

*Server Cards*  
*Reference Guide*

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## Product Description

The Server Cards provide voice compression that accept inputs directly from Voice Cards in the same system unit, or voice traffic from WAN links through the system.

### Server Cards

- **ADPCM** ADPCM 64 (8871)
- **FRS** FRS (881160)
- **MCC** MCC (8813)
- **ISDN-PRI** ISDN-PRI (8840)

# Using this Server Card Reference Guide

This Server Card Reference Guide provides technicians with installation, switch settings, connector pinouts, configuration, and troubleshooting information for the Server Cards.

Chapter 1. *ADPCM Card*

Chapter 2. *FRS Card*

Chapter 3. *MCC Card*

Chapter 4. *ISDN-PRI Card*

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# Chapter 1

## ADPCM Card

### 1.1 Introduction

This chapter provides installation, configuration, and troubleshooting information for the Adaptive Differential Pulse-Code Modulation (ADPCM) Card. This card is labeled as the ADPCM 64 card on its faceplate ejector.

### 1.2 ADPCM Card Descriptions

#### 1.2.1 ADPCM 64 Card Description (8871)

The ADPCM 64 Card has 32 pairs of voice compression engines that accept inputs directly from voice, SRU, and/or BRI data cards in the same system unit, or voice traffic from WAN links through the system. This card requires a matching card at the other end to decompress the voice channels to normal 64 kbps operation.

Each pair of compression engines uses one 64 kbps DS0 time slot for two compressed voice channels. Each engine can compress 64 kbps voice traffic into 24 kbps, 32 kbps, or 40 kbps, depending on the voice signal quality required.

The rate of a DS0 time slot is 64 kbps, so the sum of the compression rates for engines 1 and 2 must equal 64 kbps. For example, if you assign a 32 kbps circuit to engine 1, engine 2 can only accept another 32 kbps circuit. Also, a 40 kbps circuit can only be paired with a 24 kbps circuit, and vice versa.

The ADPCM compression engines always work in pairs. Engines 1 and 2, 3 and 4, 5 and 6, and 7 and 8 are paired. Each member of the pair must have the same ADPCM WAN port and ADPCM time slot. **Also, both members of the compression engine pair must be active before either port will operate.**

The ADPCM 64 Card can transport low-speed asynchronous data transmission (19.2 kbps or less) from an SRU user card port that will occupy a 24 kbps engine. Each data circuit must be paired with a 40 kbps voice channel. The card can also compress B-channel voice traffic from a BRI card without restricting compression rates.

The integrated access system can have up to three ADPCM 64 Cards (two normal cards and an identical redundant card).

The ADPCM 64 Card supports Transition Signaling as defined in ANSI T1.302-1989, with the exception of the Alarm bits. ANSI T1.302 specifies signaling at the 32 bps compression rate. The card uses this scheme for 24 bps and 40 bps, even though those rates are not included in the standard. Table 1-1 summarizes the signals supported by each transcoder data rate. Your DS0 time slot configuration must adhere to these specifications.

**Table 1-1. ADPCM Compression Rates**

Transcoder Rate	Voice Quality (MOS)*	Modem Data	DTMF	FAX
24 kbps	3.6-3.8 Range	no	no	no
32 kbps	4.0-4.3 Range	up to 4.8 kbps V.32 9.6 kbps	OK	Group II
40 kbps	4.0-4.3 Range	up to 12 kbps V.32 14.4 (no/yes)	OK	Group III

\* MOS = Mean Opinion Score based on subjective evaluation

### 1.2.1.1 Card Jumper/Switch Settings

The ADPCM 64 Card doesn't have any jumpers or switches on its mainboard.

### 1.2.1.2 Installing the ADPCM Card

Insert the ADPCM card into one of the server card chassis slots (P1 to P3). The system can accommodate up to three server cards.

## 1.3 ADPCM Card User Screens and Settings

### 1.3.1 ADPCM Card Main Screen

You must configure the ADPCM card ports for operation. This is done from the ADPCM Card Main Screen, which is shown in Figure 1-1. To go to this screen, highlight the ADPCM card in the System Main Screen and press <Enter>.

Node_1	P1	ADPCM-64	Rev	A0-0	Ser	00101	12-31-99	14:33
version #:1.33								
	1	2	3	4	5	6	7	8
STATE	stdby	stdby	stdby	stdby	stdby	stdby	stdby	stdby
USER	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
WAN/SERV	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1
TS	01	01	01	01	01	01	01	01
ADPCM W/S	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1
ADPCM TS	01	01	01	01	01	01	01	01
TYPE	v&s	v&s	v&s	v&s	v&s	v&s	v&s	v&s
RATE	24k	24k	24k	24k	24k	24k	24k	24k
SIG MODE	e&m	e&m	e&m	e&m	e&m	e&m	e&m	e&m
CODING	u-law	u-law	u-law	u-law	u-law	u-law	u-law	u-law
TC CGA	idle	idle	idle	idle	idle	idle	idle	idle
Save   Undo   Refresh   <   >   sWitch   Main								

Figure 1-1. Typical ADPCM Card Main Screen

The bottom highlighted line of this screen shows several actions you can perform from the screen. To perform an action, simply press the key indicated by the uppercase letter of the desired action. For example, to save your configuration settings, press “s” to invoke the **Save** command. Table 1-2 lists these actions.

**Table 1-2. ADPCM Card Main Screen Actions**

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Redraws the current screen with the latest information.
<	Pages through the 64 engines (highest to lowest), 8 at a time.
>	Pages through the 64 engines (lowest to highest), 8 at a time.
SWitch	Switches an active ADPCM card to its redundant mate.
Main	Returns to the ADPCM Card Main Screen. If changes are made to settings and not saved, users will be prompted to save or lose changes.

Table 1-3 summarizes the ADPCM card configuration parameters and available settings. These are also described in the following paragraphs.

**Table 1-3. ADPCM Card Setting Option Settings and Defaults**

Parameter	User Options	Default
STATE	stdby actv rdnt	stdby
USER	n/a uX-1 through uX-8	n/a
WAN/SERV	n/a w1-1 w1-2 w2-1 w2-2 w3-1 w3-2 w4-1 w4-2	none
TS	n/a 01-24 01-31	01
ADPCM W/S	w1-1 w1-2 w2-1 w2-2 w3-1 w3-2 w4-1 w4-2	none
ADPCM TS	01-24 01-31	01
TYPE	n/a v&s v trnsp	v&s
RATE	n/a 24K 32K 40K	24K
SIG MODE	n/a e&m fxs plar fxo user	e&m
CODING	n/a u-law a-inv	u-law
TC CGA	n/a idle busy	idle

## STATE

The State setting determines whether the port is active or inactive. When assigning ADPCM engine pairs for WAN traffic, set the State setting to **stdby** (standby) for ports that are not yet used or not yet configured. Set it to **actv** (active) for ports that are ready for use.

Setting the State to **rdnt** (redundant) for any port on an unused card will cause that card to act as the redundant back-up for all of the other ADPCM cards in that unit. Once a card is designated as a redundant ADPCM card the only way it can be used for regular ADPCM traffic is to change the state of the selected port back to either **actv** or **stdby**.

When assigning ADPCM engine pairs from user cards, changing the port from **stdby** to **actv** and saving the selection information on the user card screen will cause the system to automatically assign an ADPCM engine.

When the engine is assigned from a user card, no changes can be made from the ADPCM card screen to any of the fields.

## USER

The User setting identifies the user card and port connected to this engine. This is the place where the ADPCM card will expect incoming (non-compressed) voice, subrate data, and B-channel traffic. If assigned from a voice, SRU, or BRI card port, this selection will show the user card slot and port number (e.g., **u5-2** for the card in slot U5, port 2). If you are assigning a WAN time slot, this setting will show **n/a**.

## WAN/SERV

The WAN/SERV setting identifies the incoming WAN link connected to this engine. This is the place where the ADPCM card will expect incoming (non-compressed) voice. If you are assigning voice traffic to a WAN time slot, this setting will show **w1-1** to **w4-2**. If you are assigning to a voice card or SRU card port, this setting will show **n/a**.

## TS

The Time slot parameter selects the specific time slot of the above WAN link on which the ADPCM card can expect incoming voice traffic. If WAN 1-1 is equipped with a T1 CSU module or a DSX/CEPT module configured for T1 DSX interface, the options are **1** to **24**. If a DSX/CEPT module is installed on that WAN port and that module is configured for CEPT E1 interface, the options are **1** to **15** and **17** to **31**. If you are assigning time slots to voice or SRU card ports, this setting will be **n/a**.

## ADPCM W/S

The ADPCM W/S setting identifies the outgoing WAN link to which the engine is connected. If you are assigning to a voice, SRU, or BRI card port, or to voice traffic from a WAN time slot, this setting will show **w1-1** through **w4-2**. This is the WAN link to which the ADPCM card will send its outgoing (compressed) traffic.

## ADPCM TS

The ADPCM Time slot parameter selects the specific time slot on the WAN link chosen in the previous setting that the ADPCM card will send outgoing compressed traffic. The options are determined by the equipment on the WAN link selected in the previous setting. If WAN 1-1 is equipped with an 812 CSU or 811 DSX/CEPT Module configured for DSX, the options are **1** to **24**. If a DSX/CEPT module is installed and configured for CEPT E1, the options are **1** to **15** and **17** to **31**.

## TYPE

The Type parameter identifies the voice and signaling requirements for the incoming circuit. The options are **v** (voice), voice and **v&s** (signaling) and **trnsp** (transparent). Use **v** when the input to the ADPCM channel is a 64 kbps channel and inband signaling is not required. Use **v&s** when the input to the ADPCM channel is a 64 kbps voice channel and the ADPCM card must also provide inband signaling.

The **trnsp** setting allows you to map the outputs of SRU ports to the ADPCM channel. The subrate data will be clocked into the ADPCM channel at an input rate of 24 kbps, then passed transparently (non-compressed) through the ADPCM card to the appropriate WAN time slot. This could be useful if you have an odd number of voice channels and want to utilize the empty engine pair of the last ADPCM channel.

The B-channel traffic from the BRI card also uses the **trnsp** setting, but it does not place any restrictions on the compression rates.

If the engine is assigned to a voice card, this selection will show **v&s**. If assigned to an SRU card, it will show **trnsp**. You cannot change it from this screen.

## RATE

The Rate parameter identifies the compression requirements for the incoming circuit. The options are **24K**, **32K**, and **40K**. The sum of the pair of engines must always equal 64 kbps.

If this engine is assigned to a user card port, the selection will show the value that was chosen on that port. It cannot be changed from this screen.

## SIG MODE

The Signaling Mode parameter identifies the type of signaling required for the incoming circuit from the network. If **v&s** was chosen in the Type setting, the options are **e&m**, **fxs**, **plar**, and **fxo**. If **v** or **trnsp** was chosen in the Type setting, the only option is **n/a**.

If this engine is assigned to a user card, this selection will show **user**. It cannot be changed from this screen.

## CODING

The Coding parameter identifies the PCM companding format required for the incoming circuit from the network. The choices are **u-law** or **a-inv**.

If this engine is assigned to a voice or BRI card, this selection will show the value you selected for that port. If this engine is assigned to an SRU card, this selection will show **u-law**. It cannot be changed from this screen.

**TC CGA**

The Trunk Conditioning CGA setting identifies the type of trunk conditioning required for the incoming circuit. If **v&s** is chosen in the Type setting, the options are **idle** or **busy**. If **trnsp** or **v** is chosen as the Type, the only option is **n/a**.

If this engine is assigned to a voice card, this selection will show the value you selected on the voice card port. If assigned to an SRU or BRI card port, the field will show **n/a**. It cannot be changed from this screen.

## 1.4 ADPCM Card Error Messages

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

## 1.5 ADPCM Card Troubleshooting

The following are instructions on how to troubleshoot the ADPCM card. This is in case the card fails for any reason:

1. Green LED on faceplate.
2. Verify that the card is in the right slot, P1 through P3.
3. Reseat the card if necessary. This can be done with the power on.
4. View the card status on the main screen.
5. Check the cards configuration options. Select the card from the main screen to do this.
6. Now try to log into the ADPCM main screen. If this still didn't work the card may be bad. Try swapping it with a new card.
7. If the ADPCM card is determined to be faulty, replace it and return the faulty unit for repair to the location specified by your distributor.

## 1.6 ADPCM Server Card Specifications

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### ADPCM Card (8871)

Input Voice Channels	Can originate from any 2-wire or 4-wire voice card or from a DSO on a WAN (E1/T1 or HDSL) interface. $\mu$ -law & A-law 64Kbps PCM compatible on a per channel basis.
Input Sub-rate Data	SRU data traffic at 19.2Kbps or less can be carried on a 24Kbps sub-channel.
Input BRI traffic	B channel voice traffic can be compressed at any of the configurable rates.
Modem Data Support	Transcoder rate: 24, 32 or 40 Kbps; Modem Data: none, up to 4.8Kbps, V.32 to 9.6Kbps, up to 12Kbps and V.32 bis to 14.4Kbps
Fax Support	Transcoder rate for fax: 24, 32 or 40 Kbps; none, Group II and Group III fax.
Voice Quality	As measured by Mean Opinion Score (MOS) analysis, a subjective evaluation with a range of 0 (poor quality) to 5 (good quality). Toll quality voice is accorded a MOS of 4.0 24Kbps transcoder rate MOS is 3.6-3.8; 32Kbps transcoder rate MOS is 4.0-4.3 and 40Kbps transcoder rate MOS is 4.0-4.3
Echo Cancellation	Non provided—typically not required
Signaling	Transmitted in-band utilizing CAS transitional signaling, as per ANSI T1.302—1986 for 32Kbps and modified for use with 24Kbps and 40Kbps. Note Robbed Bit Signaling Alarm Transmission, as specified in ANSI T1.302a-1989 is not supported.
Maximum Card Count	3 (2 active, 1 redundant)
Transcoder Operation	Compliant to G.761 Alarm Indication and Fault Handling.

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### Standards Compatibility

ANSI	T1.302 1989
	T1.302a 1992
	T1.303 1989
CEN	EN 500 081-1
	EN 500-092-1
	EN 60950/A2
ITU-T	G.721
	G.723
	G.726 12/90



# Chapter 2

## FRS Card

### 2.1 Introduction

This chapter provides installation, configuration, and troubleshooting information for the Frame Relay Server (FRS) (8811) card.

Note that this card is labeled as an ACS card on its faceplate ejector. It is identified as an FRS card only in the user interface screens shown in this chapter. Throughout the remainder of this chapter, it will be referred to as the ACS-FRS card.

### 2.2 ACS-FRS Card Descriptions

#### 2.2.1 ACS-FRS Card Description (8811)

The ACS-FRS card concentrates multiple N x 56K or N x 64K frame relay data streams onto one or more Nx56/64K links of the integrated access system. In addition to frame relay concentration, the card encapsulates data for Nx56/64K HDLC or SDLC data streams. The frame relay server software runs on the card, which provides up to 68 logical ports. Up to 128 permanent virtual circuits (PVCs) can be configured on a single card. The aggregate speeds of all ports associated with each FRS cannot exceed 8 Mbps.

The maximum frame size supported by the ACS-FRS card is 4,096 bytes per frame. Each card can switch 4,000 frames per second, assuming a frame size of 64 bytes per frame. Up to three ACS-FRS cards can be used in a system.

##### 2.2.1.1 Card Jumpers/Switch Settings

The ACS-FRS card doesn't have any jumpers or switches on its mainboard.

##### 2.2.1.2 Installing the ACS-FRS Card

Insert the ACS-FRS card into one of the server card chassis slots (P1 to P3). The system can accommodate up to three server cards.

## 2.3 ACS-FRS Card User Screens and Settings

### 2.3.1 ACS-FRS Card Main Screen

You must configure the ACS-FRS card for operation after installing it. This is done in the ACS-FRS Card Main Screen (Figure 2-1). To go to that screen, highlight the desired ACS-FRS card in the System Main Screen and press <Enter>.

Node_1	P3	FRSx68	8811	Rev	A00-0	Ser	00101	12-31-99	14:33	
Version #:1.00										
		C1	C2	C3	C4					
STATE		stdby	stdby	stdby	stdby					
USER		n/a	n/a	n/a	n/a					
WAN		none	none	none	none					
TS		n/a	n/a	n/a	n/a					
RATE		64k	64k	64k	64k					
PORT TYPE		none	none	none	none					
LMI		none	none	none	none					
DCE PARAM		n/a	n/a	n/a	n/a					
DTE PARAM		n/a	n/a	n/a	n/a					
ASYNC		no	no	no	no					
CONG THRS		enabl	enabl	enabl	enabl					
DROP THRS		enabl	enabl	enabl	enabl					
LOOPBACK		off	off	off	off					
Save	Undo	Refresh	<	>	Endp	Circ	Perf	Lmi	Glob	Main

**Figure 2-1. Typical ACS-FRS Card Main Screen (ports C1 to C4)**

The 68 logical ports of the card are labeled C1 to C4 and 1 to 64. However, numbered ports 1 to 64 do not appear in the above display. To see those ports, press the "<" and ">" keys to scroll through them, eight at a time. Figure 2-2 shows an ACS-FRS card Main Screen display for the first eight numbered ports.

Node_1	P3	FRSx68	8811	Rev	A00-0	Ser	00101	12-31-99	14:33	
Version #:1.00										
	1	2	3	4	5	6	7	8		
STATE	stdby	stdby	stdby	stdby	stdby	stdby	stdby	stdby	stdby	
USER	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
WAN	none	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	n/a	
RATE	64k	64k	64k	64k	64k	64k	64k	64k	64k	
PORT TYPE	none	none	none	none	none	none	none	none	none	
LMI	none	none	none	none	none	none	none	none	none	
DCE PARAM	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
DTE PARAM	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
ASYN	no	no	no	no	no	no	no	no	no	
CONG THRS	enabl	enabl	enabl	enabl	enabl	enabl	enabl	enabl	enabl	
DROP THRS	enabl	enabl	enabl	enabl	enabl	enabl	enabl	enabl	enabl	
LOOPBACK	off	off	off	off	off	off	off	off	off	
Save	Undo	Refresh	<	>	Endp	Circ	Perf	Lmi	Glob	Main

**Figure 2-2. Typical ACS-FRS Card Main Screen (numbered ports)**

Table 2-1 lists the actions you can perform from the ACS-FRS Card Main Screen. These actions are listed at the bottom line of the screen; they are performed by pressing the uppercase letter key. For example, to save your option settings, press “s” to invoke the **Save** command. Table 2-2 summarizes the parameters and their option settings and defaults.

**Table 2-1. ACS-FRS Card Main Screen Actions**

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Redraws the screen.
< and >	Lets you scroll through the 68 logical ports assignable on each ACS-FRS card.
Endp	Brings up the PVC Endpoints Screen where endpoints for each PVC are assigned. See the PVC Endpoints Screen section of this chapter.
Circ	Brings up the Circuits Screen where alternate endpoints and endpoint switching are assigned. See the Circuits section of this chapter.
Perf	Initiates Port Performance Monitoring of the selected ACS-FRS card port. Refer to Port Performance Data section of this chapter.
Lmi	Brings up the LMI Screen where additional performance statistics are stored. See the LMI section of this chapter.
Glob	Brings up the Global Screen that identifies the ACS-FRS card by IP number and netmask. See the Global Setup 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 2-2. ACS-FRS Card Main Screen Option Settings and Defaults

Parameter	User Options	Notes	Default
STATE	stdby actv		stdby
USER	n/a		n/a
WAN	none w1-1 w1-2 w2-1 w2-2 w3-1 w3-2 w4-1 w4-2	5	none
TS	n/a table		n/a
RATE	64k		64
PORT TYPE	none u-dce nni u-dte frad		none
LOOPBACK	off line local		off
LMI	none ansi ccitt lmi	1	none
DCE PARAM	n/a enabl	2	n/a
DTE PARAM	n/a enabl	3	n/a
ASYNC	no yes		no
CONG THRS	enabl 1%-100%	4	enabl (95%)
DROP THRS	enabl 1%-100%	4	enabl (85%)
LOOPBACK	off line local		off

**Notes:**

1. **ansi**, **ccitt**, and **lmi** can only be selected when Port Type is changed to any selection other than **none**.
2. When Port Type is **u-dce** or **nni**, this parameter will let you change the Error Threshold, Poll Verify Timer, and Events Counter settings.
3. When Port Type is **u-dte** or **nni**, this parameter will let you change the Error Threshold, Poll Interval Timer, Events Counter, and Full Status Frequency.
4. Press <Enter> to select the desired Congestion Threshold percentages.
5. If connected to a user port, this displays user slot number and port (e.g. U1-2).

**STATE**

The State setting determines whether the port is active or inactive. Set the State field to **stdby** (standby) for ports you are not using or have not yet configured. Or, set it to **actv** (active) for ports that are ready for use.

**USER**

This is a display field only. User settings are set on the respective user card menus.

## WAN

The WAN setting identifies the WAN link assigned to this port. You do not have to assign all ports on the same card to the same WAN link. You also don't have to assign card ports to contiguous time slots of a WAN link. The default value is **none**.

## TS

The Time Slot setting identifies the time slots on the WAN link when **wan** is selected in the previous setting. The ACS-FRS card can use many (up to 24 T1 or 31 E1) time slots on a single WAN port, in order to create a super-rate circuit for an individual FRS port. One or all time slots of a T1 or E1 link can be assembled for use by the FRS port, according to the speed requirements of the DTE.

You can assign time slots by pressing <Enter> and using the space bar to select and deselect the required number of time slots. These assignments do not have to be contiguous.

## RATE

The Rate setting allows you to adjust the speed of the circuit according to the application requirements. The only speed available for ports C1 to C4 is **64k** (64 kbps). However, ports 1 to 64 can be set to either **56k** or **64k**.

## PORT TYPE

The Port Type identifies the type of interface expected for this port. The selections are **none**, **u-dce** (User-to Network Interface), **nmi** (Network to Network Interface), **u-dte** (User-to Terminal Equipment), and **frad** (Frame Relay Assembler/Disassembler).

## LMI

The Local Management Interface setting allows you to select the protocol to be used by this port. The options are **none**, **ansi** (ANSI T1.617 Annex D), **ccitt** (ITU Q.933 Annex A), and **lmi** (Group of Four specification).

## DCE PARAM

The DCE Parameters setting will show **n/a** unless a Port Type of **u-dce** or **nni** is selected. Once set to enable, the user may choose from the following options:

- Error Threshold (N392)
- Poll Verify Timer (T391)
- Events Counter (N393)

The Error Threshold (N392) counts the errors that will be tolerated during the cast number of events as set by the Events Counter before declaring the LMI link down. The number of errors options are **1** to **10**. The value is input using the keyboard of the control terminal. The default is **3**.

The Poll Verify Timer (T391) allows you to select the time interval (in seconds) that should elapse between “keep alive” messages sent from the corresponding DTE. The number of seconds options are **5** to **30**. The default is **15** seconds.

The Events Counter (N393) allows you to select the window size for the number of events (frames) in which errors will be counted. If error threshold (N392) is exceeded within cast N393 frames, the link is declared down. The number of events counted are **1** to **10**. The default is **4**.

## DTE PARAM

The DTE Parameters setting will show **n/a** unless a Port Type of **u-dte** or **nni** is selected. Once set to enable, 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 cast number of events as set by the Events Counter before declaring the LMI link down. The number of errors options are **1** to **10**. The value is input using the keyboard of the control terminal. The default is **3**.

The Poll Verify Timer (T391) allows you 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** to **30**. The default is **10** seconds.

The Events Counter (N393) allows you to select the window size for the number of events (frames) in which errors will be counted. If error threshold (N392) is exceeded within cast N393 frames, the link is declared down. The number of events counted are **1 to 10**. The default is **4**.

The Full Status Frequency (N391) allows you 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 to 255**. The default is **6**.

### **ASYNC**

This setting specifies whether a synchronous state's update messages are to be sent when changes on the link occur. If set to no, link updates are sent at regular intervals, in response to Full Status Requests.

### **CONG THRS**

The Congestion Threshold allows you to select the amount (in percentage) that the internal Tx queues on the port must be filled before declaring this port is congested (this information is communicated by FECN and BECN flags). The options are **1 to 100**. The default is **95**.

Since DE (Discard-Eligibility) frames are not queued to the same extent as non-DE frames, DE-frames may be dropped when mixed with non-DE frames on the same port before congestion control is initiated.

To assure congestion control is initiated even for DE-frames under the conditions mentioned above, the TX threshold value must be reduced sufficiently to match the percentage DE-frames being duffered.

### **DROP THRS**

The Drop Threshold allows the user to select the amount (in percentage) that the queue must be filled before dropping packets. The user must select the percentages for both Yellow and Red zones. The options are **1-100** for both Yellow and Red zones.

### **LOOPBACK**

The Loopback option sets the port into a loopback condition. The options are **off, line** and **local** loopbacks. **Currently, this option is only supported on C1-C4 ports.**

## 2.3.2 PVC Endpoints Screen

You can have up to four endpoints (two for the actual endpoints of the PVC and two that can act as backup should the primary link fail). All frame relay endpoints are inventoried on the Frame Relay Endpoints Screen, and all endpoints must be defined from this screen before the user can provision the circuit.

Figure 2-3 shows a typical PVC Endpoints Screen, which can be viewed by pressing “e” (**Endp**) in the ACS-FRS Card Main Screen. Table 2-3 lists the actions you can perform from the bottom line of this screen.

Node_1	P3	FRSx68	8811	Rev A00-0	Ser 00101	12-31-99 14:33
page: 1 of 1 PVC ENDPOINTS						
NAME	PORT	DLCI	Bc (Kb)	Be (Kb)	CIR (Kbps)	
Chicago	C1	16	64	32	64	
Node_1	C3	17	0	0	0	
Refresh	New	dElete	pgUp	pgDn	Main	

**Figure 2-3. Typical PVC Endpoints Screen**

In Figure 2-3 above illustrates the endpoint screen for two voice circuits terminated on port 01, and 02 transported over port “C1” via the HSU to the EBTS. Figure 2-3 also shows the three IP endpoints defined on C1 towards the EBTS, and on C2 towards the IPR.

Table 2-3. Frame Relay Endpoints Screen Actions

Action	Function
Refresh	Redraws the screen.
New	Adds new circuit endpoints for each of the Frame Relay ports
dElete	Deletes the highlighted endpoints. The system requires confirmation with a yes/no question before deleting the circuit.
pgUp	Pages through the pages of Frame Relay endpoints from newest to oldest.
pgDn	Pages through the pages of Frame Relay endpoints from oldest to newest.
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.

### NAME

The Name setting allows you to identify each of the endpoints with a discrete name. This setting is case-sensitive, so a endpoint called “voice01” is not the same as one called “Voice01.” Circuits are built using these names.

### PORT

The Port number identifies the Frame Relay port used for this circuit. This information is input by the user from the keyboard. Valid entries are **C1 to C4** and **1 to 64**.

### DLCI

The Data Link Connection Identifier is a unique number assigned by the carrier to this endpoint. The number must be between **1** and **996** (ansi or ccitt), or **1** and **1007** (lmi). The other numbers within the 1023 range are reserved.

### BC(Kb)

The Bits Committed setting defines the threshold for the transmit rate (outgoing frames) where the card will make every effort to deliver the traffic to the subscriber. The time used to average rate is determined by the card by dividing the Committed Information Rate (CIR) by Bc. The number input must be between **0** and **2048**.

### BE(Kb)

The Bits Excessive setting defines the threshold for the transmit rate (outgoing frames) where the carrier will admit the frames into the network (in effect, this is the maximum transmission rate). Frames sent below this threshold but above the BC(KB) threshold are admitted into the carrier network with the DE (discard eligibility) bit set. If congestion occurs in the network, these frames are the first to be discarded. The options are **0** to **2048**.

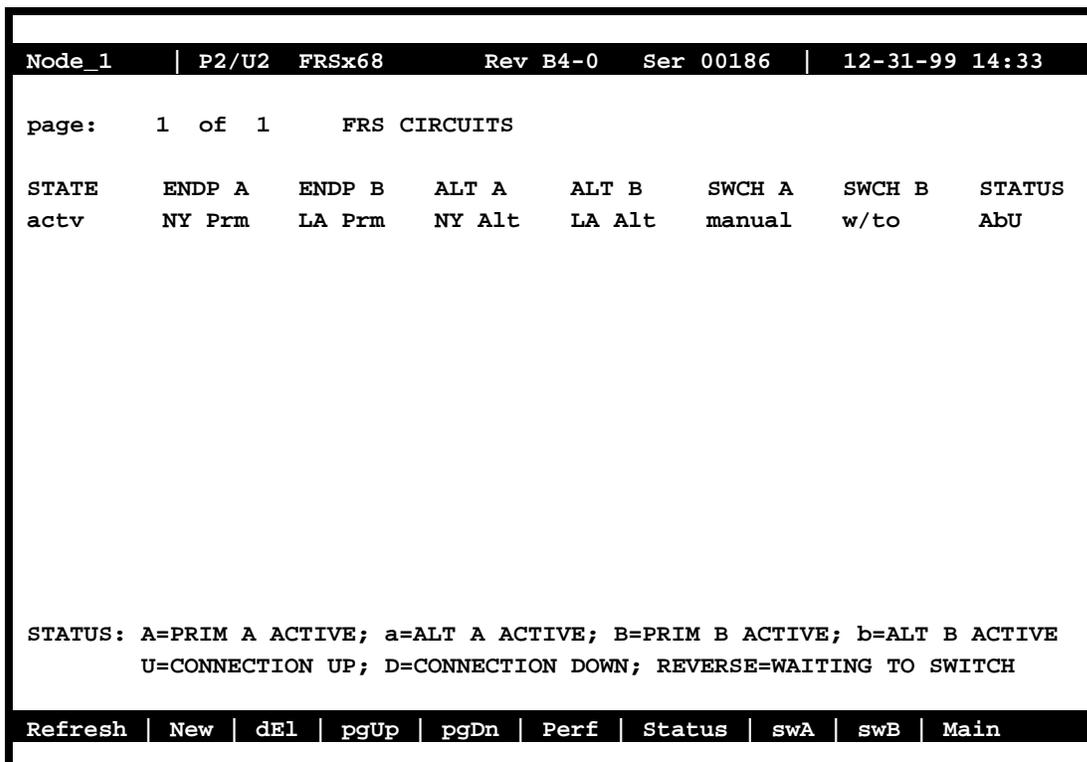
**CIR(Kbps)**

The Committed Information Rate (in kbps) is the actual information rate contracted with the carrier. The options are **0** to **2048**. CIR/Bc is used to calculate average data rate.

When CIR is set to **0**, all frames forwarded wil lhave the DE-bit set.

**2.3.3 FRS Circuits Screen**

The FRS Circuits Screen allows you to identify PVC endpoints and alternate PVCs to serve as backups to the original endpoints if the main link fails. **Endpoints must be inventoried on the PVC Endpoints Screen before they can be used to set up backup circuits.** Figure 2-4 shows a typical Circuits Screen, and Figure 2-5 is an endpoint circuit example. Table 2-4 lists the actions you can perform from the bottom of this screen.



**Figure 2-4. Typical FRS Circuits Screen**

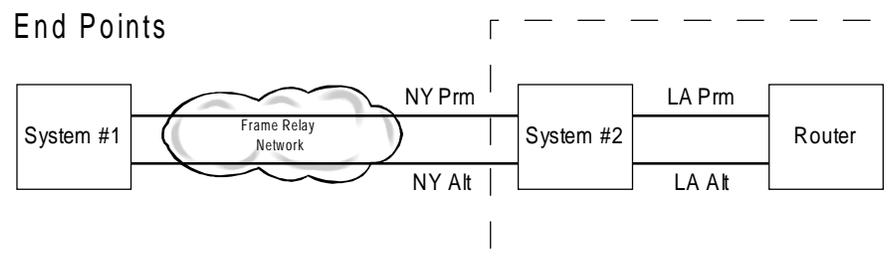
Currently the FRS is limited to 128 circuits connecting 256 endpoints. The integrated access sytem is required to serve a maximum of 8 EBTS units, each having a total of 16 channels. Each EBTS can be address by three different IP addresses. Each IP address represents a specific type of service. Each of the services: signaling, messing, and NMS will be addressed

EBTS by a different IP address. The IP router card will encapsulate IP Datagrams for each service with a unique DLCI value. The IP frames are self-contained in that channel information is embedded in the data of the datagram.

The total of 152 circuits will be required for both voice and IP circuits. Even though the maximum number of circuits for a single FRS card could be expanded to accommodate the needed number. When using two FRS cards, 64 circuits per card can be used as IP circuits after 64 circuits have been used as voice circuits.

**Table 2-4. FRS Circuits Screen Actions**

Action	Function
Refresh	Redraws the screen.
New	Creates new circuit.
dEl	Deletes the highlighted circuit. You will be prompted with a yes/no question prior to actual deletion of the circuits.
pgUp	Pages up through the circuits.
pgDn	Pages down through the circuits.
Perf	Brings up circuit performance data for the highlighted circuit. See the Circuit Performance Data section of this chapter.
Status	Shows circuit status, as described above.
swA	Used for manually switching from primary endpoint A to alternate endpoint A, and back.
swB	Used for manually switching from primary endpoint B to alternate endpoint B, and back.
Main	Returns to the FRS Card Main Screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.



**Figure 2-5. Typical FRS Endpoint Circuit**

## STATE

The State setting shows the status of the circuit. The options are **stdby** and **actv**. This setting shows the administrative state of the circuit. The operational state of each of the endpoints of the circuit is shown in the STATUS column.

**ENDP A**

Endpoint A is the FRS port used to provide service to the primary end of the PVC. All of the endpoint names assigned on the PVC Endpoints Screen (discussed earlier) are eligible options.

**ENDP B**

Endpoint B is the FRS port used to provide service to the secondary end of the PVC. All of the endpoint names assigned on the PVC Endpoints Screen (discussed earlier) are eligible options.

**ALT A**

Alternate Endpoint A is the FRS port used to provide backup service to the primary end of the PVC. All of the endpoint names assigned on the PVC Endpoints Screen (discussed earlier) are eligible options.

**ALT B**

Alternate Endpoint B is the FRS port used to provide backup service to the secondary end of the PVC. All of the endpoint names assigned on the Endpoint screen (discussed earlier) are eligible options.

**SWCH A**

The Switch A setting identifies the method used to switch from the primary Endpoint A to the Alternate Endpoint A. The options are **manual** and **w/to** (with time-out). If **w/to** is chosen, a second setting appears for the user to select the time-out period (in minutes) from **1** to **60**.

In the event of a failure of the primary endpoint, a setting of **manual** allows the user to manually switch from primary to the alternate endpoint. When the primary endpoint is restored, the user must manually switch it back again.

In the event of a failure of the primary endpoint, a setting of **w/to** will automatically switch the PVC from primary to alternate. When the primary endpoint is restored, the system will automatically switch it back again after the predetermined time set by the user.

## SWCH B

The Switch B setting identifies the method used to switch from the primary Endpoint B to the Alternate Endpoint B. The options are **manual** (pressing “b” from the bottom line of the screen), and **w/to** (with time-out). If **w/to** is chosen, a second setting appears for the user to select the time-out period (in minutes) from **1** to **60**.

In the event of a failure of the primary endpoint, a setting of **manual** allows the user to manually switch from primary to the alternate endpoint if he chooses. When the primary endpoint is restored, the user must manually switch it back again.

In the event of a failure of the primary endpoint, a setting of **w/to** will automatically switch the PVC from primary to alternate. When the primary endpoint is restored, the system will automatically switch it back again after the predetermined time set by the user.

## STATUS

The Status column shows the status of the Primary and Alternate endpoints and the connection of the PVC. You cannot edit this field. The values are “A” (Primary A is active), “B” (Primary B is active), “U” (the connection is up), “a” (Alternate A is active), “b” (Alternate B is active) and “D” (connection is down). Only displays status when “S” (**Status**) is selected from the bottom of the screen.

### 2.3.4 FRS Circuit Performance Data Screen

The ACS-FRS card accumulates statistics that show you the performance characteristics of each circuit. To access the FRS Circuit Performance Data Screen, highlight one of the circuits on the FRS Circuits Screen and press “p” (**Perf**). Figure 2-6 shows a typical FRS Circuit Performance Data Screen, and Table 2-5 lists the actions you can perform from its bottom line.

The circuit performance data is kept in 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. Press “d” (**pgDn**) to page backward through the previous 96 periods, or “u” (**pgUp**) to page forward through these periods. After each period, the oldest 15-minute segment (from exactly 24 hours ago) is discarded. Since information is not updated on screen in real time, you must press “r” (**Refresh**) periodically to obtain up-to-date statistics for the current period.

Node_1	P2/U2	FRSx68	Rev B4-0	Ser 00186	12-31-99 14:33		
Circuit NY-LA PERFORMANCE Sec. 240 of 900							
	AB FRAMES	BA FRAMES	AB BYTES	BA BYTES	AB DRP	BA DRP	STATUS
CUR	0	0	0	0	0	0	. . .
01	0	0	0	0	0	0	. . .
02	0	0	0	0	0	0	. . .
03	0	0	0	0	0	0	. . .
04	0	0	0	0	0	0	. . .
05	0	0	0	0	0	0	. . .
06	0	0	0	0	0	0	. . .
07	0	0	0	0	0	0	. . .
08	0	0	0	0	0	0	. . .
09	0	0	0	0	0	0	. . .
10	0	0	0	0	0	0	. . .
11	0	0	0	0	0	0	. . .
12	0	0	0	0	0	0	. . .
TOTAL	0	0	0	0	0	0	. . .
S STATUS: A (a) = A SWITCHED to PRIM (alt) B (b) = B SWITCHED to PRIM (alt)							
D = CONNECTION DOWN; S = STDBY							
R Refresh	Clear	pgUp	pgDn	conG	Main		

Figure 2-6. Typical FRS Circuit Performance Data Screen

Table 2-5. FRS Circuit Performance Data Screen Actions

Action	Function
Refresh	Since performance statistics are not updated on screen in “real” time, the refresh key must be pressed to obtain updated performance figures.
Clear	Clears all performance statistics for the highlighted port.
PgUp	Pages up through the 96 time segments.
PgDn	Pages down through the 96 time segments.
ConG	Brings up the Circuit Congestion Data Screen. See the Circuit Congestion Data section of this chapter.
Main	Returns to the Circuits Screen.

**AB FRAMES**

The AB FRAMES counter shows the total number of frames sent from endpoint A to endpoint B.

**BA FRAMES**

The BA FRAMES counter shows the total number of frames sent from endpoint B to endpoint A during the time period.

**AB BYTES**

The AB BYTES counter shows the total number of bytes sent from endpoint A to endpoint B during the time period.

**BA BYTES**

The BA BYTES counter shows the total number of bytes sent from endpoint B to endpoint A during the time period.

**AB DRP**

The AB DRP counter shows the total number of frames dropped that were sent from endpoint A to endpoint B during the time period.

**BA DRP**

The BA DRP counter shows the total number of frames dropped that were sent from endpoint B to endpoint A during the time period.

**STATUS**

The Status column shows the status of the selected circuit during the 15-minute intervals. The Status values are **A** or **a** (capital **A** means endpoint A was switched from alternate to primary and lower-case **a** means the endpoint A was switched from primary to alternate); **B** or **b** (capital **B** means endpoint B was switched from alternate to primary, lower-case **b** means endpoint B was switched from primary to alternate); **D** (connection was down during that period); and **S** (circuit was placed in standby state during that period).

### 2.3.5 Circuit Congestion Data Screen

The ACS-FRS card also accumulates statistics that show you the congestion characteristics of each of the circuits. To access the Circuit Congestion Data Screen, press “g” (conG) in the FRS Circuit Performance Data Screen. Figure 2-7 shows a typical Circuit Congestion Data Screen, and Table 2-6 lists the actions you can perform from its bottom line.

The data on this screen is kept in 15-minute (900 seconds) time increments for a total of 96 periods (24 hours). Each screen shows the current 15 minute segment and the twelve past periods with totals at the bottom of the column. Press “d” (pgDn) to scroll backward through the previous 96 periods, or “u” (pgUp) to scroll forward through these periods. After each period, the oldest 15-minute segment (from exactly 24 hours ago) is discarded. Since information is not updated on screen in real time, you must press “r” (Refresh) periodically to obtain up-to-date statistics for the current period.

Node_1	P2/U2	FRSx68	Rev B4-0	Ser 00186	12-31-99 14:33			
NY - LA	CIRCUIT CONGESTION INFO			Sec. 240 of 900				
	GREEN FR	DROP	YEL FR	DROP	RED FR	DROP	FECN	BECN
CUR	0	0	0	0	0	0	0	0
01	0	0	0	0	0	0	0	0
02	0	0	0	0	0	0	0	0
03	0	0	0	0	0	0	0	0
04	0	0	0	0	0	0	0	0
05	0	0	0	0	0	0	0	0
06	0	0	0	0	0	0	0	0
07	0	0	0	0	0	0	0	0
08	0	0	0	0	0	0	0	0
09	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0
Refresh	pgUp	pgDn	A->b	B->a	Main			

Figure 2-7. Typical Circuit Congestion Data Screen

**Table 2-6. Circuit Congestion Data Screen Actions**

Action	Function
Refresh	Since performance statistics are not updated on screen, you must press "r" to obtain updated performance figures.
pgUp	Pages up through the 96 time segments.
pgDn	Pages down through the 96 time segments.
A->b	Selects the direction of the congestion data.
B->a	Selects the direction of the congestion data.
Main	Returns to the Circuit Performance Data Screen.

**GREEN FR**

The Green Frames counter shows the total number of frames sent on the circuit that fell within the Committed Information rate contracted with the carrier during the time period.

**DROP**

The first DROP shows the number of Green Frames that were dropped by the card during the time period.

**YEL FR**

This counter shows the total number of frames on the circuit that exceeded the Bc rate but were within the Be rate assigned to the endpoint during the time period.

**DROP**

The second DROP shows the number of Yellow Frames that were dropped by the card during the time period.

**RED FR**

This counter shows the total number of frames on the circuit that exceeded the Be rate assigned to the endpoint during the time period.

**DROP**

The third DROP shows the number of Red Frames that were dropped by the card during the time period.

### **FECN**

The Forward Error Congestion Notification counter logs the number of frames with the FECN bit set by the system. This flag tells you that congestion avoidance procedures should be initiated.

### **BECN**

The Backward Error Congestion Notification counter logs the number of frames with the BECN bit set by the system. This flag tells you that congestion avoidance procedures should be initiated.

## **2.3.6 Port Performance Data Screen**

The ACS-FRS card also accumulates statistics that show you the performance characteristics of each active port. To address the Port Performance Data Screen, highlight one of the 68 ports on the ACS-FRS Card Main Screen and press “**p**” (**Perf**). This will access the Port Performance Data Screen associated with the selected port. Figure 2-8 shows a typical Port Performance Data Screen, and Table 2-7 lists the actions you can perform from its bottom line.

The data on this screen is 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. Press “**d**” (**pgDn**) to page backward through the previous 96 periods, or “**u**” (**pgUp**) to page forward through these periods. After each period, the oldest 15-minute segment (from exactly 24 hours ago) is discarded. Since information is not updated on screen in real time, you must press “**r**” (**Refresh**) periodically to obtain up-to-date statistics for the current period.

Node_1   P2/U2 FRSx68   Rev B4-0   Ser 00186   12-31-99 14:33									
Port	C1	PERFORMANCE		Sec. 240 of 900					
		FRAME Rx	FRAME Tx	OCTETS Rx	OCTETS Tx	DRPRx	DRPTx	STATUS	
CUR	0	0	0	0	0	0	0	. . . . .	
01	0	0	0	0	0	0	0	. . . . .	
02	0	0	0	0	0	0	0	. . . . .	
03	0	0	0	0	0	0	0	. . . . .	
04	0	0	0	0	0	0	0	. . . . .	
05	0	0	0	0	0	0	0	. . . . .	
06	0	0	0	0	0	0	0	. . . . .	
07	0	0	0	0	0	0	0	. . . . .	
08	0	0	0	0	0	0	0	. . . . .	
09	0	0	0	0	0	0	0	. . . . .	
10	0	0	0	0	0	0	0	. . . . .	
11	0	0	0	0	0	0	0	. . . . .	
12	0	0	0	0	0	0	0	. . . . .	
TOTAL	0	0	0	0	0	0	0	. . . . .	
STATUS: T = DTE DOWN C = DCE DOWN L = LOOPBACK S = STDBY									
Refresh	Clear	pgUp	pgDn	Main					

Figure 2-8. Typical Port Performance Data Screen

Table 2-7. Port Performance Data Screen Actions

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

**PORT**

The Port setting shows the port number associated with the performance statistics on this screen. This was the port highlighted on the Main screen when the “P” key was pressed. The FRS card has a maximum of 68 ports.

**FRAME Rx**

The Frame Received column tabulates the total number of frames received during the 15 minute period.

**FRAME Tx**

The Frame Transmitted column tabulates the total number of frames transmitted during the 15 minute period.

**OCTETS Rx**

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

**OCTETS Tx**

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

**DRPRx**

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

**DRPTx**

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

**STATUS**

The Status column shows different status conditions of the port during each 15-minute period. The status codes are listed at the bottom of the screen. The status codes are **T** (DTE down), **C** (DCE down), **L** (loopback), and **S** (standby).

### 2.3.7 LMI Data Screen

Local Management Interface information is displayed on the LMI Data Screen. To access this screen, press “L” in the ACS-FRS Card Main Screen to invoke the **Lmi** command. Figure 2-9 shows a typical LMI Data Screen, and Table 2-8 lists the actions you can perform from the bottom line of this screen.

Node_1	P2/U2	FRSx68	Rev B4-0	Ser 00186	12-31-99 14:33
<b>Frame Relay Port C1 Statistics</b>					
DCE	N/A	DTE	N/A		
Status Inq. RX:	0	Status Inq. TX:	0		
Status TX:	0	Status RX:	0		
Async Status TX:	0	Async Status RX:	0		
Seq # Mismatch:	0	Seq # Mismatch:	0		
Timeouts:	0	Timeouts:	0		
Bad HDLC frames:	0				
Invalid frames:	0				
No Route frames:	0				
Refresh	Clear	Main			

**Figure 2-9. Typical LMI Data Screen**

**Table 2-8. LMI Data Screen Actions**

Action	Function
Refresh	Saves changes to settings.
Clear	Returns all settings to the last saved state.
Main	Returns to the System Main Screen.

#### STATUS INQ. RX

The Status Inquiry Received figure shows the total number of status inquiry requests received by the DCE.

**STATUS TX**

The Status Transmitted figure shows the total number of “keep alive” and full status inquiries sent by the DCE.

**ASYNC STATUS TX**

If the ASYNC parameter in the ACS-FRS card Main Screen is set to **yes** for the port, asynchronous status packets transmitted by the DCE are tabulated in this figure.

**SEQ # MISMATCH**

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

**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 port.

**INVALID FRAMES**

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

**NO ROUTE FRAMES**

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

**STATUS INQ. TX**

The Status Inquiry Transmit figure shows the total number of status inquiry requests transmitted by the DTE.

**STATUS RX**

The Status Received figure shows the total number of “keep alive” and full status inquiries received by the DTE.

**ASYNC STATUS RX**

If the ASYNC parameter in the ACS-FRS card Main Screen is set to **yes** for the port, asynchronous status packets received by the DTE are tabulated in this figure.

**SEQ # MISMATCH**

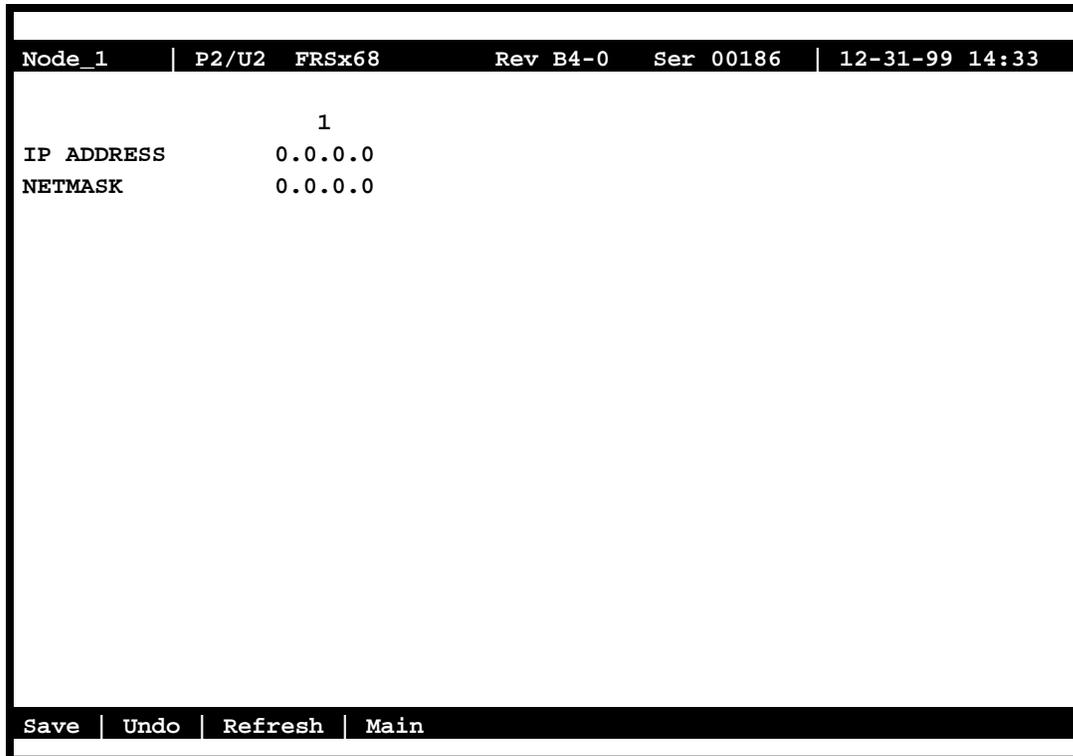
The Sequence Number Mismatch figure shows the total number of sequence number errors have been received by the DTE.

**TIMEOUTS**

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

### 2.3.8 Global Setup Screen

The Global Data Screen allows you to identify the frame relay server by its IP address. To access this screen, press “g” in the ACS-FRS Card Main Screen to invoke the **Glob** command. Figure 2-10 shows the Global Data Screen, and Table 2-9 lists the available actions from the bottom line of this screen.



**Figure 2-10. Global Data Screen**

**Table 2-9. Global Data Screen Actions**

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Redraws the screen.
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.

**IP ADDRESS**

Enter the IP address for the frame relay server in this field.

**NETMASK**

Enter the Netmask address in this field. This is the Netmask for the integrated access system. This address is also assigned on the Interface card's IP Screen.

## 2.4 ACS-FRS Card Error Messages

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

## 2.5 ACS-FRS Card Troubleshooting

Problems with a FRS card could indicate a number of causes. Some possibilities are:

- T1 or E1 network failure
- Improper frame relay network configuration
- Improper FRS card configuration
- Improper user card configuration
- Faulty cabling between the DTE and user card
- Improper DTE configuration

Typically, a problem is indicated by the inability to send or receive frame relay traffic through the FRS card. There are numerous ways of isolating and clearing the problem. When troubleshooting frame relay communications problems through an FRS card, follow this general sequence:

1. If all Frame Relay traffic is affected, verify that the US/EUR jumper is correctly placed to match the US/EUR jumper on the chassis. The FRS card performs a self-test on power-up. A “healthy” card will have a green LED lit on the front panel. Do not proceed with further steps until a green LED is present.
2. Verify that the T1 or E1 network is working properly by checking for current CGA-Red and CGA-Yellow alarms. If no CGA alarms are present that would affect the frame relay traffic, continue with step 3.
3. Verify that the FRS port is connected to the proper WAN card and time slot or user card port and that the correct type of LMI is selected. If a user card port is used, verify the configuration settings on the user card port and the cable connection to the DTE. The LMI must be UP for data to flow on the circuit. Do not proceed with further steps until the LMI is up.
4. Go to the Port Performance Monitoring Screen by pressing **P** from the FRS Main Screen. Analyze the register and status information provided to help determine the cause of the problem.
5. Go to the Circuits Screen of the FRS card (which can be accessed by selecting **Circ** from the FRS Main Screen). Verify that the affected circuit **STATUS** is up (indicated by a “U”). If it is not up, this may indicate that an LMI is down in the far end of the

circuit. Highlight the affected circuit and type **P** and the performance registers for the circuit will appear. Analyze the information provided to help determine the cause of the problem.

6. Loopbacks are available on the “C” ports only. If a “C” port with an LMI is looped back toward itself, the **PORT TYPE** must be **nni** for the loopback to function.
7. If the FRS card is determined to be faulty, replace it and return the faulty unit for repair to the location specified by your distributor.

## 2.6 ACS-FRS Server Card Specifications

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### ACS-FRS Card (Model 8811)

Input/Output Ports	68 logical ports (maximum)
Input Traffic Ports	T1, E1, fT1, fE1, V.35, RS422, EIA530, OCU-DP, FRAD
Output Traffic ports	T1, E1, fT1, fE1, V.35, RS422, EIA530
Output Port types	UNI DCE, UNI DTE, NNI, Nx64K/56K FRAD
Max Frame Size	4K Bytes
Traffic Bandwidth	8 Mbps Full Duplex
Performance	4,000 Frames per second (maximum)
Number of PVCs	128
System Capacity	Maximum 3 per System
Management	RFC1315 DTE MIB, Frame Relay Service MIB, SNMP Alarm Traps per RFC 1215
Connectivity	SNMP or TELNET
LMI Options	Q.933 Annex A, ANSI T1.617 Annex D, LMI (Gang of 4), None
Information Rates	CIR = 0 to 2048 Kb/s, Bc = 0 to 2048 Kb, Be = 0 to 2048 Kb
Congestion Handling	FECN, BECN
Circuit priorities	4

# Chapter 3

## MCC Card

### 3.1 Introduction

This chapter provides installation, configuration, and troubleshooting information for the Management Channel Concentrator (MCC) card.

Note that this card is labeled as an ACS card on its faceplate ejector, and it is called an ACS-MCC card only in the user interface screens described in this chapter. Throughout this chapter, it is referred to as the ACS-MCC card.

### 3.2 ACS-MCC Card Descriptions

#### 3.2.1 ACS-MCC Card Description (8813)

The ACS-MCC card allows you to manage remote integrated access systems by using TCP/IP or SNMP/UDP/IP communication protocols. The control link to each remote system can be the FDL (Facility Data Link) bits of an ESF-framed T1 line. Or, for an E1 line, this link can use the SA4 bits in the frame alignment words of the E1 signal. Full time slot B7R requires a DACSII 6.1 or equivalent. *MCC doesn't talk direct to FDL link, this requires a DACs to convert full timeslot B7R to B4R.*

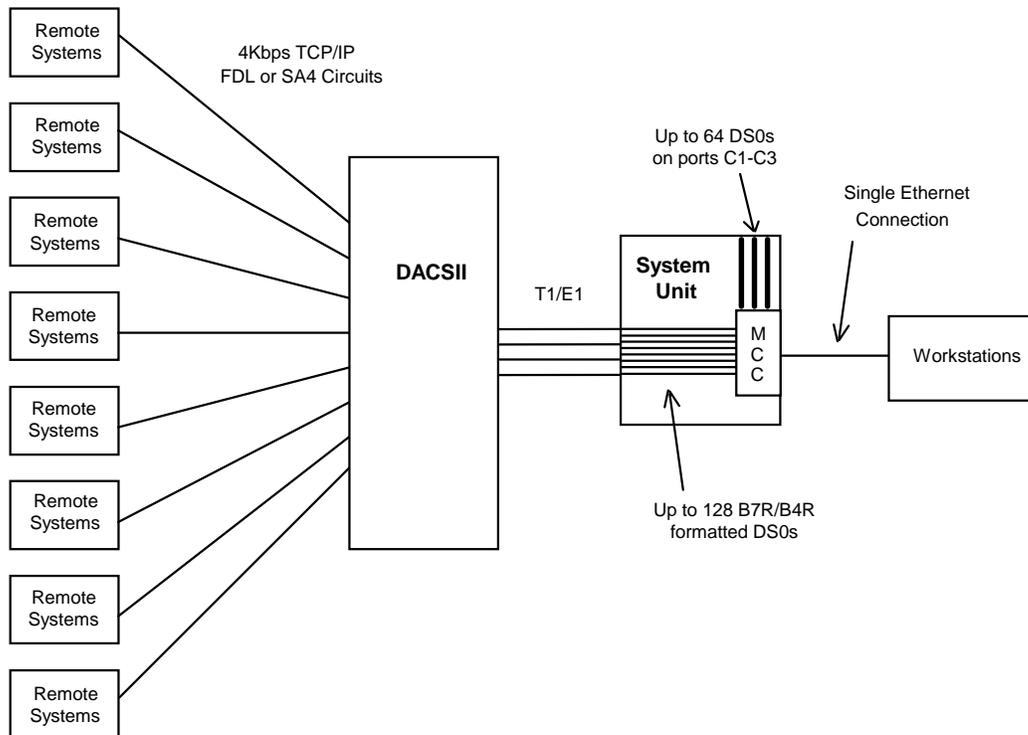
The ACS-MCC card incorporates four Munich32 chips (two on the main board and two on a daughterboard), which allow up to 128 WAN interfaces. The ACS-MCC card also supports three configurable high-speed ports (C1, C2, and C3), plus an Ethernet 10Base-T port for LAN routing management.

The MCC can route IP datagrams between all of its interfaces, based on each datagram's IP destination address. Datagrams are directed (or routed) to the interface carrying the sub-net to which the datagram belongs or is being transported to, according to the content of the routing table. The routing table may be supplied with dynamic routes from the Routing Information Protocol (RIP) when enabled. If no match is found in the routing table, a default route can be designated to direct all unresolved datagrams to a specific interface.

Figure 3-1 shows the role of the ACS-MCC card in a Network Management System. Both SNMP alarm traps and TELNET configurations run over this path. They can use the FDL (T1 line), the SA4 bit of the frame alignment word (E1 line), or a full DS0 time slot of a T1 or E1 line.

The FDL is a 4 kbps channel that uses every other framing bit of the T1 extended superframes. When the FDL is used for remote system control via TCP/IP, T1 performance statistics are not gathered.

The SA<sub>4</sub> bit of the E1 frame alignment word is the first bit of time slot 0 of each frame. This bit is called the *national* bit; it also comprises a 4 kbps data channel.



**Figure 3-1. Typical MCC Application**

If the FDL is used to transmit and receive information, a DACSII (6.1 or higher) must be used to convert the FDL/IP information into DS0. On point-to-point circuits, the DACSII is not needed. The MCC can also be used to create larger "trees" in which the high-speed ports (C1, C2, and C3) can interconnect the different ACS-MCC cards in the hierarchy.

### 3.2.1.1 Jumper/Switch Settings

The ACS-MCC card doesn't have any jumpers or switches on its mainboard.

### 3.2.1.2 Installing the ACS-MCC Card

Insert the ACS-MCC card into one of the server card chassis slots (P1 to P3). The system can accommodate up to three server cards.

### 3.3 ACS-MCC Card User Screens and Settings

#### 3.3.1 ACS-MCC Card Main Screen (Ethernet Port Configuration)

The ACS-MCC card routes datagrams onto Ethernet at the NMS site for communications with the NMS. Figure 3-2 shows the ACS-MCC Card Main Screen, in which you must set various parameters for the Ethernet interface. To go to this screen, highlight the desired card in the System Main Screen and press <Enter>.

```

Node_1 | P1 MCC | Rev A1-0 | Ser 00101 | 12-31-99 14:33
Version #:1.1
STATE          E
STATE          stdbY
IPADDR         ip
NETMASK        ip
DEF RT         static
RIP            off
SH             off
WEIGHT         01
FMT-MAIN       bxr
FMT-SUB        bxr
IF-TYPE        unnum

Save | Undo | Refr | Copy | < | > | porT | Nstat | Main

```

**Figure 3-2. Typical ACS-MCC Card Main Screen**

The bottom highlighted line of this screen shows numerous actions that you can perform from this screen. To perform the desired action, simply press the key shown by a uppercase letter. For example, to save your configuration settings, press “s” to invoke the **Save** command. Table 3-1 lists the available screen actions, and Table 3-2 summarizes the ACS-MCC card Main Screen parameters and available option settings. These parameters and settings are also described in the following paragraphs.

Table 3-1. Main Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Redraws the screen.
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.
<	The “less than” symbol scrolls backward through the 128 ports associated with this card.
>	The “greater than” symbol scrolls forward through the 128 ports associated with this card.
porT (C1-C3)	The port option allows you to “jump” to a specific port. Enter the number of the port you wish to see, press the <Enter> key, and the requested port will be displayed. To return to the Main Screen, press “e” and then press <Enter>.
Nstat	Displays the Network Data Screen.
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. Main Screen Option Settings and Defaults

Parameter	User Options	Default
STATE	stdby actv	stdby
IPADDR	ip	0.0.0.0
NETMASK	ip	0.0.0.0
DEF RT	none stat dyn	none
RIP	off rx tx rx/tx	off
SH	off on	off
WEIGHT	01-15	01
FMT-MAIN	bxr hdlc	bxr
FMT-SUB	bxr hdlc	bxr
IF-TYPE	unnum num	unnum

## STATE

The State setting determines whether the port is active or inactive. Set the State to **stdby** (standby) to disable the Ethernet port, or choose **actv** (active) to enable the port.

## IPADDR

When configured for unnumbered interfaces, the IP Address setting identifies the global IP Address of the MCC. This address is thus valid regardless of the state of the Ethernet port. When configured for numbered interfaces, the IP address of the Ethernet port identifies the IP address of the Ethernet interface only.

## NETMASK

The IPADDR together with the NETMASK identifies the IP network for the Ethernet interface. Any valid netmask address is acceptable.

## DEF RT

The Default Route setting identifies the IP Address of the port used to forward IP datagrams with destination unknown to the MCC. When **stat** (static) is selected, the IP address must be entered by the user. When **dyn** (dynamic) is selected, the IP address is dynamically assigned by a router. RIP must be turned on if **dyn** is selected. The default is **none**.

## RIP

When the Routing Information Protocol (RIP) setting is **off** (default), no RIP traffic is allowed into or out of the Ethernet interface. Setting this variable to **rx** allows incoming RIP traffic only, while setting it to **tx** allows only outgoing RIP traffic. Setting this variable to **rx/tx** allows both incoming and outgoing RIP traffic.



*Note: Due to the high number of interfaces on the ACS-MCC card and the relatively low bandwidth of the Munich interfaces, you should be careful when implementing the RIP option.*

## SH

When the Split Horizon (SH) variable is set to **on**, the ACS-MCC card does not automatically send RIP information along routes it "learned" through the same interface. The default is **off**.

## WEIGHT

The Weight parameter assigns a weighting variable to the specified interface. The number must be between **1** and **15**. The default is **1**.

## FMT-MAIN

This parameter is used to indicate the format of the 64 ports on the main board. When **bxr** is selected, ports 1 through 64 are configured to B4R (E1) or B7R (T1). When **hdlc** is selected, ports 1 through 64 are configured to 64 kbps. (See note below for exception.)

## FMT-SUB

This parameter is used to indicate the format of the 64 ports on the sub-board. When **bxr** is selected, ports 65 through 128 are configured to B4R (E1) or B7R (T1). When **hdlc** is selected, ports 65 through 128 are configured to 64 kbps. (See note below for exception.)



**Note:** *The only invalid configuration for FMT-MAIN and FMT-SUB occurs when FMT-MAIN = **bxr** and FMT-SUB = **hdlc**. This configuration is not supported.*

## IF-TYPE

The IF-TYPE parameter determines the IP addressing scheme to be used by all interfaces (except the Ethernet interface, which is always numbered). The default option is **unnum**, which causes the interfaces to be unnumbered. When configured in this manner, the MCC is addressed through the global IP address of the Ethernet interface, regardless of the originating interface, and the IP address of all interfaces (except the Ethernet interface) is determined by the interface on the remote end. Selecting **unnum** may help conserve IP address, but may not be compliant with the HP OpenView network management system.

The **num** option allows for numbered interfaces. When this option is selected, each interface is assigned a local IP address on the same network as (but different from) the remote device. Two broadcast IP addresses are also reserved for each interface, for a total of four IP addresses per port. Numbered interfaces are industry-standard, and are compliant with the HP OpenView network management system.

### 3.3.1.1 C-Port and Numbered Port Configuration (1.1 Version Only)

After establishing the card's Ethernet parameter settings, configure the card's ports. From the ACS-MCC Card Main Screen, press "**t**" (**porT** command) to go to its ports. The ACS-MCC card has three high-speed ports (C1, C2, and C3) and 128 other ports (1 to 128), in addition to the Ethernet port.

Table 3-3 shows a typical C-Port Screen. After pressing "**t**" above, choose the C-ports (C1, C2, and C3) and 128 other ports (1 to 128) to view this screen.

Node_1	P1	MCC	Rev	A01-0	Ser	00101	12-31-99	14:33
Version #:1.1								
			C1	C2	C3			
STATE			stdby	stdby	stdby			
WAN/SERV			none	none	none			
TS			n/a	n/a	n/a			
IP ADDR			ip	ip	ip			
NETMASK			ip	ip	ip			
FORMAT			hdlc	hdlc	hdlc			
RIP			off	off	off			
SH			off	off	off			
WEIGHT			01	01	01			
Save	Undo	Refresh	Copy	<	>	port	Netstat	Main

**Figure 3-3. Typical C-Port Screen**

The “less than” (<) and “greater than” (>) keys allow you to scroll through the other numbered ports associated with this card. Figure 3-4 shows a Typical Numbered Port Screen. Table 3-2 lists the options and defaults for the card ports.

Table 3-3 lists the actions you can perform from either screen. To perform an action, press the key indicated by the capitol letter on the bottom highlighted line of the screen.

Table 3-4 lists the Port Assignment Screen parameters and available setting. These are also described in the following paragraphs.

Node_1	P1	MCC	Rev	A01-0	Ser	00101	12-31-99	14:33
Version #:1.1								
	1	2	3	4	5	6	7	8
STATE	stdby	stdby						
WAN/SERV	none	none						
TS	n/a	n/a						
IP ADDR	ip	ip						
NETMASK	ip	ip						
FORMAT	b7r	b7r						
RIP	off	off						
SH	off	off						
WEIGHT	01	01	01	01	01	01	01	01
Save   Undo   Refresh   Copy   <   >   porT   Netstat   Main								

Figure 3-4. Typical Numbered Port Screen

Table 3-3. Port Assignment Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Redraws the screen.
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.
<	Scrolls backward through the 128 ports associated with this card.
>	Scrolls forward through the 128 ports associated with this card.
porT (C1-C3)	The port option allows you to “jump” to a specific port. Enter the number of the port you wish to see, press the <Enter> key, and the requested port will be displayed. To display the Ethernet port, press "e" and then press <Enter>.
Nstat	Displays the Network Data Screen for the current port.
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 3-4. Port Screen Option Settings and Defaults

Parameter	User Options	Notes	Default
STATE	stdby actv		stdby
WAN	none w1-1 through w4-2		none
TS	n/a 1-24 1-31		n/a
IPADDR	ip		0.0.0.0
NETMASK	ip		0.0.0.0
FORMAT	b7r b4r hdlc fr	1	see note 1
RIP	off rx tx rx/tx		off
SH	off on		off
WEIGHT	1-15		1

**Notes:**

1. For ports C1, C2, and C3, the options are **hdlc** (default) and **fr**. For ports 1 to 128, the options are **b7r** (default) and **b4r**.

**STATE**

The State setting determines whether the port is active or inactive. 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 on which the system information is sent. This signal will come from either the distant system unit or the DACSII™. The options are **none** and **w1-1** to **w4-2**. Ports 65 to 128 are limited to WAN links **w2-1** through **w4-2**.

**TS**

The Time Slot setting identifies the specific time slot on the WAN link (from the previous paragraph) used for this particular port. The options are **n/a**, **1-24** (for T1 links) and **1-31** (for E1 links).

**IP ADDR**

The IP Address setting identifies the IP Address of the remote end. Any unique valid IP address is acceptable.

## NETMASK

The NETMASK setting together with the IP ADDR identifies the network for this port.

## FORMAT

The Format setting determines the format of the information received from the remote system unit. For the numbered ports (1-128), the options are **b7r** (for T1 links) and **b4r** (for E1 links). For ports C1-C3, the options are **hdlc** (high-level data link control) and **fr** (frame relay). If **fr** is selected, the user must select a DLCI (data link connection identifier), which corresponds to the virtual circuit number of the frame relay destination address. When more than one TS is selected, the MTU is 1,500. The internal MTU is expanded by four on the WAN segment to allow 1,500 byte frames to pass with the addition of the frame relay header without fragmentation. When **fr** is selected, more than one TS must be allocated.

## RIP

When the Routing Information Protocol (RIP) setting is off (default), no RIP traffic is allowed into or out of the Ethernet interface. Setting this variable to rx allows incoming RIP traffic only, while setting it to tx allows only outgoing RIP traffic. Setting this variable to rx/tx allows both incoming and outgoing RIP traffic.



***Note:** Due to the high number of interfaces on the ACS-MCC card and the relatively low bandwidth of the Munich interfaces, the user should be cautious about implementing the RIP option, as there is a substantial risk of broadcast storms causing congestion in the network.*

## SH

When the Split Horizon (SH) variable is set to **on**, the ACS-MCC card does not automatically send RIP information along routes it "learned" through the same interface. The default is **off**.

## WEIGHT

The Weight parameter assigns a weighting variable to the specified interface. The number must be between **1** and **15**. The default is **1**.

## NETWORK DATA

The Network Data Screens provide maintenance and diagnostics information for this equipment. Statistics begin to accumulate when the port is changed from **stdby** to **actv** and they continue to store information until the port is changed back to **stdby**. These are status information screens; you cannot edit their data.

### 3.3.2 Network Port Statistics Screen

Figure 3-5 shows typical statistics for a network port (in this case, C1 port). To view this data, type “n” in the ACS-MCC Card Main Screen to invoke the **Nstat** command. Then, enter the desired port number. This data is described in the following paragraphs.

Node_1   P1 MCC   Rev A1-0   Ser 00101   12-31-99 14:33	
PORT C1 INTERFACE	
In Packets	0
In Octets	0
In Discards	0
In Errors	0
Out Packets	0
Out Octets	0
Out Discards	0
Out Errors	0
interFace   Ip   Refresh   Main	

Figure 3-5. Typical Network Port Data Screen

#### IN PACKETS

The In Packets counter shows the total number of packets received from the remote systems through this port.

**IN OCTETS**

The In Octets counter shows the total number of octets received from the remote systems for this port.

**IN DISCARDS**

The In Discards counter shows the total number of packets received from the remote systems and discarded due to lack of resources for this port.

**IN ERRORS**

The In Errors counter shows the total number of packets received from the remote systems that had CRC errors when received.

**OUT PACKETS**

The Out Packets counter shows the total number of packets sent to the remote systems by the NMS equipment.

**OUT OCTETS**

The Out Octets counter shows the total number of octets sent to the remote systems by the NMS equipment.

**OUT DISCARDS**

The Out Discards counter shows the total number of packets that were sent to the remote systems and discarded due to lack of resources.

**OUT ERRORS**

The Out Errors counter shows the total number of errors related to packets transmitted.

Table 3-5 lists the other actions you can perform from the Network Port Statistics Screen. These actions appear on the bottom highlighted line of the statistics screen. To perform an action, just press the letter that corresponds to the uppercase letter associated with the desired action.

Table 3-5. Network Port Data Screen Actions

Action	Function
interFace	Switches from the IP Data Screen to the Interface Data Screen.
Ip	Switches from the Interface Data Screen to the IP Data Screen.
Refresh	Data collection is not updated automatically. Pressing the “r” key will update all data fields.
Main	Returns to the System Main Screen.

### 3.3.3 MCC Protocol Stack Data Screen

Figure 3-6 shows typical statistics for the ACS-MCC card protocol stack. To display this data, press “i” in the Network Port Statistics Screen to invoke the **Ip** command. These statistics are described in the following paragraphs.

Node_1		P1	MCC	Rev A01-0	Ser 00101	12-31-99	14:33
ACS-MCC CARD PROTOCOL STACK STATISTICS							
---IP Netstack ---							
Datagrams In							0
Input Datagrams Discarded							0
Output Datagrams Discarded							0
Datagrams Forwarded							0
Requests Out							0
---ICMP Netstat---							
In Messages							0
Out Messages							0
In Errors							0
In Echo Requests							0
In Echo Replies							0
Out Echo Requests							0
Out Echo Replies							0
In Destination Unreach							0
Out Destination Unreach							0
interFace	Ip	Refresh	Main				

Figure 3-6. Typical MCC Protocol Stack Data Screen

**DATAGRAMS IN**

The Datagrams In counter shows the total number of IP datagrams received from the remote systems.

**INPUT DATAGRAMS DISCARDED**

The Input Datagrams Discarded counter shows the total number of IP datagrams received that were discarded.

**OUTPUT DATAGRAMS DISCARDED**

The Output Datagrams Discarded counter shows the total number of IP datagrams sent to the remote system and discarded.

**DATAGRAMS FORWARDED**

The Datagrams Forwarded counter shows the total number of IP datagrams that were received from the remote systems and then forwarded.

**REQUESTS OUT**

The Requests Out counter shows the total number of IP datagrams that originated at the MCC.

**IN MESSAGES**

The In Messages counter shows the total number of ICMP messages sent by the remote systems.

**OUT MESSAGES**

The Out Messages counter shows the total number of ICMP messages sent to the remote systems.

**IN ERRORS**

The In Errors counter shows the total number of ICMP messages sent by the remote systems and had errors when received.

**IN ECHO REQUESTS**

The In Echo Requests counter shows the total number of ICMP echo requests sent by the remote systems.

**IN ECHO REPLIES**

The In Echo Replies counter shows the total number of ICMP echo replies sent by the remote systems.

**OUT ECHO REQUESTS**

The Out Echo Requests counter shows the total number of ICMP echo requests sent to the remote systems.

**OUT ECHO REPLIES**

The Out Echo Replies counter shows the total number of ICMP echo replies sent to the remote systems.

**IN DESTINATION UNREACH**

The In Destination Unreachable counter shows the total number of “destination unreachable” requests sent by the remote systems.

**OUT DESTINATION UNREACH**

The Out Destination Unreachable counter shows the total number of “destination unreachable” requests sent to the remote systems.

## 3.4 ACS-MCC Card Error Messages

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

## 3.5 ACS-MCC Card Troubleshooting

MCC card problems could indicate a number of possible causes, including:

- Misconfigured IP parameter at the far end
- Faulty cabling between the MCC LAN port and the LAN
- T1 or E1 network failure
- Improper network configuration
- Improper MCC card configuration

Typically, a problem is indicated by the inability to route IP traffic to/from or through the MCC card. You can perform numerous tasks to isolate the trouble and clear it. When troubleshooting problems on IP communications through an MCC card, follow this general sequence:

1. If all IP traffic is affected, verify that the US/EUR jumper is correctly placed to match the US/EUR jumper on the chassis. The MCC card performs a self-test on power-up. A “healthy” card will have a green LED lit on the front panel. Do not proceed with further steps until a green LED is present.
2. Verify that the Ethernet Port (**E**) is **actv** and that the correct IP address (**IPADDR**) and **NETMASK** have been entered. At this point, attempt to “ping” (from the CPU card TCP/IP screen) the IP address of the MCC Ethernet port from another device on the LAN. Pressing **N** from this screen will display the Network Statistic registers for the Ethernet port. Analyze the information to determine the cause of the failure. Do not proceed with further steps until this ping is successful.
3. From the CPU Main Menu screen, go to the TCP/IP screen by pressing **I**. Verify that the options and addresses on the TCP/IP screen are correct. Press “**P**” (for ping) and enter the IP address of the MCC card Ethernet port.
4. If Step 3 is not successful, verify that the **DEFAULT IP PORT** is set to **serv** and that the **DEFAULT IP SLOT** is set to the chassis slot in which the MCC card resides (**P1**, **P2**, or **P3**). At this point, attempt to ping the card again by pressing **P**. Do not proceed until this ping is successful.
5. Verify that the T1 or E1 network is working properly by checking for current CGA-Red and CGA-Yellow alarms. If no CGA alarms are present that would affect IP traffic, continue with step 6.

6. Verify the configuration settings for the affected MCC port. Be sure the port is connected to the proper WAN card and port, that the correct **FORMAT** is selected and that the appropriate IP address (**IPADDR**) and **NETMASK** have been entered. If these assignments appear correct, go back to the CPU TCP/IP menu and ping the address of the remote device connected to that MCC port. If this is not successful, ping back toward the MCC card from the remote device. Pressing **N** from the MCC card Port screen will display the Network Statistic registers for the port. Analyze the information to help determine the cause of the failure. The problem may be either in the network between the MCC port and the remote device, or incorrect IP addressing/configuration of the remote device.
7. If the MCC card is determined to be faulty, replace it and return the faulty unit for repair to the location specified by your distributor.



# Chapter 4

## ISDN-PRI Card

### 4.1 Introduction

The ISDN-PRI server card offers users the ability to effectively terminate and manage both dedicated and switched carrier services in a single system. This capability allows users to pick the most cost-effective services for both permanent connections (e.g., LAN-to-WAN) and periodic connections (e.g., video conferencing).

Three specific features enable the system to use ISDN-PRI services, and are therefore covered in this chapter. These features are:

- ISDN PRI server card
- Call profiles (accessed from the Interface Card)
- HSU-AD 530/35 switched services data card

The switched services HSU card information is repeated in the chapter on HSU cards, and the call profile information is repeated in the Interface Card chapter.

#### 4.1.1 Definitions

##### 4.1.1.1 Time slot

Each T1 or E1 WAN link accessed by the system is subdivided into individual 64 kbps channels called time slots (T1 has 24 time slots, E1 has 32). A time slot is sometimes also called a DS0 or a B (bearer) channel. While all three terms refer to the same concept, this manual will assign arbitrary definitions to distinguish time slots controlled by ISDN from those that are not.

##### 4.1.1.2 DS0

**A DS0 is a time slot on any WAN link that is not controlled by an ISDN signaling channel (the D channel).** Thus, DS0s are controlled via assigning user ports to WAN time slots (see individual user card chapters) via setting up cross-connect circuits (see Chapter 4, *System Configuration and Operation*, in the *System Reference Guide*).

#### 4.1.1.3 B Channel

A **B channel** is a time slot on any WAN link that **is controlled by an ISDN D channel**. B channel assignments to WAN links are used dynamically by the system as incoming and outgoing ISDN calls occur.

In the system, every time slot is either a B channel or a DS0. Users can define which is which via the D channel configuration screen described later in this chapter.

#### 4.1.1.4 D Channel

A **D channel** carries signaling information for all B channels with which it is associated. Each D channel occupies an entire time slot which is dedicated to ISDN signaling. The D channel can also be used to log into a remote system unit (see later in this chapter).

#### 4.1.1.5 Facility

A facility is another term for an individual T1 or E1 WAN link.

#### 4.1.1.6 Interface

The term “interface” is used interchangeably with facility when referring to an ISDN link.

#### 4.1.1.7 NFAS (Non-Facility Associated Signaling)

A basic ISDN PRI facility is a T1 link that consists of 23 B channels and 1 D channel (23B+D), or an E1 link that consists of 30 B channels and 1 D channel (30B+D). Note that one time slot on any E1 link is reserved for maintenance use and is neither a B channel nor a D channel. The D channel provides signaling for all (23 or 30) of the B channels on the facility carrying the D channel.

However, many ISDN applications have relatively low call rates (i.e., the D channel is not very busy), but need more than 23 (or 30) B channels to carry user (bearer) traffic. In these cases, a D channel can be set up to perform signaling not only for the B channels on its own facility, but also for B channels on other facilities (i.e., other T1/E1 WAN links). When a D channel is so provisioned it is considered to be performing **non-facility associated signaling (NFAS)**.

Some carriers' implementations of NFAS allow one D channel to carry signaling for up to 20 facilities (i.e., 479 B channels and 1 D channel in a T1 environment). However, the system is limited to 8 WAN links. Thus, the system limit for NFAS is 191B+D in T1 environments (8 times 24 minus 1 D channel), and 239B+D in E1 environments (8 times 30 minus 1).

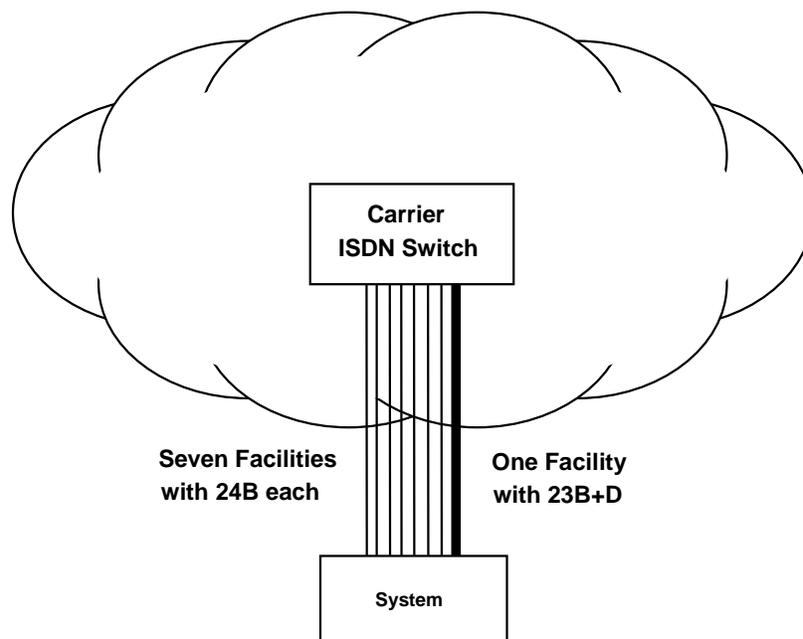
#### 4.1.1.8 Trunks

An ISDN trunk is a logical division of B channels pertaining to a D channel. It consists of one or more contiguous or non-contiguous B channels. All B channels in a trunk must belong to the same D channel. However, a trunk may be assigned across different physical interfaces when NFAS is used.

### 4.1.2 Selecting D Channels, B Channels, and DS0s

The D channel configuration screens described later in this chapter show how to configure D channels, assign B channels to one or more D channels, and how to identify dedicated DS0s that cannot be used as B channels. This section will give a few examples of applications that would require various combinations of D channel(s), B channels, and DS0s.

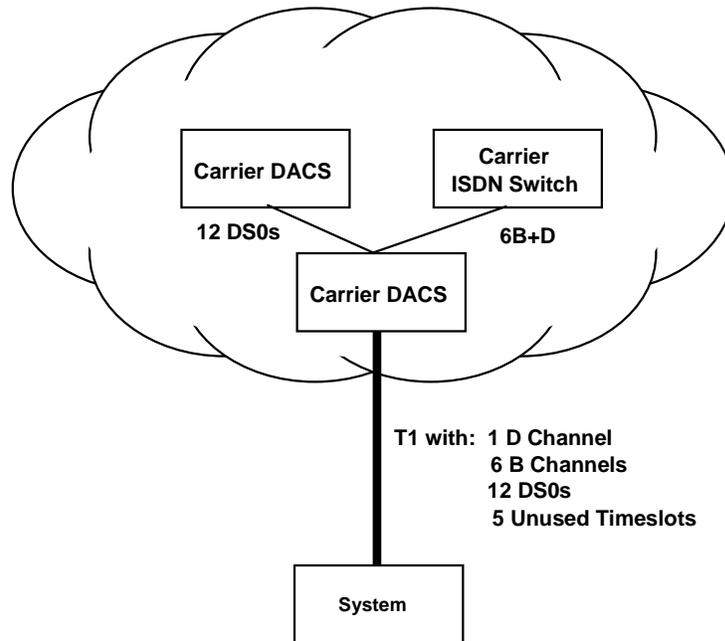
Figure 4-1 shows an application where a single D channel performs ISDN signaling for 8 T1's worth of B channels (191 B+D). There are actually 8 separate T1 facilities: seven with 24 B channels each, and one with 23 B channels and one D channel.



**Figure 4-1. ISDN Channels: 191B+D**

Figure 4-2 shows an application where a user needs less than 23 B channels (say 6 B channels for video), and some dedicated DS0s (say 12 for LAN-WAN interconnect). In this case, the D channel, B channels, and the DS0s all run on the same facility from the equipment to the

carrier. Inside the carrier's facility access point, the D and B channels are extracted from the facility and sent to the ISDN switch, and the 12 DS0s are extracted from the facility and sent to the carrier's dedicated DACS network. In this example, 5 time slots are unused.



**Figure 4-2. DS0s and B Channels on the Same Facility**

Figure 4-3 shows an application that requires 3 D channels. The user has ordered a 23B+D facility to each of two different carriers. The third facility is a local NFAS (47B+D) connection to the user's PBX. In this application, the system will route calls from the PBX to the appropriate carrier based on called phone number (see Call Routing section later in this chapter).

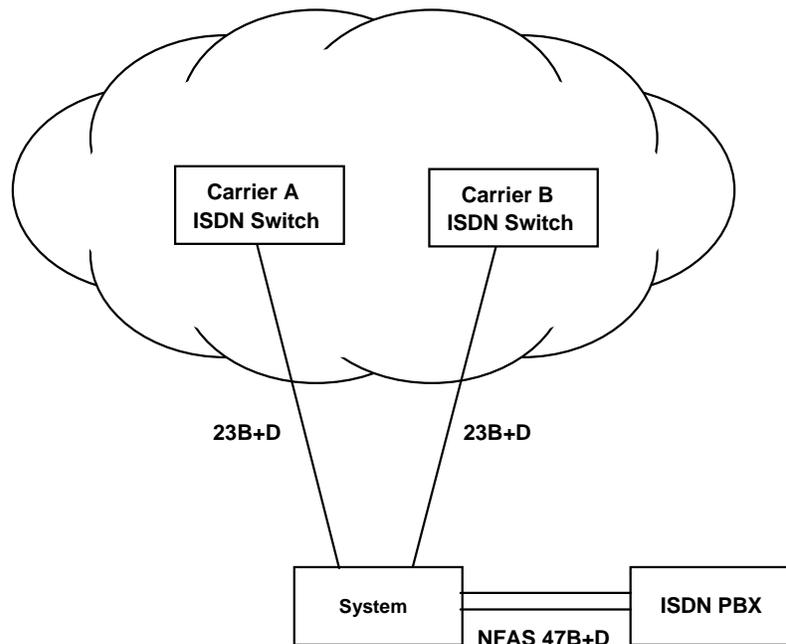


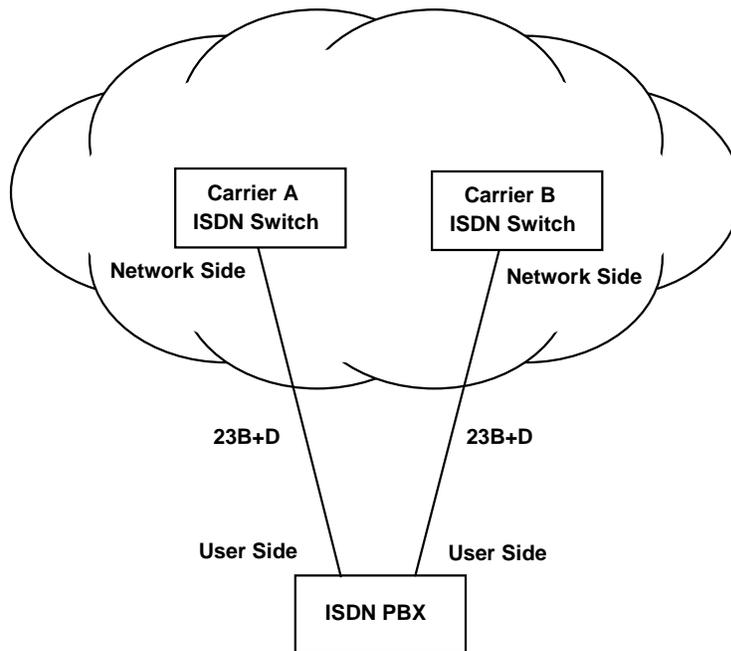
Figure 4-3. ISDN-PRI Links to Two Carriers from an ISDN PBX

#### 4.1.2.1 Network and User Side Protocols

In the example application shown in Figure 4-3, there is an important difference between the two D channels terminating in the carrier switches and the D channel terminating in the user's PBX. The ISDN signaling protocol that runs on the D channel is not symmetrical. Signaling messages are treated differently depending on whether the D channel is setup to run the **network side** protocol or the **user side** protocol. All carrier switches run the network side protocol, and all user devices connected directly to a network switch must run the user side protocol. In general, network side applications cannot be connected to other network side applications. **Local routing, the exception to this rule, is explained in the next section.**

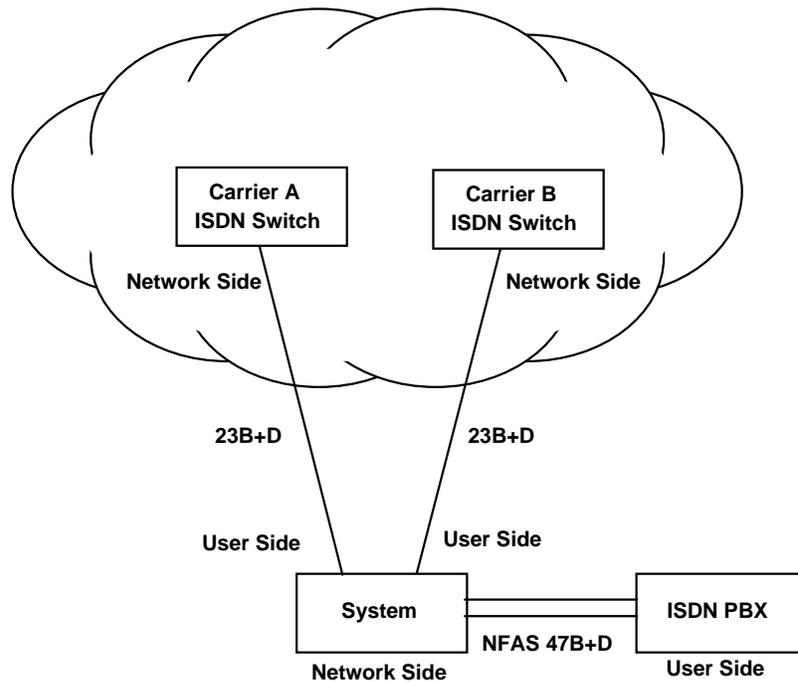
Figure 4-4 shows how the application in Figure 4-3 would be set up if the user's PBX was **not** connected to the system.

The disadvantage of this configuration is that the PBX may not be able to support two D channels, may not be able to handle the differences in D channel protocols between the two carriers, and may not be able to route calls to the appropriate carrier.



**Figure 4-4. ISDN-PRI Links to Two Carriers**

Figure 4-5 shows how the system overcomes these disadvantages. Note that the configuration in Figure 4-5 is identical to the one in Figure 4-3. Figure 4-5 highlights the ability of the system to be able to set the protocol between network side and user side for each D channel it uses. Since the PBX can only run the user side protocol, the system must run the network side protocol on the D channel connected to the PBX. However, on the D channels connected to the carrier switches, the system must run the user side protocol.



**Figure 4-5. Network and User Side Protocols**

### 4.1.3 Call Routing

The system can be simultaneously connected to several network and user side ISDN PRI facilities and to a user's data terminal equipment (DTE) such as a video codec or a LAN router. The DTE is typically connected through one or more of the system's HSU cards.

#### 4.1.3.1 Calls Originating from an HSU Port

Any call originating from an HSU port must be associated with a call profile (see Call Profiles section). The call profile specifies which D channel is to carry the call. The system will always route an outgoing HSU call to B channels controlled by the D channel specified in the call profile. If no B channels are available, the call will not be placed.

#### 4.1.3.2 Calls Destined to an HSU Port

Each HSU port in the system that is available to receive incoming calls must be assigned a unique primary phone number that allows the system to route an incoming call to it (see the Dial screen in the HSU section). Optionally, a hunt group phone number (which need not be unique) can also be assigned to the same HSU port.

When an incoming call is received by the system, it first scans all of the primary HSU phone numbers to attempt a match. If a match occurs, the call is routed to that HSU port. If no match is found, the system then searches the list of hunt group numbers to find a match. The call will be routed to the first HSU port with a matching hunt group phone number.

If a match is still not found, the system begins searching the D channel routing tables (see next section). If no match is found after all searches are finished, the system rejects the incoming call.

#### 4.1.3.3 Calls Originating from a D Channel

All calls originating from a D channel are considered incoming calls to the system because the system is first made aware of the call when an incoming call message is received on the originating D channel.

As described above, the system first tries to route any incoming call from a D channel to an HSU port. If it cannot match the called number to an HSU port primary number or hunt group number, the system begins looking in the D channel routing tables (see Assignment of Call Routing Information later in this chapter). It will route the call to the first D channel it matches. If no D channel routing information matches, the call is rejected. Xs are used as "wildcards" that will allow any number in its place to match. **It is recommended that one carrier D channel be assigned the default routing code of "xxx-xxx-xxxx" so that there will always be a match.**

#### 4.1.4 ISDN Trunks

An ISDN trunk is a logical division of B channels pertaining to the same D channel. A D channel can have one or more trunks. **Trunks cannot be used for local routing, so unless the user has more than one D channel, trunks will not apply to their system.** The basic rules for trunk assignment are:

- A single B channel cannot belong to multiple trunks simultaneously
- The maximum number of trunks that can be assigned to a single D channel is 15 (labeled trunk "A" through trunk "O")
- B channels in a trunk can be contiguous or noncontiguous
- A trunk cannot cross D channel borders, but can span different WAN links when NFAS is used by the carrier.

After ISDN trunks are configured, users can designate a routing table where incoming trunks can be routed to outgoing trunks. The routing table can be constructed to specify up to three outgoing trunk paths for each incoming trunk.

The basic rules for trunk routing are:

- Each incoming trunk can be routed to up to three outgoing trunks which are prioritized into search patterns 1, 2 or 3
- The D channel of the incoming trunk must be different from that of the outgoing trunk
- A trunk can be used as an outgoing trunk for more than one incoming trunks
- All trunks must be configured before assigning them to a routing table.

### 4.1.5 Local Routing

Devices such as video codecs or PBXs that are directly attached to the system (i.e., do not pass through a carrier network to connect to the system) are considered "local" devices. All HSU ports are local devices. In addition, any PRI device such as a PBX that is connected to a D channel configured for network side is a local device (as explained in the previous section, any D channel connected to a carrier network must be configured for user side).

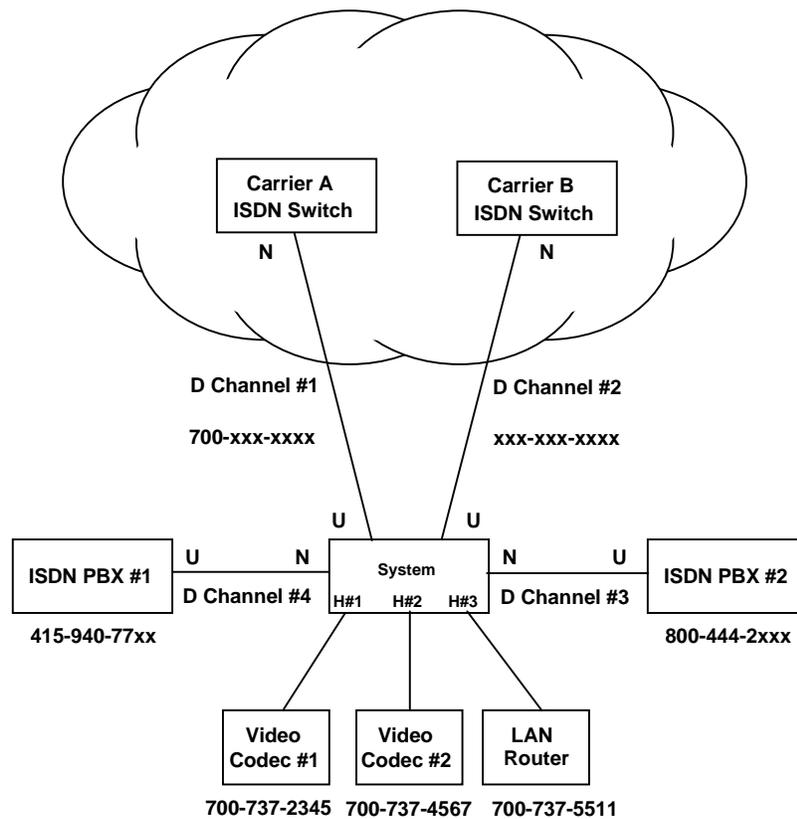
Local routing is defined as call routing between any two local devices. Because each HSU port can be mapped by its call profile to any specific D channel (local or non-local), users can prevent local routing of calls originating from any HSU port by insuring that the call profile refers to a user side (i.e., non-local) D channel.

However, calls coming into the system on a D channel (user or network) are routed based on the called phone number, not on call profiles. Because the system does not provide billing information, users may want to prohibit local routing of D channels. This prohibition will force all incoming D channel calls (user or network) to be routed to a carrier network so billing information can be obtained. In other cases, however, users may want to enable local routing.

Thus, if local routing is disabled, any call coming into the system on a network side (i.e., local) D channel will be routed only to a user side D channel based on the called number. Even if the called number matches, such a call will never be routed to an HSU port or a network side D channel when local routing is disabled.

If local routing is enabled, then any call coming in on a D channel will be routed to the first matching phone number, regardless of whether or not the match is for a local device.

Figure 4-6 shows a system connected to two carriers (A and B), two ISDN PBXs, two video codecs (#1 and #2) and a LAN router. The examples that follow help explain the call routing parameters.



**Figure 4-6. Call Routing**

In the example shown in Figure 4-6, the following call routings will occur:

- An incoming call to 700-737-2345 from either carrier will be routed to HSU port #1.
- Any outgoing call from any HSU port will be routed to the D channel specified in the call profile including D channels #3 and #4 to the PBXs.
- A call to 510-623-1574 from the PBX will be routed to carrier B.
- A call to 800-444-2400 from either carrier will be routed to PBX #2.
- A call from either PBX to 700-737-5511 will be routed to HSU #3 if local routing is enabled, but routed to Carrier A if local routing is disabled.
- A call from PBX #1 to 800-444-2095 will be routed to PBX #2 if local routing is enabled, but will be routed to Carrier B if local routing is disabled.

### 4.1.6 Call Profiles

A call profile is similar to a speed dial button on a telephone or fax machine. The user enters call profiles on the Interface Card and stores them in the system's memory. *The maximum number of call profiles is six.* These stored call profiles can be recalled from memory, copied to the HSU port memory, and used by that port to dial a call. The same call profile may be copied in the dialing memory of multiple HSU ports.

For ISDN calls, call profiles specify the D channel to use, the number to call, the data rate of the call, the service to use, and other pertinent information required to place the call.

Before any HSU port can dial a call, it must load a call profile from the main system memory into its own dialing memory. The HSU port can use the call profile "as is" or change the various parameters depending upon the calling needs. The loaded profile, including changes, will remain associated with the HSU port until another call profile is copied from the Interface card.

## 4.2 ISDN-PRI Card Description

### 4.2.1 ISDN-PRI Card Description (8840)

The ISDN-PRI (or "PRI") card is an eight-port card that offers users the ability to effectively terminate and manage both dedicated and switched carrier services in a single system. Eight D channels can be managed from a single card.

#### 4.2.1.1 Card Jumpers/Switch Settings

The ISDN-PRI card doesn't have any jumpers or switches on its mainboard.

#### 4.2.1.2 Installing the ISDN-PRI Card

Insert the ISDN-PRI card into one of the server card chassis slots (P1 to P3). The system can accommodate up to three server cards.

## 4.3 ISDN-PRI Card User Screens and Settings

### 4.3.1 ISDN-PRI Card Main Screen

The ISDN-PRI card must be configured before you can use it. Figure 4-7 shown the ISDN-PRI call status screen, which can be accessed by selecting the ISDN-PRI card from the Main Screen. The information shown in italics below is for reference only. The default ISDN-PRI call status screen does not show this type of information until after it is configured.

Node_1	P1	ISDN-PRI	Rev	A00-0	Ser	00101	12-31-99	14:33
ver:	1.5	page:	1	of	1			
Cref	Status	Called #	Calling #	Type	Dch	Bwdth		
1	<i>connected</i>	<i>4157316545</i>	<i>5106231574</i>	<i>bdata</i>	1	56u		
32769	<i>answered</i>	<i>5103537670</i>	<i>5105551212</i>	<i>bdata</i>	2	56u		
Refresh	pgUp	pgDn	Config	Perf	Main			

Figure 4-7. ISDN-PRI Call Status Screen

### 4.3.2 Main Screen Parameters

#### PAGE

The page reference shows how many pages of ISDN calls that are currently active in the system. Users can move through the pages using the “pgUp” and “pgDn” commands from the Menu of Actions.

#### CREF

The Call Reference number is a five digit number that uniquely identifies each call controlled by a specific D channel. A call reference number is valid only for the life of the call, and may be reused once the call is released. If the number is between 1-32768, it is an outgoing call from the system. If the number is 32769 or larger, the call is an incoming call to the system.

#### STATUS

The Status column shows the current status of each active call in the system. The possible call statuses are shown in Table 4-1 below.

***Special Note:** The information on this screen is not updated automatically. To receive the latest status information, users must press "R" (refresh) from the Menu of Actions to update the screen.*

**Table 4-1. Call Status Screen**

Call Status	Meaning
incoming	A call has been received by the system, but has not yet been answered.
outgoing	A call has been placed by the system to a far end user, but the far end has not yet answered.
connected	An incoming call has been answered by the system, but the far end has not yet confirmed that it knows the system has answered.
answered	Both ends (system end and the far end) have answered and the call is active.
disconnect	The far end has requested a disconnect and is waiting for the system to confirm.
released	The system has requested a disconnect and is waiting for the far end to confirm.

#### CALLED #

The called number is the phone number dialed by the originator of the call (either the system or the far end).

**CALLING #**

The calling number is the phone number of the call originator.

**TYPE**

The type of the call is either **voice**, **bdata** (56k or 64k), **H0** (384k), **H11** (1536k) or **MRate** (variable rate).

**DCH**

The D Channel number is the number of the D channel that is performing the signaling for that call.

**BWDTH**

The Bandwidth field indicates how much bandwidth is being used by the call and whether it is restricted or unrestricted (i.e., 64u, 64r).

**Table 4-2. ISDN-PRI Screen Menu of Actions**

<b>Action</b>	<b>Function</b>
Refresh	Updates the screen for calling activity since the last refresh.
pgUp	Scrolls list from back to front for long lists of ISDN calls.
pgDn	Scrolls list from front to back for long lists of ISDN calls.
Config	Invokes the D Channel configuration screen. Press to assign D channels and associated information.
Perf	Calls up the Performance Monitoring screen (see below for details).
Main	Returns to the Main System screen.

### 4.3.3 D Channel Configuration Screen

The D channel configuration screen consists of a static display on the top half of the screen, with a number of subscreens displayed on the bottom half of the screen. The bottom half subscreens are invoked by selecting from the menu items in the menu bar at the bottom of the D channel configuration screen.

The user **MUST** pay attention to which D channel (1-8) is highlighted when choosing **Intf.id**, **Bmap** or **sErVICES**. Each of these menu selections brings up the appropriate subscreen for the D channel that is highlighted when the menu item is selected.

Figure 4-3 shows the top level ISDN D channel configuration screen.

Note that there is a separate column for each D channel supported by the system. Table 4-3 lists the settings controlled on this screen along with their possible and default values.

Node_1	P1	ISDN-PRI		Rev	A5-0	Ser	00101	12-31-99	14:33
		1	2	3	4	5	6	7	8
STATE		stdby	stdby	stdby	stdby	stdby	stdby	stdby	stdby
WAN		w1-1	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1
TS		24	24	24	24	24	24	24	24
RATE		64k	64k	64k	64k	64k	64k	64k	64k
SIDE		user	user	user	user	user	user	user	user
SW. TYPE		fjtsu	fjtsu	fjtsu	fjtsu	fjtsu	fjtsu	fjtsu	fjtsu
DATA INV		no	no	no	no	no	no	no	no

Save	Intf	Bmap	sErV	rOut	special	Trunk	rtYpe	Dial	Perf	Main
------	------	------	------	------	---------	-------	-------	------	------	------

Figure 4-8. D Channel Configuration Screen

Table 4-3. D Channel Configuration Option Settings and Defaults

Parameter	User Options								Default	
STATE	stdby	conf	actv							stdby
WAN	w1-1	w1-2	w2-1	w2-2	w3-1	w3-2	w4-1	w4-2		w1-1
TS	1-24	1-31								24
RATE	56k	64k								64k
SIDE	user	net								user
SW. TYPE	fjtsu	att_4	dms_1	dms_2	att_5	ni_2	dpnss	dass2		fjtsu
	net_5	mcl								
DATA INV	no	yes								no

## STATE

The State setting determines the status of each D channel. The available options are **stdby**, **conf** or **actv**.

As with most other cards in the system, the **stdby** (standby) setting keeps the resource to which it is associated (in this case, the associated D channel) in inactive mode. When a D channel is in **stdby**, it does not use any system resources such as B channels or processor time on the ISDN PRI server card.

When a D channel is in **actv** (active) state, all B channels are reserved, and the system attempts to maintain its D channel session with the other end (e.g. switch or PBX) of the D channel. If the D channel loses contact with the other end when it is in the active state, a D channel alarm will be generated.

Because there are times when users want to temporarily suspend the D channel session with the other end (e.g., when adding additional B channels to the system), but do not want to lose all the D channel settings already completed (see caution below), a third state has been added to the D channels on the ISDN PRI card. The **conf** (configure) state is used to initially configure the D channel and to change the configuration later.

When a D channel is in the configure state, it does not attempt to maintain a protocol session with the far end. Also, B channels assigned to a D channel that is in the configure state are reserved for the D channel, and thus are not available to other D channels nor to other system modules (e.g. user ports or cross-connect) that might want to use them as DS0s. The only ways to free up B channels taken by a D channel in configure state is to free each resource individually, or to put the D channel back into standby state.



## CAUTION!

**When a D channel that is either in actv (active) or conf (configure) state is returned to standby state, Interface ID and BMap settings are lost and returned to their default values. Thus, caution should be exercised before returning a D channel to standby state.**

## WAN

The WAN setting shows the WAN link carrying this D channel. In standard applications (23B + D), the WAN link will be the same as the WAN link carrying the B channels. In NFAS applications, this may not be the case.

**TS**

The TS (time slot) setting identifies the time slot on the WAN link that carries this D channel. Even though the system allows values that range from **1-24** for T1 links and **1-31** for E1 links, in almost all cases, TS 24 will be used for T1 applications and TS 16 will be used for E1 applications (when available).

**RATE**

The Rate parameter allows users to choose the rate of the D channel. Even though the equipment allows values of **56k** and **64k**, in almost all cases, the rate of 64k will be used.

**SIDE**

The options for this parameter are **user** (user side) and **net** (network side). See discussion earlier in this chapter that describes which side to choose.

**SW. TYPE**

The Switch Type is selected from the possible central office equipment types to which the system is connected. The choices are **fjtsu** (Fujitsu), **att\_4** (AT&T #4ESS), **att\_5** (AT&T #5ESS<sup>®</sup>), **dms\_1** (DMS-100<sup>®</sup>), **dms\_2** (DMS-200<sup>®</sup>), **ni\_2** (National ISDN II), **dpnss** (Digital Private Network Signaling System), **dass2** (Digital Access Signaling System #2), **net\_5** (European ISDN), and **mcl**.

**DATA INV**

The Data Inversion option allows users to select whether or not the HDLC (High level Data Link Control) will invert the data bits when B8ZS format is not available. In almost all cases, DATA INV should be set to **no**.

Table 4-4. ISDN-PRI Screen Menu of Actions

Action	Function
Save	Saves changes to settings.
Intf	Install and change the Interface Identifications for the highlighted D Channel.
Bmap	Install and change all ISDN B Channels for the highlighted D Channel. Shows a map of all time slots in the system. See Assigning B Channels below.
sErv	Specifies which type of billing services can be used by the highlighted D Channel. Eight service types are available for each D Channel. Must have a two digit address code 00-99. 24 characters are allowed. See Assignment of Services below.
rOut	Specifies routing profiles for all ISDN D Channels. See Routing of Incoming Calls section below.
special	The Special Number table is a list of telephone numbers that will only be routed to the default D channel trunk. See Special Numbers section below.
Trunk	Displays the Trunk Routing screen. See the Trunk Routing section below.
rtType	The Routing type allows users to select the routing pattern for each D channel used by the system. See Routing Type section below
Dial	Activates a remote VT-100 terminal session with a remote system unit. User enters the phone number of the remote unit (see Remote Login Using the D Channel later in this chapter).
Perf	Shows accumulated performance statistics for the highlighted D Channel. See Performance section below.
Main	Returns to the Call Status screen. If changes are made to settings and not saved, the system will prompt you to save or lose changes.

### 4.3.4 Configuring ISDN Features

When one or more T1 WAN links terminating in a system are provisioned for ISDN PRI, users must configure the system's ISDN features before calls can be set up.

Configuring ISDN features consist of the following four steps:

1. Assigning interface identifications to WAN link(s)
2. Assigning B channels to the D channel(s)
3. Coding the call-by-call service(s) to be used
4. Assigning call routing information

Each of these steps is accessed from the top level D channel configuration screen by selecting the corresponding menu item to bring up the desired subscreen. Each subscreen is described in the following sections.

### 4.3.5 Assigning Interface Identifications

Each ISDN facility (interface) that terminates at the user's premises is assigned a unique **Intf. ID** (interface identification) by the carrier. Whenever the system signals the carrier switch on the D channel, it uses the **Intf. ID(s)** assigned by the carrier to tell the switch to which facility (interface) it is referring.



***Note:** In the unlikely (but possible) event that a single facility is split between two carriers (i.e., two D channels each controlling some of the B channels on that facility), it is possible that the same facility (interface) will have two different interface IDs—one for each carrier. Thus, the list of interface IDs is unique to a specific D channel only, but may be repeated across different D channels.*

Figure 4-9 shows the Interface Identification subscreen. This subscreen is accessed by placing the cursor in the column of the desired D channel, then pressing “i”. The list of all interfaces (WANs) then appear with their assigned interface IDs. The default value is 99, which means “interface ID not yet assigned.” Values for the Interface ID are **00-31** and **99**.

You must assign an interface ID to any WAN link that will contain B channels before you will be able to assign the specific B channels to that facility. If you assign a B channel to a WAN that is not assigned an Interface ID, the system message, “Intf.ID must be uniquely identified,” will appear when you try to activate the D channel. In the example shown in Figure 4-9, for D channel #1, the user plans to assign B channels on WAN 1-1, 1-2 and 2-1.

To change an interface ID, place the cursor over the desired Intf. ID, and press the “Enter” Key. Input the correct value in the space provided using the up and down arrow keys and press the “Enter” key again. Save your work, and press “m” to return to the main D channel configuration screen.

Node_1		P1	ISDN-PRI		Rev	A5-0	Ser	00101	12-31-99	14:33
		1	2	3	4	5	6	7	8	
STATE		conf	stdby	stdby	stdby	stdby	stdby	stdby	stdby	
WAN		w1-1	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1	
TS		24	24	24	24	24	24	24	24	
RATE		64k	64k	64k	64k	64k	64k	64k	64k	
SIDE		user	user	user	user	user	user	user	user	
SW. TYPE		att_4	att_4	att_4	att_4	att_4	att_4	att_4	att_4	
DATA INV		no	no	no	no	no	no	no	no	
Intf. ID	W1-1	00								
Intf. ID	W1-2	01								
Intf. ID	W2-1	02								
Intf. ID	W2-2	99								
Intf. ID	W3-1	99								
Intf. ID	W3-2	99								
Intf. ID	W4-1	99								
Intf. ID	W4-2	99								
Save		Main								

Figure 4-9. Interface Identification Screen

### 4.3.6 Assigning B Channels

Choosing the “Bmap” option from the D channel configuration screen of the ISDN card screen brings up the subscreen shown in Figure 4-10. This figure shows a typical “Bmap” screen. It is a detailed map of all the WAN time slots available to users as potential B channels.

When D channel #1 is placed in the “Configure” mode, the system recognizes the assignment of WAN 1-1, time slot #24 to this D channel and places it on the Bmap in the proper location. Notice that since all WAN links are T1 interfaces, the Bmap shows the last 7 places with a dash (-) indicating that the time slot is unavailable for assignment.

Additionally, time slots that are already in use by other resources (e.g. user ports and cross-connect) are “blocked-out” with the letter “x” in the appropriate WAN time slot. This letter “x” means that these time slots are used as DS0s, and thus are not available for use as B channels. In Figure 4-10, time slots 14-19 on WAN 1-1 and time slots 4-9 on WAN 1-2 are in use as DS0s and thus are unavailable for assignment.

Node_1	P1	ISDN-PRI	Rev A5-0	Ser 00101	12-31-99	14:33	
		1 2 3 4 5 6 7 8	3 4 5 6 7 8	5 6 7 8	6 7 8	7 8	
STATE	<b>conf</b>	stdby	stdby	stdby	stdby	stdby	stdby
WAN	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1
TS	24	24	24	24	24	24	24
RATE	64k	64k	64k	64k	64k	64k	64k
SIDE	user	user	user	user	user	user	user
SW. TYPE	att_4	att_4	att_4	att_4	att_4	att_4	att_4
DATA INV	no	no	no	no	no	no	no
			1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 3 3				
	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1
w1-1			x x x x x x		d - - - - -		
w1-2	x x x x x x				d - - - - -		
w2-1					- - - - -		
w2-2					- - - - -		
w3-1					- - - - -		
w3-2					- - - - -		
w4-1					- - - - -		
w4-2					- - - - -		
Save	sTatus	truNk	Main				

Figure 4-10. Basic Bmap Screen

### 4.3.7 Assigning B Channels to One D Channel

B channels are assigned to the highlighted D channel by placing the cursor in the row representing the WAN link (interface) and the column representing the time slot. Pressing the <Enter> key will place a lowercase “b” in that time slot (the "Enter" key toggles the "b" off and on). This indicates that you have designated this time slot as a B channel to be controlled by the highlighted D channel. You will not be able to place a “b” in any time slot that is currently occupied by a letter, number or dash, because these time slots are controlled by other system modules, thus are unavailable to this D channel.

Figure 4-11 shows 36 B channels assigned to D channel #1. In this example, the carrier requested that you use time slots 1-9 on WAN 1-1, time slots 11-19 on WAN 1-2, time slots 1-9 on WAN 2-1 and time slots 1-9 on WAN 2-2.

Node_1	P1	ISDN-PRI	Rev A5-0	Ser 00101	12-31-99 14:33				
		1	2	3	4	5	6	7	8
STATE		conf	stdby	stdby	stdby	stdby	stdby	stdby	stdby
WAN		w1-1	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1
TS		24	24	24	24	24	24	24	24
RATE		64k	64k	64k	64k	64k	64k	64k	64k
SIDE		user	user	user	user	user	user	user	user
SW. TYPE		att_4	att_4	att_4	att_4	att_4	att_4	att_4	att_4
DATA INV		no	no	no	no	no	no	no	no
				1 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 3 3					
		1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0
w1-1		b b b b b b b b b		x x x x x x			d - - - - -		
w1-2		x x x x x x	b b b b b b b b b				- - - - -		
w2-1		b b b b b b b b b					- - - - -		
w2-2		b b b b b b b b b					- - - - -		
w3-1							- - - - -		
w3-2							- - - - -		
w4-1							- - - - -		
w4-2							- - - - -		
Save   sTatus   truNk   Main									

Figure 4-11. Assigned Bmap Screen

Figure 4-12 shows the cross-connect screen for WAN 1-1 (see WAN chapter). Note that the D channel shows up on time slot #24, the B channels appear in the proper time slots, and the DS0s (in this case assigned to the card in user slot 5, port 1) also appear.

Node_1		W1 CSU+CSU		Rev A6-2 Ser 00101		12-31-99 14:33	
TS	XCON	TS	CIRCUIT_ID	TS	XCON	TS	CIRCUIT_ID
1	b-chan		status-idle	13			
2	b-chan		status-idle	14	U5-1	D-06	user_circuit
3	b-chan		status-idle	15	U5-1	D-07	user_circuit
4	b-chan		status-idle	16	U5-1	D-08	user_circuit
5	b-chan		status-idle	17	U5-1	D-09	user_circuit
6	b-chan		status-idle	18	U5-1	D-10	user_circuit
7	b-chan		status-idle	19	U5-1	D-11	user_circuit
8	b-chan		status-idle	20			
9	b-chan		status-idle	21			
10				22			
11				23			
12				24	p1-1	A-01	dchan_circuit

Refresh | Test | Main

Figure 4-12. WAN Cross-Connect Screen

### 4.3.8 Assignments for Two or More D Channels

Previous paragraphs dealt with multiple B channels for a single D channel. Often, the system will be called upon to manage the ISDN communication for more than one D channel, as described earlier in this chapter.

In Figure 4-13, D channel #2 is changed from **stdby** to **conf** and is assigned to time slot #24 on WAN 1-2.

Node_1	P1	ISDN-PRI		Rev A5-0	Ser 00101	12-31-99 14:33			
		1	2	3	4	5	6	7	8
STATE		conf	conf	stdby	stdby	stdby	stdby	stdby	stdby
WAN		w1-1	w1-2	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1
TS		24	24	24	24	24	24	24	24
RATE		64k	64k	64k	64k	64k	64k	64k	64k
SIDE		user	user	user	user	user	user	user	user
SW. TYPE		att_4	att_4	att_4	att_4	att_4	att_4	att_4	att_4
DATA INV		no	no	no	no	no	no	no	no
				1 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 3 3					
		1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0
w1-1		1 1 1 1 1 1 1 1 1		x x x x x x			d - - - - -		
w1-2		x x x x x x	1 1 1 1 1 1 1 1 1				d - - - - -		
w2-1		1 1 1 1 1 1 1 1 1		b b b b b b b b b b			- - - - -		
w2-1		1 1 1 1 1 1 1 1 1		b b b b b b b b b b			- - - - -		
w3-1		b b b b b b b b b b		b b b b b b b b b b			- - - - -		
w3-2							- - - - -		
w4-1							- - - - -		
w4-2							- - - - -		
Save	sStatus	trunNk	Main						

Figure 4-13. Assigning B Channels

When the Bmap selection is made (with D channel 2 highlighted), D channel #2 appears on WAN 1-2, time slot 24.

DS0s are still represented by “x”s. B channels which have already been assigned to D channel #1 (and are therefore unavailable to D channel #2) are represented by “1”s.

Using the same procedure learned in the previous section, assign a lowercase "b" to each time slot assigned by the carrier by pressing the <Enter> key in the column and row on the screen. In this example, time slots #11-22 on WAN 2-1, #11-22 on WAN 2-2 and #1-24 on WAN 3-1 are assigned as B channels for D channel #2.

Remember to save your work before pressing “m” to return to the top level D channel configuration screen.

If you check the BMap for D Channel #1 again, the screen in Figure 4-14 shows the B channels controlled by D channel #1 (the currently highlighted D channel) as “b”s, and the B channels for D Channel #2 as “2”s.





**Table 4-5. Status Screen Menu of Actions**

<b>Action</b>	<b>Function</b>
Send	Executes other Menu of Action commands. Changes in B channel states will not take effect until the Send command is issued. Send command also saves status changes.
Refresh	Updates status and time-related information fields that are not automatically updated (i.e., performance and test data).
Oos	Out of Service mode. Places the highlighted B channel in an unavailable state. Changes the "b" to an "o." Press the "B" command to return to service.
mainTenance	Testing or maintenance mode. Places the highlighted B channel in an unavailable state. Changes the "b" to an "m." Press the "B" command to return to service.
Bchan	Return to B channel operation. Returns the highlighted B channel in an available state. Changes the "m/o" to a "b."
Main	Returns to the Bmap screen. If changes are made to settings and not saved with Send command, the system will prompt you to save or lose changes.

### 4.3.10 Assigning ISDN Trunks Screen

An ISDN trunk is a group of B channels belonging to a single D channel. It consists of one or more B channels either contiguous or non-contiguous. All B channels in a trunk must belong to the same D channel. However, a trunk may be assigned across different WAN links when NFAS is used.

To access the Trunk Assignment screen, you must highlight the D channel on the Configuration screen and press "B" to access the B channel screen. Pressing "N" from the Menu of Actions will bring up the Trunk Assignment screen. To assign a B channel to a trunk group, place the cursor over the desired B channel and press the letter of the trunk group to which you want to assign this B channel. **Capital** letters between "A" and "O" are the only acceptable options. Figure 4-16 shows a typical Bmap screen with four different D channels. To simplify this discussion, all four D channels have eight B channels.

Node_1	P1	ISDN-PRI		Rev A5-0	Ser 00101	12-31-99	14:33		
		1	2	3	4	5	6	7	8
STATE		conf	conf	conf	conf	stdby	stdby	stdby	stdby
WAN		w1-1	w1-2	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1
TS		24	24	24	24	24	24	24	24
RATE		64k	64k	64k	64k	64k	64k	64k	64k
SIDE		user	user	user	user	user	user	user	user
SW. TYPE		fjtsu	fjtsu	fjtsu	fjtsu	fjtsu	fjtsu	fjtsu	fjtsu
DATA INV		no	no	no	no	no	no	no	no
				1 1 1 1 1 1 1 1 1 1	1 2 2 2 2 2 2 2 2 2	3 3			
		1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9
w1-1		A A b b b b b b					d - - - - -		
w1-2		b b b b B B b b					d - - - - -		
w2-1		b b b b b b C C					d - - - - -		
w2-2		D D b b b b b b					d - - - - -		
w3-1							- - - - -		
w3-2							- - - - -		
w4-1							- - - - -		
w4-2							- - - - -		

Figure 4-16. Assigned Trunk Screen

The first D channel on WAN1-1 has eight B channels. The first two B channels are assigned to Trunk Group “A.” The second D channel on WAN 1-2 also has eight B channels. B channels #5-6 are assigned to Trunk Group “B.” The third D channel on WAN2-1 has eight B channels. B channels #7-8 are assigned to Trunk Group “C.” The fourth D channel on WAN 2-2 also has eight B channels. B channels #1-2 are assigned to Trunk Group “D.”

Once assigned to Trunk Groups, ISDN trunks can be placed in a routing table to show how to route incoming ISDN calls that need to be passed on to downstream equipment.

### 4.3.11 Routing ISDN Trunks Screen

To select a routing pattern for the ISDN trunks created in the previous section, users must access the Trunk Routing screen from the Configuration screen. Pressing “T” from the Menu of Actions will bring up the Trunk Routing screen. To add a new trunk routing pattern, users must press “A” from the Menu of Actions, which will bring up the screen shown as Figure 4-17.

```

Node_1 | P1 ISDN-PRI          Rev A5-0   Ser 00101 | 12-31-99  14:33
-----|-----|-----|-----|-----|-----|-----|-----|
page : 1 of 1

INCOMING TRUNK   OUTGOING TRUNK1   OUTGOING TRUNK2   OUTGOING TRUNK3

dchan:1 trunk:a  dchan:1 trunk:A  dchan:1 trunk:A  dchan:1 trunk:A

Add | uPdate | dElete | pgUp | pgDn | Main

```

**Figure 4-17. Add Trunk Route Screen**

The user should use the “right arrow” and “left arrow” keys to move the cursor through the eight sections (four D channels and four trunks) of the new trunk route. Press the <Enter> key to change each section. D channel numbers are changed with the “up arrow” and “down arrow” that scroll through numbers 1-8 (the maximum number of D channels per system). The user changes trunk letters by typing a **capital** letter from A-to O (the fifteen available trunk letters per D channel).

**All eight fields must be changed for each new trunk route.** For instance, if you want a single incoming trunk group to be routed to three outgoing trunk groups on three different D channels, the process is easy. In Figure 4-18 the first trunk route shows this configuration. D

channel #1, trunk group “A” is to be routed to D channel #2, trunk group “B.” If that route is busy, it will be routed to D channel #3, trunk group “C.” If that route is busy, it will be routed to D channel #4, trunk group “D.” If that route is busy, the unit will drop the call.

Another example of this procedure is shown in Figure 4-18. If you want a single incoming trunk group to be routed to only one outgoing trunk group, D channel #1, trunk group “A” is routed to D channel #2, trunk group “B.” **The alternate routes 2-3 must contain the same information in alternate route #2.** Since this is the only alternative route, if that route is busy, the unit will drop the call.

```

Node_1 | P1 ISDN-PRI          Rev A5-0   Ser 00101 | 12-31-99  14:33
-----|-----|-----|-----|-----|-----|-----|-----
page : 1 of 1

INCOMING TRUNK   OUTGOING TRUNK1  OUTGOING TRUNK2  OUTGOING TRUNK3
dchan:1  trunk:A  dchan:2  trunk:B  dchan:3  trunk:C  dchan:4  trunk:D
dchan:1  trunk:A  dchan:2  trunk:B  dchan:2  trunk:B  dchan:1  trunk:B

Add | update | delete | pgUp | pgDn | Main

```

Figure 4-18. Add Trunk Route Screen

### 4.3.12 Assignment of Services Screen

Some carriers support call-by-call service selection in their ISDN PRI offerings. This feature allows users to select a different service (and, usually, a different billing rate) for each call placed.

If call-by-call service is supported, users must tell the system which service(s) is/are supported by each D channel, and what the code is for each service. The carrier will supply a service code for each supported service. The Service format code is **always** two digits, a space and the name of the service. When placing a call using call profiles, only valid service codes will be allowed (see Call Profiles below for additional information about services).

If call-by-call service selection is not supported by the carrier or not required for the user's applications, then there is no need to assign service to a D channel.

Figure 4-19 shows the Services screen and the assignment of two mythical services (MASTERPIECE and BUSINESS PLAN) to D channel #1. The service codes of "01" and "02" were assigned by the carrier to these services. Remember to Save your work before returning to the top level D channel configuration screen.

(Pressing the Clear command will erase all Service entries for the highlighted D channel.)

Node_1	P1	ISDN-PRI			Rev A5-0	Ser 00101	12-31-99	14:33
	1	2	3	4	5	6	7	8
STATE	conf	stdby	stdby	stdby	stdby	stdby	stdby	stdby
WAN	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1
TS	24	24	24	24	24	24	24	24
RATE	64k	64k	64k	64k	64k	64k	64k	64k
SIDE	user	user	user	user	user	user	user	user
SW. TYPE	att_4	att_4	att_4	att_4	att_4	att_4	att_4	att_4
DATA INV	no	no	no	no	no	no	no	no
SERVICE 1:	01 Masterpiece							
SERVICE 2:	02 Business Plan							
SERVICE 3:								
SERVICE 4:								
SERVICE 5:								
SERVICE 6:								
SERVICE 7:								
SERVICE 8:								
Save   Clear   Main								

Figure 4-19. Assigning Services Screen

### 4.3.13 Routing of Incoming Calls Screen

Call routing in the system is described in the introduction section of this chapter. Assignment of phone numbers for routing calls between D channels is done from the routing subscreen.

Figure 4-20 shows the ISDN routing subscreen. It is accessed from the D channel configuration screen by pressing “o” (lowercase letter o).

Node_1	P1	ISDN-PRI	Rev A5-0	Ser 00101	12-31-99	14:33		
	1	2	3	4	5	6	7	8
STATE	conf	stdby	stdby	stdby	stdby	stdby	stdby	stdby
WAN	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1
TS	24	24	24	24	24	24	24	24
RATE	64k	64k	64k	64k	64k	64k	64k	64k
SIDE	user	user	user	user	user	user	user	user
SW. TYPE	att_4	att_4	att_4	att_4	att_4	att_4	att_4	att_4
DATA INV	no	no	no	no	no	no	no	no
Route local : yes								
D-Chan 1:		415940xxxx		415975xxxx				
D-Chan 2:		510xxxxxxxx		510353xxxx				
D-Chan 3:		xxxxxxxxxxxx						
D-Chan 4:		xxxxxxx4700		415221xxxx				
D-Chan 5:								
D-Chan 6:								
D-Chan 7:								
D-Chan 8:								
Save	Clear	Main						

Figure 4-20. Routing Numbers Screen

Each D channel may be assigned two ten-digit phone numbers to be used for routing calls addressed to those phone numbers. The use of the wild card letter “x” means any digit will match. Note that D channel routing occurs only after all attempts to route a call to an HSU port are unsuccessful.

If local routing is disabled (Route Local = **no**), any call coming into the system on a network side (i.e., local) D channel will be routed only to a user side D channel based on the called number. Even if the called number matches, such a call will never be routed to an HSU port or a network side D channel when local routing is disabled.

The routing table should always contain the default number "xxxxxxxx" (10 Xs) to make sure that all dialed numbers are routed to the network.

If local routing is enabled (Route Local = **yes**), then any call coming in on a D channel will be routed to the first matching phone number, regardless of whether or not the match is for a local device.

Any calls originating from an HSU port will be routed to the D channel specified in the call profile, regardless of the called number.

#### 4.3.14 Special Numbers Screen

Pressing L from the Menu of Actions will bring up the Special Numbers screen shown in Figure 4-21. Special numbers are any telephone numbers that the user does not want routed to HSU cards. Special numbers have the highest priority in the number searching process. Any number that matches one of the special numbers will always be routed to the default trunk "xxxxxxxx," to the ISDN network and then into the Public Switched Network.

Some special numbers used in the United States include "0," "00," "911," "411" and "611." Some special numbers used in the foreign countries includes "0," "119" and "110." The special number table can contain telephone numbers up to 10 digits in length. It also includes the use of the "+" character, so that the special number "0+" would include any series of numbers that starts with the number "0." The character "x" is used as a wildcard in the same way as the routing table.

Node_1	P1	ISDN-PRI		Rev A5-0	Ser 00101	12-31-99	14:33	
	1	2	3	4	5	6	7	8
STATE	conf	stdby	stdby	stdby	stdby	stdby	stdby	stdby
WAN	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1
TS	24	24	24	24	24	24	24	24
RATE	64k	64k	64k	64k	64k	64k	64k	64k
SIDE	user	user	user	user	user	user	user	user
SW. TYPE	att_4	att_4	att_4	att_4	att_4	att_4	att_4	att_4
DATA INV	no	no	no	no	no	no	no	no
SPECIAL 1:	[REDACTED]							
SPECIAL 2:								
SPECIAL 3:								
SPECIAL 4:								
SPECIAL 5:								
SPECIAL 6:								
SPECIAL 7:								
SPECIAL 8:								
Save		Clear		Main				

Figure 4-21. Special Numbers Screen

### 4.3.15 Performance Monitoring Screen

Another special feature of the ISDN-PRI card is the ability to track and log performance statistics on incoming and outgoing ISDN traffic for each D channel. The Performance Monitoring screen is accessed from the Configure screen by highlighting the D channel with the cursor and pressing the "P" command from the Menu of Actions. Figure 4-22 shows the Performance Monitoring screen.

Node_1   P1 ISDN-PRI Rev A5-0 Ser 00101   12-31-99 14:33								
OUTGOIN	CLATT	CLSUC	CLREJ	NDISC	EDISC	PDISC	NMPKT	ERPKT
CUR	0	0	0	0	0	0	0	0
01	-----	-----	-----	-----	-----	-----	-----	-----
02	-----	-----	-----	-----	-----	-----	-----	-----
03	-----	-----	-----	-----	-----	-----	-----	-----
04	-----	-----	-----	-----	-----	-----	-----	-----
05	-----	-----	-----	-----	-----	-----	-----	-----
06	-----	-----	-----	-----	-----	-----	-----	-----
07	-----	-----	-----	-----	-----	-----	-----	-----
08	-----	-----	-----	-----	-----	-----	-----	-----
09	-----	-----	-----	-----	-----	-----	-----	-----
10	-----	-----	-----	-----	-----	-----	-----	-----
11	-----	-----	-----	-----	-----	-----	-----	-----
12	-----	-----	-----	-----	-----	-----	-----	-----
TOTAL	0	0	0	0	0	0	0	0

Refresh | Clear | pgUp | pgDn | Outgoing | Incoming | Main

**Figure 4-22. Performance Monitoring Screen**

Calling statistics are kept for one hour periods for the current hour and the previous 24 one-hour periods. As each hour passes, the statistics for the twenty-fourth hour are dropped. Users can scroll through the current figures using the "U" (pgUp) and "D" (pgDn) commands from the Menu of Actions.

Since the system does not log statistics incrementally (i.e., second by second), the only way to have truly current figures is to use the "R" (Refresh) command from the Menu of Actions which redraws the screen with the new information.

**TIME PERIOD COLUMN**

The first column shows one-half of the current 24 hour one-hour periods and the total calculation of each field for the entire 24 hour period. The top of the column shows if the statistics are based on either outgoing or incoming calls and will toggle back-and-forth from commands in the Menu of Actions.

**CLATT**

The Calls Attempted column shows the total number of calls initiated on the selected D channel.

**CLSUC**

The Calls Successful column shows the total number of calls initiated on the selected D channel that were completed to the destination required.

**CLREJ**

The Calls Rejected column shows the total number of calls initiated on the selected D channel that were not completed to the destination required due to call-setup problems.

**NDISC**

The Normal Disconnect column shows the total number of calls completed on the selected D channel that were disconnected through hang-up by the calling number.

**EDISC**

The Error Disconnect column shows the total number of calls completed on the selected D channel that were disconnected through some unpredictable equipment error.

**PDISC**

The Peer Disconnect column shows the total number of calls completed on the selected D channel that were disconnected through hang-up by the called number.

**NMPKT**

The Number of Packets column shows the total number of good HDLC frames that were sent during the one hour period. This number, plus ERPKT, will equal the total number of packets sent.

## ERPKT

The Errored Packets column shows the total number of HDLC frames that were in error during the one hour period.

### 4.3.16 Remote Login Using the D Channel

In addition to carrying ISDN signaling information, the D channel can also be used to log into a remote system unit to check card status, and perform necessary system maintenance. This unique application does not require B channel allocation. The ISDN call is placed on the D channel to the ISDN network and routed to the D channel of the remote unit. Coordination with the ISDN facility provider is necessary to obtain the number for the remote system unit.

The ISDN card software must be version 1.2 or higher (the software version is printed on the ROM chip on the printed circuit board).

On the CPU card screen on the remote system unit, change the "D Chan Ph #" from blank to the ten digit ISDN phone number assigned to the unit. Figure 4-23 shows a completed CPU card screen for the Remote system.

```

Remote | C1 CPU XCON          Rev C1-0   Ser 01103 | 12-31-99 14:33
-----|-----|-----|-----|-----|-----
N1     |      |      |      |      |      |
NODE ID |      |      |      |      |      |
SUPERUSER |      |      |      |      |      |
MANAGER  |      |      |      |      |      |
OPERATOR |      |      |      |      |      |
VIEWER   |      |      |      |      |      |
SYS CONT. |      |      |      |      |      |
SYS LOC  |      |      |      |      |      |
SYS PH#  |      |      |      |      |      |
ALRM SEQ |      |      |      |      |      |
ACO      |      |      |      |      |      |
C1 Active Host 5.0   Voice 5.0

Save | Undo | Refresh | Prt | tcp/Ip | Main

```

Figure 4-23. CPU Card Screen

### 4.3.17 Initiate Remote Login Screen

From the ISDN Configure screen of the Local system, press the "D" (Dial) command from the Menu of Actions and the system will prompt you to enter the phone number. Enter the phone number assigned to the remote system on the CPU card and press the <Enter> key. The local system will start a terminal session with the remote system. Figure 4-24 shows the ISDN Card screen.

Local	P1	ISDN-PRI	Rev A5-0	Ser 00101	12-31-99	14:33			
	1	2	3	4	5	6	7	8	
STATE	actv	stdby	stdby	stdby	stdby	stdby	stdby	stdby	
WAN	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1	w1-1	
TS	24	24	24	24	24	24	24	24	
RATE	64k	64k	64k	64k	64k	64k	64k	64k	
SIDE	user	user	user	user	user	user	user	user	
SW. TYPE	att_4	att_4	att_4	att_4	att_4	att_4	att_4	att_4	
DATA INV	no	no	no	no	no	no	no	no	
Enter phone #: <input type="text"/>									
Save	Intf. id	Bmap	sErVICES	rOut	special	Dial	Perf	Main	

Figure 4-24. ISDN Card Screen

#### 4.3.17.1 Terminate the Session

Logging off the remote system using the "L" (Logout) command from the Menu of Actions on the Main screen will terminate the remote session and return the system to normal control.

## 4.4 ISDN-PRI Card Error Messages

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

## 4.5 ISDN-PRI Card Troubleshooting

ISDN-PRI card problems could indicate a number of possible causes, including:

- Faulty ISDN PBX/CPE at the near end (where the problem was first noticed)
- Faulty ISDN PBX/CPE at the far (opposite) end
- T1 or E1 network failure
- T1 or E1 D-channel failure
- Improper network switch configuration
- Improper ISDN-PRI card configuration

Typically, a problem is indicated by the inability to originate or receive/route calls. You can perform numerous tasks to isolate the trouble and clear it. When troubleshooting problems on a call routing through an ISDN-PRI card, follow this general sequence:

1. If all calls are affected, verify that the US/EUR jumper is correctly placed to match the US/EUR jumper on the chassis. The ISDN-PRI card performs a self-test on power-up. A “healthy” card will have a green LED lit on the front panel. Do not proceed with further steps until a green LED is present.
2. Verify that the T1 or E1 network is working properly by checking for current CGA-Red and CGA-Yellow alarms. If an ISDN-PRI DS-1 is faulty, a D-channel alarm will also be present. If no CGA alarms on ISDN-PRI DS-1s are present, but a D-channel alarm is present continue with step 3. If there is no D-channel alarm continue with step 4.
3. A D-channel alarm will be posted if the ISDN D-channel is not communicating properly with the ISDN switch/PBX connected to the WAN port. Verify the configuration settings for the affected ISDN port. Be sure the port is connected to the proper WAN card and port, that the correct **SIDE** (**net** or **user**) is selected and that the appropriate **SW. TYPE** has been chosen. If these assignments appear correct, it may be necessary to consult with the network or PBX provider to clear the D-channel alarm. Do not proceed with further steps until the D-channel alarm is cleared. In the alarm filter screen DCHAN alarm needs to be set as “log” or “report” to see ISDN D channel alarms (the default is “ignore”).



**Note:** When changing configuration settings on the ISDN-PRI card, set **STATE** to **conf** (for “configure”), make changes and then set **STATE** to **actv**. Selecting **stdby** will cause the configuration information for that D-channel to return to the default parameters.

4. The Call Status Screen will indicate if any calls are currently connected through the ISDN-PRI card. Review the Call Status Screen to determine if calls from any of the ISDN ports are currently active. Generate calls through the ISDN-PRI card and review the performance register information (accessed by pressing **P** from the ISDN-PRI Main Screen) for the affected D-channel(s). This will assist in determining the extent and possible cause of call failures (error disconnects, call attempt, call rejected, etc.). Many configuration parameters can affect an ISDN call. Verify that all configuration options (routing, B-channel assignment and status, etc.) are correct before proceeding.



**Note:** When changing configuration settings on the ISDN-PRI card, set **STATE** to **conf** (for “configure”), make changes and then set **STATE** to **actv**. Selecting **stdby** will cause the configuration information for that D-channel to return to the default parameters.

5. If an HSU card is being used to originate or receive ISDN calls, additional circuit tests can be performed. Once an end-to-end call is established, use the loopback and test signal functions of the HSU card to test the affected port. These tests are accessible from the HSU Card Main Screen and associated Test Screen, as described in the HSU chapter. They allow you to test the end-to-end circuit path for that call.
6. If the ISDN-PRI card is determined to be faulty, replace it and return the faulty unit for repair to the location specified by your distributor

