a DTMF type of caller ID to be passed through the system before any ringing has been sent from the central office COOP start port.

CAUTION!

Before activating a port, verify the behavior expected by both the station equipment and the remote central office equipment and ensure that you have the system properly configured.

Rx TLP

The Receive Transmission Level Point setting controls the amount of gain or attenuation added to signals after they are decoded to analog signals. To increase the signal level, set the Rx TLP setting to a positive number (i.e., the larger the number, the more gain is added). To decrease the signal level, set the Rx TLP setting to a negative number (i.e., the more negative the number, the more the signal level is decreased). For example, an incoming signal at -5 dBm can be increased to -3 dBm by setting Rx TLP to +2 dB. Acceptable values range from **-10.0 dB to +2.0 dB**.

Tx TLP

The Transmit Transmission Level Point setting controls the amount of gain or attenuation added to signals after they are received from the local analog port and before they are encoded to digital PCM signals. To increase the signal level, set the Tx TLP setting to a negative number (i.e., the more negative the number, the more gain is added). To decrease the signal level, set the Tx TLP setting to a positive number (i.e., the more positive the number, the more the signal level is decreased). For example, an incoming signal at -5 dBm can be increased to -2 dBm by setting Tx TLP to -3 dB. Acceptable values range from **-10.0 dB to +5.0 dB**.

CODING

The Coding setting sets the PCM companding method used for a port. Generally, the North American T1 environment uses **m-law** coding. The International E1 environment uses **a-law** or **a-inv** (inverted A-law) coding, and **a-inv** provides a higher ones density than **a-law**. The coding default is determined by the type of card in the WAN port you select.

TC CGA

The Trunk Conditioning during Carrier Group Alarm setting defines whether the iFXO port should be placed in **idle** or **busy** mode upon declaration of a Carrier Group Alarm (CGA) on the WAN link to which the port is assigned. In most cases, you should set this parameter to **busy**. If a call is in progress when the CGA alarm is received, the system will hold the call for two seconds, drop it and then busy out the port to the attached PBX for the duration of the alarm. Once the alarm clears, the system will automatically place the port back in **idle** mode thereby making it available to the attached PBX.

LB

The Loopback field lets you loop the port back toward the network and far end. The **dgtl** (digital) loopback sends the incoming digital DS0 signal back to the far end without decoding it. The **anlg** (analog) loopback sends the decoded analog signal back to the far end after decoding and then re-encoding it. Figure 4-3 shows the loopback options, which allow you to test and troubleshoot the FXS card. To disable a loopback, set this field to **off**.
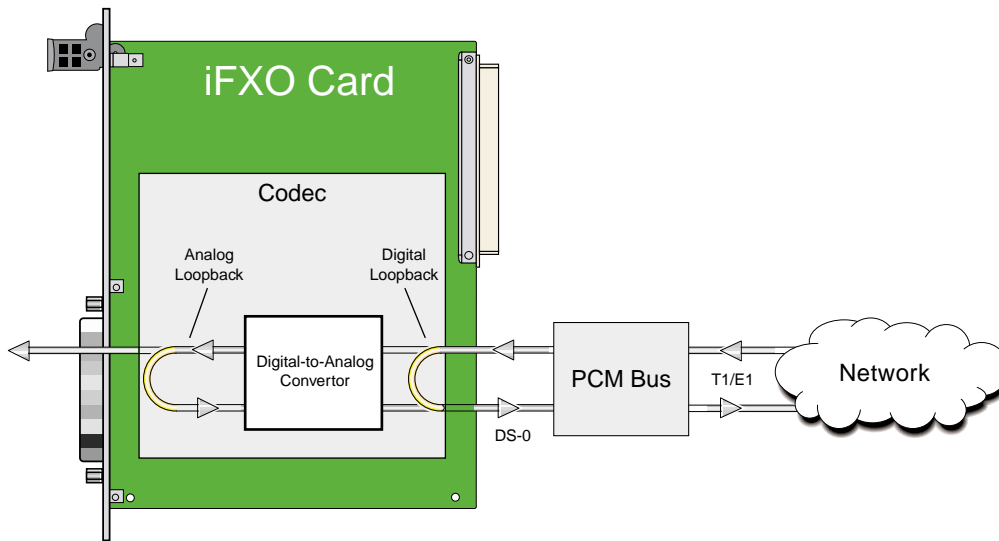
Figure 4-3.iFXO Card Loopbacks

PATTRN

The Pattern setting sets the outgoing test pattern for this analog port. The pattern, generated by the system, is sent only to the currently selected port. The **none** option disables sending a test pattern. The **D-mW** (Digital milliwatt) option sends a 1 kHz tone at 0.0 dBm. The Rx TLP setting affects the D-mW signal level. The **quiet** option places a termination on the line so that no analog signal is sent.

HYBRID

The Hybrid option assigns a three-byte pattern to define the adjustment for return loss (similar to Build-Out Capacitors). The default, **set1**, balances to the ideal termination of 600 ohms + 2.15 uF. The other settings are reserved for future use.

WK DLY

The Wink Delay setting allows you to set the wink delay time. The options are units of 100 milliseconds. Settings are **1-99** (100 milliseconds to 9.9 seconds). The Wink Delay and Wink options are applicable to CCITT systems for determining the delay of the R2 state machine. They should only be used with modes **fxodn** and **dpt** (**R2** and **i-R2**).

WINK

The Wink setting allows you to set the wink duration time. The options are units of 100 milliseconds. Settings are **1-99** (100 milliseconds to 9.9 seconds). This option is only applicable with modes **fxodn** and **dpt** (**R2** and **i-R2**).

SIG CONV

The Signaling Conversion parameter allows you to change the ABCD signaling bits from CCITT (E1) to ANSI (T1) standards. This conversion is completed regardless of the type of WAN aggregate (CSU/DSX **or** CEPT) to which it is attached. The options are **off** (which means that ANSI signaling is used) and **on** (which converts transmit signaling from ANSI to CCITT format according to the Interface Card Conversion Table for FXO signaling, and also converts receive signaling from CCITT to ANSI).

RATE

The Rate parameter allows you to use the voice compression capabilities of the ADPCM resource card. If that card is not present in the system, changes cannot be made to this setting. The **64K** option (default) does not use ADPCM resources (it is the normal operation rate for voice circuits).

ADPCM voice channels are assigned in pairs by designating two voice ports (E&M, FXO or FXS) to the same WAN link and time slot and selecting rate settings for the pair that add up to 64kbps (i.e. [24K,1+40K,2],[32K,1+32K,2] and [40K,1+24K,2]). The numeral 1 after the rate setting assigns that portion of the voice port pair to the odd side of the ADPCM pair. The numeral 2 after the rate setting assigns that portion of the voice port pair to the even side of the ADPCM pair.

For more information about voice port assignments to the ADPCM card, please consult the ADPCM section of the manual.

ADPCM

The ADPCM parameter lets you choose the ADPCM card on which to place this iFXO port. The default setting is **n/a** and only changes when a Rate smaller than **64k** is selected (see above). You can then select which ADPCM card to use for the port (assignment is made by chassis slot number). The options are **P1**, **P2,** and **P3**.

OHD TOUT

The On-Hook Data Timeout parameter lets you choose a value range of 1600ms - 3700ms. This value tells how long the system should be in ONHOOKDATA state. The default value is **3700ms**.

4.3.2   Test Screen

The Test option facilitates testing and maintenance by allowing you to monitor and set the status of the analog interface leads as well as monitoring and setting the value of the A, B, C and D signaling bits of all iFXO circuits on that card. In cross-connect systems only, the test option also allows you to apply test patterns and tones towards the user and network sides of the system.

Figure 4-4 shows a typical iFXS Card Test Screen, Table 4-3 lists some actions you can perform from this screen, and Table 4-4 shows the option settings and defaults for each parameter.
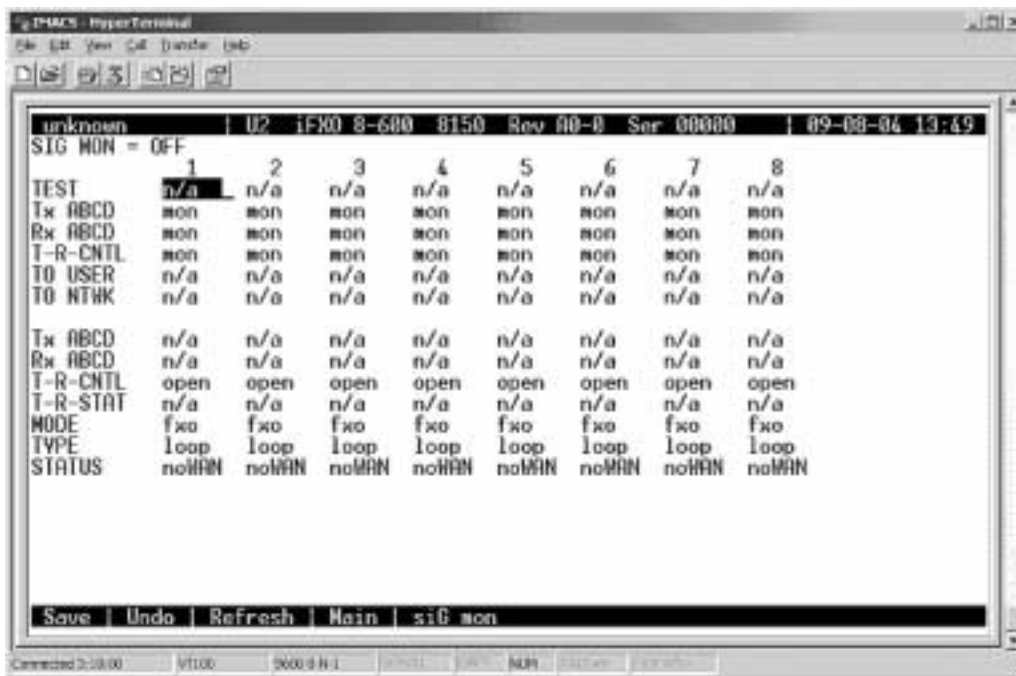
Figure 4-4.Typical iFXO Card Test Screen

Table 4-3. Test Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e., test data).
Main	Returns to the iFXO Card Main Screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.
siG mon	Used with the user card alarm system to notify you of excessive transitions of signaling bits.

Table 4-4. Test Screen Option Settings and Defaults

Parameter	User Options	Default
SIG MON	off on	off
TEST	off on	off
Tx ABCD	mon set	mon
Rx ABCD	mon set	mon
T-R-CNTL	mon set	mon
TO USER	PCM 300Hz 1kHz 3kHz quiet	PCM
TO NTWK	PCM 300Hz 1kHz 3kHz quiet	PCM
Tx ABCD	Status information only; not editable	n/a
Rx ABCD	Status information only; not editable	n/a
T-R-CNTL	Status information only; not editable	n/a
T-R-STAT	Status information only; not editable	n/a
MODE	Status information only; not editable	n/a
TYPE	Status information only; not editable	n/a
STATUS	Status information only; not editable	n/a

SIG MON

The Signaling Monitor feature works with the user card alarm system to detect excessive signaling bit transitions. The system will generate alarms if the number of transitions of any signaling bit in transmit or receive direction for an active port exceeds 255 in any four second interval. The options are **off** and **on**, and they are toggled by pressing "**g**" (**siGmon** command) in the Test Screen.

TEST

The Test Parameter shows if the port is in the test mode or not. Inactive ports and ports that are assigned to inactive WANs will show a test status of **n/a**. The test status options for active ports are **off** and **on**.

Tx ABCD

The Transmit ABCD setting allows you to either monitor the status of the ABCD signaling bits being transmitted towards the network or set a specific ABCD pattern for testing the transmit side of the circuit. The options for this field are **mon** (monitor) or **set**. Choosing **set** will bring up a four digit field for you to input the ABCD pattern you want to transmit. Any four digit combination of ones and zeros is acceptable for this setting.

Rx ABCD

The Receive ABCD setting allows you to either monitor the status of the ABCD signaling bits being received from the network or set a specific ABCD pattern for testing the receive side of the circuit. The options for this field are **mon** (monitor) or **set**. Choosing **set** will bring up a four-digit field for you to input the ABCD pattern you want to receive. Any four digit combination of ones and zeros is acceptable for this setting.

T-R-CNTL

The Tip and Ring Control setting allows you to either monitor (**mon**) or set (**set**) the state of the Tip and Ring leads of an iFXO port. Choosing **set** will bring up the following options:

- **loop** (the Tip and Ring leads are tied together)
- **open** (the Ring lead is not connected to either Tip or ground)

TO USER

In cross-connect systems only, the To User parameter allows you to break the circuit and send a test tone toward the user side of the system. The options for this field are **PCM**, **300Hz**, **1 kHz**, **3 kHz** and **quiet**. Selecting **PCM** means that you do not want to inject a tone toward the user and that the PCM signal received from the network should continue to be sent to the user port in the normal manner.

TO NTWK

In cross-connect systems only, the To Network parameter allows you to break the circuit and send a test tone toward the network side of the system. The options for this field are **PCM**, **300Hz**, **1 kHz**, **3 kHz** and **quiet**. Selecting **PCM** means that you do not want to inject a tone toward the network and that the PCM signal received from the user port should continue to be sent to the network in the normal manner.

Tx ABCD

The Transmit ABCD information field shows the current values of the ABCD bits that are being transmitted to the network. If TX ABCD in the top half of the screen is changed via the **set** function mentioned above, and the settings are saved by the Save command in the Menu of Actions, the new bit pattern chosen will be reflected here.

Rx ABCD

The Receive ABCD information field shows the current values of the ABCD signaling bits that are received from the network. If RX ABCD in the top half of the screen is changed via the **set** function mentioned above, and the settings are saved by the Save command in the Menu of Actions, the new bit pattern chosen will be reflected here.

T-R-CNTL

The Tip and Ring Control information field shows the current status of the Tip and Ring leads of the iFXO port from the perspective of the system. The possible values are:

*   **loop** (the Tip and Ring leads are tied together)

*   **open** (the Ring lead is not connected to either the Tip or to ground)

*   **rgnd** (the Ring lead is grounded)

*   **lpgnd** (the Tip and Ring leads are tied together and the Tip is grounded)

*   **ring** (ringing voltage is being applied between the Tip and Ring)

T-R-STAT

The Tip and Ring Status information field describes what the attached device is doing with the Tip and Ring leads of the iFXO port. The possible values are:

*   **ring** (attached device is applying ringing voltage between Tip and Ring)

*   **TbRg** (attached device is applying -48V battery to Tip and grounding Ring)

*   **ToRo** (attached device is leaving both the Tip and Ring leads open)

*   **TgRo** (attached device is grounding the Tip lead and is leaving the Ring lead open)

*   **RbTg** (attached device is applying -48V battery to Ring and grounding Tip)

*   **RbTo** (attached device is applying -48V battery to Ring and leaving Tip open)

*   **TgR*** (attached device is grounding Tip, and the Ring lead state is unknown)

*   **ToR*** (attached device is leaving Tip open, and the Ring lead state is unknown)

*   **RoT*** (attached device is leaving Ring open, and the Tip lead state is unknown)

*   **n/a** (information is not available)

MODE

The Mode information field shows the current mode of the port that was selected on the main iFXO card Screen. Valid settings are **fxo**, **fxodn**, or **dpt**.

TYPE

The Type information field shows the current status of the signal field selected on the main FXO card screen for this port. Valid settings for both **fxo** and **fxodn** modes are **loop** (loop), **gs** (ground start), **lp-fd** (loop start-forward disconnect) and **R2** (R2). Valid settings for the **dpt** mode are **dpt** (dial pulse terminating), **R2** (R2), **i-R2** (immediate R2), and **dp-em** (Dial Pulse Electromechanical).

STATUS

The Status information field shows the current status of the port Table 4-5 lists and describes all of the possible conditions that are reported in this field.

Table 4-5. Status Information Field Settings

Setting	Meaning
stdby	The iFXO port is in standby.
W stb	The WAN card to which the iFXO port is assigned is in standby.
W tst	The WAN card to which the iFXO port is assigned is under test.
W OOS	The WAN card to which the iFXO port is assigned is out of service.
noWAN	No WAN card is configured in the slot to which the iFXO port is assigned.
call	Call setup is in progress.
busy	Call is in progress.
idle	No call in progress (port is available for a call).
TC	Port is in Trunk Conditioning because a CGA alarm occurred on the associated WAN port.
test	Port is under test (i.e., you are actively controlling the circuit by setting values for Tx ABCD or Rx ABCD).
maint	The port is in a maintenance condition.

4.4 ɪFXO Card Error Messages

Refer to Appendix B in the System Reference Guide for further information on Error Messages regarding this card.

4.5 ɪFXO Card Troubleshooting

The iFXO card may be faulty if a voice signal is not received at one end of a circuit, or if signaling is not detected. The following are possible causes:

• Faulty receiving CPE at the near end (where the problem was first noticed)

• Faulty transmitting CPE at the far (opposite) end

- Faulty cabling between the CPE and iFXO card at the near end

- Faulty cabling between the CPE and iFXO or FXS card at the far end

- T1 or E1 network failure

- Improper card configuration at either end (e.g., time slot and/or WAN port assignments)

First, verify that the T1 or E1 network has not failed. Check for a CGA-Red alarm on the associated WAN port at the end where the incoming VF signal loss is first noticed. The CGA indicates that the incoming network signal was lost (or that the receiving WAN port is out of frame). During the CGA, all voice ports with time slots on that WAN port will also be disabled, and the associated far-end WAN port will be in a CGA-Yellow alarm state. If the network is faulty, you must clear that trouble to restore your circuits.

If the network is okay, verify that the proper WAN ports and time slots are assigned to the associated iFXO and FXS voice ports at both ends, as previously outlined in this chapter. In a point-to-point network, the near-end and far-end FX card ports should both be assigned the same WAN port and time slot number. Also make sure the other parameters (such as the transmit and receive TLPs) are set properly at both ends.

If the FX card port parameters are correct at both ends, and if the network is okay, the trouble is isolated to the iFXO card or the associated port. Proceed as follows:

1. At the far end, activate an analog loopback on the FX card port.

2. Send a 0 dBm (digital milliwatt) test signal toward the CPE at that end. That signal will be substituted for the normal signal coming from the far-end CPE; it will be sent back to the CPE at your end via the loopback path.

3. Check your CPE for this signal. If it is present, the far-end CPE or cabling to the far-end FX card is probably faulty. Disable the loopback and test signal there, and fix the problem. If you still don't receive a signal, go to step 4.

4. At your end, go to the iFXO Card Main Screen and send a digital milliwatt test tone (0 dBm) toward the CPE. If you still don't receive a signal, check the cabling from the FXO card to your CPE, and check the CPE itself. If those items are okay, replace the FXO card at your end.

5. If the FXO card is determined to be faulty, replace it and return the faulty unit for repair to the location specified by your distributor.

4.6   iFXO Card Specifications

iFXO Card (815060 2-wire)	
Number of Ports	
Models 815060	8 ports
Physical Interface	
Connector	1 female 50-pin telco connector
Transmission Performance	
Performance	Exceeds requirements of ITU-T Rec. G.713
Signaling Modes	
Model 815060 Signaling Modes	Software selectable on a per port basis
	Foreign Exchange Office (FXO)
	Ground Start
	Loop Start with DTMF CLIP
	Foreign Exchange Office- Defined Network (FXSDN)
	Dial Pulse Termination (DPT)
Termination Impedance	
Model 815060	600 Ohms with 2.16 µF
VF Transmission Characteristics	
Nominal Transmit TLP	-10.0 dB to +5.0 dB in steps of 0.1 dB
Nominal Receive TLP	-10.0 dB to +2.0 dB in steps of 0.1 dB
PCM Encoding	Software selectable on a per port basis

Attenuation Versus Frequency Relative to 1 kHz with 0 dBm0 input

Frequency	Transmit (A to D)	Receive (D to A)
200 Hz	-0.25 to +3.0 dB	-0.25 to +2.0 dB
300 to 3000 Hz	-0.25 to +0.5 dB	-0.25 to +0.5 dB
3200 Hz	0.25 to +0.75 dB	-0.25 to +0.75 dB
3400 Hz	-0.25 to +1.5 dB	-0.25 to +1.5 dB

Return Loss (at 1 kHz)	$\geq$28 dB
Transhybrid Loss	34dB
Idle Channel Noise (rcv and xmt)	< -65 dBm0p Typ < -70 dBmop or < 20 dBrnc0
Interchannel Crosstalk	Typ < -75 dBm0 using 7 adjacent channels being disturbed with a signal of 0.0 dBm0

Total Distortion including Quantization (Signal to Distortion Ratio) Input Frequencies 1004-1020 Hz

Input Level	Rcv or Xmt	Overall
-30 to 0 dBm0	$\geq$35 dB	$\geq$33 dB
-40 dBm0	$\geq$29 dB	$\geq$27 dB
-45 dBm0	$\geq$25dB	$\geq$22 dB

Absolute group delay	< 750 microseconds
Group Delay Distortion vs. frequency	within boundaries of ITU-T Rec. G.713 Figure 2
Longitudinal Balance	Nom > 46 dB
	Typ > 50 dB
Variation of Gain with Input Level	within boundaries of ITU-T Rec. G.713 Figure 7

Chapter 5
FXS Coin Card

5.1   Introduction

This chapter provides connector pinout, configuration, and troubleshooting information for the Foreign Exchange - Station (FXSC) Coin Voice Cards.

These cards manage the flow of FXS voice traffic over the network. Each card encodes analog (voice, VF) signals to a digital bitstream at the local system for transmission over a T1 or E1 network. It also decodes the digital signals to analog at the remote system.

Each FXS coin card has two-wire interface and use the voice-compression features of an ADPCM card.

5.2   FXS Coin Card Descriptions

5.2.1   FXS-C 2W*8-6 Coin Card Description (8149)

The FXS-C 2W*8-6 Coin Card has six two wire ports and two wires, providing a 600-ohm terminating impedance. The card consists of backplane interface circuitry, serial EEPROM for card identification and adjustment parameters storage, metering pulse interface extension between Coin Box Office (CO) and coin phone on the side of the coin phone, and six voice line interface circuits. Each line interface circuit consists of a codec, a hybrid circuit.

5.2.1.1   Card Jumper/Switch Settings

The FXS-C 2W*8-6 Coin Card has the following jumpers on the motherboard. JP1 - Global Metering Signal Frequency Selection (12/16 kHz). JP2 - Global Signal Frequency Selection (0.5/1/2 Vrms). JP3 - Global Loop Length Selection; this jumper should be set to SL (short loop) for loops not exceeding 700 ohms, or to LL (long loop) for loops comprised between 700 ohms and 1800 ohms. The default is LL. JP4 - EUR/US jumper. Set to US for domestic applications and to EUR for European applications. Its default position is US. JPX01 (JP101, JP201, JP301, JP401 and JP601) - Per Channel Metering Signal Frequency Selection (these per channel jumpers settings should be consistent with the setting of JP1).
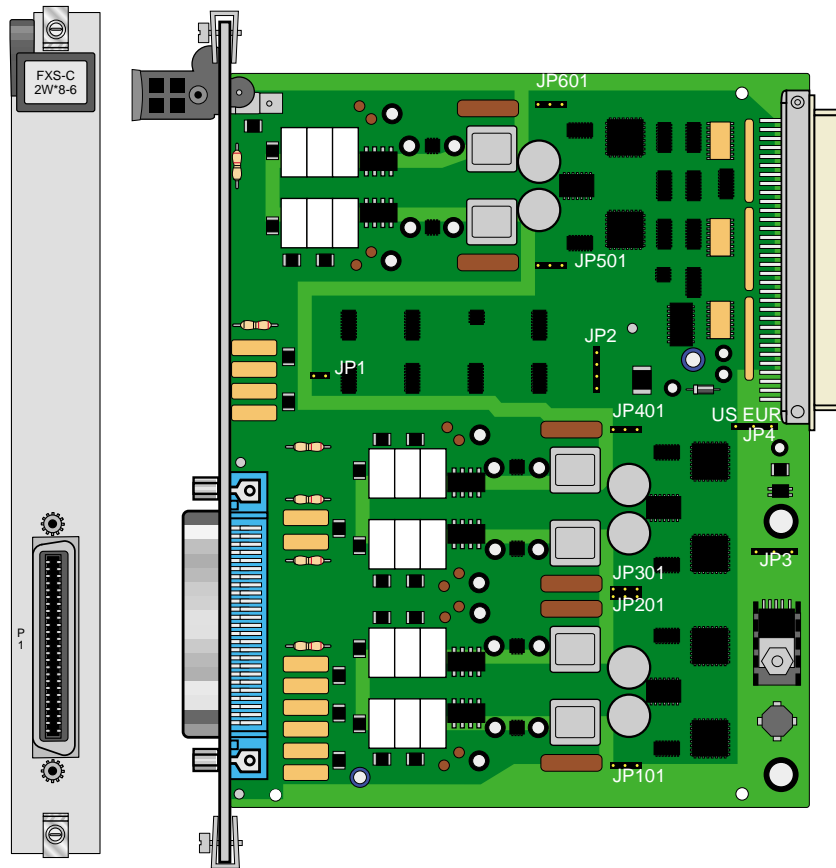
Figure 5-1.Jumper Settings for FXS Coin Card

5.2.1.2   Installing the FXS-C 2W*8-6 Card

Install the FXS Coin Card in any user card slot. These slots are U1 to U8 on the two-sided chassis and front-loading chassis with power supplies on top, or P1 to P4 and W1 to W4 on the front-loading chassis with power supplies on the side.

5.3   FXS Coin Card User Screens and Settings

5.3.1   FXS Coin Card Main Screen

You must configure the FXS Coin Card for operation after installing it into the system chassis. This is done from the FXS Coin Card Main Screen (see Figure 5-2). To go to that screen, highlight the desired card in the System Main Screen and press <Enter>. This screen shows one configuration column for each port on the card.
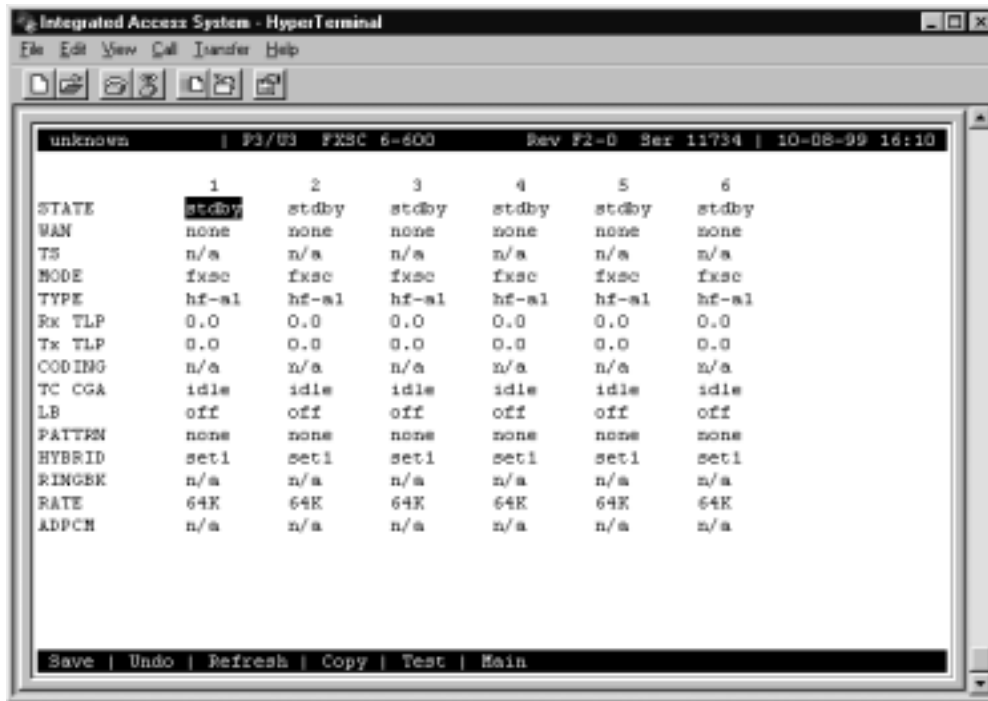
Figure 5-2. Typical FXS Coin Card Main Screen

The bottom highlighted line of this screen shows various actions that you can perform from the screen. You perform the desired action by pressing the associated capital letter key. Table 5-1 summarizes these actions. For example, after you configure the FXS Coin Card ports, press **"s"** to save your settings.

Table 5-1. Main Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e., test status).
Copy	Copies the contents of the current column to the next column. Useful if you change a lot of entries in one column and want to repeat those changes in subsequent columns.
Test	Initiates and monitors testing of all FXS coin card ports. Refer to the Test section of this chapter.
Main	Returns to the Systems Main Screen. If changes are made to settings and not saved, you will be prompted to either save or lose your changes.

Table 5-2 summarizes the configuration settings for the FXS Coin Card, along with the available and factory-default option settings. The parameters and settings are also described in the following paragraphs.

Table 5-2. Main Screen Option Settings and Defaults

Parameter	User Options	Notes	Default
STATE	stdby actv		stby
WAN	none wan (w1-1 through w4-2) serv (P1 through P3)	1	w1-1
TS	01-24 01-31	2	01
MODE	fxsc		fxsc
TYPE	hf-a1 hf-a2 hf-cb rb-a1 rb-a2 rb-cb		hf-a1
Rx TLP	-10.0 dB to +2.0 dB		0.0
Tx TLP	-10.0 dB to +5.0 dB		0.0
CODING	u-law a-law a-inv	3	u-law
TC CGA	idle busy		idle
LB	off dgtl anlg		off
PATTERN	none D-mW quiet		none
HYBRID	set1 to set8 user	4	set1
RINGBK	off on		off
RATE	64K, 24K,1 32K,1 40K,1 24K,2 32K,2 40K,2	5	64K
ADPCM	n/a P1 P2 P3	6	n/a

Notes:

1. Choosing **wan** allows you to choose a WAN port (w1-1 through w4-2).

2. Time slot 16 is not available if the port is assigned to an E1 WAN link whose time slot 16 is programmed for CAS or CCS.

3. The default is **a-inv** for E1 and **u-law** for T1. These values will change depending upon the WAN link selected.

4. The default (**set1**) is the only active option. It balances to the ideal termination of 600 ohms + 2.15 uF. The other settings are reserved for future use.

5. Choosing a Rate other than 64K allows you to select an ADPCM.

6. The default setting is n/a and only changes when a Rate smaller than 64K is selected.

STATE

The State setting determines whether the port is active or inactive. An inactive port does not occupy a time slot on a WAN link. Set the State setting to **stdby** (standby) for ports that are not to be used or that have not yet been configured. Set it to **actv** (active) for ports that are ready for use.

WAN

The WAN setting identifies the WAN link assigned to this port. If you choose **wan**, you also must select the desired port (w1-1 through w4-2) of a WAN card for transmission over a T1 or E1 link. This can be an ATM or FRS card, which resides in chassis slot P1, P2, or P3. You must then choose a logical port on that card. The **user** option is not used.

It is not necessary to assign all ports of the same FXS coin card to the same WAN link, or to contiguous time slots on a WAN link.

TS

The TS setting identifies the time slot on the WAN link to which this port is assigned. Values range from **1** to **24** for T1 links and **1** to **31** for E1 links. Time slot 16 is not available on E1 links that are programmed for **cas** or **ccs** signaling. For a display of the available time slots, refer to the cross-connect map for the WAN link; see the Operations chapter for information about viewing cross-connect maps.

MODE

The Mode setting should be determined by the type of equipment to which the user is connecting the port. All options use two-wire balanced connections. The **fxsc** (Foreign Exchange Station-Coin) option allows users to connect the system to a two-way (both inbound and outbound calls) PBX trunk or a key system trunk.

TYPE

The Type setting matches the signaling behavior of the FXSC equipment and the remote switch. These settings are **hf-a1** (high frequency - 12kHz), **hf-a2** (high frequency - 16kHz), **hf-cb** (high frequency-clear back), **rb-a1** (reverse battery-answer 1), **rb-a2** (reverse battery-answer 2), and **rb-cb** (reverse battery-clear back).

Rx TLP

The Receive Transmission Level Point (TLP) setting controls the amount of gain or loss added to the incoming signal after it is decoded to analog. To increase the signal level, set the Rx TLP setting to a positive value (i.e., the larger the number, the more gain is added). To decrease the signal level, set the Rx TLP setting to a negative value (i.e., the more negative the number, the more the signal level is decreased). For example, an incoming signal at -5 dBm can be increased to -3 dBm by setting Rx TLP to +2 dB. The Rx TLP range is -10.0 dB to +2.0 dB.

Tx TLP

The Transmit TLP setting controls the amount of gain or loss added to a voice signal from the CPE before it is encoded to digital PCM. To increase the signal level, set the Tx TLP setting to a negative value (i.e., the more negative the number, the more gain is added). To decrease the signal level, set the Tx TLP setting to a positive value (i.e., the more positive the number, the more the signal level is decreased). For example, an incoming signal at -5 dBm can be increased to -2 dBm by setting the Tx TLP to **-3 dB**. The Tx TLP range is **-10.0 dB** to +**5.0 dB**.

CODING

The Coding setting sets the PCM companding method used for a port. Generally, the North American T1 environment uses **m-law** coding, and the International E1 environment uses **a-law** or **a-inv** (inverted A-law) coding. The **a-inv** setting provides a higher ones density than **a-law**. The default coding setting is determined by the type of associated WAN card.

TC CGA

The Trunk Conditioning during Carrier Group Alarm setting defines whether the FXS port should be forced **idle** or **busy** upon declaration of a Carrier Group Alarm (CGA) on the WAN link to which the port is assigned. In most cases, you should set this parameter to **busy**. If a call is in progress when the CGA alarm is received, the system will hold the call for two seconds, drop it, and then busy out the port to the attached PBX for the duration of the alarm. Once the alarm clears, the system will automatically place the port back in the **idle** mode, making it available to the PBX.

LB

The Loopback field lets you loop the port back toward the network and far end. The **dgtl** (digital) loopback sends the incoming digital DS0 signal back to the far end without decoding it. The **anlg** (analog) loopback sends the decoded analog signal back to the far end after decoding and then re-encoding it. Figure 5-3 shows the loopback options, which allow you to test and troubleshoot the FXS card. To disable a loopback, set this field to **off**.
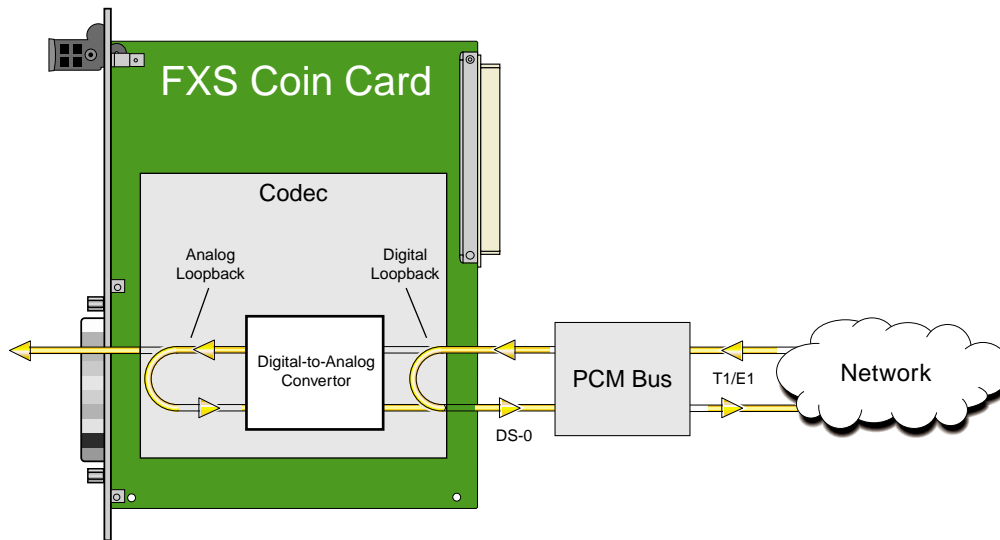
Figure 5-3.FXS Coin Card Loopbacks

PATTRN

The Pattern field selects an outgoing test pattern for the current card port. The test pattern is generated by the system and sent to the selected port. You can select a different pattern for each port. The **none** option disables the test pattern. The **D-mW** (Digital milliwatt) option sends a 1 kHz tone at 0.0 dBm. The setting of the Rx TLP setting affects the D-mW signal level. The **quiet** option places a 600-ohm termination on the line so that no analog signal is sent (idle mode).

HYBRID

The Hybrid option assigns a three byte pattern to define the adjustment for return loss (similar to Build Out Capacitors). The default, **set1**, balances to the ideal termination of 600 ohms + 2.15 uF. The other settings are reserved for future use.

RINGBK

The ringback setting specifies whether a ringback tone is generated by the system and sent towards the network. Turn this option **off** when the network service does not provide an audible ringing tone to the calling party.

RATE

The Rate parameter allows you to use the voice compression capabilities of an ADPCM card. If that card is not present in the system, the Rate stays at **64k** and cannot be changed. The **64k** option is the normal encoding/decoding rate for voice circuits.

ADPCM voice channels are assigned in pairs by designating two voice ports (E&M, FXO, or FXS) to the same WAN link and time slot, and selecting rate settings for the pair that add up to 64 kbps. The following combinations are possible:

- **24K,1+40K,2** (24 kb coding on one side of the time slot and 40 kb coding on the other side of the same time slot)

- **32K,1+32K,2** (32 kb encoding on each side of a time slot)

- **40K,1+24K,2** (40 kb coding on one side of the time slot and 24 kb coding on the other side)

Number **1** after the rate setting assigns that portion of the voice port pair to the odd side of the ADPCM pair. Number **2** after the rate setting assigns that portion of the voice port pair to the even side of the ADPCM pair.

For more information about voice port assignments to an ADPCM card, please refer to the *Server Card Reference Guide*.

The number **1** after the rate setting assigns that portion of the voice port pair to the odd side of the ADPCM pair. The number **2** after the rate setting assigns that portion of the voice port pair to the even side of the ADPCM pair.

For more information about voice port assignments to the ADPCM card, please refer to the *ADPCM* section of the *Server Card Reference Guide*.

ADPCM

The ADPCM parameter lets the user choose which ADPCM card to place this E&M port. The default setting is **n/a** and only changes when a Rate smaller than **64k** is selected (see above). The user is then allowed to select which ADPCM card to use for the port (this assignment is made by chassis slot number). The options are slots **P1**, **P2**, and **P3**.

5.3.2   Test Screen

The Test option facilitates testing and maintenance by allowing you to monitor and set the status of the analog interface leads, and to monitor or set the value of the A, B, C, and D signaling bits of all FXS circuits on that card. In cross-connect systems, the test option also allows you to apply test patterns and tones towards the user and network sides of the system.

Figure 5-4 shows the FXS Coin Card Test Screen parameters, Table 5-3 lists some actions you can perform from this screen, and Table 5-4 shows the settings for each parameter.
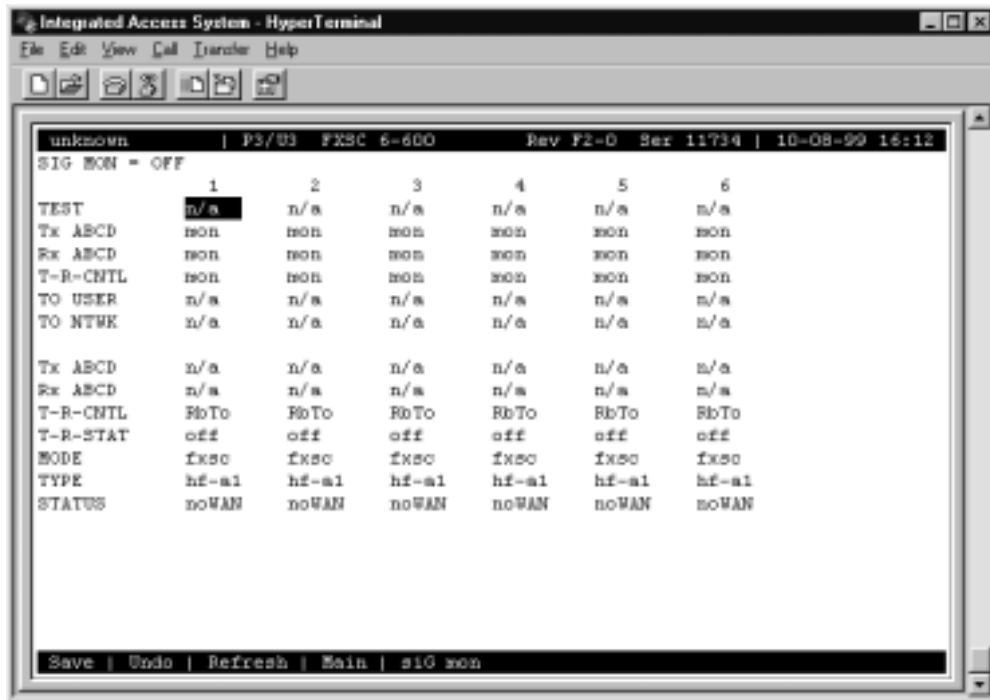
Figure 5-4.Typical FXS Coin Card Test Screen

Table 5-3. Test Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e. performance and test data).
Main	Returns to the FXS Coin Card Main Screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.
siGmon	Used with the user card alarm system to notify you of excessive transitions of signaling bits.

Table 5-4. Test Screen Option Settings and Defaults

Parameter	User Options	Default
SIG MON	off on	off
TEST	off on	off
Tx ABCD	mon	mon
Rx ABCD	mon	mon
T-R-CNTL	mon	mon
TO USER	n/a	n/a
TO NTWK	n/a	n/a
Tx ABCD	Status information only; not editable	n/a
Rx ABCD	Status information only; not editable	n/a
T-R-CNTL	Status information only; not editable	n/a
T-R-STAT	Status information only; not editable	n/a
MODE	Status information only; not editable	n/a
TYPE	hf-a1 hf-a2 hf-cb rb-a1 rb-a2 rb-cb	hf-al
STATUS	Status information only; not editable	n/a

SIG MON

The Signaling Monitor feature works with the user card alarm system to detect excessive signaling bit transitions. The system will generate alarms if the number of transitions of any signaling bit in transmit or receive direction for an active port exceeds 255 in any four second interval. The options are **off** and **on**, and they are toggled by pressing "**g**" (**siGmon** command) in the Test Screen.

TEST

The Test parameter shows if the port is in test mode or not. Inactive ports and ports that are assigned to inactive WANs will show a test status of **n/a**. The test status options for active ports are **off** and **on**.

Tx ABCD

The Transmit ABCD setting allows you to either monitor the status of the ABCD signaling bits being transmitted towards the network or set a specific ABCD pattern for testing the transmit side of the circuit. The option for this field is **mon** (monitor).

Rx ABCD

The Receive ABCD setting allows the user to either monitor the status of the ABCD signaling bits being received from the network or set a specific ABCD pattern for testing the receive side of the circuit. The option for this field is **mon** (monitor).

T-R-CNTL

The Tip and Ring Control setting allows you to **mon** (monitor) the state of the Tip and Ring leads of an FXS port:

- **RbTo** (-48V is applied to the Ring lead and the Tip lead is open)

- **TbRo** (-48V is applied to the Tip lead and the Ring lead is open)

- **RbTg** (-48V is applied to the Ring lead and the Tip lead is grounded)

- **TbRg** (-48V is applied to the Tip lead and the Ring lead is grounded)

TO USER

In cross-connect systems only, the **To User** parameter allows you to break the circuit and send a test tone on the user side of the system. The options for this field are **PCM**, **300Hz**, **1kHz**, **3kHz,** and **quiet**. Choose **PCM** if you do not want to inject a tone toward the CPE. In this case, the PCM signal received from the network is still sent to the CPE in the normal manner.

TO NTWK

In cross-connect systems only, the **To Network** parameter allows you to break the circuit and send a test tone on the network side of the system. The options for this field are **PCM**, **300Hz**, **1kHz**, **3kHz,** and **quiet**. Choose **PCM** if you do not want to inject a tone toward the network. In this case, the PCM signal received from the CPE is still sent to the network in the normal manner.

Tx ABCD

The Transmit ABCD informational field shows the current values of the ABCD bits that are being transmitted to the network. If TX ABCD in the top half of the screen is changed via the **set** function mentioned above, and the settings are saved by the Save command in the Menu of Actions, the new bit pattern chosen will be reflected here.

Rx ABCD

The Receive ABCD informational field shows the current values of the ABCD signaling bits that are received from the network. If RX ABCD in the top half of the screen is changed via the **set** function mentioned above, and the settings are saved by the Save command in the Menu of Actions, the new bit pattern chosen will be reflected here.

T-R-CNTL

The Tip and Ring Control informational field shows the current status of the Tip and Ring leads of the FXS port from the perspective of the system. The possible values are as follows (**b** = battery, **o** = open, **g** = ground):

*   **RbTo** (-48V is applied to the Ring lead and the Tip lead is open)
*   **TbRo** (-48V is applied to the Tip lead and the Ring lead is open)
*   **RbTg** (-48V is applied to the Ring lead and the Tip lead is grounded)
*   **TbRg** (-48V is applied to the Tip lead and the Ring lead is grounded)
*   **ring** (the ringing voltage is applied between Tip and Ring)

T-R-STAT

The Tip and Ring Status informational field describes what the attached device is doing with the Tip and Ring leads of the FXS port. The possible values are:

*   **loop** (attached device is connecting Tip and Ring together)
*   **rgnd** (the Ring lead is grounded by the attached device)
*   **open** (Ring lead is not connected to either the Tip lead or to ground)

MODE

The Mode informational field shows the current mode of the port that was selected on the main FXS coin card Screen. Valid settings are **fxsc**.

TYPE

The Type setting matches the signaling behavior of the FXSC equipment and the remote switch. These settings are **hf-a1** (high frequency - 12kHz), **hf-a2** (high frequency - 16kHz), **hf-cb** (high frequency-clear back), **rb-a1** (reverse battery-answer 1), **rb-a2** (reverse battery-answer 2), and **rb-cb** (reverse battery-clear back).

STATUS

The Status field shows the current status of the port. Table 5-5 lists and describes all of the possible conditions reported by this field.

Table 5-5. Status Information Field Settings

Setting	Meaning
stdby	The FXS port is in standby.
W stb	WAN card to which the FXS port is assigned is in standby.
W tst	WAN card to which the FXS port is assigned is under test.
W OOS	WAN card to which the FXS port is assigned is out of service.
noWAN	There is no WAN card configured in the slot to which the FXS port is assigned.
call	Call set-up is in progress.
busy	Call is in progress.
idle	No call is in progress (port is available for a call).
TC	The port is in Trunk Conditioning because a CGA alarm occurred on the associated WAN port.
test	A test is in progress on the port (i.e., you are actively controlling the circuit by setting values for Tx ABCD or Rx ABCD).
maint	The port is in a maintenance condition.

5.4   FXS Coin Card Error Messages

Refer to Appendix B in the System Reference Guide for further information on Error
Messages regarding this card.

5.5   FXS Coin Card Troubleshooting

The FXS coin card may be faulty if a voice signal is not received at one end of a circuit, or if
signaling is not detected. The following are possible causes:

- Faulty receiving CPE at the near end (where the problem was first noticed)

- Faulty transmitting CPE at the far (opposite) end

- Faulty cabling between the CPE and FXS coin card at the near end

- Faulty cabling between the CPE and FXS or FXO coin card at the far end

- T1 or E1 network failure

- Improper card configuration at either end (e.g., time slot and/or WAN port assignments)

First, verify that the T1 or E1 network has not failed. Check for a CGA-Red alarm on the
associated WAN port at the end where the incoming VF signal loss is first noticed. The CGA
indicates that the incoming network signal was lost (or that the receiving WAN port is out of
frame). During the CGA, all voice ports with time slots on that WAN port will also be
disabled, and the associated far-end WAN port will be in a CGA-Yellow alarm state. If the
network is faulty, you must clear that trouble to restore your circuits.

If the network is okay, verify that the proper WAN ports and time slots are assigned to the
associated FXS and FXO voice ports at both ends, as previously outlined in this chapter. In a
point-to-point network, the near-end and far-end FX card ports should both be assigned the
same WAN port and time slot number. Also make sure the other parameters (such as the
transmit and receive TLPs) are set properly at both ends.

If the FX card port parameters are correct at both ends, and if the network is okay, the trouble
is isolated to the FXS card or the associated port. Proceed as follows:

1. At the far end, activate an analog loopback on the FX card port.

2. Send a 0 dBm (digital milliwatt) test signal toward the CPE at that end. That signal will
   be substituted for the normal signal coming from the far-end CPE; it will be sent back
   to the CPE at your end via the loopback path.

3. Check your CPE for this signal. If it is present, the far-end CPE or cabling to the far-end
   FX card is probably faulty. Disable the loopback and test signal there, and fix the
   problem. If you still don't receive a signal, go to step 4.

4. At your end, go to the FXS Card Main Screen and send a digital milliwatt test tone (0 dBm) toward the CPE. If you still don't receive a signal, check the cabling from the FXS card to your CPE, and check the CPE itself. If those items are okay, replace the FXS card at your end.

5. If the FXS coin card is determined to be faulty, replace it and return the faulty unit for repair to the location specified by your distributor.

Chapter 6
FXO Coin Card

6.1 Introduction

The Foreign Exchange Office Coin Card manages the flow of FXOC voice traffic over the network. The FXOC card translates an analog signal to a digital bitstream at the local system and digital to analog at the remote system. All FXOC cards have a two-wire interface and use the voice-compression features of the ADPCM resource card.

6.2 FXO Coin Card Descriptions

6.2.1 FXO-C 2W*8-6 Coin Card Description (8159)

The FXO-C 2W*8-6 Coin Card has eight wire ports, providing a 600-ohm terminating impedance. The card consists of backplane interface circuitry, serial EEPROM for card identification and adjustment parameters storage, metering pulse interface extension between Coin Box Office (CO) and coin phone on the CO side, and eight voice line interface circuits. Each line interface circuit consists of a codec, a hybrid circuit (2 to 4 wire converter), line feed circuitry and relays to control modes of operation.

6.2.1.1 Card Jumper/Switch Settings

The FXO-C 2W*8-6 Coin Card has the following jumpers on the motherboard. JP1, JP103, JP203, JP303, JP403, JP503, JP603, JP703 and JP803 - Global Metering Signal Frequency Selection (12/16 kHz).
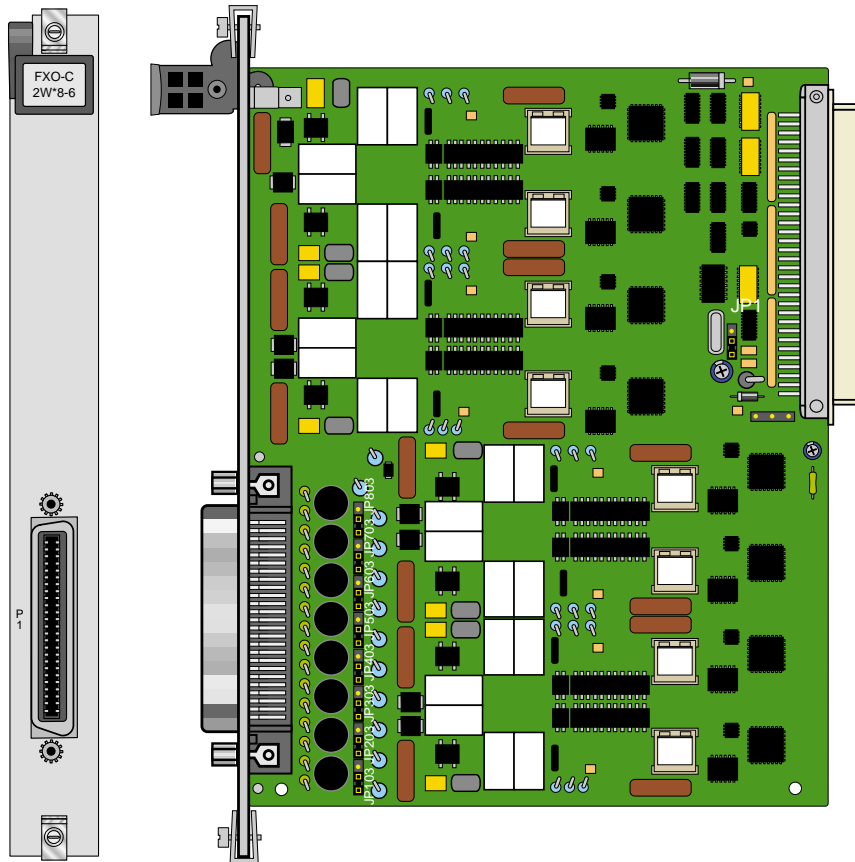
Figure 6-1.Jumpers Settings for FXO Coin Card

6.2.1.2 Installing the FXO-C 2W*8-6 Card

Install the FXO Coin Card in any user card slot. These slots are U1 to U8 on the two-sided chassis and front-loading chassis with power supplies on top, or P1 to P4 and W1 to W4 on the front-loading chassis with power supplies on the side.

6.3   FXO Coin Card User Screens and Settings

6.3.1   FXO Coin Card Main Screen

FXO Coin Card setting options are displayed in columns on the FXO Coin Card screen, as shown in Figure 6-2. Table 6-1 lists the settings controlled on the screen along with the possible and default values. The settings are similar to those for other voice cards.


```
Integrated Access System - HyperTerminal                              _□×
File  Edit  View  Call  Transfer  Help

 D|ᵇ  6|ᶻ  c|ᵇ  ᵇ|

 unknown           | P3/U3   FXOC 8-600          Rev F2-0  Ser 11734 | 10-08-99 16:15


                     1      2      3      4      5      6      7      8
      STATE        stdby  stdby  stdby  stdby  stdby  stdby  stdby  stdby
      WAN          none   none   none   none   none   none   none   none
      TS           n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a
      MODE         fxoc   fxoc   fxoc   fxoc   fxoc   fxoc   fxoc   fxoc
      SIGNAL       hf-al  hf-al  hf-al  hf-al  hf-al  hf-al  hf-al  hf-al
      Rx TLP       0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
      Tx TLP       0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
      CODING       n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a
      TC CGA       idle   idle   idle   idle   idle   idle   idle   idle
      LB           off    off    off    off    off    off    off    off
      PATTRN       none   none   none   none   none   none   none   none
      HYBRID       set1   set1   set1   set1   set1   set1   set1   set1
      RATE         64K    64K    64K    64K    64K    64K    64K    64K
      ADPCM        n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a



 Save | Undo | Refresh | Copy | Test | Main
```

Figure 6-2.Typical FXO Coin Card Main Screen

The bottom highlighted line of this screen shows various actions that you can perform from the screen. You perform the desired action by pressing the associated uppercase letter key. Table 6-1 summarizes these actions. For example, after you configure the FXO coin card ports, press "**s"** to save your settings.

Table 6-1. Main Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e., test status).
Copy	Copies the contents of the current column to the next column. Useful if you change a lot of entries in one column and want to repeat those changes in subsequent columns.
Test	Initiates and monitors testing of all FXO coin card ports. Refer to the Test section of this chapter.
Main	Returns to the System Main Screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Table 6-2 summarizes the configuration settings for the FXO coin card, along with the available and factory-default option settings. The parameters and settings are also described in the following paragraphs.

Table 6-2. Main Screen Option Settings and Defaults

Parameter	User Options	Notes	Default
STATE	stdby actv		stdby
WAN	none wan (w1-1 through w4-2) serv (P1 through P3)	1	w1-1
TS	01-24 01-31	2	01
MODE	fxoc		fxoc
SIGNAL	hf-a1 hf-a2 hf-cb rb-a1 rb-a2 rb-cb	3	hf-a1
Rx TLP	-10.0 dB to +2.0 dB		0.0
Tx TLP	-10.0 dB to +5.0 dB		0.0
CODING	u-law a-inv a-law	4	u-law
TC CGA	idle busy		idle
LB	off dgtl anlg		off
PATTRN	none D-mW quiet		none
HYBRID	set1 to set8 user	5	set1
RATE	64K 24K,1 32K,1 40K,1 24K,2 32K,2 40K,2	6	64K
ADPCM	n/a P1 P2 P3		n/a

Notes:

1. Choosing **wan** allows you to choose a WAN port (w1-1 through w4-2).

2. Time slot 16 is not available if the port is assigned to an E1 WAN link whose TS 16 is programmed for **cas** or **ccs**.

3. The default is **hf-a1** for high frequency.

4. The default is **a-inv** for E1 and **m-law** for T1. These values will change depending upon the WAN link selected.

5. The default, **set1**, is the only active option. It balances to the ideal termination of 600 ohms +2.15uF. The other settings are reserved for future use.

6. Choosing a Rate other than **64K** allows you to select an ADPCM slot.

STATE

The State setting determines whether the port is active or inactive. An inactive port does not occupy a time slot on a WAN link. Set the State setting to **stdby** (standby) for ports you are not using or have not yet configured. Set it to **actv** (active) for ports that are ready for use.

WAN

The WAN setting identifies the WAN link assigned to this port. It is not necessary for all ports on the same card to be assigned to the same WAN link, or to contiguous time slots on a WAN link.

TS

The TS setting identifies the time slot on the WAN link to which this port is assigned. Values range from **1-24** for T1 links and **1-31** for E1 links. Time slot 16 is not available on E1 links that are programmed for **cas** or **ccs** signaling. For a display of the available time slots, refer to your cross-connect map for the WAN link.

MODE

The Mode setting should be determined by the type of equipment to which you connect the port. All options use two-wire balanced connections. The **fxoc** (Foreign Exchange Office Coin) option allows you to connect the system to a 2 way PBX trunk (both inbound and outbound calls) or a key system trunk.

SIGNAL

The Signal setting matches the signaling behavior of the FXOC equipment and the remote switch. Use the **loop** (Loop Start) option with telephone sets and simple PBX trunks. Use the **gs** (Ground Start) option with two-way PBX trunks because it helps to prevent glaring or call collisions. Use the **lp-fd** (Loop Start - Forward Disconnect) option with automated answering equipment. The **R2** option is provided for a CCITT R2 interface. The selection you choose must match the behavior of the station equipment and the remote central office or PBX equipment.If you selected the **dpt** option for the Mode of any port, then the three options that are supported under Type are **dpt** for standard Dial Pulse Termination signaling used in North America, **R2** for CCITT signaling used internationally and **i-R2**

(immediate R2) which provides immediate seizure acknowledgment to the network. If you selected **mrd** as the Mode, then Type will automatically default to **mrd**.The Signal setting matches the signaling behavior of the FXOC equipment and the remote switch. These settings are **hf-a1**(high frequency - 12kHz), **hf-a2** (high frequency - 16kHz), **hf-cb** (high frequency-clear back), **rb-a1** (reverse battery-answer 1), **rb-a2** (reverse battery-answer 2), and **rb-cb** (reverse battery-clear back).

CAUTION!

Before activating a port, verify the behavior expected by both the station equipment and the remote central office equipment and ensure that you have the system properly configured.

Rx TLP

The Receive Transmission Level Point setting controls the amount of gain or attenuation added to signals after they are decoded to analog signals. To increase the signal level, set the Rx TLP setting to a positive number (i.e., the larger the number, the more gain is added). To decrease the signal level, set the Rx TLP setting to a negative number (i.e., the more negative the number, the more the signal level is decreased). For example, an incoming signal at -5 dBm can be increased to -3 dBm by setting Rx TLP to +2 dB. Acceptable values range from **-10.0 dB to +2.0 dB**.

Tx TLP

The Transmit Transmission Level Point setting controls the amount of gain or attenuation added to signals after they are received from the local analog port and before they are encoded to digital PCM signals. To increase the signal level, set the Tx TLP setting to a negative number (i.e., the more negative the number, the more gain is added). To decrease the signal level, set the Tx TLP setting to a positive number (i.e., the more positive the number, the more the signal level is decreased). For example, an incoming signal at -5 dBm can be increased to -2 dBm by setting Tx TLP to -3 dB. Acceptable values range from **-10.0 dB to +5.0 dB**.

CODING

The Coding setting sets the PCM companding method used for a port. Generally, the North American T1 environment uses **m-law** coding. The International E1 environment uses **a-law** or **a-inv** (inverted A-law) coding, and **a-inv** provides a higher ones density than **a-law**. The coding default is determined by the type of card in the WAN port you select.

TC CGA

The Trunk Conditioning during Carrier Group Alarm setting defines whether the FXOC port should be placed in **idle** or **busy** mode upon declaration of a Carrier Group Alarm (CGA) on the WAN link to which the port is assigned. In most cases, you should set this parameter to **busy**. If a call is in progress when the CGA alarm is received, the system will hold the call for two seconds, drop it and then busy out the port to the attached PBX for the duration of the alarm. Once the alarm clears, the system will automatically place the port back in **idle** mode thereby making it available to the attached PBX.

LB

The Loopback setting sets the loopback for this circuit to **off**, **dgtl** (digital), or **anlg** (analog). Figure 6-3 illustrates the loopback options.
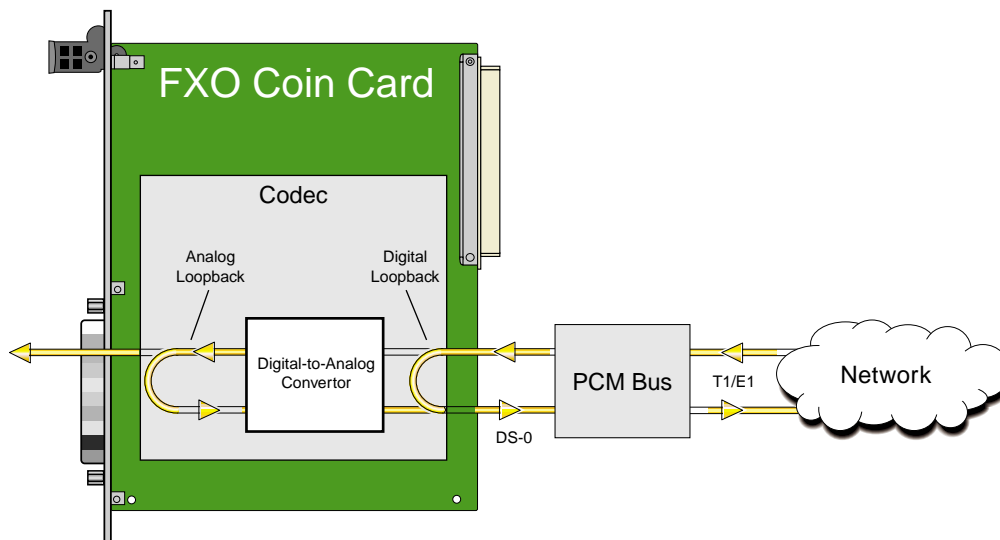
Figure 6-3.FXO Coin Card Loopbacks

PATTRN

The Pattern setting sets the outgoing test pattern for this analog port. The pattern, generated by the system, is sent only to the currently selected port. The **none** option disables sending a test pattern. The **D-mW** (Digital milliwatt) option sends a 1 kHz tone at 0.0 dBm. The Rx TLP setting affects the D-mW signal level. The **quiet** option places a 900Ω termination on the line so that no analog signal is sent.

HYBRID

The Hybrid option assigns a three byte pattern to define the adjustment for return loss (similar to Build Out Capacitors). The default, **set1**, balances to the ideal termination of 900Ω @ 2.15mF, in the case of the 8134 and 8138 cards and to 600Ω @ 2.15mF, in the case of the 8135 and 8139 cards. The other settings are reserved for future use.

RATE

The Rate parameter allows you to utilize the voice compression capabilities of the ADPCM resource card. If that card is not present in the system, changes cannot be made to this setting. The **64K** option (default) does not use ADPCM resources (it is the normal operation rate for voice circuits).

ADPCM voice channels are assigned in pairs by designating two voice ports (E&M, FXOC or FXS) to the same WAN link and time slot and selecting rate settings for the pair that add up to 64Kbps (i.e., [24K,1+40K,2], [32K,1+32K,2] and [40K,1+24K,2]). The numeral 1 after the rate setting assigns that portion of the voice port pair to the odd side of the ADPCM pair. The numeral 2 after the rate setting assigns that portion of the voice port pair to the even side of the ADPCM pair.

For more information about voice port assignments to the ADPCM card, please refer to the *ADPCM* chapter in *Server Cards Reference Guide*.

ADPCM

The ADPCM parameter lets you choose the ADPCM card on which to place this FXO port. The default setting is **n/a** and only changes when a Rate smaller than **64k** is selected (see above). You can then select which ADPCM card to use for the port (assignment is made by chassis slot number). The options are **P1**, **P2,** and **P3**.

6.3.2   Test Screen

The Test option facilitates testing and maintenance by allowing the user to monitor and set the status of the analog interface leads as well as monitoring and setting the value of the A, B, C and D signaling bits of all FXOC circuits on that card. In cross-connect systems only, the test option also allows the user to apply test patterns and tones towards the user and network sides of the system.

Figure 6-4 shows the FXO Coin Card Test parameters and Table 6-4 shows the settings for each.
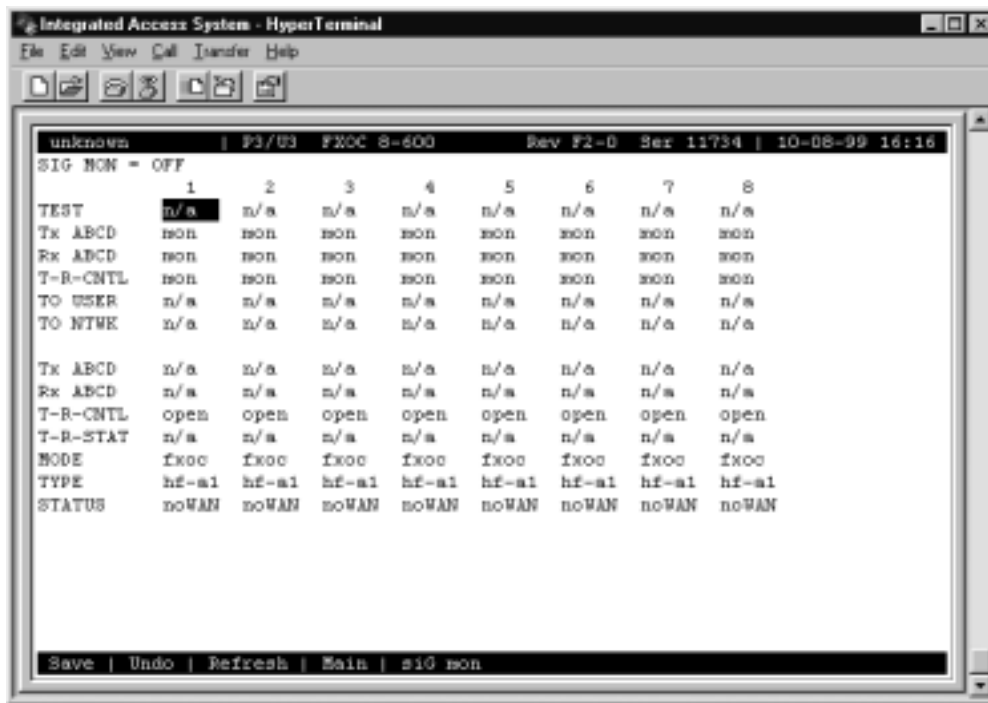
Figure 6-4.Typical FXO Coin Card Test Screen

Table 6-3. Test Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e. performance and test data).
Main	Returns to the main terminal screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.
siGmon	The signal monitor is used with the user card alarm system to notify the user of excessive transitions of signaling bits.

Table 6-4. Test Screen Option Settings and Defaults

Parameter	User Options	Default
SIG MON	off on	off
TEST	off on	off
Tx ABCD	mon set	mon
Rx ABCD	mon set	mon
T-R-CNTL	mon set	mon
TO USER	PCM 300Hz 1kHz 3kHz quiet	PCM
TO NTWK	PCM 300Hz 1kHz 3kHz quiet	PCM
Tx ABCD	Status information only; not editable	n/a
Rx ABCD	Status information only; not editable	n/a
T-R-CNTL	Status information only; not editable	n/a
T-R-STAT	Status information only; not editable	n/a
MODE	Status information only; not editable	n/a
TYPE	Status information only; not editable	n/a
STATUS	Status information only; not editable	n/a

SIG MON

The Signaling Monitor feature works with the user card alarm system to detect excessive
signaling bit transitions. The system will generate alarms if the number of transitions of any
signaling bit in transmit or receive direction for an active port exceeds 255 in any four second
interval. The options are **off** and **on**, and they are toggled using the G command in the Menu
of Actions.

TEST

The Test Parameter shows if the port is in the test mode or not. Inactive ports and ports that
are assigned to inactive WANs will show a test status of **n/a**. The test status options for active
ports are **off** and **on**.

Tx ABCD

The Transmit ABCD setting allows you to either monitor the status of the ABCD signaling
bits being transmitted towards the network or set a specific ABCD pattern for testing the
transmit side of the circuit. The option for this field is **mon** (monitor).

Rx ABCD

The Receive ABCD setting allows you to either monitor the status of the ABCD signaling bits
being received from the network or set a specific ABCD pattern for testing the receive side of
the circuit. The option for this field is **mon** (monitor). The Rx ABCD bits cannot be set in
bus-connect systems and the only option is **mon** (monitor).

T-R-CNTL

The Tip and Ring Control setting allows you to only monitor **mon** the state of the Tip and Ring leads of an FXO port.

TO USER

In cross-connect systems only, the **To User** parameter allows you to break the circuit and send a test tone toward the user side of the system. The options for this field are **PCM**, **300Hz**, **1 kHz**, **3 kHz** and **quiet**. Selecting **PCM** means that you do not want to inject a tone toward the user and that the PCM signal received from the network should continue to be sent to the user port in the normal manner.

This parameter is not supported in bus-connect systems and will always appear as **n/a**.

TO NTWK

In cross-connect systems only, the **To Network** parameter allows you to break the circuit and send a test tone toward the network side of the system. The options for this field are **PCM**, **300Hz**, **1 kHz**, **3 kHz** and **quiet**. Selecting **PCM** means that you do not want to inject a tone toward the network and that the PCM signal received from the user port should continue to be sent to the network in the normal manner.

This parameter is not supported in bus-connect systems and will always appear as **n/a**.

Tx ABCD

The Transmit ABCD setting allows you to either monitor the status of the ABCD signaling bits being transmitted towards the network or set a specific ABCD pattern for testing the transmit side of the circuit. The options for this field are **mon** (monitor) or **set**. Choosing **set** will bring up a four digit field for you to input the ABCD pattern you want to transmit. Any four digit combination of ones and zeros is acceptable for this setting.

Rx ABCD

The Receive ABCD setting allows you to either monitor the status of the ABCD signaling bits being received from the network or set a specific ABCD pattern for testing the receive side of the circuit. The options for this field are **mon** (monitor) or **set**. Choosing **set** will bring up a four-digit field for you to input the ABCD pattern you want to receive. Any four digit combination of ones and zeros is acceptable for this setting.

T-R-CNTL

The Tip and Ring Control information field shows the current status of the Tip and Ring leads of the FXOC port from the perspective of the system. The possible values are:

- **loop -** the Tip and Ring leads are tied together
- **open -** the Ring lead is not connected to either the Tip or to ground
- **rgnd -** the Ring lead is grounded
- **lpgnd -** the Tip and Ring leads are tied together and the Tip is grounded
- **ring** - ringing voltage is being applied between the Tip and Ring

T-R-STAT

The Tip and Ring Status information field describes what the attached device is doing with the Tip and Ring leads of the FXO port. The possible values are:

ring (attached device is applying ringing voltage between Tip and Ring)

TbRg (attached device is applying -48V battery to Tip and grounding Ring)

ToRo (attached device is leaving both the Tip and Ring leads open)

TgRo (attached device is grounding the Tip lead and is leaving the Ring lead open)

RbTg (attached device is applying -48V battery to Ring and grounding Tip)

RbTo (attached device is applying -48V battery to Ring and leaving Tip open)

TgR* (attached device is grounding Tip, and the Ring lead state is unknown)

ToR* (attached device is leaving Tip open, and the Ring lead state is unknown)

RoT* (attached device is leaving Ring open, and the Tip lead state is unknown)

n/a (information is not available)

MODE

The Mode information field shows the current mode of the port that was selected on the main FXOC card Screen. Valid settings are **fxoc.**

TYPE

The Type information field shows the current status of the signal field selected on the main FXOC card screen for this port. Valid settings for both **fxo** and **fxodn** modes are **loop** (loop), **gs** (ground start), **lp-fd** (loop start-forward disconnect) and **R2** (R2). Valid settings for the **dpt** mode are **dpt** (dial pulse terminating), **R2** (R2) and (**i-R2**) immediate R2). The only valid setting for the **mrd** mode is **mrd** (manual ringdown).

STATUS

The Status information field shows the current status of the port. Table 6-5 lists and describes all of the possible conditions that are reported in this field.

Table 6-5. Status Information Field Settings

Setting	Meaning
stdby	The FXOC port is in standby.
W stb	The WAN that the FXOC port is assigned to is in standby.
W tst	The WAN that the FXOC port is assigned to is in test.
W OOS	The WAN that the FXOC port is assigned to is Out Of Service.
noWAN	There is no WAN card configured in the slot to which the FXOC port is assigned.
call	Call set-up is in progress.
busy	A call is in progress.
idle	The FXOC circuit is not being used and is available.
TC	The FXOC circuit is undergoing Trunk Conditioning because of a CGA alarm on the WAN to which it is assigned.
test	The operator is actively controlling the circuit by setting values for Tx ABCD or Rx ABCD.
maint	The FXOC port is in maintenance condition.

6.4   FXO Coin Card Error Messages

Refer to Appendix B in the System Reference Guide for further information on Error
Messages regarding this card.

6.5   FXO Coin Card Troubleshooting

The FXO coin card may be faulty if a voice signal is not received at one end of a circuit, or if
signaling is not detected. The following are possible causes:

- Faulty receiving CPE at the near end (where the problem was first noticed)
- Faulty transmitting CPE at the far (opposite) end
- Faulty cabling between the CPE and FXO coin card at the near end
- Faulty cabling between the CPE and FXO or FXS coin card at the far end
- T1 or E1 network failure
- Improper card configuration at either end (e.g., time slot and/or WAN port assignments)

First, verify that the T1 or E1 network has not failed. Check for a CGA-Red alarm on the
associated WAN port at the end where the incoming VF signal loss is first noticed. The CGA
indicates that the incoming network signal was lost (or that the receiving WAN port is out of
frame). During the CGA, all voice ports with time slots on that WAN port will also be
disabled, and the associated far-end WAN port will be in a CGA-Yellow alarm state. If the
network is faulty, you must clear that trouble to restore your circuits.

If the network is okay, verify that the proper WAN ports and time slots are assigned to the
associated FXO and FXS voice ports at both ends, as previously outlined in this chapter. In a
point-to-point network, the near-end and far-end FX card ports should both be assigned the
same WAN port and time slot number. Also make sure the other parameters (such as the
transmit and receive TLPs) are set properly at both ends.

If the FX card port parameters are correct at both ends, and if the network is okay, the trouble
is isolated to the FXO coin card or the associated port. Proceed as follows:

1. At the far end, activate an analog loopback on the FX card port.

2. Send a 0 dBm (digital milliwatt) test signal toward the CPE at that end. That signal will
   be substituted for the normal signal coming from the far-end CPE; it will be sent back
   to the CPE at your end via the loopback path.

3. Check your CPE for this signal. If it is present, the far-end CPE or cabling to the far-end
   FX card is probably faulty. Disable the loopback and test signal there, and fix the
   problem. If you still don't receive a signal, go to step 4.

4. At your end, go to the FXO Coin Card Main Screen and send a digital milliwatt test tone (0 dBm) toward the CPE. If you still don't receive a signal, check the cabling from the FXO coin card to your CPE, and check the CPE itself. If those items are okay, replace the FXO coin card at your end.

5. If the FXO coin card is determined to be faulty, replace it and return the faulty unit for repair to the location specified by your distributor.

Chapter 7
Low Bit Rate Voice Card

7.1   Introduction

This chapter provides installation, configuration, and troubleshooting information for the Low Bit Rate Voice Cards, LBRV-8 FAX (8300) and LBRV-16 FAX (8310).

7.2   LBRV-8 FAX Card Description

7.2.1   LBRV-8 FAX Card Description (8300)

The LBRV-8 FAX Card is a plug-in user card for the CPU server which provides voice compression with echo cancellation and Group 3 fax relay capabilities for up to eight 64Kbps voice ports. This card will accept input directly from voice cards, or voice traffic on WAN links through the Server. The LBRV card requires a matching card (one for voice compression only, or one to include fax capabilities) at the other end to decompress the voice channels to 64Kbps operation.

7.2.1.1   Card Jumper/Switch Settings

The LBRV-8 FAX Card doesn't have any jumpers or switches on its mainboard.

7.2.1.2   Installing the LBRV-8 FAX Card

Each system can have up to three LBRV-8 FAX cards installed.

7.3   LBRV-8 FAX Card User Screens and Settings

7.3.1   LBRV-8 FAX Card Main Configuration Screen

You must configure the Low Bit Rate Voice Card for operation after installing it into the system chassis. This will allow the configuration of the three CPipes to the desired settings. This screen will also allow access to the Wan-Voice Circuit screen by pressing "**W**" (**Wan-voice**). The Performance screen by pressing "**P**" (**Perf**) and the LMI screen by pressing "**L**" (**Lmi**). The compressed voice traffic can be encapsulated to any of the active CPipes: 1 through 3. The CPipes can be directed to either a WAN or an FRS server card or directly to a Frame Relay Network.
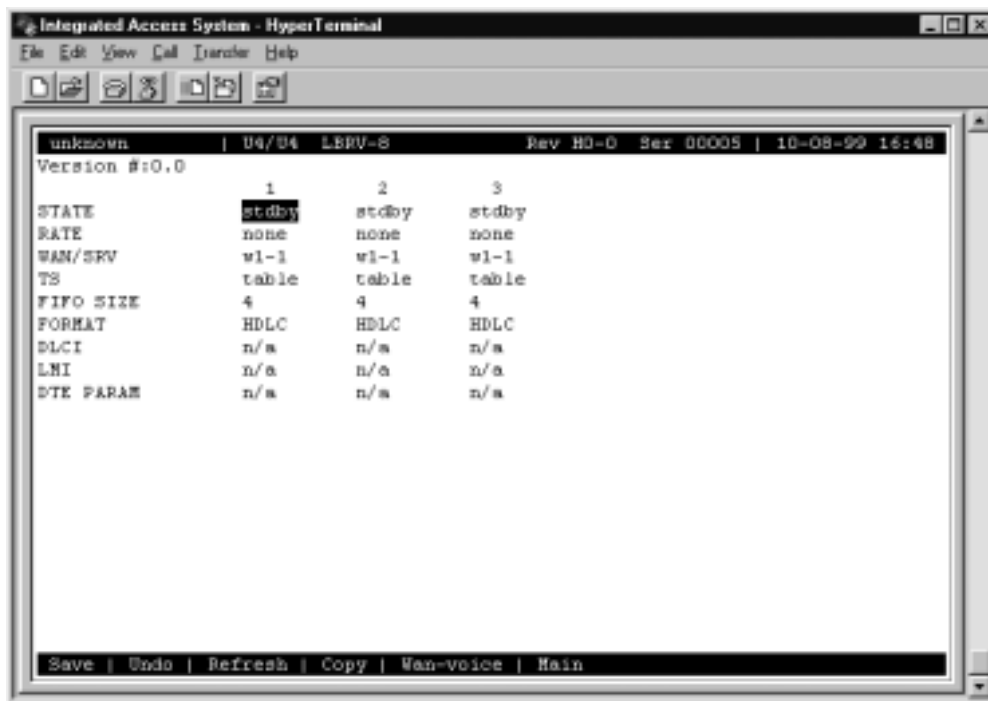

Figure 7-1.LBRV-8 FAX Card Main Configuration Screen

The bottom highlighted line of this screen shows various actions that you can perform from this screen. You perform the desired action by pressing the associated uppercase key. Table 7-1 summarizes these actions. For example, after you configure the Low Bit Rate Voice Card ports, press "**s**" to save your settings.

Table 7-1. LBRV-8 FAX Card Main Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e., test status),
Copy	Copies the contents of the current column to the next column. Useful if you change a lot of entries in one column and want to repeat those changes in subsequent columns.
Perf	Displays the Performance screen for the CPipe on which the cursor is positioned.
Lmi	Displays the LMI screen for the CPipe on which the cursor is positioned.
Wan-voice	Displays the Wan-voice configuration screen.
Main	returns to the Systems Main Screen. If changes are made to settings and not saved, you will be prompted to either save or lose your changes.

Table 7-2 summarizes the configuration settings for the Lot Bit Rate Voice Card, along with the available and factory-default option settings. The parameters and settings are also described in the following paragraphs.

Table 7-2. LBRV-8 FAX Card Main Screen Option Settings and Defaults

Parameter		User Options	Default
STATE		stdby actv	stdby
RATE		1x64 2x64 3x64 none	none
WAN/SRV	WAN FRS	w1-1 w1-2 w2-1 w2-2 w3-1 w3-2 w4-1 w4-2 Pxyy x=1-3 yy=C1-C4, 01-64	w1-1
TS		table n/a 1-24 (T1) 1-31 (E1)	table
FIFO SIZE		1 - 10	4
FORMAT		HDLC frame	HDLC
DLCI		16 - 1023 n/a	n/a
LMI		ansi ccitt lmi n/a	n/a
DTE PARAM		n/a enabled	n/a
FAX/VOICE RATE		9.6/8 7.2/8	9.6/8
TC DELAY (SECONDS)		notc 0.5 1 2 3 4 5 6	6

STATE

The State setting determines whether the port is active or inactive. An inactive port does not occupy a time slot on a WAN link. Set the state setting to **stdby** (standby) for ports you are not using or have not yet configured. Set it to **actv** (active) for ports that are ready for use.

RATE

The RATE field displays the compressed rate of the CPipes. The values are **1x64** for 64Kbps pipes, **2x64** for 128Kbps pipes and **3x64** for 192 Kbps pipes. The default is 1x64.

WAN/SRV

The WAN/SRV setting identifies the WAN link or server card assigned to this CPipe. If you choose **wan**, you also must select the desired WAN Link (**w1-1** through **w4-2**) of a WAN card for transmission over a T1 or E1 link.

If **serv** is chosen, then the compressed data form this CPipe will be directed to **Pxyy** (**x**=1-3, a server Resource card plugged into one of the P1, P2 or P3 slots; **yy**=C1-C4, or 01-64, one of the logical ports available for reach server card). The Pxyy is not the only setting required. To complete the rest of the settings the user must go to the server screen and define the rest of the parameters. The server configuration here is incomplete.

These CPipes are identified by **UxCy** (**x**=1-8 for user card slot number, and y=1-3 for the CPipe number) in the FRS card screen.

If the WAN/SRV field is set for FRS Server but the circuit at the FRS Server is taken already, then the message will be: "Port is in use. Please press any key to continue." If the WAN/SRV field is changed while a CPipe is **active**, then the CPipe becomes **standby**.

TS

When the WAN/SRV field is assigned to be WANx-y (x=1-4, y=1-2), this field allows selecting the specific time slots for the CPipe. The time slot is provided for this selection. If WAN x-y is equipped with either a CSU or DSX module, the options are **1-24**. If a CEPT module is installed on that link, the options are **1-15** and **17-31**. If the WAN/SRV field is assigned to be server, the setting will show **n/a**.

- The number of time slots available for selection from the table is as follows:
- If one time slot is selected form the table, then the RATE field is set to 1x64.
- If two time slots are selected form the table, then the RATE field is set to 2x64.
- If three time slots are selected form the table, then the RATE field is set to 3x64.

FIFO SIZE

The FIFO Size should be set to an estimated failure rate of the compressed data network in units of 24 ms. If the Performance screen shows significant Rx underflows, the Fifo size should be increased. The Fifo size option is a number from **1** to **10** that will be entered in this field.

FORMAT

The **format** setting identifies the type of format used for this CPipe. The options are: **HDLC, Frame Relay,** and **n/a**. HDLC option will be used when the CPipe traffic is directed to the wan card, toward the T1/E1 network, or the Frame Relay server. Frame Relay option will be used when the CPipe traffic is directed toward the frame relay network or the Frame Relay Server.

DLCI

If the Format field is set to Frame Relay, then this field must be configured. Otherwise, it will show **n/a**. The DLCI (Data Link Connection Identifier) identifies the frame logical connection's within the frame relay. The option is a number from **16** to **1023** that will be entered in this field.

LMI

If the Format field is set to Frame Relay, then this field must be configured. Otherwise, it will show **n/a.** The Local Management Interface setting allows the user to select protocol to be used by this pipe. The options are **ansi**, **ccitt**, and **lmi**.

DTE PARAM

If the Format field is set to **Frame Relay**, then this field must be configured. Otherwise, it will show n/a. The port type for the LBRV is always **u-dte** for CPipes directed to the FRS card.

The user may choose from the following options:

- Error Threshold (N392)
- Poll Interval Timer (T391)
- Events Counter (N393)
- Full Status Frequency (N391)

The Error Threshold (N392) counts the errors that will be tolerated during the last number of events as set by the Events Counter before declaring that the LMI link is down. The number of errors options are 1-10. The default is **3**.

The Poll Interval Timer (T391) allows the user to select the time interval (in seconds) that should elapse between "keep alive" messages sent from the corresponding DCE. The number of seconds options are 5-30. The default is **15** seconds.

The Events Counter (N393) allows the user to select the window size from the number of events (frames) in which errors will be counted. If Error Threshold (N392) is exceeded within last N393 frames, the link is declared down. The number of events counted are 1-10. The default is **4.**

The Full Status Frequency (N391) allows the user to select the number of "keep alive" messages (see T391 above) that should elapse before the full status inquiry message is sent. The number of messages are 1-255. The default is **6.**

FAX/VOICE RATE

The fax/voice rate setting selects the combination of maximum fax transmission rate and the voice compression rate. Currently, the user may select maximum fax rates of 9.6 Kbps or 7.2 Kbps and a voice compression rate of 8 Kbps by selecting **9.6/8** option or **7.2/8** option respectively. This setting is available for fax bandwidth conservation if needed.

TC DELAY (SECONDS)

The Trunk Conditioning Delay allows the user to select the time interval (in seconds) that should elapse without receiving data packets before declaring that the trunk is down. If the trunk is declared to be down, then trunk conditioning is enabled. It will then put a busy/idle state on the AB or ABCD signaling bits for two seconds, and then put a busy/idle state on the signaling bits for the duration of the trunk down time depending on the TC CGA\ user selection. E&M, FXO loop start, FXS loop start, and plar signaling are supported. The LBRV-8 FAX will send a PCM all ones pattern to the (uncompressed) voice ports. If the "no TC" option is selected, then trunk conditioning is disabled.

7.3.2   LBRV-8 FAX Wan-Voice Time Slots Configuration Screen

Figure 7-2 shows the Wan-Voice Time Slots Configuration Screen. By Pressing "W" from Main Screen on any of the CPipe columns will display this screen.

The user voice time slots must be configured for LBRV-8 FAX compression from the user card screens.

The number 1-8 at the top of the screen represent the eight LBRV-8 FAX ports. Each port compresses one 64 Kbps voice traffic channel.
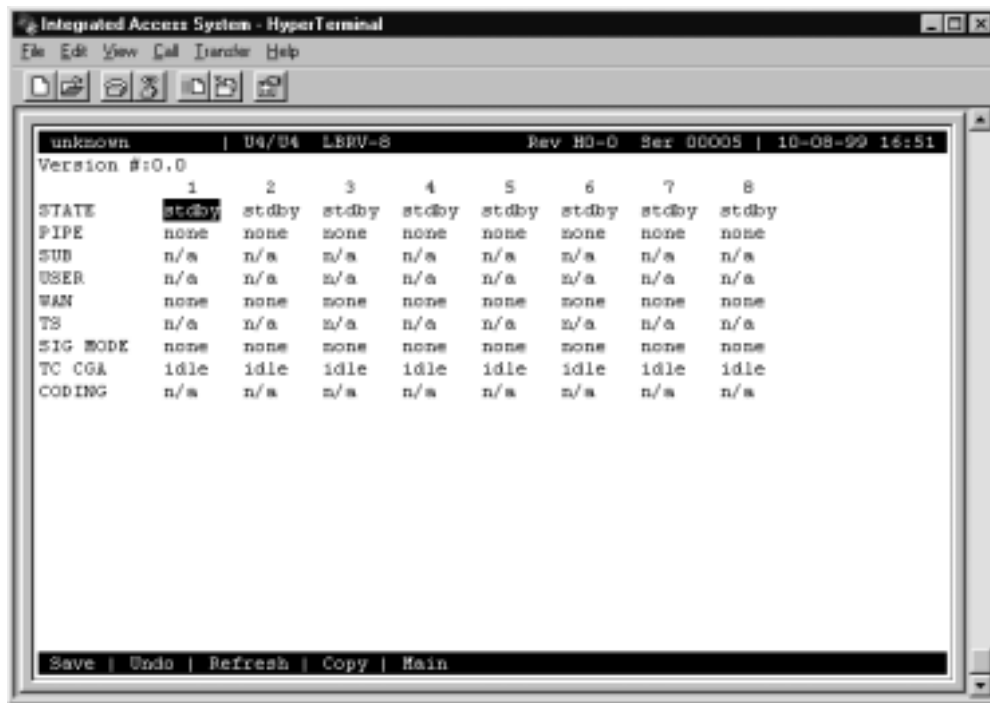
Figure 7-2. Wan-Voice Time Slots Configuration Screen

Table 7-3. Wan-Voice Time Slots Configuration Screen Menu of Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e. performance and test data).
Copy	Copies the contents of the current column to the next column. Useful if you change a lot of entries in one column and want to repeat those changes in subsequent columns.
Main	Returns to the main terminal screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Table 7-4. WAN-Voice Time Slots Setting Options and Defaults

Parameter	User Options	Default
STATE	stdby actv	stdby
PIPE	none 1 2 3	none
SUBCHANNEL	1-8 n/a	n/a
USER	n/a uX-01 through uX-08	n/a
WAN	n/a w1-1 w1-2 w2-1 w2-2 w3-1 w3-2 w4-1 w4-2 none	none
TS	n/a 01-24 01-31	n/a
SIG MODE	e&m fxs plar fxo none	none
TC CGA	n/a idle busy	idle
CODING	n/a u-law a-inv	n/a

STATE

The State setting determines whether the port is active or inactive. An inactive port does not occupy a time slot on a WAN link. Set the state setting to **stdby** (standby) for ports you are not using or have not yet configured. Set it to **actv** (active) for ports that are ready for use.

Note: *Voice ports cannot be assigned from the LBRV-8 FAX screen, but must be assigned from their respective cards.*

PIPE

The Pipe field refers to the CPipe through which the compressed data will be transmitted. The pipe number can range from **1** to **3.**

SUB

The Sub field refers to the subchannel within a CPipe to which the port is assigned. The system will limit the number of subchannels within a CPipe as follows: 1-6 (1-5 for 9.6/8 Fax/Voice Rate) for 64 Kbps, 1-8 for 128 Kbps, and 1-8 for 192 Kbps. If the user selects a sub-channel that is not available, then the system will prompt: **"Sub-channel already in use. Press any key to continue."** If the user selects an invalid subchannel number, then the system will prompt: **"Value out of range. Press any key to continue."**

USER

The User display identifies the User card and port connected to this LBRV-8 FAX port. If a WAN time slot is being assigned then this setting will show **n/a.** For already assigned voice channels (from a voice card) this field will display the voice card slot and port numbers (i.e. **u5-2** for card in slot U5 and port 2). This is a display field only and is assigned from the respective user card.

WAN

The WAN setting identifies the WAN link assigned to this port. It is not necessary for all ports on the same card to be assigned to the same WAN link, or to contiguous time slots on a WAN link.

TS

The TS setting identifies the time slot on the WAN link to which this port is assigned. Values range from **1-24** for T1 links and **1-31** for E1 links. Time slot 16 is not available for E1 links that are programmed for **cas** or **ccs** signaling. For a display of the available time slots, refer to your cross-connect map for the WAN link selected (see the System Operations chapter for information about viewing cross-connect maps).

SIG MODE

If the assignment of the port is from a WAN, then the options are **e&m, fxs, plar, fxo,** and **none.**

When the assignment is from a voice card, this field is **e&m, fxs, plar, or fxo** and cannot be changed from this screen.

TC CGA

The Trunk Conditioning during Carrier Group Alarm setting defines whether the E&M port should be placed in **idle** or **busy** mode upon declaration of a Carrier Group Alarm (CGA) on the WAN link to which the port is assigned. The TC CGA setting has no effect on **to** (Transmission Only) circuits.

CODING

The Coding setting sets the PCM companding method used for a port. In general, in the T1/North American environment use **m-law** coding. In the E1/International environment use **a-law** or **a-inv** (inverted A-law) coding; **a-inv** provides greater 1s density than **a-law**. The coding default is determined by the type of card in the WAN port you select.

7.4   LBRV-16 FAX Card Description

7.4.1   LBRV-16 FAX Card Description (8310)

The LBRV-16 FAX Card provides the same features and functionality as the LBRV-8 FAX (8300) card with the addition of faster access time from 15nsec to 12nsec. The new LBRV-16 FAX card supports voice compression algorithm at 7.3kbps allowing 8 channel packing into a single 64kbps DS0. End-to-end R2 signaling can be supported through LBRV-16 FAX card if clear channel signaling is used. Common channel signaling cannot be supported since the compression algorithm intended for voice cannot transparently pass signaling in the same time slot.

7.4.1.1   Card Jumper/Switch Settings

The LBRV-16 FAX Card has jumpers JP11 and JP12 on its mainboard. These jumpers must be set to the OFF position as illustrated in Figure 7-3 below.

Set Jumpers JP11 and JP12 to the OFF position
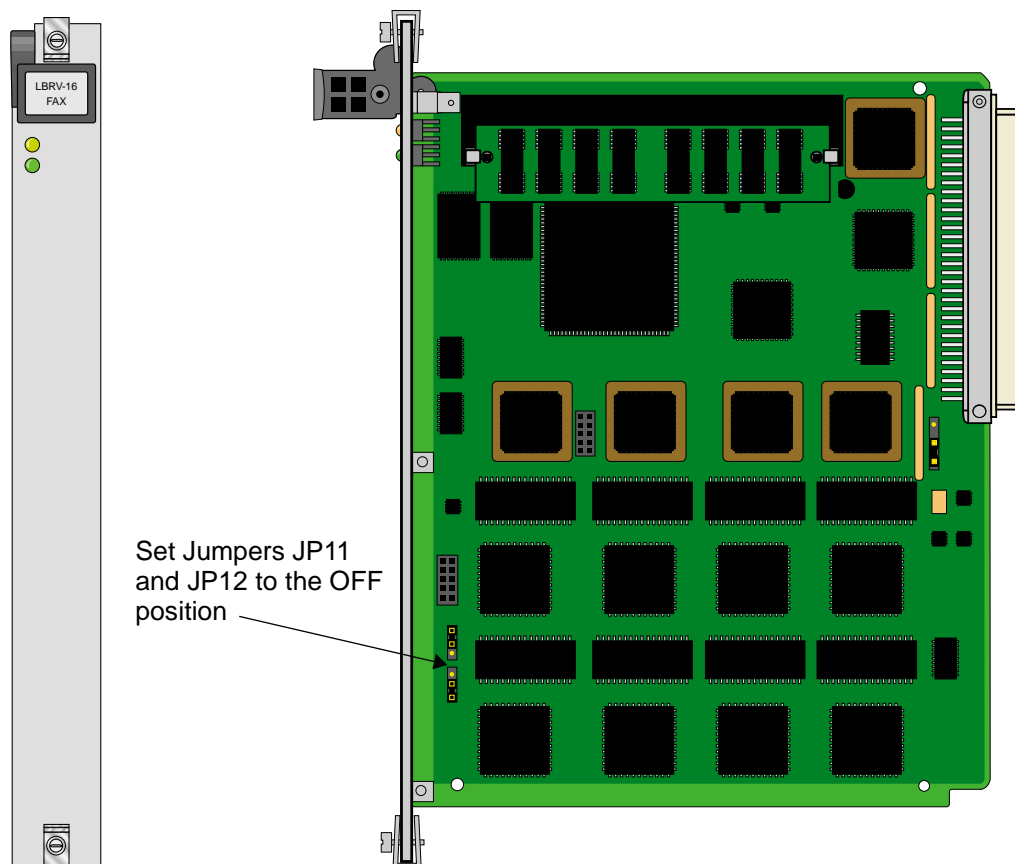
Figure 7-3.LBRV-16 FAX Card Jumper Settings

7.4.1.2   Installing the LBRV-16 FAX Card

Each system can have up to three LBRV-16 FAX cards installed.

7.5   LBRV-16 FAX Card User Screens and Settings

7.5.1   LBRV-16 FAX Card Main Configuration Screen

You must configure the Low Bit Rate Voice Card for operation after installing it into the system chassis. This will allow the configuration of the three CPipes to the desired settings. The screen will also allow access to the Performance screen by pressing "**P**" (**Perf**) and the LMI screen by pressing "**L**" (**Lmi**). The Wan-Voice Circuit screen by pressing "**W**" (**Wan-voice**). The compressed voice traffic can be encapsulated to any of the active CPipes: CPipe 1 through CPipe 3. The CPipes can be directed to either a WAN or an FRS server card or directly to a Frame Relay Network.

Figure 7-4.LBRV-16 FAX Card Main Configuration Screen

The bottom highlighted line of this screen shows various actions that you can perform from this screen. You perform the desired action by pressing the associated uppercase key. Table 7-1 summarizes these actions. For example, after you configure the Low Bit Rate Voice Card ports, press "**s**" to save your settings.

Table 7-5. LBRV-16 FAX Card Main Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e., test status),
Copy	Copies the contents of the current column to the next column. Useful if you change a lot of entries in one column and want to repeat those changes in subsequent columns.
Perf	Displays the Performance screen for the CPipe on which the cursor is positioned.
Lmi	Displays the LMI screen for the CPipe on which the cursor is positioned.
Wan-voice	Displays the Wan-voice configuration screen.
Main	returns to the Systems Main Screen. If changes are made to settings and not saved, you will be prompted to either save or lose your changes.

Table 7-2 summarizes the configuration settings for the Lot Bit Rate Voice Card, along with the available and factory-default option settings. The parameters and settings are also described in the following paragraphs.

Table 7-6. LBRV-16 FAX Card Main Screen Option Settings and Defaults

Parameter		User Options	Default
STATE		stdby actv	stdby
RATE		1x64 2x64 3x64	64
WAN/SRV	WAN FRS	n/a w1-1 w1-2 w2-1 w2-2 w3-1 w3-2 w4-1 w4-2 Pxyy x=1-3 yy=C1-C4, 01-64	w1-1
TS		table n/a	table
FIFO SIZE		1 - 10	4
FORMAT		HDLC frame	HDLC
DLCI		16 - 1023 n/a	n/a
LMI		ansi ccitt lmi n/a	n/a
DTE PARAM		n/a enabled	n/a
FAX/VOICE RATE		9.6/8 7.2/8	9.6/8
TC DELAY (SECONDS)		notc 0.5 1 2 3 4 5 6	6

STATE

The State setting determines whether the CPipe is active or inactive. An inactive CPipe does not occupy a time slot on a WAN link. Set the state setting to **stdby** (standby) for CPipe that are not being used or have not yet configured. Set it to **actv** (active) for CPipes that are ready for use.

RATE

The RATE field displays the compressed rate of the CPipes. The values are **1x64** for 64Kbps pipes, **2x64** for 128Kbps pipes and **3x64** for 192 Kbps pipes. The default is **1x64**.

Based on the value of this field, the system will limit the number of displayed subchannels on the WAN voice circuit screen as follows for **Fax 9.6: 9.6/8 1x64 5, 9.6/8 2x64 11, 9.6/8 3x64 16**, and for **Fax 7.2: 7.2/8 1x64 7, 7.2/8 2x64 15** and **7.2/8 3x64 16**.

If the WAN option is selected in the WAN/SRV field, the rate is determined by the number of time slots that are selected in the time slot field. If one time slot is selected, the rate is 64 Kbps, if two time slots are selected, then the rate is 128 Kbps, and if three time slots are selected, then the rate is 192 Kbps. If an attempt is made to assign more than 3 time slots in the Time slots field, then "error" is displayed in the rate field.

WAN/SRV

The WAN/SRV setting identifies the WAN link or server card assigned to this CPipe. If you choose **wan**, you also must select the desired CPipe (**w1-1** through **w4-2**) of a WAN card for transmission over a T1 or E1 link.

If **serv** is chosen, then the compressed data form this CPipe will be directed to **Pxyy** (**x**=1-3, a server Resource card plugged into one of the P1, P2 or P3 slots; **yy**=C1-C4, or 01-64, one of the logical ports available for reach server card). The Pxyy is not the only setting required. To complete the rest of the settings the user must go to the server screen and define the rest of the parameters. The server configuration here is incomplete.

These CPipes are identified by **UxCy** (**x**=1-8 for user card slot number, and y=1-3 for the CPipe number) in the FRS card screen.

If the WAN/SRV field is set for FRS Server but the circuit at the FRS Server is taken already, then the message will be: "Port is in use. Please press any key to continue." If the WAN/SRV field is changed while a CPipe is **active**, then the CPipe becomes **standby**.

TS

When the WAN/SRV field is assigned to be WANx-y (x=1-4, y=1-2), this field allows selecting the specific time slots for the CPipe. The time slot is provided for this selection. If WAN x-y is equipped with either a CSU or DSX module, the options are **1-24**. If a CEPT module is installed on that link, the options are **1-15** and **17-31**. If the WAN/SRV field is assigned to be server, the setting will show **n/a**.

The number of time slots available for selection from the table is as follows:

- If one time slot is selected form the table, then the RATE field is set to 1x64.

- If two time slots are selected form the table, then the RATE field is set to 2x64.

- If three time slots are selected form the table, then the RATE field is set to 3x64.

FIFO SIZE

The FIFO Size should be set to an estimated failure rate of the compressed data network in units of 24 ms. If the Performance screen shows significant Rx underflows, the Fifo size should be increased. The Fifo size option is a number from **1** to **10** that will be entered in this field.

FORMAT

The **format** setting identifies the type of format used for this CPipe. The options are: **HDLC, Frame Relay,** and **n/a**. HDLC option will be used when the CPipe traffic is directed to the wan card, toward the T1/E1 network, or the Frame Relay server. Frame Relay option will be used when the CPipe traffic is directed toward the frame relay network or the Frame Relay Server.

DLCI

If the Format field is set to Frame Relay, then this field must be configured. Otherwise, it will show **n/a**. The DLCI (Data Link Connection Identifier) identifies the frame logical connection's within the frame relay. The option is a number from **16** to **1023** that will be entered in this field.

LMI

If the Format field is set to Frame Relay, then this field must be configured. Otherwise, it will show **n/a.** The Local Management Interface setting allows the user to select protocol to be used by this pipe. The options are **ansi** (ANSI T1.617 Annex D), **ccitt** (ITU Q.922 Annex A) and **lmi** (Group of Four Specification).

DTE PARAM

If the Format field is set to **Frame Relay**, then this field must be configured. Otherwise, it will show n/a. The port type for the LBRV-16 FAX is always **u-dte** for CPipes directed to the FRS card.

The user may choose from the following options:

- Error Threshold (N392)

- Poll Interval Timer (T391)

- Events Counter (N393)

- Full Status Frequency (N391)

The Error Threshold (N392) counts the errors that will be tolerated during the last number of events as set by the Events Counter before declaring that the LMI link is down. The number of errors options are 1-10. The default is **3**.

The Poll Interval Timer (T391) allows the user to select the time interval (in seconds) that should elapse between "keep alive" messages sent from the corresponding DCE. The number of seconds options are 5-30. The default is **15** seconds.

The Events Counter (N393) allows the user to select the window size from the number of events (frames) in which errors will be counted. If Error Threshold (N392) is exceeded within last N393 frames, the link is declared down. The number of events counted are 1-10. The default is **4.**

The Full Status Frequency (N391) allows the user to select the number of "keep alive" messages (see T391 above) that should elapse before the full status inquiry message is sent. The number of messages are 1-255. The default is **6.**

FAX/VOICE RATE

The fax/voice rate setting selects the combination of maximum fax transmission rate and the voice compression rate. Currently, the user may select maximum fax rates of 9.6 Kbps or 7.2 Kbps and a voice compression rate of 8 Kbps by selecting **9.6/8** option or **7.2/8** option respectively. This setting is available for fax bandwidth conservation if needed.

TC DELAY (SECONDS)

The Trunk Conditioning Delay allows the user to select the time interval (in seconds) that should elapse without receiving data packets before declaring that the trunk is down. If the trunk is declared to be down, then trunk conditioning is enabled. It will then put a busy/idle state on the AB or ABCD signaling bits for two seconds, and then put a busy/idle state on the signaling bits for the duration of the trunk down time depending on the TC CGA\ user

selection. E&M, FXO loop start, FXS loop start, and plar signaling are supported. The LBRV-16 FAX will send a PCM all ones pattern to the (uncompressed) voice ports. If the "no TC" option is selected, then trunk conditioning is disabled.

7.5.2   Performance Screen

Figure 7-5, shows the Performance Screen. Pressing "**P**" (**Perf**) from the CPipe Screen on any of the CPipe columns will display this screen for that CPipe.

The LBRV-16 FAX accumulates statistics to show the user the performance characteristics of each of the active pipes. Figures are kept by 15 minute (900 seconds) time increments for a total of 96 periods (24 hours). Each screen shows the current 15 minute segment and the past 12 periods with totals at the bottom of the column. Pressing the "**D**" (**pgDn**) key allows the user to scroll backward through the previous 96 periods. After each period, the oldest 15 minute segment (after 24 hours) is discarded. Since information is not updated on screen in "real" time, the user must press the "**R**" (**Refresh**) key periodically to obtain up-to-date statistics.

Figure 7-5.LBRV-16 FAX Card Performance Screen

PIPE

The Pipe setting shows the pipe number associated with the performance statistics on this screen. This was the port highlighted on the Main screen when the "P" key was pressed.

PCKT RX

The Packet received column tabulates the total number of packets received during the 15 minute period.

PCKT TX

The Packet transmitted column tabulates the total number of packets transmitted during the 15 minute period.

OCTETS RX

The Octets received column tabulates the total number of octets received during the 15 minute period.

OCTETS TX

The Octets transmitted column tabulates the total number of octests transmitted during the 15 minute period.

DRPRX

The Dropped (frame) received column tabulates the total number of frames dropped on the pipe while being received.

DRPTX

The Dropped (frame) transmitted column tabulates the total number of frames dropped before being transmitted during the 15 minute period.

RX UF

The Receive underflow column tabulates the total number of underflows in the receive FIFO during the 15 minute period. This value may be used to adjust the receive Fifo size as necessary.

STATUS

The Status column shows different status conditions of the port during the 15 minute period. The status codes are listed at the bottom of the screen. The status codes are: **S** (Standby), **F** (Frame), **T** (DTE down), and **C** (Trunk Conditioning).

Table 7-7. LBRV-16 FAX Card Performance Screen Actions Menu

Action	Function
Refresh	Since performance statistics are not updated on scree in "real" time, the refresh key must be pressed to obtain updated performance figures.
Clear	Clears all performance statistics for the highlighted port.
pgUp	Scrolls up through the 96 time segments.
pgDn	Scrolls down through the 96 time segments.
Main	Returns to the LBRV CPipe configuration screen.

7.5.3   LBRV LMI Screen

Local Management Interface information is display on the LMI screen, as shown in Figure 7-6.
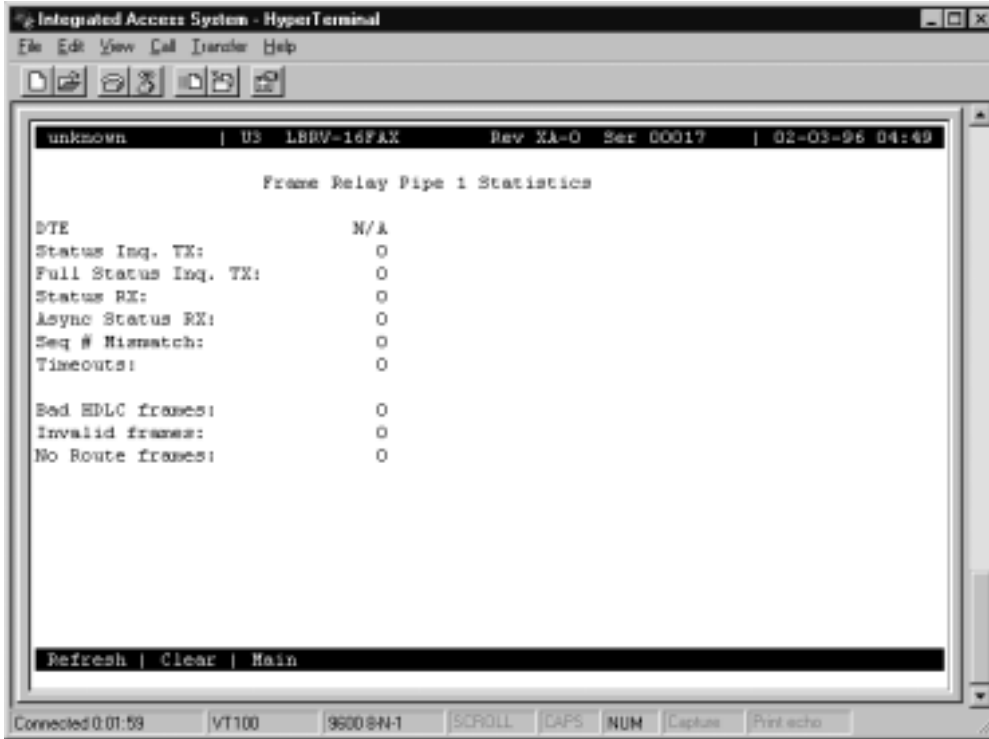
Figure 7-6.LBRV-16 FAX LMI Screen

STATUS INQ. TX

The Status Inquiry Transmitted figure shows the total number of status inquiry requests sent by the DTE.

FULL STATUS INQ. TX

The Full Status Inquiry Transmitted figure shows the total number of full status inquiries sent by the DTE.

STATUS RX

The Status Received figure shows the total number of "keep alive" requests received by the DTE.

ASYNC STATUS RX

Asynchronous status packets received by the DTE are tabulated in this figure.

SEQ. # MISMATCH

The Sequence Number Mismatch figure shows the total number of sequence number errors that have been received by the DTE.

TIMEOUTS

The Timeouts figure shows the total number of times that expected requests from the DTE are missed.

BAD HDLC FRAMES

The Bad HDLC Frames figure shows the total number of HDLC errors received on this pipe.

INVALID FRAMES

The Invalid Frames figure shows the total number of short frames or frames with invalid headers received on this pipe.

NO ROUTE FRAMES

The No Route Frames figure shows the total number of frames received that have incorrect or unknown DLCI for the port.

Table 7-8. LBRV-16 FAX LMI Screen Actions Menu

Action	Function
Refresh	Since LMI statistics are not updated on scree in "real" time, the refresh key must be pressed to obtain updated performance figures.
Clear	Clears all LMI statistics for the highlighted port.
Main	Returns to the LBRV CPipe configuration screen.

7.5.4   LBRV-16 FAX Wan-Voice Time Slots Configuration Screen

Figure 7-7 shows the Wan-Voice Time Slots Configuration Screen. By Pressing "**W**" (**Wan-voice**) from Main Screen on any of the CPipe columns will display this screen.

The user voice time slots must be configured for LBRV-16 FAX compression from the user card screens.

The number 1-8 at the top of the screen represent the eight LBRV-16 FAX ports. Each port compresses one 64 Kbps voice traffic channel.
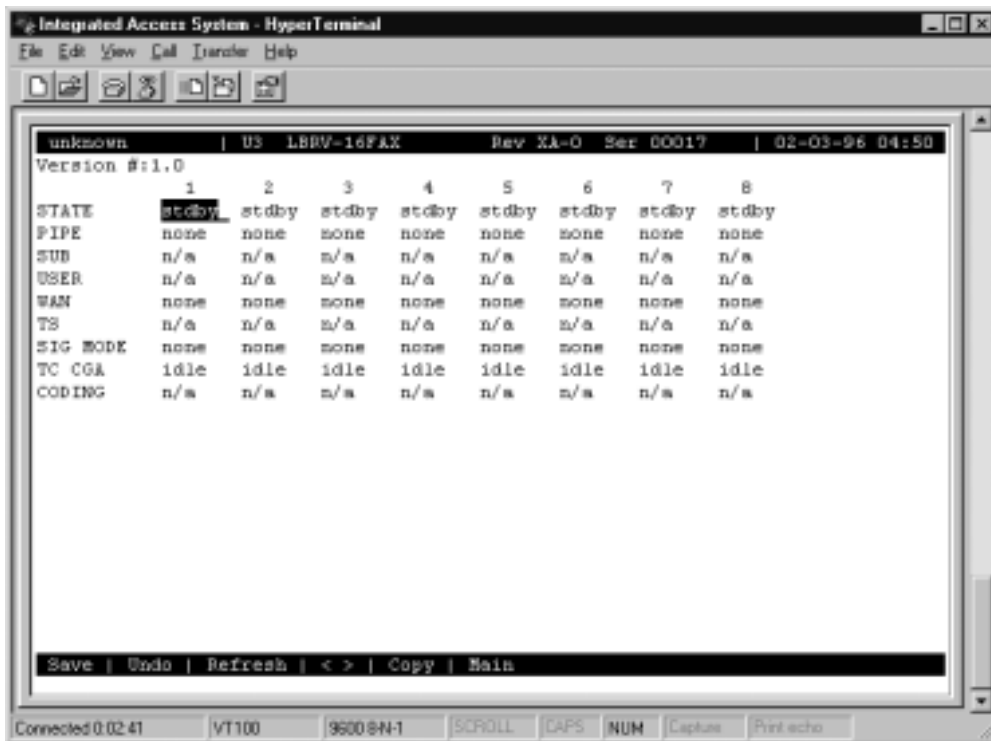

Figure 7-7.Wan-Voice Time slots Configuration Screen

Table 7-9. Wan-Voice Time Slots Configuration Screen Menu of Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e. performance and test data).
< >	There are 16 ports. By pressing the right arrow key ">" will page ythrogh to the next set of ports 9-16 for configuration. Press the left arrow key "<" to page back to the first set of ports 1-8.
Copy	Copies the contents of the current column to the next column. Useful if you change a lot of entries in one column and want to repeat those changes in subsequent columns.
Main	Returns to the main terminal screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Table 7-10. WAN-Voice Time Slots Setting Options and Defaults

Parameter	User Options	Default
STATE	stdby actv	stdby
PIPE	none 1 2 3	none
SUB	1-16 n/a	n/a
USER	n/a uX-01 through uX-08	n/a
WAN	n/a w1-1 w1-2 w2-1 w2-2 w3-1 w3-2 w4-1 w4-2 none	none
TS	n/a 01-24 01-31	n/a
SIG MODE	e&m fxs plar fxo none	none
TC CGA	n/a idle busy	idle
CODING	n/a u-law a-inv	n/a

STATE

The State setting determines whether the port is active or inactive. An inactive port does not occupy a time slot on a WAN link. Set the state setting to **stdby** (standby) for ports you are not using or have not yet configured. Set it to **actv** (active) for ports that are ready for use.

Note: *Voice ports cannot be assigned from the LBRV-16 FAX screen, but must be assigned from their respective cards.*

PIPE

The Pipe field refers to the CPipe through which the compressed data will be transmitted. The pipe number can range from **1** to **3.**

SUB

The Sub field refers to the subchannel within a CPipe to which the port is assigned. The system will limit the number of subchannels within a CPipe as follows for **Fax 9.6: 9.6/8 1x64 5, 9.6/8 2x64 11, 9.6/8 3x64 16,** and for **Fax 7.2: 7.2/8 1x64 7, 7.2/8 2x64 15** and **7.2/8 3x64 16**. If the user selects a sub-channel that is not available, then the system will prompt: **"Sub-channel already in use. Press any key to continue."** If the user selects an invalid subchannel number, then the system will prompt: **"Value out of range. Press any key to continue."**

USER

The User display identifies the User card and port connected to this LBRV-16 FAX port. If a WAN time slot is being assigned then this setting will show **n/a.** For already assigned voice channels (from a voice card) this field will display the voice card slot and port numbers (i.e. **u5-2** for card in slot U5 and port 2). This is a display field only and is assigned from the respective user card.

WAN

The WAN setting identifies the WAN link assigned to this port. This is where the LBRV-16 FAX card will expect incoming (uncompressed) voice traffic. If the voice traffic is assigned from a WAN time slot, this setting will show **w1-1** through **w4-2**. If it is assigned from a voice card port, this setting will show **n/a**.

TS

The TS setting identifies the time slot on the WAN link to which this port is assigned. Values range from **1-24** for T1 links and **1-31** for E1 links. Time slot 16 is not available for E1 links that are programmed for **cas** or **ccs** signaling. For a display of the available time slots, refer to your cross-connect map for the WAN link selected (see the System Operations chapter for information about viewing cross-connect maps).

SIG MODE

If the assignment of the port is from a WAN, then the options are **e&m, fxs, plar, fxo,** and **none.**

When the assignment is from a voice card, this field is **e&m, fxs, plar, or fxo** and cannot be changed from this screen.

TC CGA

The Trunk Conditioning during Carrier Group Alarm setting defines whether the E&M port should be placed in **idle** or **busy** mode upon declaration of a Carrier Group Alarm (CGA) on the WAN link to which the port is assigned. The TC CGA setting has no effect on **to** (Transmission Only) circuits.

CODING

The Coding setting sets the PCM companding method used for a port. In general, in the T1/North American environment use **m-law** coding. In the E1/International environment use **a-law** or **a-inv** (inverted A-law) coding; **a-inv** provides greater 1s density than **a-law**. The coding default is determined by the type of card in the WAN port you select.

7.6   Low Bit Rate Voice Card Error Messages

Refer to Appendix B in the System Reference Guide for further information on Error Messages regarding this card.

7.7   Low Bit Rate Voice Card Troubleshooting

Contact the technical support organization specified by your distributor.

Chapter 8
P-Phone (PPO/PPS Cards)

8.1 Introduction

The P-Phone Subscriber (PPS) and the P-Phone Office (PPO) Cards extend the features of the Meridian Business Sets to locations which are beyond the normal distance limitations of the Meridian Digital Centrex (MDC). The PPO and PPS are 2-wire cards employing Data Over Voice (DOV) to provide an 8kHz signaling channel using the least significant bit of each PCM sample. The P-Phone cards are classified as User Cards. The model numbers assigned to the cards are 8121 (PPS) and 8131 (PPO). The P-Phone function requires CPU firmware 5.2.

Note: *A 5.2 Host Code release is required for P-Phone circuits, and these features also require the Meridian Business Sets^{TM} (MBS) and/or Meridian Digital Centrex^{TM} (MDC) equipment.*

8.1.1 Features

- Eight circuits per card

- 2-Wire, full duplex voice interface

- Software provisional options:
  - Level control
  - A-law / Mu-law

- Capable of transport over 3000' of 26AWG non-loaded copper pair (including bridge taps) at the 2-wire VF Ports

- Hot line card insertion and extraction

- CE Compliant

8.1.2   PPhone Compatibility Requirements

The P-Phone Line Cards are compatible with the following equipment:

Switches, PBXs:

- DMS100 (Class 5 switch)
- DMS500 (Combination of Class 5 and a tandem switch)
- DMS10 (Lower capacity switch for rural areas)
- SL100 (Large Enterprise PBS; same as DMS100)

Meridian Business Sets (Enhanced Business Sets or P-Phones):

M5000 series business sets include:

- M5009
- M5112
- M5209
- M5212
- M5312

8.2   P-Phone Cards (PPO/PPS)

8.2.1   P-Phone Cards Description (8131/8121)

The P-Phone service uses an 8kHz out-of-band signaling between the MBS (Meridian Business Sets) and the DMS (Digital Multiplex System) for sending signaling and supervisory information. The signaling channel is used by the MBS to activate MDC features such as Conference Calling, Voice Mail etc. and the SuperNode delivering Caller ID to the MBS. The 8kHz is transmitted using amplitude shift keying (ASK).

The PPO and PPS are passive cards in that they repeat the signaling information end-to-end. The robbed bit signaling is used to transport the signaling information over the carrier. The analog data to be transmitted is received by the line card at the 2-wire interface and is encoded as a PCM sample. The line card will encode the 8kHz signaling is transmitted over the carrier and will occupy a single 64KBps time slot. The line card will extract the LSB from every PCM sample received and will generate the 8kHz ASK tone. The PCM sample is also decoded and the analog signal as well as the 8kHz tone are sent to the 2-wire interface for the SuperNode switch or the MBS.

The line card uses sealing current to detect if the MBS is disconnected or if the wire between the Central Office and the phone is damaged. The PPO terminates the sealing current provided by the SuperNode switch and the PPS generates the sealing current for the MBS.

The terminator is opened or the generator is disabled only if there is a loss of sealing current at either end or if there is a CGA alarm on the T1. If there is a loss of sealing current at the office end, it will be reported to the station end and vice versa.

Notice!

UL Statement

Operation of this Interface is Limited to Intra-Building Connections ONLY.

8.2.1.1   Card Jumper/Switch Settings

The P-Phone PPO and PPS Cards have one, two position jumper on each card. The jumper set is designated JP2 (US/EUR). One position is for US domestic applications and the other is EUR for European installations. The default position is US. There are two other jumpers used for testing, JP1 and JP3. (See Figure 8-1).
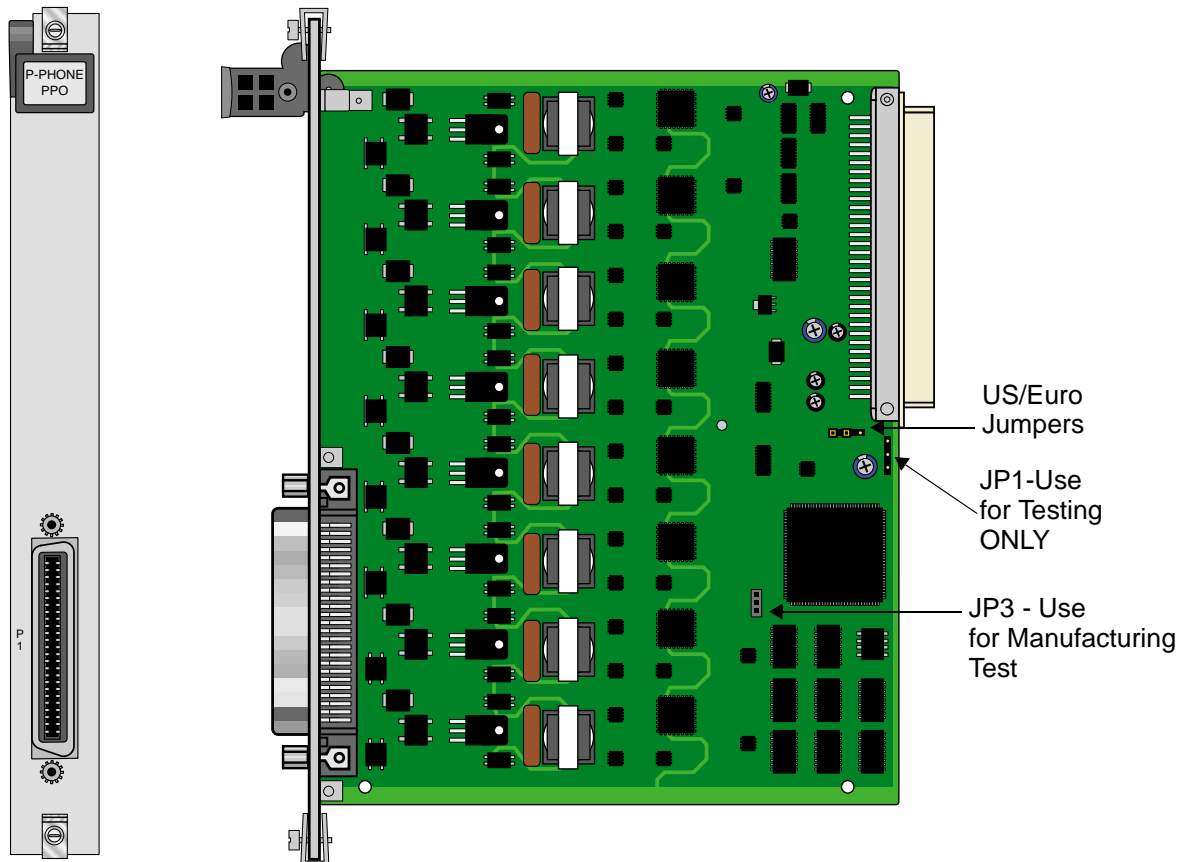
Figure 8-1.P-Phone PPO and PPS Cards Jumper Settings

8.2.1.2   Installing the P-Phone (PPO/PPS) Cards

Install the PPO and PPS Cards in any user card slot. The slots are numbered U1 to U8 on the two-sided chassis and front-loading chassis with power supplies on top, or P1 to P4 and W1 to W4 on the front-loading chassis with power supplies on the side.

> *Note:* *P-Phone Line Cards can only be cross-connected with WAN cards. They do not support Server Cards because Server Cards modify the transmission and receive data streams. Sealing current information specific to P-Phone operation is encoded in this data and cannot be modified without disrupting proper operation of the service.*

8.2.2   P-Phone Cards User Screens and Settings

8.2.3   P-Phone (PPO/PPS) Cards Main Screen

You must configure the P-Phone (PPO/PPS) Cards for operation after installing them into the system chassis. This is done from the PPO/ PPS Cards Main Screen (see Figure 8-2). To access that screen, highlight the desired card in the System Main Screen and press <Enter>. This screen includes one configuration column numbered for each port on the card.

Figure 8-2.PPO/PPS Cards Main Screen

The bottom highlighted line of the Main Screen shows various actions that you can perform from this screen. You perform the desired action by pressing the associated uppercase letter key. Table 8-1 summarizes these actions. For example, after you configure the P-Phone Card ports, press "**s**" to save your settings.

Table 8-1. PPO/PPS Cards Main Screen Menu of Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e., test status).
Copy	Copies the contents of the current column to the next column. Useful if you change a lot of entries in one column and want to repeat those changes in subsequent columns.
Main	Returns to the System Main Screen. If changes are made to settings and not saved, you will be prompted to either save or lose your changes.

Table 8-2 summarizes the configuration settings for the PPO/PPS Cards, along with the available and factory default option settings. The parameters and settings are also described in the following paragraphs.

Table 8-2. PPO/PPS Cards Main Screen Option Settings and Defaults

Parameter	User Options	Notes	Default
STATE	stdby actv		stdby
WAN	none w1-1, w1-2, w2-1, w2-2, w3-1, w3-2, w4-1, w4-2	1	none
TS	01-24 (T1) 01-31 (E1)	2	1
Rx TLP	-4.0 to 2.0		0.0
Tx TLP	-5.0 to 2.0		0.0
CODING	u-law a-inv a-law	3	u-law
HYBRID	set1 set2 set3 set4 set5 set6 set7 set8 user	4	set1
SCL	none, local, rmt (read only)		none

Notes:

1. Choosing **wan** allows you to choose a WAN port (w1-1 through w4-2).

2. Time slot 16 is not available if the port is assigned to an E1 WAN link whose time slot 16 is programmed for CAS or CCS.

3. The default is **u-law** for T1 and **a-inv** for E1. These values will change depending upon the WAN option module selected.

4. The default (**set1**) is the only active option. It balances to the ideal termination of 900 ohms + 2.15 uF. The other settings are reserved for future use.

STATE

The State setting determines whether the port is active or inactive. An inactive port does not occupy a time slot on a WAN link. Set the State setting to **stdby** (standby) for ports that are not to be used, or that have not yet been configured. Set it to **actv** (active) for ports that are ready for use.

WAN

The WAN setting identifies the WAN link assigned to this port. When you choose **wan**, you must also select the desired port (w1-1 through w4-2) of a WAN Card for transmission over the T1 or E1 link.

It is not necessary to assign all ports of the same P-Phone Card to the same WAN link, or to contiguous time slots on a WAN link.

TS

The Time Slot (TS) setting identifies the time slot on the WAN link to which this port is assigned. Values range from **1** to **24** for T1 links and **1** to **31** for E1 links. Time slot 16 is not available on E1 links that are programmed for **cas** or **ccs** signaling. For a display of the available time slots, refer to the cross-connect map for the WAN link. See Chapter 3, *System Configuration and Operation,* in the *System Reference Guide* for information about viewing cross-connect maps.

Rx TLP

The Receive Transmission Level Point (Rx TLP) setting controls the amount of gain or loss added to the incoming signal after it is decoded to analog. To increase the signal level, set the Rx TLP setting to a positive value (i.e., the larger the number, the more gain is added). To decrease the signal level, set the Rx TLP setting to a negative value (i.e., the more negative the number, the more the signal level is decreased). For example, an incoming signal at -5 dBm can be increased to -3 dBm by setting Rx TLP to **+2 dB**. The Rx TLP range is **-4.0 dB** to **+2.0 dB**.

Tx TLP

The Transmit Transmission Level Point (TLP) setting controls the amount of gain or loss added to a voice signal from the Customer Provided Equipment (CPE) before it is encoded to digital Pulse Code Modulation (PCM). To increase the signal level, set the Tx TLP to a negative value (i.e., the more negative the number, the more gain is added). To decrease the signal level, set the Tx TLP setting to a positive value (i.e., the more positive the number, the more the signal level is decreased). For example, an incoming signal at -5 dBm can be increased to -2 dBm by setting the Tx TLP to **-3 dB**. The Tx TLP range is **-5.0 dB** to **+2.0 dB**.

CODING

The Coding setting sets the PCM companding method used for a port. Generally, the North American T1 environment uses **u-law** coding, and the International E1 environment uses **a-law** or **a-inv** (inverted A-law) coding. The **a-inv** setting provides a higher ones density than **a-law**. The default coding setting is determined by the setting of the associated WAN card.

HYBRID

The Hybrid option assigns a three-byte pattern to define the adjustment for return loss (similar to Build Out capacitors). The default, **set1**, balances to the ideal termination of 900 ohms + 2.15 uF. The other settings are reserved for future use.

SCL

The Sealing Current Loss (SCL) displays the loss of sealing current either at the local or remote end. This field is read-only and cannot be changed by the operator. The options are **none**, **local** and **rmt** (remote).

8.2.4   Alarm Handling

The Host CPU will display an alarm when there is a loss of sealing current. The alarms are set or cleared by the Host based on the information it receives from the Voice CPU. The alarms can also be cleared by changing the STATE of the port in fault condition from ACTV to STDBY. The alarm displayed will be:

UCA   U2   Sealing Current Loss at Local end or Remote end (User Card 2)

The SCL parameter of each port will display the circuit end (local or remote) which is experiencing the Loss of Sealing Current. The 'Refresh' or 'Save' menu options on the PPO, PPS Card screens will update the status of the Sealing Current Loss. This parameter is for information only and cannot be configured by the user.

When a port is experiencing a loss of Sealing Current at Local or Remote ends, the status of the port on the System Main screen will also be updated to reflect the alarm conditions. 'R' indicates loss at Remote end and 'A' indicates loss at the Local end. When the Sealing Current is restored, the status will reflect the STATE of the port i.e., '**a**' if port is in ACTV state and '**s**' if the port is in STDBY state. See Figure 8-3 Main System Screen.

If the User Card Alarm (UCA) is reported by several ports on the PPO card, the alarms are filtered and only one alarm per card will be reported. This mechanism will prevent overwriting any critical alarms that are logged in the alarm history.

Figure 8-3.Main System Screen

Table 8-3. Status Indicators

Status	Description
s	Port standby
a	Port is active
A	Loss of sealing current at local end
R	Loss of sealing current at remote end

8.3   P-Phone (PPO/PPS) Card Error Messages

Refer to Appendix B in the System Reference Guide for further information on Error Messages regarding this card.

8.4   P-Phone (PPO/PPS) Card Troubleshooting

A PPO or PPS Card may be faulty if a voice signal is not received at one end of a circuit, or if signaling is not detected. The following are possible causes:

- Faulty reception from CPE at the near end (where the problem was first noticed)

- Faulty transmission to CPE at the far (opposite) end

- Faulty cabling between the CPE and PPS card a the near end

- Faulty cabling between the CPE and PPO card at the far end

- T1 network failure

- Improper card configuration at either end (e.g., time slot and/or WAN port assignments)

First, verify that the T1 network has not failed. Check for a CGA-Red alarm on the associated WAN port at the end where the incoming VF signal loss is first noticed. The CGA indicates that the incoming network signal was lost (or that the receiving WAN port is out of frame). During the CGA, all voice ports with time slots on that WAN port will also be disabled, and the associated far-end WAN port will be in a CGA-Yellow or Red alarm state. If the network connection is faulty, you must clear the trouble to restore your circuits.

If the network is okay, verify that the proper WAN ports and time slots are assigned to the associated PPS and PPO voice ports at both ends, as previously outlined in this chapter. In a point-to-point network, the near-end and far-end P-Phone card ports should both be assigned the same WAN port and time slot number. Also make sure the other parameters (such as the transmit and receive TLPs) are set properly at both ends.

If the P-Phone Card port parameters are correct at both ends, and if the network is okay, the trouble must be isolated to the P-Phone card or an associated port. Proceed as follows:

1. Check if any UCA alarms are set for the card. If not, go to step 3.

2. Go to the Main System Screen of P-Phone Card, check the 'SCL' parameter of the associated port. if SCL is set to 'Local', the local CPE or cabling form CPE to the P-Phone Card is faulty. If SCL is set to 'Remote' the far-end CPE or cabling to the far-end P-Phone card is faulty. Correct these faults and make sure alarms are clear.

3. If the voice signal is still not received, the P-Phone Cards are determined to be faulty. Replace it and return the faulty unit for repair to the location specified by your distributor.

Chapter 9
Analog Bridging Server Card

9.1   Introduction

This chapter provides installation, configuration, and troubleshooting information for the Analog Bridging Server Card, (832060).

9.2   Analog Bridging Server Card Description

9.2.1   Analog Bridging Server Card Description (832060)

The Analog Bridging Server Card is a plug-in user card which allows the analog voice band signals from up to thirty voice circuits to be combined (bridged). In the case of the IMACS application, each analog circuit is a DS0 channel carrying analog traffic from an access card port such as a FXS, 4W E&M, 2W E&M or from a WAN port. Although this traffic originates as an analog signal, it is bridged digitally in the Analog Bridge card after it has been digitalized into a DS0. The bridge itself is set up via the provisioning interface on the IMACS maintenance terminal. Once the bridge is set up, the circuits remain permanently bridged until the provisioning is changed. There is no supervision (on/hook or off/hook) or signaling (digit dialing) involved with circuits that are bridged. End-users can not dynamically add or delete themselves from the bridge, making this a permanent telephone conference bridge with no dynamic end-user control.

9.2.1.1   Card Jumper/Switch Settings

The Analog Bridge Server Card has jumpers JP11 and JP12 on its mainboard. These jumpers must be set to the OFF position as illustrated in Figure 9-1 below.

Set Jumpers JP11
and JP12 to the OFF
position
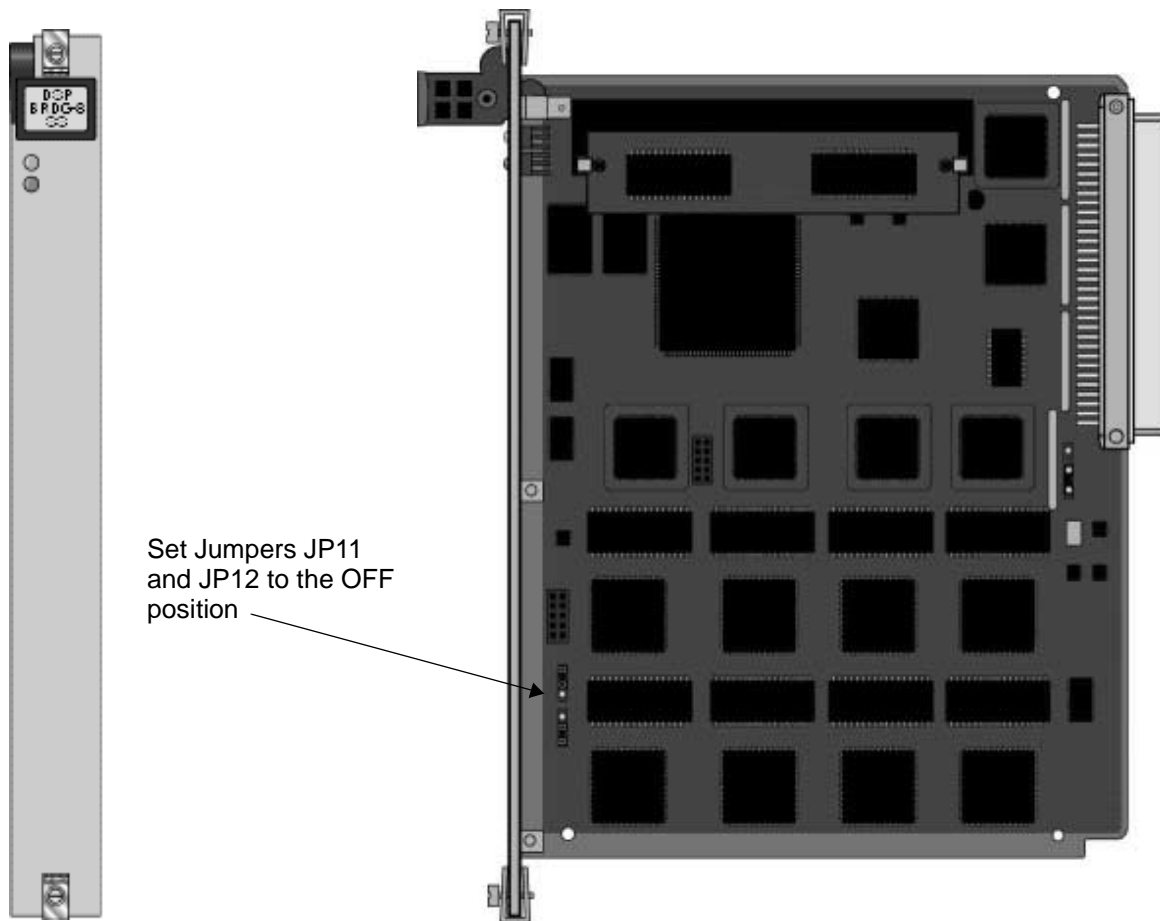
Figure 9-1.Analog Bridge Server Card Jumper Settings

9.2.1.2   Installing the Analog Bridge Server Card

Insert the Analog Bridge Server card into any user card slot. These slots are U1 to U8 on the
two-sided chassis or the front-loading chassis with power supplies on top or P1 to P4 and
W1-W4 on the front-loading chassis with power supplies on the side.

Each system can have up to two Analog Bridge Server cards installed.

9.3 Analog Bridge Server Card User Screens and Settings

9.3.1 Provisioning steps - high level

The bridges can be set up in two methods: Activating a voice user port and assign it to a bridge, or assigning an existing WAN port to a bridge. Here are the high-level steps for each.

9.3.1.1 Assign and Activate a Voice User Card Slot to a Bridge

1. Provision the Voice User Card slot with slot/unit information

2. Go to the Bridge card screens and activate the bridge

3. Go to the All_ports screen and select the bridge

4. Go to the Ports screen after moving the cursor to the appropriate bridge.

5. Activate that port.

9.3.1.2 Assign a WAN timeslot to a Bridge

1. Activate the bridge

2. On the Ports screen for that bridge, position on WAN field and select WAN and TS.

3. Activate the port.

9.3.2 Analog Bridge Server Card Main Configuration Screen

On the Analog Bridge card main configuration screen, all the bridges will show up initially in standby mode. When a Bridge is in standby mode, all ports on that particular bridge will be turned off automatically. The bridge must be active in order to activate the individual ports.
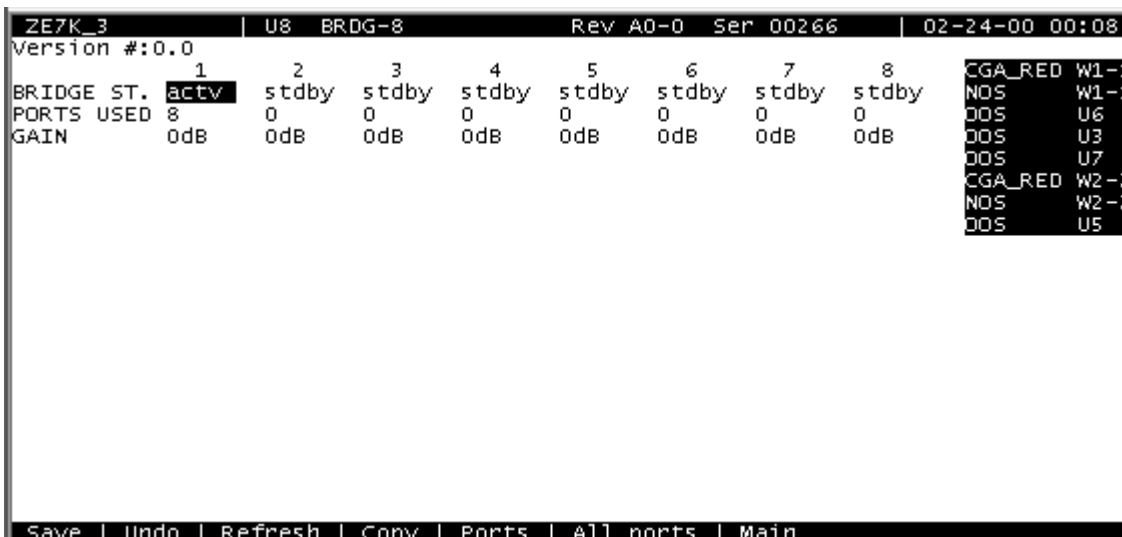
Figure 9-2.Analog Bridge Server Card Main Configuration Screen

The bottom highlighted line of this screen shows various actions that you can perform from this screen. You perform the desired action by pressing the associated uppercase key. Table 9-1 summarizes these actions. For example, after you configure the Analog Bridge Card ports, press "**s**" to save your settings.

Table 9-1. Analog Bridge Main Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e., test status). Refresh will also compact and reorder all the ports in the LogUNIT sequence.
Copy	Copies the contents of the current column to the next column. Useful if you change a lot of entries in one column and want to repeat those changes in subsequent columns.
Ports	Displays the Ports assigned to the selected Bridge.
All_ports	Displays all Ports assigned to any bridge.
Main	returns to the Systems Main Screen. If changes are made to settings and not saved, you will be prompted to either save or lose your changes.

Table 9-2 summarizes the configuration settings for the Analog Bridge Server Card, along with the available and factory-default option settings. The parameters and settings are also described in the following paragraphs.

Table 9-2. Analog Bridge Main Screen Option Settings and Defaults

Parameter	User Options	Default
BRIDGE ST.	stdby actv	stdby
PORTS USED	This field is Display Only, from 0 to 30 ports	n/a

GAIN	0dB -3dB -6dB	0dB

BRIDGE ST.

The State setting determines whether the Bridge is active or inactive. An inactive Bridge does not occupy a time slot on a WAN link. Set the state setting to **stdby** (standby) for Bridges that are not being used or have not yet been configured. Set it to **actv** (active) for Bridges that are ready for use.

PORTS USED

The Ports Used field is a display-only field. It reflects the number of ports (subscribers) that are assigned to the particular Bridge.

GAIN

The gain setting allows for a specified gain to be applied to the bridge itself. All subscribers will be attenuated to the assigned settings. Valid settings are: **0dB -3dB -6dB**

9.3.3   Ports Screen

The ports screen allows the craftsperson to setup the corresponding participants in the Bridged connection. The ports screen will display eight logical ports of the thirty that are available for each Bridge. The craftsperson can scroll through all thirty (eight at a time) by using the right 'greater than' sign, as described below in Table 9-3.


```
 ZE7K_3          | U8   BRDG-8          Rev A0-0  Ser 00266  | 03-01-00 17:32
Version #:1.1
               1        2        3        4        5        6        7        8    CGA_RED W1-1
STATE       actv     actv     actv     actv     actv     actv     actv     actv    NOS     W1-1
BRIDGE      1        1        1        1        1        1        1        1       OOS     U6
USER        n/a      n/a      n/a      n/a      n/a      n/a      n/a      U1-02   OOS     U3
WAN         w2-1     w2-1     w2-1     w2-1     w2-1     w2-1     w2-1     n/a     OOS     U7
TS          02       03       04       05       06       07       08       n/a    CGA_RED W2-2
CODING      u-law    u-law    u-law    u-law    u-law    u-law    u-law    n/a    NOS     W2-2
phySLOT     U8       U8       U8       U8       U8       U8       U8       U8      OOS     U5
logUNIT     02       03       04       05       06       07       08       64


 Save | Undo | Refresh | Copy | Delete | Bridges | < | > | Main
```

Figure 9-3.Ports Screen

The bottom highlighted line of this screen shows various actions that you can perform from this screen. You perform the desired action by pressing the associated uppercase key. Table 9-3 summarizes these actions. For example, after you configure the Analog Bridge Card ports, press "**s**" to save your settings.

Table 9-3. Ports Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e., test status),
Copy	Copies the contents of the current column to the next column. Useful if you change a lot of entries in one column and want to repeat those changes in subsequent columns.
Delete	Deletes the provisioning for the Port selected, removing it from the Bridge.
Bridges	Returns one window, same as the M key below.
<	Allows the user to scroll down to the next set of eight ports.
>	Allows the user to scroll up to the next set of eight ports, if available. If a port can be provisioned on the current screen, this action is disabled.
Main	returns to the Systems Main Screen. If changes are made to settings and not saved, you will be prompted to either save or lose your changes.

Table 9-4 summarizes the configuration settings for the Bridged Ports Screen, along with the available and factory-default option settings. The parameters and settings are also described in the following paragraphs.

Table 9-4. Bridged Ports Screen

Parameter	User Options	Default
STATE.	stdby actv	stdby
BRIDGE	This is a Display-only field of bridge 1 through 8.	n/a
USER	This is a Display-only field and will display card U1 through U8, and logical ports 01 through 64	n/a
WAN	none w1-1 w1-2 w2-1 w2-2 w3-1 w3-2 w4-1 w4-2	None
TS	01-24 01-31	n/a
CODING	u-law	n/a
phySLOT	This is a Display-only field, and will show U1 through U8	n/a
logUNIT	This is a Display-only field, and will show logical ports 01 through 64	XX

STATE

The State setting determines whether the Bridge is active or inactive. An inactive Bridge does not occupy a time slot on a WAN link. Set the state setting to **stdby** (standby) for Bridges that are not being used or have not yet configured. Set it to **actv** (active) for Bridges that are ready for use.

BRIDGE

The Ports Used field is a display-only field. It reflects which bridge this subscriber is assigned to, if any.

USER

The USER field is a display-only field. This field will be populated with the user card and port number assigned during provisioning of the voice service on the voice card. Figure 9-3 shows that port two on user card U1 (an FXS card on the demo system) provisioned a WAN/SRV connection onto the Bridge card on U8. Port two of that card was assigned to logical port 64. Further discussion on logical ports is explained below on the logUNIT field.

WAN

The WAN setting identifies the WAN link assigned to this port. When you choose **wan**, you also must select the desired port (w1-1 through w4-2) of a WAN card for transmission over a T1 or E1 link. It is not necessary to assign all ports of the same source to the same WAN link, or to contiguous time slots on a WAN link.

TS

The TS setting identifies the time slot on the WAN link to which this port is assigned. This value is from **1** to **24** for T1 links and **1** to **31** for E1 links. However, time slot 16 is not available for E1 links that are programmed for CAS or CCS signaling. For a display of available time slots, refer to the cross-connect map for the WAN link selected.

CODING

The Coding field sets the PCM companding (coding) method used for a port. Generally, the North American T1 environment uses **u-law** (mu-law) coding, and the International E1 environment uses either **a-law** or **a-inv** (inverted A-law) coding. The **a-inv** setting provides a higher ones density on an E1 line than **a-law**. The coding default setting is defined by the type of associated WAN card. All ports of the bridge must use **u-law**.

phySLOT

The phySLOT field is a display-only field. It will reflect the Bridge card slot that owns the particular port used in a Bridge.

logUNIT

The logUNIT field is reflective of a common pool of DS0 resources available to the Analog Bridge card. These 64 logical ports are shared by all 8 bridges on the card. These are numbered from **01** to **64**, although a maximum of 62 DS0 resources can be used on the system.Each of these resources is unique, and is assigned automatically when a WAN connection is selected from the Bridge card. When setting up an existing or new Voice circuit onto the bridge, an available port must be chosen by the craftsperson from the pool while they are provisioning the Voice card circuit. To locate an available resource, use the All_ports screen described below to identify an available pool resource.

9.3.4 All_ports Screen

The All_port screen looks identical to the ports screen, referenced above. The available commands are identical to the ports screen, as referenced in Table 9-4 and actions covered in Table 9-3. The difference on this screen is the ability to change the Bridge number assigned to a port, thereby moving the subscriber from one bridge to another.

Another difference is the < > keys. The All_ports screen shows all available ports for use, sixty-four in all; of these, only sixty-two can be provisioned. The < and > keys will allow the user to observe all sixty-four ports, regardless of their provisioned status. When at the first port screen, port 1, the left arrow will wrap-around to the 64th port screen. Conversely, if the user is on the uppermost ports screen, hitting the > key will wrap around to the lowest port screen.

Figure 9-4 shows the all_ports screen.

```
 ZE7K_3          | U8   BRDG-8            Rev A0-0  Ser 00266   | 03-01-00 17:34
Version #:1.1
               1       2       3       4       5       6       7       8    CGA_RED W1-1
STATE        stdby   actv    actv    actv    actv    actv    actv    actv   NOS     W1-1
BRIDGE       2       1       1       1       1       1       1       1      OOS     U6
USER         n/a     n/a     n/a     n/a     n/a     n/a     n/a     n/a    OOS     U3
WAN          w2-1    w2-1    w2-1    w2-1    w2-1    w2-1    w2-1    w2-1    OOS     U7
TS           01      02      03      04      05      06      07      08     CGA_RED W2-2
CODING       a-inv   u-law   u-law   u-law   u-law   u-law   u-law   u-law  NOS     W2-2
phySLOT      U8      U8      U8      U8      U8      U8      U8      U8      OOS     U5
logUNIT      01      02      03      04      05      06      07      08




 Save  | Undo | Refresh | Copy | Bridges | < | > | Main
```

Figure 9-4.All_ports Screen

Positioning on the Bridge number and depressing the enter key will show the available options available to the user. Choosing **none** will remove the port from the assigned bridge, and choosing a value from **1** to **8** will move the subscriber from the current bridge to the bridge selected.

9.4   Analog Bridge Server Card Specifications

Analog Bridge Card (8320)	
Physical Interface (Model 8320)	
Card Height	8 inches (20 cm)
Card Width	15/18 inches (2.35 cm)
Card Depth	7.5 inches (18.75 cm)
Power Consumption	8.8 Watts
BTU per hour	30
Operating Temperature	0 to 50 C, 32 to 122 F
Storage Temperature	-20 to 80 C, -4 to 176 F
Humidity	0 to 95% humidity, non-condensing
IMACS Platform Support	
IMACS Chassis	891630 IMACS 600
	891830 IMACS 800
	891930 IMACS 900
Control CPU Support	880360 or 880361 cross-connect CPU
Software Requirement	5.4.6 or later
Interface Card Support	892260, 892360 or 892460
Power Supply Options	All AC/DC power supplies are supported
Card Interface	
Input Voice Channels	Any 2-wire or 4-wire voice card, or from a DS0 on a WAN (E1/T1)
	Mu-law 64Kbps PCM only is supported.
Maximum Card count	2 per shelf
Bridge Maximum	Maximum of eight per card
Maximum DS0's per Shelf	Thirty per bridge
Maximum Bridged DS0's per shelf	Sixty-two DS0's can be bridged in a shelf (see note)

> *Note: Although the card will support 8 bridges of up to 30 DS0's each, the card occupies a user slot; this leaves a maximum of 7 user slots for voice cards. Therefore the maximum number of voice DS0's that can originate on the shelf is 56 (7 x 8). Additional DS0's from the WAN ports can occupy the bridge. However, the shelf bus structure limits the shelf to 62 voice DS0's for any application, including bridging.*