IMACS

Integrated Multiple Access Communications Server

Reference Guide

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Premisys Communications

Trademarks:

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FCC Registration number:	1H5SNG-73866-DD-E	(multiplexer)
	1H5SNG-73866-DD-E	(integral CSU)
	B468NR-68618-DM-E	(internal modem)

Canadian Certification number: 1932 5217 A
Canadian DOC Load number: 5

Ringer Equivalence number (REN):	0.8B	(multiplexer)
	0.2A	(internal modem)

Approvals:

UL listed to UL# 1459 Second Edition, Number 9K09
CSA listed to C22.2 No. 950-M89

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Important Safety Instructions:

1. Read and follow all warning notices and instructions marked on the product or included in this Reference Guide.

2. This product is intended to be used with a three-wire grounding type plug **-** a plug which has a grounding pin. This is a safety feature. Equipment grounding is vital to ensure safe operation. Do not defeat the purpose of the grounding type plug by modifying the plug or using an adapter.

Prior to installation, use an outlet tester or a voltmeter to check the AC receptacle for the presence of earth ground. If the receptacle is not properly grounded, the installation must not continue until a qualified electrician has corrected the problem. If a three-wire grounding type power source is not available, consult a qualified electrician to determine another method of grounding the equipment.

3. Slots and openings in the cabinet are provided for ventilation. To ensure reliable operation of the product and to protect it from overheating, these slots and openings must not be blocked or covered.

4. Do not allow anything to rest on the power cord and do not locate the product where persons could step or walk on the power cord.

5. Do not attempt to service this product yourself, as opening or removing covers may expose you to dangerous high voltage points or other risks. Refer all servicing to qualified service personnel.

6. Special cables, which may be required by the regulatory inspection authority for the installation site, are the responsibility of the customer.

7. When installed in the final configuration, the product must comply with the applicable Safety Standards and regulatory requirements of the country in which it is installed. If necessary, consult with the appropriate regulatory agencies and inspection authorities to ensure compliance.

8. A rare phenomenon can create a voltage potential between the earth grounds of two or more buildings. If products installed in separate buildings are **interconnected**, the voltage potential may cause a hazardous condition. Consult a qualified electrical consultant to determine whether or not this phenomenon exists and, if necessary, implement corrective action prior to interconnecting the products.

9. Electrostatic Discharge (ESD) protection must be used when handling circuit card assemblies and all other electronic parts covered in this manual.

WARNING

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

The authority to operate this equipment is conditioned by the requirement that no modifications will be made to the equipment unless the changes or modifications are expressly approved by Premisys Communications.

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Introduction

Premisys Communications' **I**ntegrated **M**ultiple **A**ccess **C**ommunications **S**erver (IMACS) allows you to take advantage of the sophisticated network services available from long-distance companies, telephone companies, specialized carriers and PTTs. By using these new services, you can increase the capabilities of your private network and simultaneously reduce costs. This Reference Guide will help you put the IMACS to work in your networking environment.

The IMACS takes the place of many network access devices, including:

- CSUs
- DSUs
- Channel banks
- Drop-and-insert multiplexers
- Digital cross-connect systems

By taking over the functions of all these network access devices, a single IMACS system allows linking a wide range of voice and data equipment over the network, among them:

- LAN bridges and routers
- PBXs (analog or digital) and key systems
- Fax machines
- Terminals and computers
- Telephones
- Modems
- Video CODECs

How to Use this Reference Guide

This Reference Guide is arranged to assist the technician in unpacking, assembling, configuring, and running the integrated access system. The Reference Guide is divided into Sections. Some Sections are further subdivided into Chapters.

Section 1 contains the Preface (this chapter).

Section 2, System Operations, consists of five chapters: System Slot Map, Installation, Basic Operations, System Operations, and Redundant Operations. Section 2 answers most “what-goes-where” questions. Other sections give more detailed descriptions of the procedures involved in configuring and running the IMACS.

The System Slot Map chapter describes the chassis and details the placement of individual components.

The Installation chapter elaborates upon the previous section and shows various installation techniques. It also discusses each of the power supplies, converters, and ringing generators, and provides methods of installing them in the system.

The Basic Operations chapter is an overview that allows users to launch and test the system and assign values to the alarm warnings. The System Operations chapter discusses how users define the timeslot map for the individual nodes. The Redundant Operations chapter deals with power, CPU, WAN, and ADPCM card redundancy features.

Section 3 contains detailed information on the CPU card.

Section 4 discusses the ADPCM Server Card, which is the only Server card supported in this release.

Section 5 covers all WAN Cards and their functionalities, including CSU, DSX, HDSL, and CEPT.

Section 6 discusses the Interface and External Alarm cards.

Section 7 presents the Voice Cards. Currently, these include E&M, FXS, and FXO cards, as well as FXS and FXO Coin cards.

Section 8 describes the Data Cards. Data cards compatible with this release include the HSU, SRU, OCU-DP, FRAD, DS0-DP, B7R, and BRI cards.

Section 9 shows Pinouts for all applicable cards. It shows the wiring specifications for each of the cards.

Section 10 contains a list of error messages and their meanings, as well as a glossary of frequently encountered terms.

T1/E1 Operations

The IMACS can handle either T1 or E1 operations alone or simultaneously. For consistency, most of the screenshots in this documentation reflect T1 operation. The only chapters that specifically address E1 operation are:

- System Operations
- Basic Operations
- Redundant Operations
- WAN Card

Page Layout

This Reference Guide was designed to adhere to conventional documentation standards. The header on each page contains the Revision and Chapter names. The footer of each page has the version, date of publication, and page number. The page number consists of the section number, chapter letter, and page.

Special Instructions

The following recommendations are to be performed by a qualified service person ONLY.

1. Never install telephone wiring during a lightning storm.

2. Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.

3. Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.

4. Use caution when installing or modifying telephone lines.

5. E&M wiring must be confined to inside plant ONLY.

6. Never attempt to remove the power panel without first disconnecting input power cables.

7. Never attempt to operate this system when the power panel screws are removed. They provide the safety ground for the system.

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

Redundant Power Supplies

The following information applies only to systems with redundant power supplies (see Redundant Operations chapter). *The redundant power supply does not share the power load with other equipment.*

1. An equipment grounding conductor that is not smaller in size than the ungrounded branch-circuit supply conductors, is to be installed as part of the circuit that supplies the product or system. Bare, covered or insulated grounding conductors are acceptable. Individually covered or insulated equipment grounding conductors shall have a continuous outer finish that is either green, or green with one or more yellow stripes. The equipment grounding conductor is to be connected to ground at the service equipment.

2. The attachment-plug receptacles in the vicinity of the product or system are all to be of a grounding type, and the equipment grounding conductors serving these receptacles are to be connected to earth ground at the service equipment.

Operator Services Requirements

This equipment is capable of giving users access to interstate providers of operator services through the use of equal access codes. Modifications by aggregators to alter these capabilities may be in violation of the Telephone Operator Consumer Services Improvement Act of 1990 and Part 68 of the FCC Rules.

Safety Precautions

The equipment is designed and manufactured in compliance with Safety Standard EN60950. However, the following precautions should be observed to ensure personal safety during installation or service, and prevent damage to the equipment or equipment to be connected.

Grounding

The equipment can be grounded through the power cord as well as the terminal marked ⏚.

For detailed information on grounding procedures, please see the Grounding section in the Installation chapter.

Power Source

AC: 120 Volts @ 2.0 amps / 240 Volts @ 1 amp, 50/60 Hz
DC: +24 Volts @ 3.0 amps / -48 Volts @ 1.5 amps

Additionally, the DC source must provide a means of disconnecting power from the supply, and the supply voltage must be provided from an isolated source complying with SELV requirements of EN60950.

Fusing

To avoid fire hazard, use only the fuse with the specified type and rating for the equipment.

Panel and Cover Removal

Removal of covers and panels should only be attempted by qualified service or operations persons.

Never attempt to operate the equipment with power panel fasteners removed, or removal of power panel cover without first disconnecting input power.

Regulatory Compliance Information

FCC Part 68 Information

This equipment complies with Part 68 of the FCC rules. On the rear panel of the equipment is a label that contains, among other information, the FCC registration number and ringer equivalence number (REN) for this equipment. If requested, this information must be provided to the telephone company. Tables Preface-1, -2 and -3 show the Ringer-Jack configuration information necessary for FCC registration.

The equipment has FCC Registration Number 1H5SNG-73866-DD-E. This equipment uses the following USOC jacks: RJ11C, RJ21X, RJ2EX, RJ2FX, RJ2GX and RJ2HX.

The REN is used to determine the quantity of devices which may be connected to the telephone line. Excessive RENs on the telephone line should not exceed five (5.0). To be certain of the number of devices that may be connected to the line, as determined by the total RENs, contact the telephone company to determine the maximum RENs for the calling area.

If this equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. If advance notice is not practical, the telephone company will notify you as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make the necessary modifications to maintain uninterrupted service.

This equipment cannot be used on telephone company-provided coin service. Connection to Party Line Service is subject to state tariffs.

This equipment is hearing-aid compatible.

The following information is required for registration with the FCC and is placed on the rear panel of each unit:

"This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation."

"Complies with Part 68 FCC Rules
FCC Registration Number: 1H5SNG-73866-DD-E
Ringer Equivalence: 0.8 B"

Table Preface-1. FCC Registration Information

Reg. Status	MTS/WATS Interfaces	Model #	Ringer Equiv. Number	SOC	Networ k USOC	Canadian Jacks
M	02LS2	8138	0.4B (ac), 0.0 (dc)	-----	RJ11X	CA11X
M	02GS-2	8138	0.4B (ac), 0.0 (dc)	-----	RJ11X	CA11X
Reg.	02LS2	8920	0.8B (ac), 0.0 (dc)	-----	RJ11X	CA11X

Table Preface-2. FCC Registration Information

Reg.	Analog PL Interfaces	Model #	SOC	Network USOC	Canadian Jacks
Reg.	0L13C	8128	9.0F	RJ21X	CA21A
Reg.	02LR2	8128	9.0F	RJ21X	CA21A
Reg.	TL11M	8128	9.0F	RJ2EX	CA2EA
Reg.	TL12M	8128	9.0F	RJ21FX	CA2FA
Reg.	TL11E	8108, 8118	9.0F	RJ2EX	CA2EA
Reg.	TL12E	8108, 8118	9.0F	RJ2FX	CA2FA
Reg.	TL31M	8108, 8118	9.0F	RJ2GX	CA2GA
Reg.	TL32M	8108, 8118	9.0F	RJ2HX	CA2HA
Reg.	TL31E	8108, 8118	9.0F	RJ2GX	CA2GA
Reg.	TL32E	8108, 8118	9.0F	RJ2HX	CA8HA

Table Preface-3. FCC Registration Information

Reg.	Digital Interfaces	Model #	SOC	Network USOC	Canadian Jacks
Reg.	04DU9-BN	8000, 8010*	6.0Y	RJ48	CA81A
Reg.	04DU9-DN	8000, 8010*	6.0Y	RJ48	CA81A
Reg.	04DU9-1KN	8000, 8010*	6.0Y	RJ48	CA81A
Reg.	04DU9-1SN	8000, 8010*	6.0Y	RJ48	CA81A
Reg.	04DU9-1ZN	8000, 8010*	6.0Y	RJ48	CA81A
Reg.	04DU9-BN	8000, 8010**	6.0P	N/A	---
Reg.	04DU9-DN	8000, 8010**	6.0P	N/A	---
Reg.	04DU9-1KN	8000, 8010**	6.0P	N/A	---
Reg.	04DU9-1SN	8000, 8010**	6.0P	N/A	---
M	04DU5-24	8249	6.0F	RJ48	CA81A
M	04DU5-48	8249	6.0F	RJ48	CA81A
M	04DU5-56	8249	6.0F	RJ48	CA81A
M	04DU5-96	8249	6.0F	RJ48	CA81A
* with 812 CSU ** with 811 DSX					

CE Marking

The CE mark is affixed to the equipment that conforms to the following Commission Directives:

- **EMC Directive -** 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility.
- **Low Voltage Directive -** 73/23/EEC on the harmonization of the laws of the Member States relating to electrical equipment designed for use within certain voltage limits.
- **Telecom Directive -** 91/263/EEC on the approximation of the laws of the Member States concerning telecommunications terminal equipment, including the mutual recognition of their conformity.

Country-Specific Regulatory Compliance Information

Canada

Canadian DOC Information

NOTICE TO USERS OF THE CANADIAN TELEPHONE NETWORK

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

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request to disconnect the equipment.

Users should ensure for their own protection the electrical ground connection of the power utility, telephone line and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

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

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

Japan

CLASS A ITE NOTIFICATION

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Europe

EUROPEAN TELECOMMUNICATION APPROVALS

Under the Telecommunications Terminal Directive the following connections are approved:

The Dual WAN card (8010), the Single WAN card (8000) and the 120 ohm version of the DSX/CEPT Module (811) are approved for connection to ONP unstructured 2048 kbiVs digital leased lines with G.703 interfaces, following assessment against CTR12

United Kingdom

UK APPROVAL NUMBER

The BABT approval number is M606037.

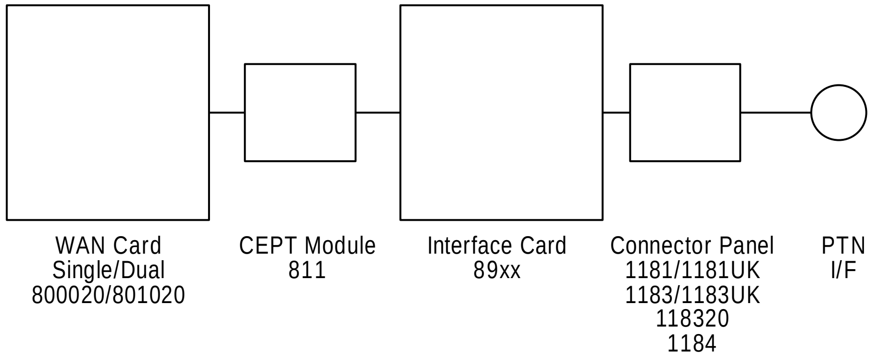
The Dual WAN card (8010), the Single WAN card (8000) and the 75 ohm version of the DSX/CEPT Module (811), connected via the BNC connector panel (1183) are approved for connection to UK 2048 kbiVs digital leased lines with G.703 (75Ohm) interfaces.

UK COMPLIANCE STATEMENTS

The E1 Interface is approved in the UK for direct connection to PTO-provided circuits operating at data rates up to 2.4Mbit/s.

The E1 Interface comprises a combination of single or dual WAN cards, CEPT module and connector panels as listed in the UK approval documentation.

The approved configuration options are shown below.



The 89xx Interface Card is also listed in the approval documentation and provides a direct metallic path between the CEPT module and appropriate Connector Panel.

The power required by the host and the total of all adapter cards installed within the host environment, together with any auxiliary apparatus, shall not exceed the power specification of the host apparatus.

The power requirements for this E1 interface are:

8901 PSU
AC Mains: 100 - 240 Vrms, 47 - 63 Hz
DC Output: +5VDC 2A, +12VDC 1.2A, -12VDC 0.2A

8902 PSU
DC Input: 35 - 60 VDC, ± 15%, 120KVA max.
DC Output: +5.6VDC 2.5A, -5.2VDC 1.0A
+12VDC 1.9A, -12VDC 1.0A

It is essential that, when other option cards are introduced which use or generate a hazardous voltage, the minimum creepages and clearances specified in the table below are maintained. Suitable user protection to ensure compliance with EN 60950 should be present on the card. A hazardous voltage is one which exceeds 42.2V peak AC or 60VDC. If you have any doubt, seek advice from a competent installation engineer before installing other adapters into the host equipment.

The equipment must be installed such that with the exception of the connections to the host, clearance and creepage distances shown in the table below are maintained between the card and any other assemblies which use or generate a voltage shown in the table below. The large distance shown in brackets applies where the local environment is subject to conductive pollution or dry non-conductive pollution which could become conductive due to condensation. Failure to maintain these minimum distances would invalidate the approval.

Clearance (mm)	Creepage (mm)	Voltage Used or Generated By Host or Other Cards
2.0	2.4 (3.8)	Up to 50Vrms or VDC
2.6	3.0 (4.8)	Up to 125Vrms or VDC
4.0	5.0 (8.0)	Up to 250Vrms or VDC

4.0	6.4 (10.0)	Up to 300Vrms or VDC
For a host or other expansion card fitted in the host, using or generating voltages *greater* than 300V (rms or DC), advice from a competent telecommunications safety engineer must be obtained before installation of the relevant equipment		Above 300Vrms or VDC

Germany

German Approval Number

The German approval number is A118 142F.

Safety Warning

SPEZIFISCHE SICHERHEITSMAßNAHMEN

DIE EINRICHTUNG IST GEMÄß DEM SICHERHEITSSTANDARD EN60950 ENTWORFEN UND HERGESTELLT WORDEN. DOCH DIE FOLGENDEN SICHERHEITSMAßNAMEN SOLLEN EINGEHALTEN WERDEN. UM IHRE PERSÖNLICHE SICHERHEIT BEI INSTALLATION ODER BEI WARTUNG SICHERZUSTELLEN UND UM SCHADEN AN DER EINRICHTUNG ODER AN DER ZUM ANSCHLUß BESTIMMTEN EINRICHTUNG ZU VERMEIDEN.

ERDUNG

Die Einrichtung kann genauso durch das Netzanschlußkabel wie durch das mit gekennzeichnete Terminal geerdet werden.

STROMVERSORGUNG

Wechselspannung 120/240 Volts 2/1 Amps 50/60 Hertz

Gleichstrom 24/48 Volts 1/1.5 Amps

Die Gleichstromversogung muß zusätzlich den Strom von der Versorgung abstellen können, und die Versorgungsspannung muß von einer isolierten Quelle gemäß der SELV-Voraussetzungen von EN60950 versorgt werden.

SCHMELZSICHERUNG

Um Brandgefahr zu vermeiden, dürfen Sie nur die Sicherung von der vorgeschriebenen Sorte und Nennwerte für die Einrichtung gerbrauchen.

ENTFERNUNG VON PLATTEN UND ABDECKUNGEN

Die Abdeckungen und Platten sollen nur von einem qualifizierten Wartungs- oder Operationsperson entfernt werden.

Betreiben Sie nie die Einrichtung, wenn die Stromplattenverschlüsse entfernt worden sind, und entfernen Sie nie die Stromplattenabdeckung, ohne zuerst die Stromversorgung abzustellen.

Customer Service

Service

If you require technical assistance with the installation, operation or maintenance of products purchased directly from Premisys or you wish to return a product under Warranty for repair, please call:

Premisys Technical Support at (510) 353-7686.

If you purchased the Premisys product from an authorized dealer, distributor, Value Added Reseller (VAR) or a third party, please contact that vendor for technical assistance and warranty support.

Ordering Information

To order equipment, cables or additional copies of this Reference Guide, please call:

Premisys Customer Service at (510) 353-7600.

Introduction

The system offers the choice of three chassis and employs four types of cards. This chapter specifies the slots in which cards of different types may be installed in the three chassis.

The chassis options are:

1. Front-Loading Chassis - Power Supplies on Side: This chassis provides full functionality for smaller systems that require few options and small capacity.
2. Two-Sided Chassis: With front and rear-facing card cages, this chassis provides maximum system functionality and capacity.
3. Front-Loading Chassis - Power Supplies on Top: This chassis provides the same functionality and capacity as the two-sided chassis with front facing card cages.

The following types of cards may be installed in the chassis:

1. Common cards (CPU and Interface cards)
2. User cards (Voice, Data and Alarm cards)
3. WAN cards (single or dual T1/E1,or HDSL)
4. Communications Server cards (ADPCM)

All cards slide into slots in the front of the front-loading systems or the front and back of the two-sided chassis. Rail guides in the top and bottom of the slots align the cards with the connectors for easy insertion.

Two-Sided Unit

Figure Slot-1 shows the front of the chassis (often called the Network side) with the slot numbers labeled. Cards inserted from the Network side have plastic face plates with a handle in the middle and a retaining screw on the bottom of the cards. Figure Slot-2 shows the back of the chassis (often called the User side) with the slot numbers labeled. Cards inserted from the User Side have metal face plates with handles at the top and bottom. Those cards have screws on both the top and bottom of the face plates. Push the cards firmly into the chassis until the face plate touches the chassis. Screw the face plates to the chassis so the cards cannot come loose accidentally.

The two-sided chassis has an error-free card placement system. Certain card types are "keyed" to fit only in their own slots. User cards, for instance, will not seat properly in the CPU Slots (C-1 and C-2). Table Slot-1 describes card placement and should be used to determine setup arrangements.

Always put blank face plates over any slots you are not using. Blank face plates help protect the installed cards from contamination, and are an integral part of the air circulation system that keeps the system cool. Also, the blank face plates are required for compliance with UL regulations.

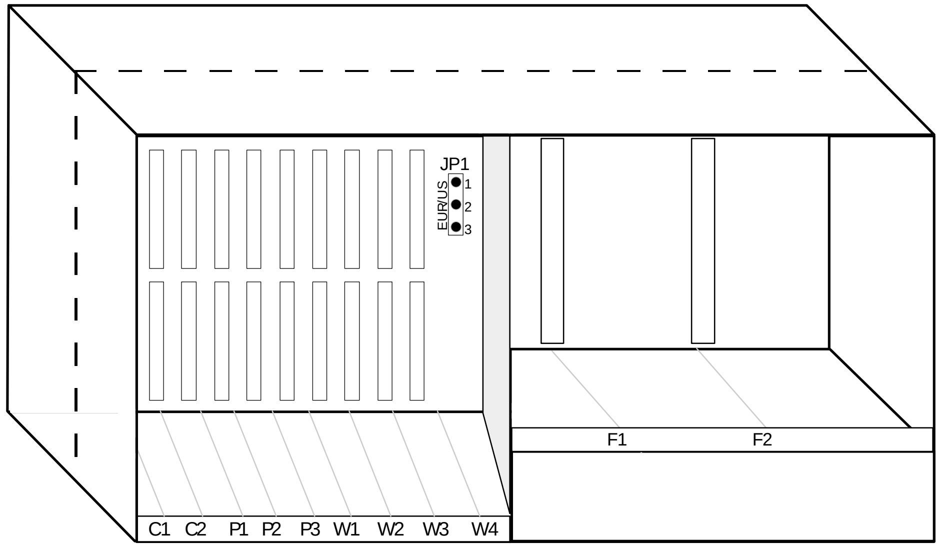


Figure Slot-1. Two-Sided Chassis - Front View

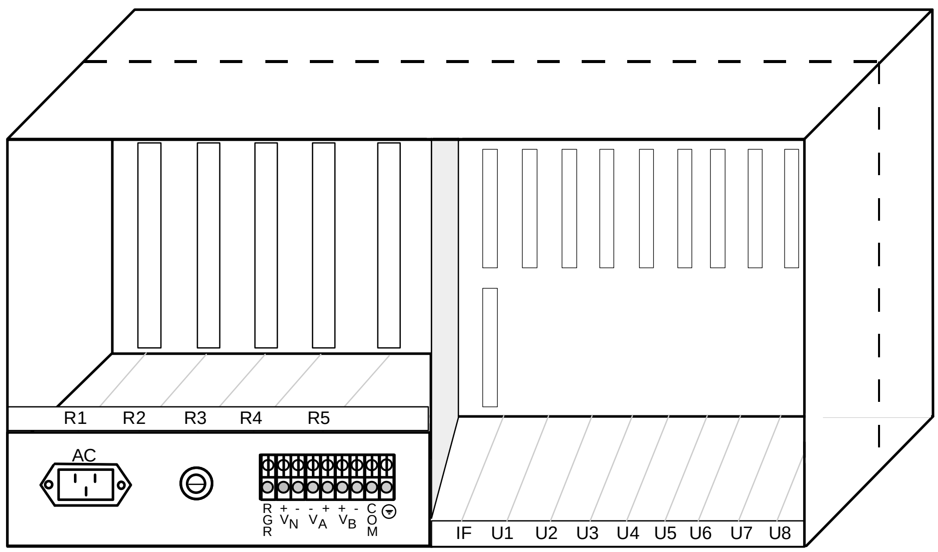


Figure Slot-2. Two-Sided Chassis - Rear View

Table Slot-1. Card Placement: Two-Sided Chassis

Type of Card	# of Cards	Slots Used	Notes
CPU Cards	1-2	C1-C2	One required in either slot
Server Cards	1-3	P1-P3	ADPCM cards; any slot
WAN Cards	1-4	W1-W4	One required
Interface Card	1	IF	Required
Alarm Cards	0-8	U1-U8	Internal/External, any user slot
E&M Cards	0-8	U1-U8	2/4 wire voice, any user slot
FXO Cards	0-8	U1-U8	2 wire voice, any user slot
FXS Cards	0-8	U1-U8	2 wire voice, any user slot
B7R Cards	0-8	U1-U8	FDL Mux, any user slot
BRI Cards	0-8	U1-U8	BRI, any user slot
DS0-DP Cards	0-8	U1-U8	4 wire data, any user slot
FRAD Cards	0-8	U1-U8	Frame Relay, any user slot
HSU Cards	0-8	U1-U8	High speed data, any user slot
OCU-DP Cards	0-8	U1-U8	4 wire data, any user slot
SRU Cards	0-8	U1-U8	Sub-rate data, any user slot
Main Power (AC/DC)	1-2	F1-F2	AC or DC power Supplies
Optional Power	0-2	R1-R5	AC/DC converter
Optional Ringer	0-5	R1-R5	Ringing generator

Front-Loading Unit

Figures Slot-3 and Slot-4 show the front-loading chassis. Designed to maximize the use of space, the front loading chassis has a common bus that allows all cards to be placed in similar slots. The combination slots for this unit are P1-P4 (Communications Server card slots) and W1-W4 (WAN slots). Together, these slots are sometimes referred to as slots U1-U8 (when used for voice, data or alarm cards).

Cards have either metal face plates or plastic face plates. Push the cards firmly into the chassis until the face plate touches the chassis. Screw the face plates to the chassis so the cards cannot come loose accidentally.

As with the two-sided chassis, the user should always put blank face plates over any slots you are not using. Blank face plates help protect the installed cards from contamination and are an integral part of the air circulation system that keeps the system cool. Also, the blank face plates are required for compliance with UL regulations.

Table Slot-2 describes card placement and should be used to determine setup arrangements.

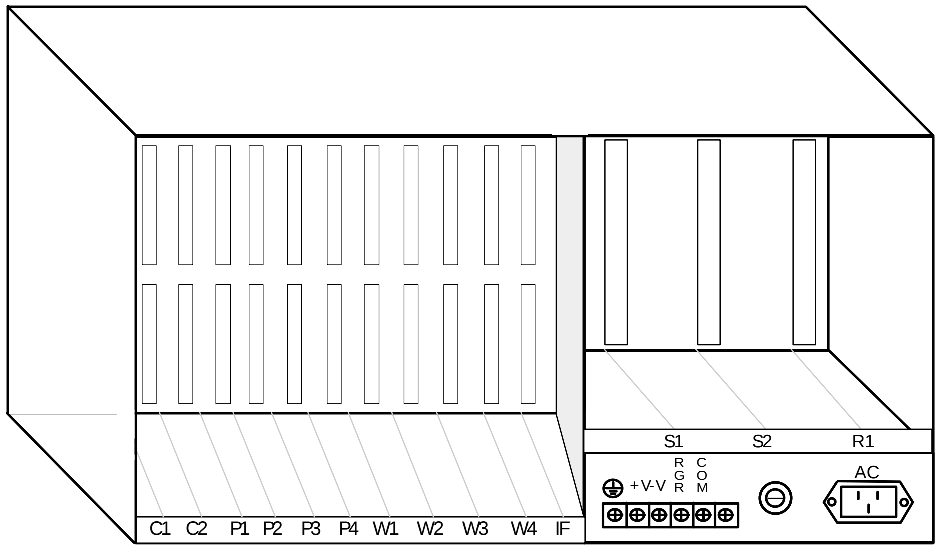


Figure Slot-3. Front-Loading Chassis - Power Supplies on Side (older model)

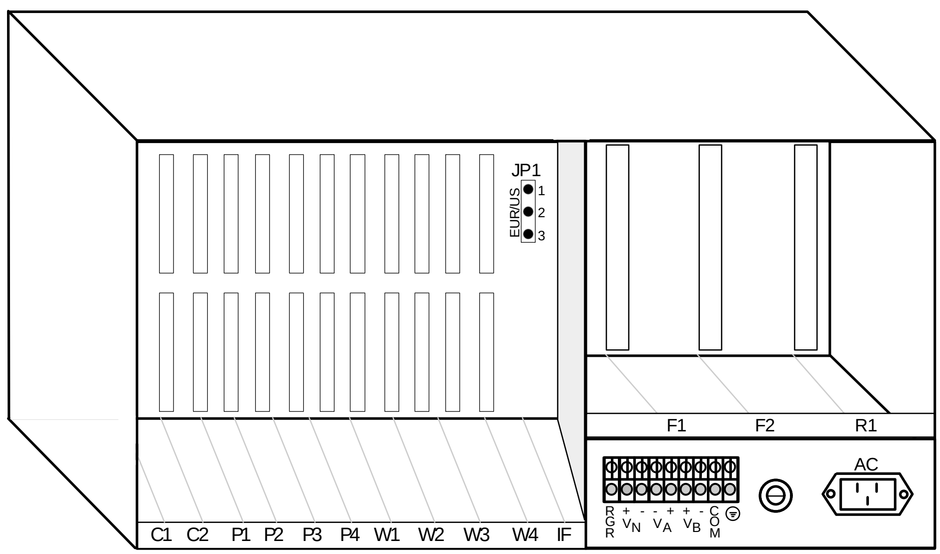


Figure Slot-4. Front-Loading Chassis - Power Supplies on Side (newer model)

Table Slot-2. Card Placement: Front-Loading Chassis - Power Supplies on Side

Type of Card	# of Cards	Slots Used	Notes
CPU Cards	1-2	C1-C2	One required in either slot
Server Cards	1-3	P1-P3	ADPCM Cards
WAN Cards	1-4	W1-W4	One required
Interface Card	1	IF	Required
Alarm Cards	0-7	P1-4, W1-4	Internal/External, any user slot
E&M Cards	0-7	P1-4, W1-4	2/4 wire voice, any slot
FXO Cards	0-7	P1-4, W1-4	2 wire voice, any slot
FXS Cards	0-7	P1-4, W1-4	2 wire voice, any slot
B7R Cards	0-7	P1-4, W1-4	FDL Mux, any slot
BRI Cards	0-7	P1-4, W1-4	BRI, any slot
DS0-DP Cards	0-7	P1-4, W1-4	4 wire data, any slot
FRAD Cards	0-7	P1-4, W1-4	Frame Relay, any slot
HSU Cards	0-7	P1-4, W1-4	High speed data, any slot
OCU-DP Cards	0-7	P1-4, W1-4	4 wire data, any slot
SRU Cards	0-7	P1-4, W1-4	Sub-rate data, any slot
Main Power (AC/DC)	1-2	S1-S2	AC or DC power Supplies
Optional Power	0-1	S1-S2	AC/DC converter
Optional Ringer	0-1	R1	Ringing generator

Front-Loading Chassis—Power Supplies on Top

Figure Slot-5 shows the front-loading chassis with the power supplies on top. This chassis has three server card slots (P1-3), four WAN card slots (W1-4), and eight user card slots (U1-8). Slots S1 and S2 can accommodate up to two power supplies, while slots R1-5 can accommodate up to five power converters or ringing generators. Table Slot-3 describes card placement and should be used to determine setup.

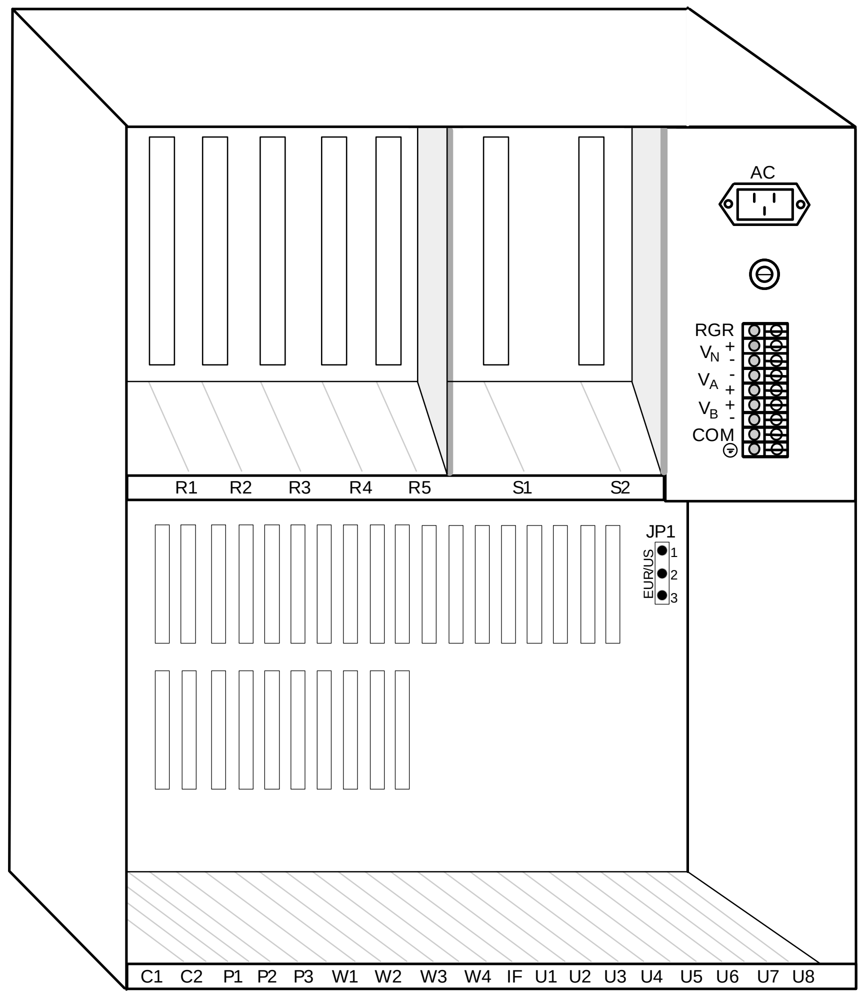


Figure Slot-5. Front-Loading Chassis - Power Supplies on Top

Table Slot-3. Card Placement: Front-Loading Chassis - Power Supplies on Top

Type of Card	# of Cards	Slots Used	Notes
CPU Cards	1-2	C1-C2	One required in either slot
Server Cards	1-3	P1-P3	ADPCM Cards; any slot
WAN Cards	1-4	W1-W4	One required
Interface Card	1	IF	Required
Alarm Cards	0-8	U1-U8	Internal/External, any user slot
E&M Cards	0-8	U1-U8	2-/4-wire voice, any user slot
FXO Cards	0-8	U1-U8	2-wire voice, any user slot
FXS Cards	0-8	U1-U8	2-wire voice, any user slot
B7R Cards	0-8	U1-U8	FDL Mux, any user slot
BRI Cards	0-8	U1-U8	BRI, any user slot
DS0-DP Cards	0-8	U1-U8	4-wire data, any user slot
FRAD Cards	0-8	U1-U8	FRAD, any user slot
HSU Cards	0-8	U1-U8	High-speed data, any user slot
OCU-DP Cards	0-8	U1-U8	4-wire data, any user slot
SRU Cards	0-8	U1-U8	Sub-rate data, any user slot
Main Power (AC/DC)	1-2	F1-F2	AC or DC power supplies
Optional Power	0-2	R1-R5	AC/DC converter
Optional Ringer	0-5	R1-R5	Ringing generator

DC Power Supply Fuse

The DC power supply fuse is located on the chassis next to the DC external power supply connectors on the front or rear panel (depending on chassis model). This fuse is used to protect any over current on the network voltage (V_n) located on the DC connector panel. Table Slot-4 lists the part numbers of approved replacement fuses. Figure Slot-6 shows the location of the fuse replacement cartridge.

Table Slot-4. Replacement Fuses for the DC Power Supply

Manufacturer	250VDC 5A
Bussman	GDC
Littlefuse	218005

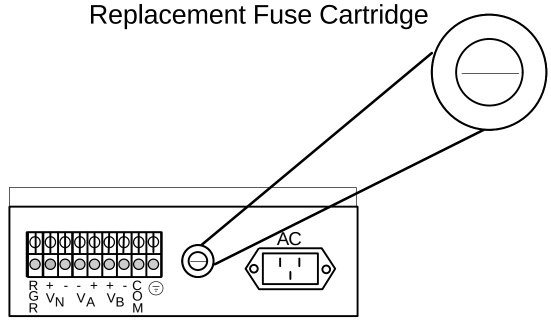


Figure Slot-6. Replacement Fuse Cartridge on Chassis

Introduction

The Installation section provides the user with information to unpack and assemble the Integrated Access Controller. The installation checklist on the next page is provided for the experienced user as a road map of installation procedures. This chapter will discuss the unit, power supplies, and different hardware configurations for some of the cards. The physical installation of the cards that make up the system is discussed in the Slotmap chapter. Configuration of these cards is presented in later chapters.

Design Plan

The installation should be based upon a thoroughly considered, documented design plan. Such a plan assures that the necessary components are on hand to implement the system requirements and that the site can accommodate them.

Site Selection and Preparation

A site survey should be performed to avoid unforeseen problems. A site survey involves a physical check on key information about a site, including building codes, floor plans, available power, existing wiring and grounding.

An integrated access device requires a reasonably dust-free operating environment, such as a computer room or a wiring closet. Do not install the chassis in direct sunlight, which may increase the unit's temperature and discolor the chassis. You may mount the chassis on a wall or in an equipment rack, or place it on a table or other flat surface.

The unit can operate on either AC or DC power when equipped with the proper power supply. Table Install-2 lists the electrical and environmental requirements.

The mounting brackets (supplied) are required for table top installations to assure proper airflow in the chassis. The top and bottom of the unit must be clear of any objects.

When the chassis is installed in a rack, allow a minimum of 2 inches (1.6 cm) space between the chassis and the equipment above and below the unit for proper ventilation.

Caution: *The chassis MUST be installed horizontally for proper ventilation and cooling effect.*

Each customer must provide either space or climate control to assure an ambient temperature less than approximately 40° C for reliable operations. If heat dissipation is a problem, increase the space between rack mounted units or install commercially available "heat baffles" above and below each chassis.

A wide variety of system functions and capacities can be supported by various combinations of system cards. Table Install-3 lists the specifications for all components supported by the system in Version 3.6.

Installation Checklist

	Complete and document design plan
	Perform site survey and preparation
	Unpack and mount chassis
	Remove power supply covers (as needed)
	Install ground connection
	Install AC or DC power supply
	Install 115VAC to -48VDC converter (if applicable)
	Install ringing generator (if applicable)
	Install CPU Card
	Configure and install WAN card plug-in modules on WAN card (see Section 5)
	Install WAN Card
	Install Interface Card
	Install all other Cards. **Set all jumpers and switches as required before installation. See Table Install-1 and relevant card chapters in this manual.**
	Verify voltages (all power supplies in the chassis)
	Verify fuse rating
	Connect VT-100 to Interface Card with cable (see Basic Operations chapter)
	Replace power supply covers
	Connect AC power cord or apply DC voltage
	Verify that power supplies, CPU, and WAN cards come up with green LEDs on
	Register the system (refer to Basic Operations Chapter)
	Set Alarm Filters (refer to Basic Operations Chapter)
	Test Alarm History (remove card - restore card)
	Configure CPU Card (refer to CPU Card Chapter)
	Configure WAN Card(s) (refer to WAN Card Chapter)
	Configure Interface Card (refer to Interface Card Chapter)
	Configure all other Cards (refer to Individual Card Chapters)

Table Install-1 Module Switches and Jumpers

Card	Model	Jumpers or Switches	Options
WAN: CSU Module	812	JP1-3	
WAN: DSX/CEPT Module	811	JP1-4	T1/E1, 75 ohm/120 ohm
WAN: HDSL Plug-in	820		
Interface Card	8927	JP2-4	balanced/unbalanced operation
Alarm Card	8401	JP1-4	Active/Passive
Alarm Card	8403	JP1-4	Active/Passive
E&M Card	8108		
E&M Card	8115	SW1-4	GND/BAT options
E&M Card	8118	SW1-4	GND/BAT options
E&M Card	8119	SW1-4	GND/BAT options
FXS Card	8124	SW1-4	GND/BAT options
FXS Card	8128		
FXO Card	8134	P1-8: JP1,2	MRD option
FXO Card	8135	P1-8: JP1,2	MRD option
FXO Card	8138	P1-8: JP1,2	MRD option
FXO Card	8139	P1-8: JP1, 2	MRD option
FXS Coin Card	8149		
FXO Coin Card	8159		
HSU Card	8202	P 1, 2 switch	RS530/V.35 IF option
HSU Card	8203	JP2	
HSU Card	8212		
HSU Card	8214	JP1-JP2	
HSU Card	8215	P 1-4 switch	RS530/V.35 IF option
SRU Card	8220	JP2, JP3, JP9	
OCU-DP	8249	JP3-JP4	
OCU-DP	8248	JP1-JP7	
OCU-DP	8247	JP1-JP7	
OCU-DP	8246	JP1	
OCU-DP	845		
DS0-DP Card	8254	JP1, JP3	
FRAD Card	8231	JP1, JP2, JP9	
B7R Card	8228		
ADPCM Card	8871		
BRI-U Card	8260	JP1, JP2, JP9, JP101 - JP602	
BRI-U Card	8261	J101-801	LT/NT option
		J102-802	7.5/15 ma sealing current
BRI-ST Card	8262	JP1, JP2, JP5, JP6, JP101 - JP804	

Table Install-2. Electrical and Environmental Requirements

Parameter	Requirement
AC Power (110VAC)	90/135VAC 50/60Hz
AC Power (220VAC)	175/264VAC 50/60Hz
DC Power (-48VDC)	-35/-60VDC
DC Power (+24VDC)	+18/+32VDC
Power consumption	125W (typical)
Temperature (operating)	0° to 50° C, 32° to 122° F
Temperature (storage)	-20° to 80° C, -4° to 176° F
Humidity	0% to 95% relative humidity, non-condensing

Table Install-3. Physical Specifications

		Height		Width		Depth		Weight		Power	
Item	Model	inches	cm	inches	cm	inches	cm	lb	Kg	Watt	BTU/hr
System Unit	8916	9.0	22.9	17	43.2	9.13	23.2	8.5	3.96	--	--
System Unit	8918	9.0	22.9	17	43.2	15.38	39.0	11.0	5.0	--	--
System Unit	8919	9.0	22.9	17	43.2						
AC Power Supply	8901	5.62	14.3	2.13	5.4	8.13	20.6	1.67	.76	--	--
-48VDC Power Supply	8902	5.62	14.3	3	7.6	8.13	20.6	1.75	.80	--	--
24VDC Power Supply	8907	5.62	14.3	3	7.6	8.13	20.6	1.75	.80	--	--
AC/DC Converter	8903	5.62	14.3	2.75	7.0	8.13	20.6	2.0	.91	--	--
Power Converter	8905	5.62	14.3	2.75	7.0	8.13	20.6	2.0	.91		
Ringing Generator	8906	5.62	14.3	1.38	3.5	6.0	15.2	1.5	.68	--	--
CPU Card	8800	8.0	20.3	.94	2.4	7.5	19.0	.75	.32	1.4	4.78
CPU Card	8801	8.0	20.3	.94	2.4	7.5	19.0	.75	.32	1	3.41
CPU Card	8804	8.0	20.3	.94	2.4	7.5	19.0	.75	.32	1.4	4.78
WAN Card	8000	8.0	20.3	.94	2.4	7.5	19.0	.75	.32	1.1	3.75
WAN Card	8010	8.0	20.3	.94	2.4	7.5	19.0	.75	.32	1.5	5.12
WAN Card (HDSL)	8011	8.0	20.3	.94	2.4	7.5	19.0	.75	.32		
WAN Card	8014	8.0	20.3	.94	2.4	7.5	19.0	.75	.32	2	6.83
CSU Module	812	3.69	9.37	2.13	5.4	.38	.95	.062	.028	0.25	0.85
DSX/CEPT Module	811	3.63	9.22	2.06	5.2	.50	1.27	.062	.028	0.45	1.54
HDSL Plug-in	820										
Interface Card	8920	8.0	20.3	.94	2.4	7.5	19.0	1.0	.45	0.6	2.05
Interface Card	8921	8.0	20.3	.94	2.4	7.5	19.0	1.0	.45		
Interface Card	8925	8.0	20.3	.94	2.4	7.5	19.0	1.0	.45	0.15	0.51
Interface Card	8926	8.0	20.3	.94	2.4	7.5	19.0	1.0	.45	0.2	0.68
Interface Card	8927	8.0	20.3	.94	2.4	7.5	19.0	1.0	.45	0.18	0.62
Alarm Card	8401	8.0	20.3	.94	2.4	7.5	19.0	.5	.23	0.4	1.37
E&M Card	8108	8.0	20.3	.94	2.4	7.5	19.0	1.0	.45	3.4	11.61
E&M Card	8115	8.0	20.3	.94	2.4	7.5	19.0	1.0	.45	1.75	5.97
E&M Card	8118	8.0	20.3	.94	2.4	7.5	19.0	1.0	.45	3.4	11.61
E&M Card	8119	8.0	20.3	.94	2.4	7.5	19.0	1.0	.45	3.5	11.94
E&M Card	8115	8.0	20.3	.94	2.4	7.5	19.0				
FXO Card	8134	8.0	20.3	.94	2.4	7.5	19.0	1.25	.57	3.5	11.94
FXO Card	8135	8.0	20.3	.94	2.4	7.5	19.0	1.25	.57	3.5	11.94
FXO Card	8138	8.0	20.3	.94	2.4	7.5	19.0	1.25	.57	7	23.9
FXO Card	8139	8.0	20.3	.94	2.4	7.5	19.0	1.25	.57	7	23.9
FXS Card	8124	8.0	20.3	.94	2.4	7.5	19.0	1.0	.45	4.85	16.54
FXS Card	8125	8.0	20.3	.94	2.4	7.5	19.0	1.0	.45	4.85	16.54
FXS Card	8128	8.0	20.3	.94	2.4	7.5	19.0	1.0	.45	9.7	33.12
FXS Card	8129	8.0	20.3	.94	2.4	7.5	19.0	1.0	.45	9.7	33.12
FXS Coin Card	8149	8.0	20.3	.94	2.4	7.5	19.0	1.0	.45	9.7	33.12
FXO Coin Card	8159	8.0	20.3	.94	2.4	7.5	19.0	1.0	.45	9.7	33.12
SRU Card	8220	8.0	20.3	.94	2.4	7.5	19.0	.5	.23	4.6	15.7
FRAD Card	8231	8.0	20.3	.94	2.4	7.5	19.0				
HSU Card	8202	8.0	20.3	.94	2.4	7.5	19.0	.5	.23	3.4	11.61
HSU Card	8203	8.0	20.3	.94	2.4	7.5	19.0				
HSU Card	8212	8.0	20.3	.94	2.4	7.5	19.0	.5	.23	2.5	8.54
HSU Card	8214	8.0	20.3	.94	2.4	7.5	19.0	.5	.23	2.5	8.54
HSU Card	8215	8.0	20.3	.94	2.4	7.5	19.0	.5	.23	3.5	11.94
OCU-DP	8249	8.0	20.3	.94	2.4	7.5	19.0	.5	.23	2.4	8.2
OCU-DP	8248	8.0	20.3	.94	2.4	7.5	19.0	1.0	.45	5.1	17.41
OCU-DP	8247	8.0	20.3	.94	2.4	7.5	19.0	1.0	.45	5.1	17.41
OCU-DP 10-Port	8246	8.0	20.3	.94	2.4	7.5					
OCU-DP	845	8.0	20.3	.5		6.25	15.9	.75	.32	5.1	17.41
DS0-DP Card	8254	8.0	20.3	.94	2.4	7.5	19.0	.5	.23	3.1	10.58
ADPCM Card	8871	8.0	20.3								
B7R Card	8228	8.0	20.3	.94	2.4	7.5	19.0	.5	.23	4.6	15.7
BRI-U Card	8260	8.0	20.3	.94	2.4	7.5	19.0	1.0	.45	6.3	21.48
BRI-U Card	8261	8.0	20.3	.94	2.4	7.5	19.0				
BRI-ST Card	8262	8.0	20.3	.94	2.4	7.5	19.0				

Unpacking and Mounting the Chassis

When you receive the system, unpack the boxes and check the chassis and cards for damage. If any part of the unit is damaged, contact the shipping company to file a claim. The shipping company representative will also tell you how to submit a claim, where to send the unit, and give you any special instructions you may need.

Pack the unit in the original packing materials and send it by prepaid freight to the address you received. If the original packing materials are unavailable, pack the unit in a sturdy box and surround it with shock-absorbing material.

The front and back of the two-sided unit must be accessible for inserting cards. Voice, data, WAN, and power cables are also attached to connectors at the rear of the chassis. The front-loading model of the Integrated Access Controller does not need access to the back side of the unit. Table Install-4 lists the minimum clearances between the equipment and the nearest object for rack-mounted, wall-mounted or table-top installations.

Table Install-4. Minimum Rack and Wall-Mount Clearances

Clearance	Front	Back*	Top	Bottom
Inches	10	15	2	2
Centimeters	25	38	5	5

* required for the two-sided chassis only

Two-Sided Chassis

The 891822 and 891823 two-sided chassis have twelve holes on each side of the chassis (see Figure Install-1). These holes facilitate mounting the unit in any standard EIA 19- or 23-inch rack (48.2 or 58.4 cm). The two holes on the bottom of the unit (t) can be used for mounting on a table or other flat surface.

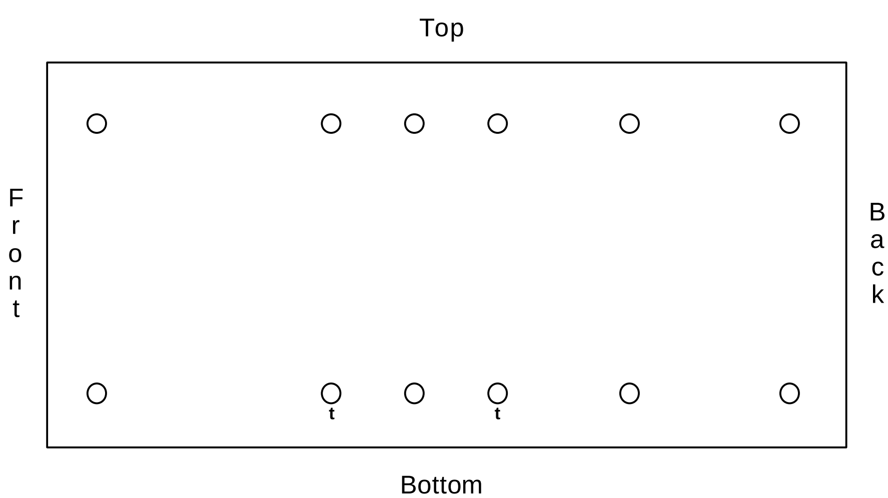


Figure Install-1. Mounting Holes (2-Sided Chassis)

Front-Loading Chassis (Power Supplies on Side)

The 8916 chassis has seven holes on each side of the chassis (as shown in Figure Install-2). These holes can be used to mount the unit in any standard EIA 19- or 23-inch rack (48.2 or 58.4 cm). The two holes on the bottom of the unit (t) can be used for mounting on a table or other flat surface.

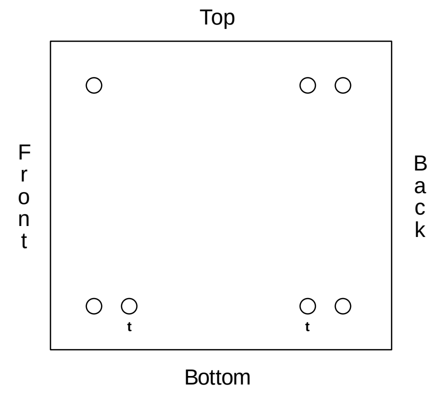


Figure Install-2. Mounting Holes (8916 Front-Loading Chassis)

The 891620 chassis has eight holes on each side of the chassis (as shown in Figure Install-3). These holes can be used to mount the unit in any standard EIA 19- or 23-inch rack (48.2 or 58.4 cm). The two holes on the bottom of the unit (t) can be used for mounting on a table or other flat surface.

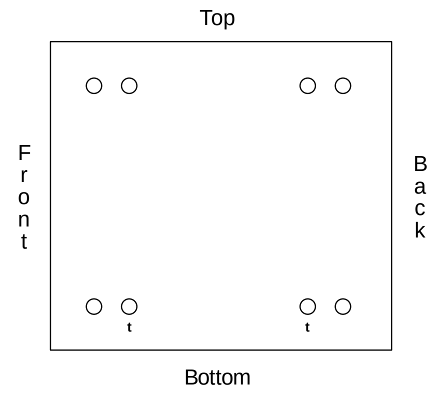


Figure Install-3. Mounting Holes (891620 Front-Loading Chassis)

Front-Loading Chassis (Power Supplies on Top)

The 891920 chassis has eight holes on each side of the chassis (as shown in Figure Install-4). These holes can be used to mount the unit in any standard EIA 19- or 23-inch rack (48.2 or 58.4 cm). The two holes on the bottom of the unit (t) can be used for mounting on a table or other flat surface.

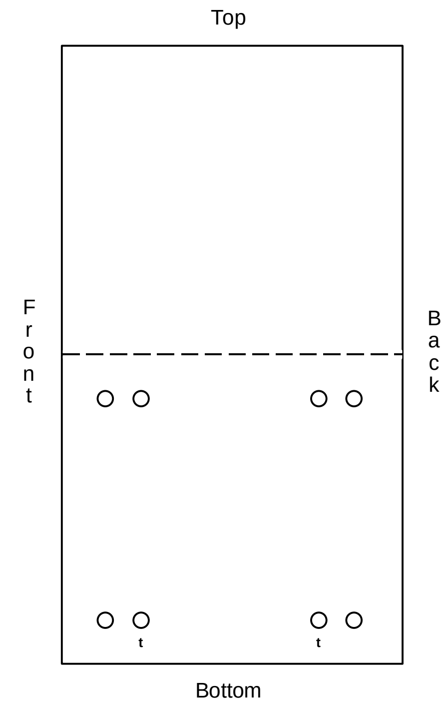


Figure Install-4. Mounting Holes (Front-Loading Chassis, Power Supplies on Top)

Mounting the Chassis

To mount the chassis to the rack, attach the metal brackets (see Figure Install-5) to the sides of the chassis with the four 10-32x1/4 screws (brackets and all screws provided in the installation pack). Four 12-24x1/2 screws are needed to attach the chassis to the rack. The brackets are reversible to allow mounting in 19- or 23-inch racks (48.2 or 58.4 cm). You can attach the brackets using holes at the front of the chassis, back of the chassis or near the middle. If you mount the brackets in the middle of the chassis, you can reduce the amount of space required behind it for cables. However, the front and the back must be accessible to insert and remove cards.

To attach the unit to the wall, use the template of the hole pattern (provided) and copy to a backboard. The backboard should be 1/2" to 3/4" construction grade plywood. Attach the unit with the 4-10x5/8 screws provided. The wall mount position must be with the power supplies closest to the wall.

If you are placing the unit on a tabletop or other hard surface, it is mandatory to assure clearance for proper airflow in the chassis. Make sure the chassis is accessible from the front, and has at least 3/4 inches (2 cm) clearance above the chassis. The metal brackets (see Figure Install-5) should be attached to provide the additional clearance needed for attaching cables to the user cards for both the two-sided and front-loading systems. Attach the brackets to the side of the chassis using the two (t) holes. Place the plastic abrasion-protective inserts ("feet") in the holes provided near the ends of the bottom of the bracket.

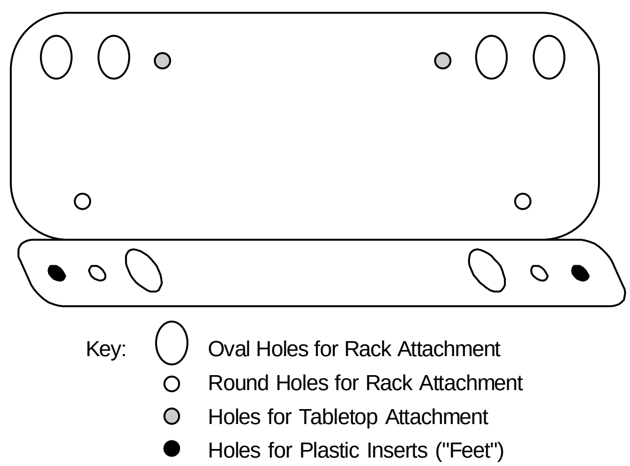


Figure Install-5. Hole Pattern on the Mounting Bracket

Power Supply and Ringing Generator System

The power supply and ringing generator system can consist of up to two power supplies, two AC to DC converters and up to four ringing generators. External -48VDC talk battery and external ringing generators may be used instead of the internal units. Use the following guidelines to determine your power supply and ringing generator requirements.

System Power

The system will always require one of the following power supplies:

- AC (8901)
- -48VDC (8902)
- +24VDC (8907)

Even though the 8907 power supply has specifications listed as negative throughout this manual, it can be used with positive voltage (+24VDC). Because of the extremely small number of applications that would require it, the conversion procedure is not covered in this manual. If you are considering using +24VDC, please call the customer service number listed in the Preface.

For backup, you may add a second power supply (see Preface for specific UL requirements when adding a redundant power supply). Redundant power supplies are not load-sharing.

-48VDC Talk Battery

In addition to the power supplies, a -48 VDC talk battery is required whenever there are analog voice cards present in the system unless all of those are E&M ports and are used in Transmission Only (**TO**) mode, or when Type 1 signaling is used.

A -48VDC power source is also required for use with:

- External Alarm card
- OCU-DP card
- BRI card (to provide sealing current)

If the unit is powered by the AC (8901) supply, either the 8903 Internal 115VAC to -48VDC or 8905 120/240VAC to -48VDC Converter or an external source will be required for the -48VDC talk battery. The 8903 AC to DC converter is available only for 115VAC sources. Use 8905 for 220 VAC locations.

Ringing Generators

Ringing generators are required whenever there are FXS cards in the unit or if any FXO ports are used in Manual Ringdown (**MRD**) mode. Ringing voltage may be provided from an external source or by using the 8906 Ringing Generator. The 8906 requires a -48VDC source in the system.

Customers having the older 8904 Ringing Generator may still use it.

Warning: The 8904 must never be used in the same system with an 8906 ringing generator.

Warning: The 8904 and 8906 ringing generators are incompatible with external ringing devices.

The 8904 provides ringing voltage of 105VAC (nominal) at 20 Hz for 11 simultaneously ringing voice ports, while the 8906 provides ringing voltage of 100VAC for the same number of ports. With normal call activity, a single ringing generator might provide all of the power necessary to run the system. In a group where incoming calls are at a minimum, 30-50 stations could share the same ringing generator. Small groups with heavy incoming call volumes might require two or more ringing generators. This card will not "quit" with a heavy load, it will just have weaker and slower ringing abilities. That condition should alert you to the need for additional equipment.

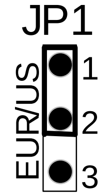
The compatibility of power sources and ringing generators that can be used together are summarized in Table Install-5.

Table Install-5. Power Supply Options Compatibility Table

Power Sources	AC (8901)	-48VDC (8902)	Converter (8903)	Converter (8905)	Ringer (8906)	+24VDC (8907)	-48VDC External	Ringer External	Ringer (8904)
AC (8901)	---	yes	yes	yes	yes	yes	yes	yes	yes
-48VDC (8902)	yes	---	no	no	yes	no	yes	yes	yes
Converter (8903)	yes	no	---	yes	yes	no	no	yes	yes
Converter (8905)	yes	no	yes	---	yes	no	no	yes	**yes**
Ringer (8906)	yes	yes	yes	yes	---	no	yes	**NO**	**NO**
+24VDC (8907)	yes	no	no	no	no	---	no	yes	yes
-48VDC External	yes	yes	no	no	yes	no	---	yes	yes
Ringer External	yes	yes	yes	yes	**NO**	yes	yes	---	**NO**
Ringer (8904)	yes	yes	yes	yes	**NO**	yes	yes	**NO**	–

US/Europe Jumper

Prior to inserting any cards and powering up the chassis, jumper **JP1** on the 891620, 891822/23, and 891920 chassis must be set to US or European configuration. The jumper is located on the resource card backplane, and is accessible from the chassis front. The default setting is **US**. The resource cards must also have the jumper set consistent with the chassis. See the Slot Map chapter for more detailed information on this feature.



Chassis Grounding

! ! ! PLEASE READ—IMPORTANT ! ! !

When using any CPU revision B or C in a six-digit chassis as depicted in figures Install-6 through Install-9, or in a four-digit chassis as depicted in figure Install-10 with a voice ringer card installed, the chassis must be properly grounded to ensure reliable operation.

In order to identify which CPU you have, you must either visually look at the white sticker that has been placed on the back of the mainboard. It indicates the type and revision of CPU that is being installed. **If you do not have revision B or C CPU's as stated above, then please disregard this notice.**

To ensure proper operation in a chassis with an external power connector like those shown below, it is crucial that each chassis is properly grounded. This section details grounding procedures for each type of chassis. This information presumes that the operator and/or installer has some knowledge of grounding issues. Please refer to Field Alert Bulletin 108-000004 for a top level grounding tutorial.

The chassis ground is usually connected to the earth ground directly (using the chassis ground screw) or via the power cord.

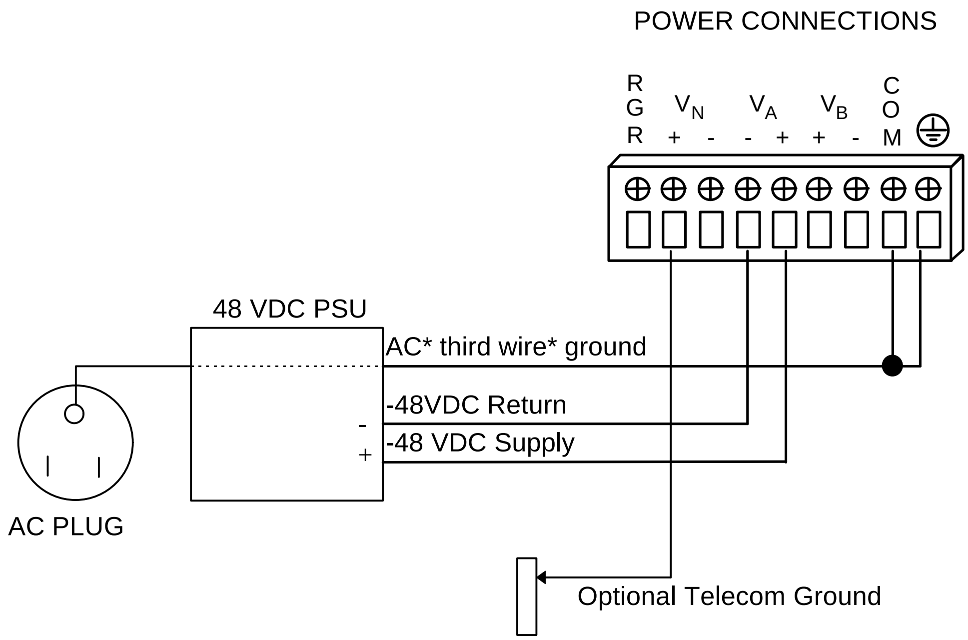
In order to minimize electrical potential between grounds, chassis ground (⏚) and common signal ground (COM) in the terminal power connector should be connected with a jumper wire or bridge.

Improper grounding may cause a difference in electrical potential between the chassis and the terminal equipment, which could damage the cards, the terminal equipment, or both.

IF YOU ARE UNCLEAR ABOUT STANDARD GROUNDING PROCEDURES, PLEASE CONSULT WITH YOUR NETWORK ADMINISTRATOR.

Front-Loading Chassis: Power Supplies on Side

Figure Install-6 details the possible ground connections for the external power connector of the front-loading chassis with power supplies on the side.

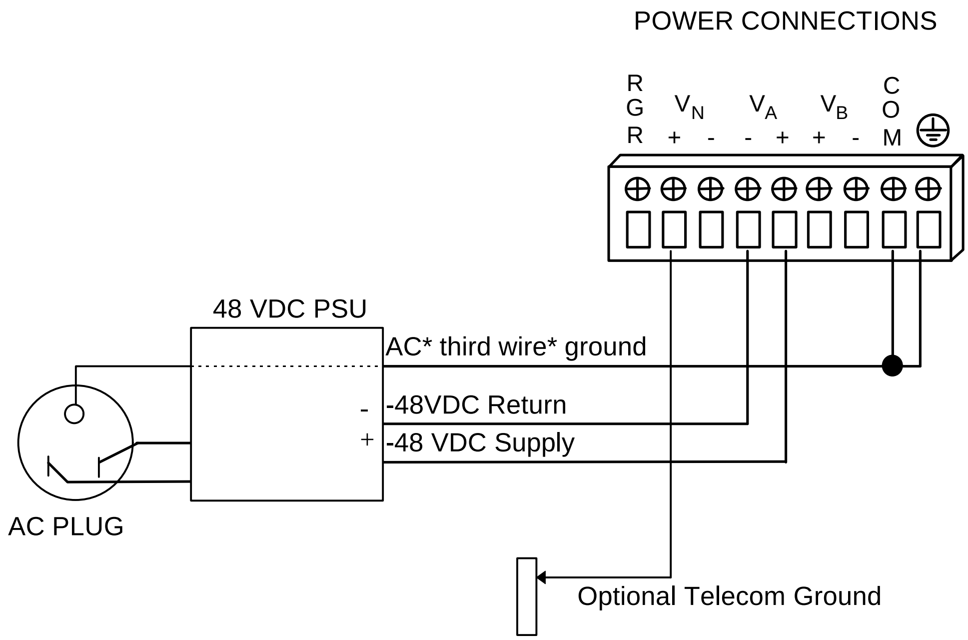


(Note: Optional Telecom Ground Connection:
It may be required when the 48VDC PSU output is not grounded or when the system is AC powered. It is only needed for the proper operation of the Telecom Ground Start and E&M signaling circuits. For Additional information please refer to Field Alert Bulletin 108-000001).

Figure Install-6. Ground Connections (Front-Loading Chassis: Power Supplies on Side)

Two-Sided Chassis

Figure Install-7 details the possible ground connections for the external power connector of the two-sided chassis.

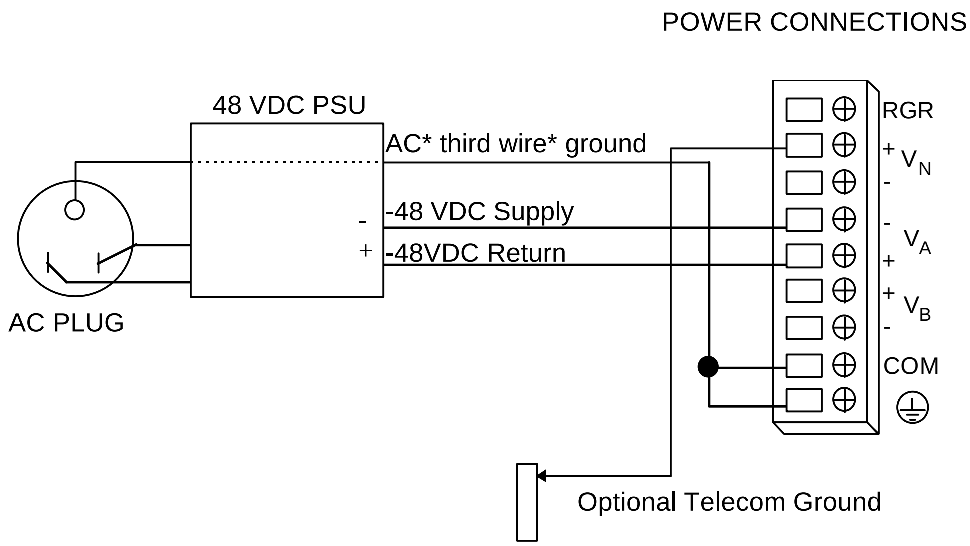


(Note: on Optional Telecom Ground Connection: It may be required when the 48VDC PSU output is not grounded or when the system is AC powered. It is only needed for the proper operation of the Telecom Ground Start and E&M signaling circuits. For Additional information please refer to Field Alert Bulletin 108-000001).

Figure Install-7. Ground Connections (Two-Sided Chassis)

Front-Loading Chassis: Power Supplies on Top

Figure Install-8 details the possible ground connections for the external power connector of the front-loading chassis with power supplies on the top.



(Note: on Optional Telecom Ground Connection:
It may be required when the 48VDC PSU output is not grounded or when the system is AC powered. It is only needed for the proper operation of the Telecom Ground Start and E&M signaling circuits. For Additional information please refer to Field Alert Bulletin 108-000001).

Figure Install-8. Ground Connections (Front-Loading Chassis: Power Supplies on Top)

Grounding Four-Digit Chassis

The front-loading chassis (revision C1 or greater) has a terminal block connector near the AC power connection and main power fuse, as shown in Figure Install-9.

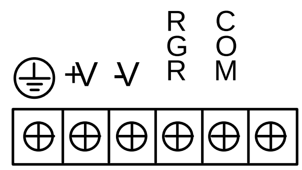
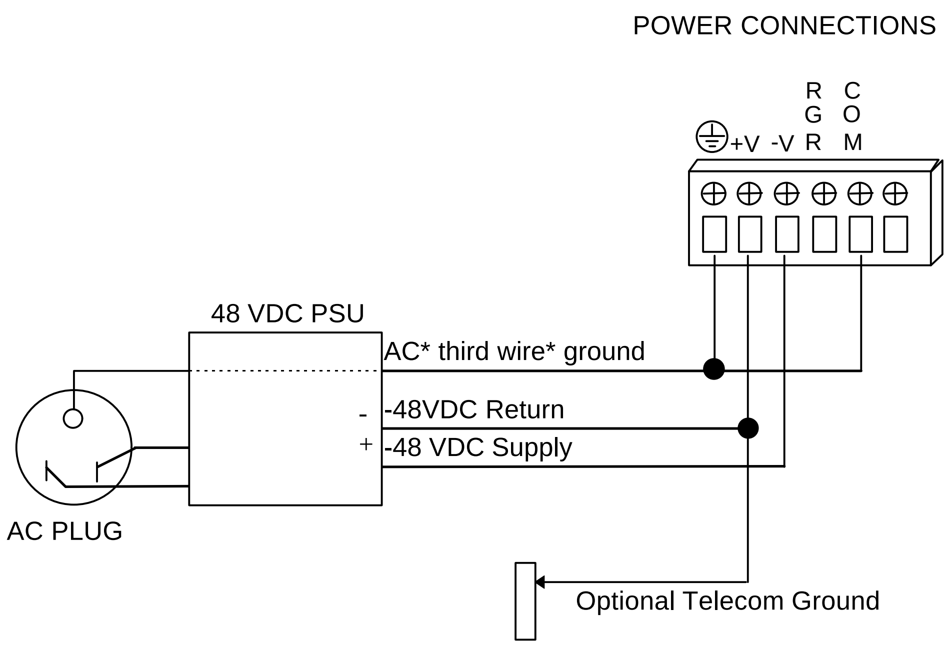


Figure Install-9. Chassis External Power Connector (rev. C1+)

As with the six-digit chassis, this chassis must be properly grounded for reliable operations and safety. This is accomplished by strapping the common ground connector (COM) to the earth ground connector ( ), as shown in Figure Install-10 below.



(Note: on Optional Telecom Ground Connection: It may be required when the 48VDC PSU output is not grounded or when the system is AC powered. It is only needed for the proper operation of the Telecom Ground Start and E&M signaling circuits. For Additional information please refer to Field Alert Bulletin 108-000001).

Figure Install-10. Chassis Ground Connections (Front-Loading Chassis: Power Supplies on Side).

Installing the AC Power Supply (8901)

To install the AC Power Supply proceed with the following steps. Table Install-6 lists the power supply specifications.

1. Remove the panel covering the front power slots. You may insert or remove the power supply module while power is on or off.
2. Hold the power supply by its metal handle and align the printed circuit board (PCB) edges with the rail guides of either power supply slot (F1 or F2 for two-sided systems, S1 or S2 for front loading systems). Push the module in until it is firmly seated in the backplane connector and replace the panel that covers the front power supply slots.

Table Install-6. AC Power Supply Specifications

Parameter	Rating
Output Power Continuous	50W
Output Power Peak (60 sec)	70W (10% duty cycle)
Input Current (maximum)	1.7A at 120VAC 60Hz full rated output load
Source Input Current (maximum)	3A
Inrush Surge Current	max 3.7A peak at 240VAC cold start
Input Frequency	47-63Hz
Efficiency	min 65%
Approvals	UL, FCC, CSA

Installing the DC Power Supply (8902 or 8907)

Table Install-7 lists specifications for the 8902 (-48VDC) and 8907 (+24VDC) power supplies.

Table Install-7. DC Power Supply Specifications

Parameter	8902 Rating	8907 Rating
Output Power	50W continuous	50W continuous
Input Power	-35 to -60VDC	+18 to +32VDC
Source Input Current (Max)	3A	5A
Approvals	UL, FCC, CSA	UL, FCC, CSA

Perform the following steps to install:

1. Remove the panel covering the front power slots. You may insert or remove the power supply module while power is on or off.
2. Hold the power supply by its metal handle and align the PCB edges with the rail guides of either power supply slot (F1 or F2 for two-sided systems, S1 or S2 for front loading systems). Push the module in until it is firmly seated in the backplane connector, and replace the panel that covers the front power supply slots.

External Power Connector

8916 Chassis Power Connector

A terminal block connector is attached to the 8916 chassis near the AC power connection and main power fuse. Figure Install-11 shows the connector.

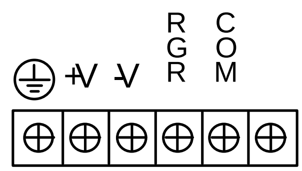


Figure Install-11. 8916 External Power Connector (rev. C1+)

Six Phillips-head screws are attached to the terminal block on the chassis. The two end screws anchor the connector to the chassis, and the one on the left acts as the chassis ground. The other screws are used to connect power wires from other sources. The "+V" screw is used for power return. The "RGR" screw is used for an external ringer.

Wiring should be done according to a wiring plan that takes into account the size of the wire, type of insulation, length of the wire and environmental conditions of the installation site. All wires should be secured according to local requirements. A 14 gauge ground wire less than 20 feet in length is recommended. The Common and Ground terminals may need to be strapped together.

All connections should be made using insulated ring terminals like the one shown in Figure Install-12.

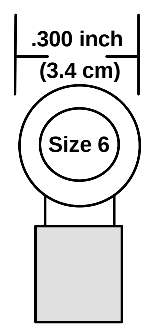


Figure Install-12. Ring Terminal (insulated) Specifications

891620 Chassis Power Connector

The power connector blocks are the same for all chassis with six-digit product numbers. Diagrams of these chassis that display the placement of the power connector block can be found in the Slot Map chapter.

Grounds and power feeds are connected to the power connector block by inserting and fastening the wires in the proper slot. The screw adjacent to each slot can be loosened or tightened to secure the connection. For safety reasons, no more than one-eighth of an inch (0.125") of the connecting wire should be exposed. **No uninsulated wire should be visible from the power connector block.**

Figure Install-13 shows the power connector block for the 891620. This block provides for dual power connections at $\mathbf{V_A}$ and $\mathbf{V_B}$ where redundant power feeds are required. Connection $\mathbf{V_A}$ feeds power supply slot F1. Connection $\mathbf{V_B}$ feeds power supply slot F2.

In addition, $\mathbf{V_N}$ can be connected to a -48v source for powering voice cards and circuits. The **COM** (common) is used for signal reference. **RGR** (ringer) connection is used when an external ringer is connected to the chassis. Ringer bias is selected by the connection to V_N+ or V_N-.

Note: If -48vdc is applied to V_A or V_B DO NOT connect external power to V_N

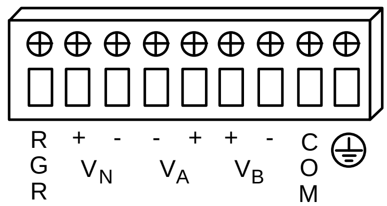


Figure Install-13. 891620 Terminal Power Connector

891822/891823 Chassis Power Connector

Figure Install-14 shows the power connector block for the 891822 and 891823. This block provides for dual power connections at $\mathbf{V_A}$ and $\mathbf{V_B}$ where redundant power feeds are required. Connection $\mathbf{V_A}$ feeds power supply slot F1. Connection $\mathbf{V_B}$ feeds slot F2.

In addition, $\mathbf{V_N}$ can be connected to a -48v source for powering voice cards and circuits. The **COM** (common) is used for signal reference. **RGR** (ringer) connection is used when an external ringer is connected to the chassis. Ringer bias is selected by the connection to V_N+ or V_N-.

Note: If -48vdc is applied to V_A or V_B DO NOT connect external power to V_N

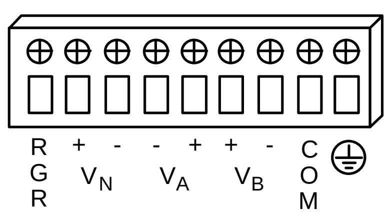


Figure Install-14. 891822/891823 Terminal Power Connector

891920 Chassis Power Connector

Figure Install-15 shows the power connector block for the 891920. This block provides for dual power connections at $\mathbf{V_A}$ and $\mathbf{V_B}$ where redundant power feeds are required. Connection $\mathbf{V_A}$ feeds power supply slot F1. Connection $\mathbf{V_B}$ feeds power supply slot F2.

In addition, $\mathbf{V_N}$ can be connected to a -48v source for powering voice cards and circuits. The **COM** (common) is used for signal reference. **RGR** (ringer) connection is used when an external ringer is connected to the chassis. Ringer bias is selected by the connection to V_N+ or V_N-.

Note: If -48vdc is applied to V_A or V_B DO NOT connect external power to V_N

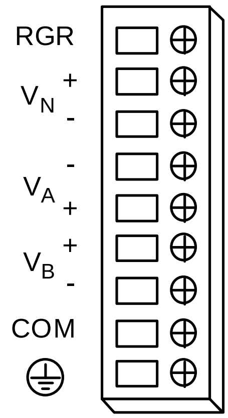


Figure Install-15. 891920 Terminal Power Connector

Installing the 115VAC to -48VDC Converter (8903, 8905 and 8908)

Do not install the 8903 if the unit is connected to an external -48VDC power source.

1. For the two-sided chassis, remove the panel covering the rear power slots. Install the module in any of the five rear slots while power is on or off. For the front-loading chassis, remove the panel covering the front power slots. Install the module in slot S1 or S2 while power is on or off.
2. Hold the converter by the metal handle and align the PCB edges with the slot rail guides in the power supply cage. Gently push the module in until it is firmly seated in the backplane connector.
3. When the power supply is installed and the power is on, the green LED on the front panel of the converter should be on. If the LED goes off, something is wrong. Check that the supply is properly seated in the connector and replace the panel that covers the power slots.

Table Install-8. AC to DC Converter Specifications

Parameter	Rating
Output Power	75 Watt Max
Output Voltage	-48VDC
Output Current	1.5A DC
Hold Up Time	20 mSec minimum at full load and 117VAC input
Input Voltage	90-135VAC
Frequency	110VAC=60Hz
Efficiency	0.83
Heat Dissipation	55 BTU per hour
Approvals	UL, FCC, CSA

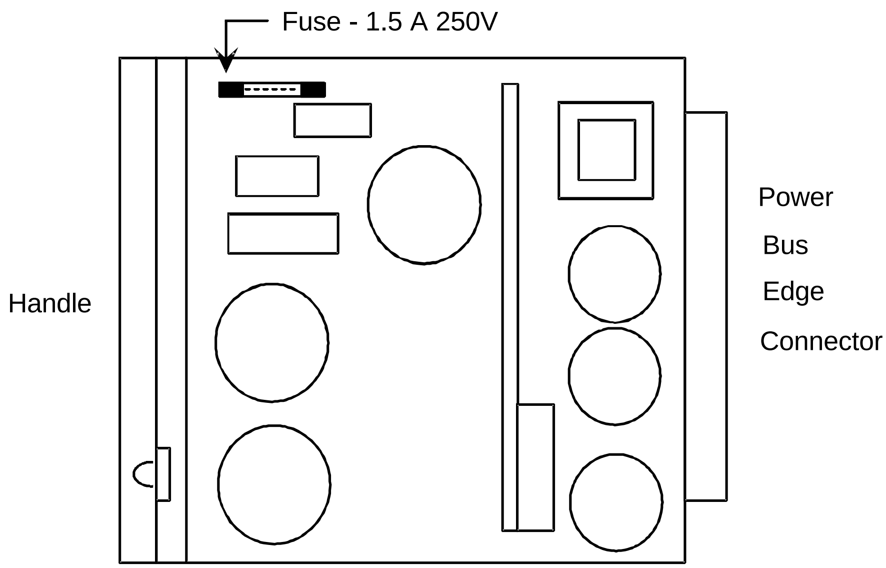


Figure Install-16. AC-to-DC Converter Layout

Installing the Ringing Generator (8904 or 8906)

The 8904 provides ringing voltage of 105VAC (nominal) at 20 Hz for 11 simultaneously ringing voice ports, while the 8906 provides ringing voltage of 100VAC (nominal) for the same number of ports.

If more than one ringing generator is required in the same chassis, they must have the same part number. **The 8904 and 8906 Ringing Generators cannot be mixed in a single chassis.** *Note: Ringing Generator 8904 is a discontinued product. If you are in need of Technical Assistance, please contact Product Support at (510) 353-7686.*

Ensure that the system has a -48VDC power source before installing either of the modules. You may install up to four (4) ringing generators on the two-sided chassis depending upon availability of slots. The front-loading system with the power supplies on the side can have only one ringing generator.

The outputs of all ringing generators are linked together by OR circuits on the ringing bus. In cases where more than one generator is installed, one must be jumpered as MASTER and the others must be jumpered as SLAVE. The master ringing generator will synchronize the ringing signals on the ringing bus. (For more information on configuring the MASTER/SLAVE jumpers, please see the diagrams of the 8904 and 8906 later in this chapter.)

Table Install-9 lists the specifications for the 8904 and the 8906.

Table Install-9. Ringing Generator Specifications

Parameter	8904 Rating	8906 Rating
Input Power	44-56VDC	45-56VDC
Input Current	70mA no load, 350mA full load	250mA RMS
Efficiency	0.6	0.6
Heat Dissipation	25 BTU per hour	12 BTU per hour
Output Power	10W	30W@56V 25W @48V 22.5W@45V
Output Voltage	105VAC	100VAC
Output Current	100mA	250mA
Output Frequency	20Hz	20Hz
Distortion	<3%	<3%
Approvals	UL, CSA	UL (pending)

To install the 8904 Ringing Generator:

1. **Be sure that power is off before inserting or removing the 8904 ringing generator.**
2. For the two-sided chassis, remove the panel covering the rear power slots. You may install the module in any of the five rear slots. For the front-loading chassis, remove the panel covering the front power slots. Install the module in slot R1 only.
3. Make sure that jumper W201 is installed if this is **the only 8904** ringing generator in the unit, or if it is the **MASTER** ringing generator (see Figure Install-17).
4. Remove jumper W201 if this is a SLAVE ringing generator. Remove the jumper by cutting it with wire cutters.
5. Hold the ringing generator by the metal handle and align the PCB edges with the slot rail guides in the power supply backplane. Gently push the module in until it is firmly seated in the backplane connector.
6. When the supply is installed and power is on, the LED on the rear panel of the ringing generator should flicker at a rate of 20 times per second. If this LED is not flickering, something is wrong. Check that the Master/Slave settings are correct and that the module is firmly seated in the connector.

5. Replace the panel that covers the rear power slots.

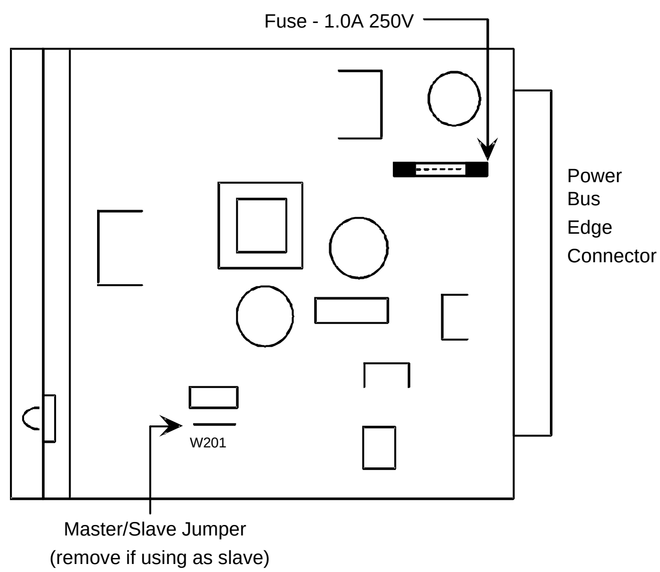


Figure Install-17. 8904 Ringing Generator Layout

To Install the 8906 Ringing Generator:

1. You must make sure that power is off before inserting or removing the ringing generator.
2. For the two-sided chassis, remove the panel covering the rear power slots. You may insert or remove the module in any of the five rear slots. For the front-loading chassis with power supplies on the top, remove the panel covering the front power slots, and insert or remove the module in any of the five slots. For the front-loading chassis with power supplies on the side, you may insert or remove the module in slot R1 only.
3. The JP1 jumper is factory-preset to the **MASTER** configuration (see Figure Install-18). You do not need to change this jumper if this is the MASTER ringing generator, or the only ringing generator in the system.

   If this is a SLAVE ringing generator, move the jumper on JP1 from the lower pins (MASTER) to the upper pins (SLAVE).
4. Hold the ringing generator by the metal handle and align the PCB edges with the slot rail guides in the power supply backplane. Gently push the module in until it is firmly seated in the backplane connector.
5. When the supply is installed and power is on, the LED on the rear panel of the ringing generator should flicker at a rate of 20 times per second. A problem is indicated if this LED is not flickering,. Check that the Master/Slave settings are correct and that the module is firmly seated in the connector.
6. Replace the panel cover.

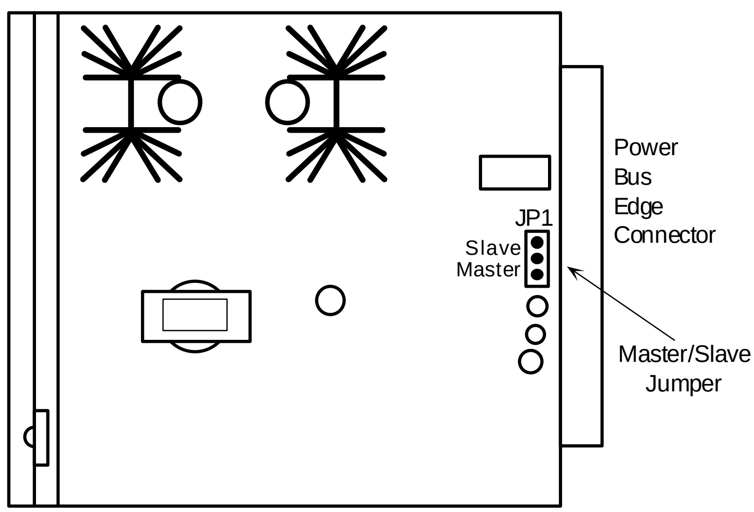


Figure Install-18. 8906 Ringing Generator Layout

Connecting AC Power

Attach the AC power source to the system at the AC power socket. This socket accommodates the standard 3-prong molded power cord supplied with the system. Secure the power cord to the rack or cabinet for strain relief and route it down to the bottom of the chassis.

Using Amphenol Connectors

Many of the cables used to connect cards in the Integrated Access Controller to wiring devices use Amphenol connectors at either one or both ends of the cable. The traditional Amphenol connector placed the connector at a right angle to the cable itself, (see Figure Install-19) thus preventing the screw at the bottom of the connector from being properly attached without removing the hood. This type of cable connector is not recommended for use with this system.

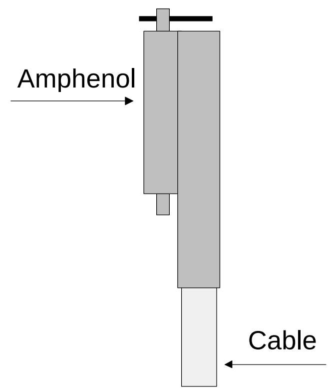


Figure Install-19. Undesirable Amphenol Connectors

Newly designed cables mount the Amphenol connector at a 25° angle to the cable and use screws that can be twisted by fingertips to attach the connector from both the top and the bottom. Other types of cables mount the connector at a 90° angle (see Figure Install-20). It is suggested that cables of this design be used with the cards in your system.

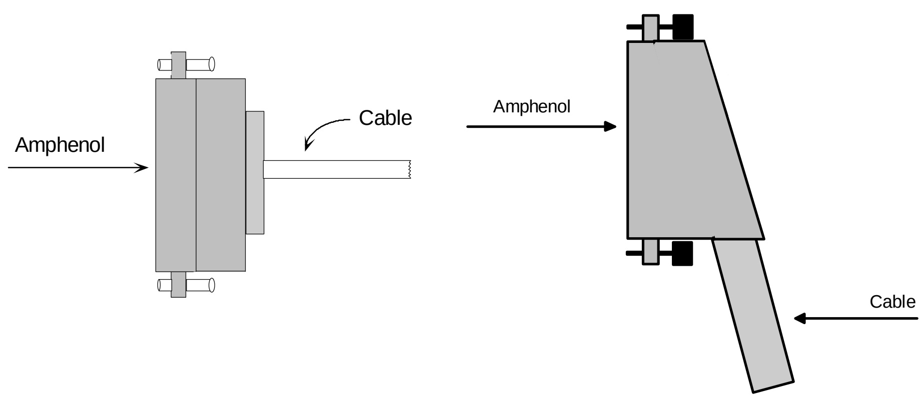


Figure Install-20. Preferred Amphenol Connectors

Terminal Interface

The system is controlled through a serial interface to a VT-100 terminal or a PC running a terminal emulation program. Connect the terminal or selected PC COM port to the Interface card **TERM** jack. Set the terminal's communications parameters as follows:

9.6 kbps; 8 data bits; no parity; 1 stop bit.

Logging On

When both the system and your terminal are on, the log-on screen shown in Figure Basic-1 will normally appear. If the screen stays blank after 30 seconds, press the <Enter> key to display the screen. If the screen remains blank, check your terminal settings and connections. (For remote log-on procedures, see the Interface Card chapter.)

When the system is started for the first time after initial installation, you will see the Registration screen. See the Registration section later in this chapter for instructions.

If new system firmware or a different type of CPU has been installed, you will be asked to "Zip" the system. For instructions check "Reinitializing the System" later in this chapter.

```
                              IMACS
          Integrated Multiple Access Communications Server
         Copyright (C) Premisys Communications Inc 1991-1996

                          Password:

                              Node:   Node_1



Version:  3.6x
```

Figure Basic-1. The Log-On Screen

The initial Log-On passwords correspond to one of four access level names. For example, the manager access level has the preset password Manager. Passwords are case-sensitive. See Table Basic-1 for a listing of all passwords and access levels. For procedures used to change passwords, see the CPU Card chapter later in this guide.

Table Basic-1. Access Levels

Access Level	Initial Password	Description
Superuser	*********	Special access for maintenance and diagnostics, to be used as directed by a certified technician.
Manager	Manager	Full access to all configuration options, diagnostic features and password management.
Operator	Operator	Read/write access to configuration and diagnostic features.
Viewer	Viewer	Read-only access to configuration and diagnostic features.

If you are configuring the system for the first time, log in as “Manager.” If you are maintaining the system after its initial configuration, the password has probably changed from "Manager;" consult your network administrator for the current password. Type the password and press the <Enter> key to display the main screen for your system.

Registration

When the system is started for the first time, the registration screen will appear. Answer the questions shown at the bottom of the screen, and the system will automatically respond with the correct application parameters and prompts.

The registration procedure consists of the three steps shown below.

1. Enter the vendor code. If no other vendor code is specified, enter the vendor code **101**.
2. Select the type of chassis used (either front-loading with power supplies on the side, front-loading with power supplies on top, or the two-sided chassis).
3. Confirm the proposed changes by selecting (**Y** for yes or **N** for no). Figure Basic-2 shows the completed Registration screen.

```
Node_1          |          Welcome  to  Registration          |     12-31-99    14:33


                          Vendor  Code:    101

               1.    Front - Loading Only  /  Power Supplies on side

               2.    Front - Loading Only  /  Power Supplies on top

               3.    Front & Rear Loading Only  /  Power Supplies on side

                                  Select one:   3



Is  the  Information  on  this  screen  correct  (Y/N)?
```

Figure Basic-2. Screen Layout

Main Screens

After login you will see one of the two following screens: Figure Basic-3 shows the main screen for a front-and-rear loading Integrated Access Controller; Figure Basic-4 shows the main screen for a front-loading only system. Depending on the number of cards installed in your system, your screen may show more or fewer cards than seen in these figures. For consistency and simplicity hereafter, this manual shows only screens for the front-and-rear loading Integrated Access Controller.

```
Node_1                  |                                              |      12-31-99
14:33

Slot       Installed      Status      Slot       Installed      Status

C1         CPU  XCON                  IF         INTF+modem
C2         CPU  XCON      RDNT        U1         ALR
P1         ADPCM-64                   U2         E&M  4Wx8-6
P2         ADPCM-64                   U3         FXS  2Wx8-9
P3         ADPCM-64                   U4         FXO  2Wx8-9
W1         CSU+CSU                    U5         HSU  366x2
W2         CSU+CSU                    U6         OCU-DPx5
W3         CEPT+CEPT                  U7         FRAD-18
W4         CEPT+CEPT                  U8         SRU-232x10
F1         PS1                        RI         RINGER
F2         PS2

Alarms | Config| Del | accepT | Xcon | sYs | Logout | sEr | Oos | cpusWtch
```

Figure Basic-3. Main Screen for Front-and-Rear Loading System

```
Node_1                 |                                    |      12-31-99    14:33

           Slot         Installed       Status

           C1           CPU  XCON
           C2           CPU  XCON       RDNT
           P1/U1        HSU-366x2
           P2/U2        ADPCM-64
           P3/U3        ALR
           P4/U4        SRU-232x10
           W1/U5        CSU+CSU
           W2/U6        B7R-8
           W3/U7        OCU-DPx2
           W4/U8        BRI  U-IFx8
           IF           INTF+modem
           S1
           S2
           S3
           RI           RINGER

Alarms | Config| Del | accepT | Xcon | sYs | Logout | sEr | Oos | cpusWtch
```

Figure Basic-4. Main Screen for Front-Loading Only System

Introduction to Screens

After you have determined configuration requirements, you can log on and set the cards to implement a custom network design. For each card, the system presents a screen that shows the options and allows you to set them.

All screens have the same general layout, as shown in Figure Basic-5.

```
Node_1        | IF  INTF+modem  8923  Rev A2-0  Ser 01103 | 12-31-99  14:33

                    1                                         OOS     U3
PRIMARY CLK       int
EXT RATE          n/a
EXT FORMAT        n/a
EXT FRAME         n/a

SECONDARY CLK     int
EXT RATE          n/a
EXT FORMAT        n/a
EXT FRAME         n/a

CURRENT CLK       int







int      ext

Save | Undo | Refresh | Time | ACO | proFiles | taBs | Ports | Main
```

Figure Basic-5. Screen Layout

- The dark line at the top of the card is the Header Information Line. This line lists the node identity (“Node_1” in the figure above), card identity, time, and date.
- The small dark area in the upper right, immediately below the header, displays alarm summary information. In this example, the alarm reveals an Out of Service (OOS) card in slot U-3. If no alarms are active, nothing will be displayed in this location.
- The area just below the node ID is the Parameter Settings section of the screen. This section displays current or default settings from the range of user options available on each card.
- The Status and Data Entry Change Line is located near the bottom of the card on the left-hand side. This line allows the user to select the options for each parameter.
- The dark line at the bottom of the screen displays the Menu of Actions. Each action contains one capitalized letter. Press the capitalized letter of an action on the keyboard to perform the described action.

It is **very important** that you record the configuration information for each card as you determine its settings. You, or someone servicing the system at a later date, will need this information to aid in troubleshooting. A simple way to record your configuration is to photocopy the setting tables in the card sections of this guide and write the information for your configuration in the column labeled Initial Setting. Store these pages in a safe place, where they can be available to anyone servicing the system.

Status Screen

A quick way to check activity of the ports of all system cards is to use the Status screen. Figure Basic-6 shows the Status screen. The **lowercase letters** that follow card entries show the status of each port on the cards. The possible values are "**s**" (Standby), "**a**" (Active), "**t**" (Test), "**l**" (Loopback) and "**r**" (Redundant).

```
Node_1          |                                         | 12-31-99
14:33


Slot      Installed    Status       Slot       Installed    Status
C1        CPU XCON                  IF         INTF+modem
C2        CPU XCON     RDNT         U1         ALR          ssss
P1        ISDN-PRI     ssssssss     U2         E&M 4Wx8-6   ssssssss
P2        ADPCM-64     ssssssss     U3         FXS 2Wx8-9   ssssssss
P3        INV MUX      ssss         U4         FXO 2Wx8-9   ssssssss
W1        CSU+CSU      ss           U5         HSU 366x2    ss
W2        CSU+CSU      rr           U6         OCU-DPx5     sssss
W3        CEPT+CEPT    ss           U7         FRAD-18      ssssssss
W4        CEPT+CEPT    rr           U8         SRU-232x10   ssssssssss
F1        PS1                       RI         RINGER
F2        PS2

Alarms | Config | Del | accepT | Xcon | sYs | Logout | Oos| cpusWtch
```

Figure Basic-6. The Status Screen

Pressing the **"s"** key again will return the screen without status settings. If the system is restarted by log-off/log-on activity or loss of power, the screen will also return to its normal condition.

Configuring the Cards

The main screen lists all the installed cards next to their slot numbers. To access the screen for each card, move the cursor using the arrow keys to highlight the card and press the <Enter> key.

Use the arrow keys and the <Enter> key to move around on the screens. When changing card parameters, some settings require you to enter values, while others allow you to select from a list of possible options. When a list of possible options is available, use the right and left arrow keys to move through the options. Use the <Enter> key to select the setting under the cursor. Use the right and left arrow keys to select the option you want or type over the old value using the keyboard. Press the <Enter> key to select the option or enter the value. After all choices are made, save your changes by pressing “s.”

To access the menu of actions at the bottom of the screen, make sure no option is selected and then press the capitalized letter that represents the action you want.

Menu of Actions

Table Basic-2 show the Menu of Actions for the Main Screen.

Table Basic-2. Main Screen Menu of Actions

Action	Function
Alarms	Brings up the Alarm screen. Refer to "Alarms" later in this chapter.
Config	Sets up the system using a standard configuration. Refer to "Using the Configuration Option" later in the System Operations Chapter.
Del	Removes an OOS card from system memory.
accep**T**	Removes card settings. Used when replacing a card in one slot with a different kind of card (see below).
Xcon	Brings up the cross-connect screens. See System Operations chapter.
s**Y**s	Brings up the system screen. Provides for high-level system testing and maintenance.
Logout	Logs the user off the system.
s**E**r	(serialization) Identify the card in a given slot
Oos	Set the card out of service
cpus**W**tch	Switches from the active CPU to the redundant CPU card. See Redundancy chapter.

Configure each card to match the system settings previously determined. On the main screen, select each card in turn and change the options for that card as appropriate. Select the Save action after making all the changes for a card; then return to the main screen to configure the next card. Once configured, card settings (by slot) are permanently stored in the NVRAM on the Interface Card. Similar cards may be replaced without having to reconfigure the new card. If you replace the card with a different type of card, the system will ask if you want to lose the current card settings. Press “t” (accepT) to allow this transaction.

Alarms

Alarms warn you of problems and alert you to possible hardware or facility failures. The Alarm sub-screens are accessed from the main screen by pressing the "A" key. The Alarm screen displays the currently active alarms, if any, and provides access to the Alarm Filters screen and the Alarm History screen. Figure Basic-7 shows the Alarm screen with one active alarm.

```
Node_1          |                                       | 12-31-99  14:33

Active Alarms:  1   Page 1 of 1


00023  W1-1   CSU+CSU    C  CGA_RED      12-31-99      12:41:21




Refresh | pgUp | pgDn | History | Filters | Main
```

Figure Basic-7. The Alarm Screen

The first entry shows the Alarm Number (a sequential number from one to 65,535) used to identify the alarm for tracking and maintenance (in this case, #00023). The second entry shows the location of the problem by card slot number (in this case, w1-1). The third column shows the type of card affected (in this case, a WAN card with two CSU modules). The fourth entry shows the alarm modifier (in this case, C [critical]). See a later section in this chapter for more information about alarm modifiers. The fifth entry shows the type of alarm generated (in this case, CGA_RED). The sixth entry shows the date of the alarm and the last entry shows the time the alarm was logged (in this case, 12-31-99 at 12:41:21).

Filters

You can set filters for each alarm so that the alarm reports occurrences in a number of different ways. Figure Basic-8 shows the Alarm Filters screen accessed by pressing "F" on the main Alarm screen.

```
Node_1          |                                         | 12-31-99  14:33

OOS        Out of Service              report    crit     aco-on
NOS        No Signal                   report    major    aco-off
LOS        Loss of Sync                report    minor    aco-off
YEL        Yellow Alarm                report    info     aco-off
AIS        Alarm Info Signal           report    crit     aco-off
CGA_RED    Carrier Group–Red           report    crit     aco-off
CGA_YEL    Carrier Group–Yellow        report    crit     aco-off
EER        Excessive Error Rate        report    crit     aco-off
SENSOR     Alarm card sensor           report    crit     aco-off
DCHAN      D-chan out of service       report    crit     aco-off
SWITCH     Switch to redundant card    report    crit     aco-off
UCA        User card/port alarm        report    crit     aco-off
RESET      System reset                report    crit     aco-off
ACO        Alarm Cut-Off               report    crit     n/a
SYNC       Clock Sync Alarm            report    crit     aco-off
EER-3      Error rate above 10e-3      report    crit     aco-off
PLC_OOF    DS3 PCLP Out of Framing     report    crit     aco-off
PLC_LOF    DS3 PCLP Losst of Frame     report    crit     aco-off
PLC_YEL    DS3 PCLP Yellow Alarm       report    crit     aco-off



Save | Undo | Refresh | Main
```

Figure Basic-8. The Alarm Filters Screen

The first column shows the alarm abbreviation that is shown on the screen when an alarm is generated. The second column shows the alarm title. The third column contains the filters **ignore, report** and **log**. The fourth column contains the filter modifiers **info**, **minor**, **major** and **critical**. The last column sets the ACO alarm **aco-off** and **aco-on**. All of these options are explained later in this chapter.

The filter in the third column will take precedence over its modifier. If, for instance, you have an alarm filter set to **ignore**, the setting of the modifier as **info**, **minor**, **major** or **critical** will be ignored as well. Table Basic-3 identifies the alarms and their meanings.

Alarm filters should be set prior to activation of card ports!

Table Basic-3. Alarm Filters

Filter	Alarm	Meaning
OOS	Out of Service	The card, power supply or ringing generator is faulty or has been removed from the unit.
NOS	No Signal	Incoming WAN signal is lost.
LOS	Loss of Synchronization	Frame Alignment is lost.
YEL	Yellow Alarm	The system has received a Yellow Alarm signal from a remote device. Usually received when the device loses WAN signal or synchronization.
AIS	Alarm Information Signal	The system has received a Blue Alarm signal from a remote device. Usually received when the remote or intermediate device has a major failure.
CGA_RED	Carrier Group Alarm - Red	The local incoming WAN signal has a serious problem and trunk conditioning is started. After receiving a RED alarm (NOS or LOS) for 2-3 seconds, the system initiates the appropriate trunk conditioning sequence (see voice cards for information about the TC_CGA setting) and sends a Yellow Alarm to the remote device. If the system is in drop/insert mode, it also sends an AIS signal to the downstream equipment.
CGA_YEL	Carrier Group Alarm - Yellow	The system has initiated trunk conditioning in response to a Yellow Alarm from a remote device. After 2-3 seconds, the system initiates the appropriate trunk conditioning sequence (see voice cards for information about the TC_CGA setting)
EER	Excessive Error Rate	The error rate measured by the system has exceeded the threshold set on the WAN card.
SENSOR	Alarm Card Sensor	The Alarm Card sensor has received an alarm indication from an attached device.
DCHAN	D-chan out of service	If the network side D channel looses contact with the user side, an alarm message will be generated. The alarm message will show the slot # and D channel # where the problem exists.
SWITCH	Switch to redundant card	The primary card has failed and the system has switched to the redundant card. See the Redundant Operations Chapter.
UCA	User card/port alarm	One or more active ports on a user card are not working properly. Voice ports will show an alarm for excessive signaling transitions and data ports will show an alarm for exceeding the data error threshold.
RESET	System reset	The system has been reset by either loss of power or by system software upgrade.
ACO	Alarm Cut-Off	The ACO option forces you to manually clear certain alarms. Without this option, self-correcting alarms might not be noticed. When the ACO option is set to either Report or Log and the modifier is set to Major, alarms will report normally but will also generate an ACO alarm. If the modifier is set to Minor, it will not generate the ACO alarm. If the filter is set to Ignore, no alarms will be generated.
SYNC	Clock Sync Alarm	The SYNC alarm is generated when either the primary or secondary external clock source is lost. This alarm is in addition to the condition that lost the clock source (CGA-RED or OOS).
EER-3	Excessive Error Rate (10e-3)	While using transcoder operations for E1 that involve downstream tributaries, setting EER-3 to "report" will cause an alarm to appear on the local system when E1 transmission errors exceed 10e-3 (1 in 1000). The local EER-3 alarm will identify the effected WAN link (i.e., W1-1) and take it out of service. Simultaneously, the downstream tributary will receive an AIS alarm to warn them of the condition.
PLC_OOF	DS3 PLCP Out of Framing	Physical Layer Convergence protocol is Out of Framing
PLC_LOF	DS3 PLCP Loss of Frame	Physical Layer Convergence protocol has lost framing

PLC_YEL	DS3 PLCL Yellow Alarm	Physical Layer Convergence protocol is reporting a yellow alarm

Report

Setting the filter for the various alarms to **report** causes the alarm indication to be sent to a remote device (see the Interface Card chapter), displays the alarm report on the screen, and logs the alarm in the Alarm History.

Log

Setting the filter for the alarms to **log**, displays the alarm report on the screen and logs the alarm in the Alarm History (see later in this chapter).

Ignore

Setting the filter for the alarms to **ignore**, will cause the alarm indication to be ignored by the system.

Modifiers

Each alarm may also be designated as **info**, **minor**, **major** and **critical**. The filter modifier shows on both the active alarm and alarm history screens.

When used in conjunction with the External Alarm card, the occurrence of any alarm designated as **critical** will trigger a form-C contact on the External Alarm card which, in turn, can serve to activate an external device such as a bell or light. Similarly, the occurrence of any alarm designated as **major** would trigger a different contact and therefore activate a different external indicator. (See External Alarm Card chapter.)

ACO

ACO (Alarm Cut Off) is an additional security feature used by the system to alert the operator of alarms that clear themselves while the unit is unattended. If ACO is set to report or log, any alarm set to report or log with a **major** modifier will cause an additional alarm message to appear on the screen. This message, known as the ACO alarm message, must be manually cleared by the operator. Used with the node port of the Interface card (see Interface card chapter), ACO can also trigger some external alarm device such as a bell or light that must also be manually cleared by the operator. *ACO alarms must be cleared from the Interface card screen.*

Alarm Handling

The **report** alarm function attempts to send alarm information to a remote printer, Network Management System or other logging device, in addition to logging the alarm in the Alarm History log. These features use the built-in serial port and modem on the Interface card. You need to change settings on the Printout Alarms screen or IP screen on the Interface card to activate these special functions. (See Interface Card for more information.)

Alarms set to either **log** or **report** record occurrences automatically to the Alarm History log. You can access the Alarm History log from the Main Alarm screen by pressing the "H" key from the Main Alarm Screen.

Figure Basic-9 shows the Alarm History Screen. While the history screen is displayed, you can update the list with any new alarms that occur by selecting Refresh from the bottom menu of actions. You can delete all entries in the log by selecting Clear from the menu of actions on the history screen by pressing the “c” key.

All alarms (except those set to **ignore**) appear in the Alarms field (in the upper right corner of the screen), regardless of their setting on the filters screen. The display in the alarms field is the abbreviated version of the alarm name and slot number. For example, OOS U3 indicates that the card in user slot three is out of service.

```
Node_1          |                                        | 12-31-99  14:33

History Alarms:     4  Page 1 of 1


00012   W1-1   CSU+CSU    C CGA_RED    12-31  12:22:00   12-31  12:23:00
00011   W1-1   CSU+CSU    M NOS        12-30  08:02:09   12-30  09:30:00
00010   W1-1   CSU+CSU    I YEL        12-30  10:45:00   12-30  11:15:55
00009   C1     CPU XCON   m RESET      12-28  16:35:17   12-28  22:02:00















Refresh | Clear | pgUp | pgDn | Main
```

Figure Basic-9. The Alarm History Screen

Reinitializing the System

Information about cards inserted, card settings, WAN connections, passwords and other data is stored on the nonvolatile RAM (NVRAM) on the Interface Card. When most card types are removed and replaced, the NVRAM remembers the card settings and if the same kind of card is inserted in the slot, there will be no need to reprogram the settings. If, on the other hand, a card is replaced with a different type of card, then the system will offer the operator the option of deleting the old card, so that the new parameters can be established (see Accept function in "Configuring the Cards," earlier in this chapter).

CPU Card

One exception to the rule in the previous paragraph is changing the CPU card type between standard bus-connect, enhanced bus-connect or cross-connect. When a CPU card is removed and replaced by a **like** CPU card, the system will reevaluate the NVRAM and assign the old system parameters to the new CPU card (including passwords).

If the CPU card is replaced with one of the other types of CPU card, or in some cases with the same type of CPU card that is equipped with a different version of firmware, the new CPU card will want to "cold-start" the system (overwrite NVRAM information on the Interface card). The screen shown as Figure Basic-10 will be shown.

```
        ***  NVRAM on INTF Card is not available, Software revision has been changed  ***



                                 Press 'Z' to zip the System



Zip | zAp |  Debug  | Reg  | Main
```

Figure Basic-10. Cold Start NVRAM Screen

If the new CPU card was inserted in error, the process can be stopped by removing the wrong CPU card and replacing it with the correct type of card.

*Warning: Pressing the **Z** command from the Menu of Actions will start the ZIP process. "Zipping " the system deletes all of the information stored on NVRAM on the Interface Card and resets the system. **All cards must then be completely reconfigured.***

When the **Z** key is pressed, the system will display the main log-in screen and ask for password authorization from either Manager or Operator access levels. After the correct password, the system will ask the question, "OK to Zip the system (y/n)"? If **Y** is pressed, the system will test and reinitialize itself. All NVRAM information will be erased from the Interface card and a new log-in screen will appear.

Test and Debug Screen

Advanced configuration and diagnostics are available through the use of the **sYs** (System) command from the Menu of Actions of the Main Screen. Pressing **Y** brings up the Test and Debug screen shown in Figure Basic-11.

```
                              Test and Debug




Zip | Debug  | Reg  | Backup | rEstore  | Main
```

Figure Basic-11. Test and Debug Screen

ZIP

Caution: The **Z** (Zip) command allows the user with Operator (and higher) password authority to reset the entire system. Since the settings for all cards in the system will be reset to their original factory settings, "zipping" the system should be thoroughly considered prior to implementation. The Zip screen is shown as Figure Basic-12.

```
                                Test and Debug











Zip will reboot the system.    Ok to Zip (y/n)?

Zip  | Debug  | Reg  | Backup | rEstore | Main
```

Figure Basic-12. Zip Screen

DEBUG

The **D** (Debug) command is only available to factory software engineers with a password authorization higher than "Superuser." It gives access to the system software coding.

REG

The **R** (Registration) command allows the user with Operator (and higher) password authority to change the registration of the system. The user must have the information shown below to properly reregister the system. **There should be no reason for this command to be used during normal operation of the system.**

The registration procedure consists of the three steps shown below. Answer the questions at the bottom of the screen and the system will automatically respond with the correct application parameters and prompts.

1. Enter the vendor code. If no other vendor code is specified, enter the vendor code **101**.
2. Select the type of chassis used (either front-loading with power supplies on the side, front-loading with power supplies on top, or the two-sided chassis).

Confirm the proposed changes by selecting **y** for yes or **n** for no). Figure Basic-13 shows the completed Registration screen.

```
Node_1          |        Welcome  to  Registration       |     12-31-99    14:33


                              Vendor  Code:    xxx

                1. Front - Loading Only / Power Supplies on side

                2. Front - Loading Only / Power Supplies on top

                3. Front & Rear Loading Only / Power Supplies on side

                                   Select one:  3



Is  the  Information  on  this  screen  correct  (Y/N)?
```

Figure Basic-13. Registration Screen

BACKUP

The **Backup** command backs up system information to a text file in the PC that is running the terminal emulation program. The **Backup** command allows backup of information on a system-wide or card-by-card basis. It also backs up Alarm Filters, Alarm History, Installation Table and Cross Connect information. It is best to back up information after any significant changes in system configuration and at intervals that assure that alarm history and other operating information will be maintained dependably. Figure Basic-14 shows the Backup Screen. The Backup procedure is detailed below.

```
Node_1            |            NVRAM Backup             | 12-31-99  14:33

       C1      backup        Install Table       backup
       C2      backup        Cross Connect       backup
       P1      backup        Alarm Filters       backup
       P2      backup        Alarms History      backup
       P3      backup
       P4      backup
       W1      backup
       W2      backup
       W3      backup
       W4      backup
       IF      backup
       U1      backup
       U2      backup
       U3      backup
       U4      backup
       U5      backup
       U6      backup
       U7      backup
       U8      backup

Go | Copy | Main
```

Figure Basic-14 Backup

The Backup procedure creates a text file in which the parameters for the chosen cards are encoded. This information can then be used by the **Restore** command (see below) to restore the parameters to certain cards, or to the whole unit.

Because the Backup command creates a simple text file, the actual commands for the Backup procedure will vary depending on the computer system and terminal software you are using to interface with the unit. The following procedure is specific to Windows 95 using Microsoft Terminal software, but can be easily modified to adapt to other systems and software.

BACKUP PROCEDURE

1. From the Main Screen, type **Y** (for s**Y**s)
2. Type **B** (for **B**ackup). The screen in Figure Basic-14 lists all slots and categories with the default option **backup**. If you wish to do a full backup, proceed to Step 3.

   If you do **not** want to backup a certain slot, use the arrow keys to highlight it, and press <Enter>. The choices **no** and **backup** appear at the bottom of the screen. Use the left arrow key to highlight **no**, and press <Enter>. The slots or categories deselected will show **no** after the slot or category and will not be backed up. If you wish to deselect a number of entries in sequence, press **C** (for **C**opy) to change the next slot or category to match the slot or category you have just deselected.
3. In the Microsoft Terminal menu bar, select the **Transfers** pull-down menu.
4. From the **Transfers** pull-down menu, select **Receive Text File**.
5. In the "Receive Text File" field, select the name of the file and its directory location. When you select **OK** a bar will appear at the bottom of the screen, with two buttons, **Stop** and **Pause**, as well as the number of bytes and the name of the file being received.
6. Type **G** (for **G**o). The screen will fill with scrolling text. When the text stops scrolling, you will see the message "BACKUP COMPLETE, hit 'm' to go back to menu."
7. At this point, turn the transfer function off by selecting the **Stop** button at the bottom of the screen. The text file containing all the parameters for the selected cards and categories has now been saved.
8. Type **M** to return to the NVRAM Backup screen. This will allow you to double-check that your backup selections were correct. Type **M** again to return to the Test and Debug screen.

RESTORE

The **Restore** command restores all selected card and system information from a file created by the Backup procedure.

The Restore procedure is detailed below. This procedure is specific to the use of Microsoft Terminal in Windows 95, but can be easily modified for other systems and software.

RESTORE PROCEDURE

1. From the Main Screen, type **Y** (for s**Y**s)
2. Type **E** (for r**E**store). In the screen shown in Figure Basic-15, the default for all slots and categories is **restore**. To do a full restore, proceed to Step 3.

   If you do **not** want to restore a certain slot, use the arrow keys to highlight it, and press <Enter>. The choices **no** and **backup** appear at the bottom of the screen. Use the left arrow key to highlight **no**, and press <Enter>. The slots or categories deselected will show **no** after the slot or category and will not be restored. To deselect a number of entries in sequence, press **C** (for **C**opy) to change the next slot or category to match the entry you have just deselected.
3. Type **G** (for **G**o). You will see the message "Restore is active. Press <ESC> twice to end".
4. In the Microsoft Terminal menu bar, select the **Transfers** pull-down menu.
5. From the **Transfers** pull-down menu, select **Send Text File.**
6. At the bottom of the screen, you will see the progress of the file as it is received by the unit. (On some systems, you will not see any progress indicator.) When the restoration is complete, you will see the message "Restore COMPLETED, press <ESC> twice to end." At this point, all parameters for the selected cards and categories have been restored.
7. Pressing **<ESC>** twice will bring up the message "Resetting..." and then show the following prompt: "Restore is done, do you wish to restart now (y/n)?" Selecting **Y** will cause the unit to reinitialize itself using the restored parameters. You will be required to log in again.

```
Node_1                      NVRAM Restore                       12-31-99    14:33
    C1       restor         Install Table   restore
             e
    C2       restor         Cross Connect   restore
             e
    P1       restor         Alarm Filters   restore
             e
    P2       restor
             e
    P3       restor
             e
    P4       restor
             e
    W1       restor
             e
    W2       restor
             e
    W3       restor
             e
    W4       restor
             e
    IF       restor
             e
    U1       restor
             e
    U2       restor
             e
    U3       restor
             e
    U4       restor
             e
    U5       restor
             e
    U6       restor
             e
    U7       restor
             e
    U8       restor
             e

    Go     | Copy    | Main
```

Figure Basic-15. Restore Screen

Note: *The "Alarm History" field does not display on the Restore Screen because alarm history can only hold 32k of memory. This history information can be saved to a separate storage device (i.e. Personal Computer) indifferently for future reference and use.*

MAIN

The "M" (Main) command returns the user to the main system screen.

Introduction

The primary purpose of your equipment is to maximize the use of incoming and outgoing T1/E1 lines by assigning specific channels (DS0s) to perform voice, data and cross-connect functions. These system operations are described in detail in this chapter.

Assigning the Timeslot Map

The system operations described in this chapter use two types of CPU, bus-connect (Models 8800 and 8804) and cross-connect (Model 8801). For the purposes of this chapter, the operation of the Model 8804 CPU is identical to that of the Model 8800 CPU. As a result, the 8804 CPU is not explicitly covered in this chapter. Differences between it and the 8800 are discussed in the CPU card section.

The cross-connect CPU differs in application from the bus-connect models because of the DS0 cross-connect module that allows you to select and assign independent connections of one DS0 to another. In this chapter we will refer to these connections as "pass-through" circuits because they link a DS0 from one T1/E1 link to another through the system. Using the cross-connect CPU also allows the user to have up to eight separate T1/E1 links on four WAN cards in any cross-connect combination possible.

The next six sections describe ways to administer the network and assemble bandwidth portions to meet these needs. Where applicable, each section first addresses bus-connect systems with Model 8800 CPUs and then cross-connect systems with Model 8801 CPUs.

- ➢ The first section deals with assigning incoming and outgoing user card ports to T1/E1 channels (timeslot).

- ➢ The second section describes a time-saving tool known as the "Configuration" option that automatically assigns sequential WAN timeslot to ports on analog voice cards and allows WANs to be assigned without any cards.

- ➢ The third section concerns cross-connecting WAN timeslot to other WAN timeslot in both bus-connect and cross-connect systems.

- ➢ The fourth section addresses a special application that is supported in cross-connect systems only: the ability to broadcast a data signal over multiple WAN aggregates.

- ➢ The fifth section describes signaling status, signaling conversion and companding conversion in bus-connect systems.

- ➢ The sixth section shows you how to view the timeslot map after the assignments and cross-connects are made.

In this manual, we define "assigning timeslots" as the process of connecting user card ports to WAN timeslots, and "cross-connecting timeslots" as the process of connecting WAN timeslots to other WAN timeslots.

Assigning Timeslots from a User Card

The timeslot map specifies the connections between all incoming and outgoing lines connected to the system. It allows you to split the bandwidth of T1/E1 lines into amounts appropriate for normal voice and data communications. A timeslot map comprises all the connections you define for all the cards in the system.

Bus-Connect Model

A system equipped with a Model 8800 bus-connect CPU can access only two T1/E1 links and has two modes accessed from the WAN card screen: Drop-and-Insert (**d-i**) and Terminal (**term**). ***Note: When voice is going through the d-i, signaling must be turned on for voice to work correctly***. Drop-and-Insert mode allows you to route part of the bandwidth of one of the T1/E1 lines to user cards while the unit automatically routes the rest to the other WAN link. In Terminal mode you can route the bandwidth of both T1/E1 links to user cards only. A description of the process follows.

Timeslot assignment will be as unique as each customer's needs. A system using an E&M card and HSU card in T1 operation is used as an example here to illustrate the timeslot assignment process. Many different arrangements of timeslot assignments are possible with these two cards. Figure System-1 illustrates of one of those ways. In Drop-and-Insert mode, you can define a route on the timeslot map that assigns WAN port 1-1 timeslots (TS) 1-8 to ports 1-8 on the E&M card and TS#9-16 to the first port on the HSU card which is programmed to operate as an 8xDS0 super-rate data port. The remaining 8 timeslots will automatically be cross-connected to the corresponding timeslots on WAN port 1-2. The E&M card illustrates the case in which each port on the card can be assigned to only a single WAN timeslot (see Figure System-2). The HSU card illustrates the case in which one port may be assigned to multiple WAN timeslots using a table (see Figure System-3). *All other available cards are assigned to timeslots in a similar manner, and specific instructions are included in each card chapter.*

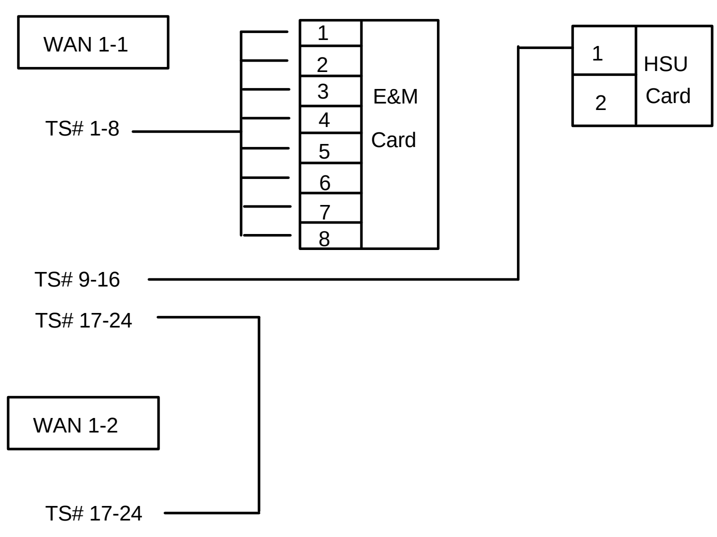


Figure System-1. A Drop-and-Insert Mode for T1 Operations

E&M Card

You can define a timeslot map from any user card (data or voice) for connections involving that user card, or from a WAN card for connections involving only WAN cards. For example, Figure System-2 shows the E&M card screen for the above example, from which you can define a timeslot map as follows:

1. From the Main Screen, select the E&M card.
2. Select the WAN port to which you want to assign the E&M port. In our example, this would be WAN w1-1.
3. Select TS for each port and a number for the corresponding timeslot on the WAN port will appear at the bottom of the screen. **You can change the number by using the up and down arrow keys and the <Enter> key.**
4. Change the STATE for each port you intend to use from **stdby** to **actv**.
5. Select **Save** from the menu of actions at the bottom of the screen to save your changes.

```
Node_1        |  U1 E&M  4Wx8ER  8119  Rev A2-0  Ser 00101  |  12-31-99
14:33

           1       2       3       4       5       6       7       8
STATE      actv    actv    actv    actv    actv    actv    actv    actv
WAN        w1-1    w1-1    w1-1    w1-1    w1-1    w1-1    w1-1    w1-1
TS         01      02      03      04      05      06      07      08
MODE       e&m     e&m     e&m     e&m     e&m     e&m     e&m     e&m
R2 TYPE    n/a     n/a     n/a     n/a     n/a     n/a     n/a     n/a
Rx TLP     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
Tx TLP     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
CODING     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
LB         off     off     off     off     off     off     off     off
PATTRN     none    none    none    none    none    none    none    none
HYBRID     n/a     n/a     n/a     n/a     n/a     n/a     n/a     n/a
SIG CONV   off     off     off     off     off     off     off     off
RATE       64k     64k     64k     64k     64k     64k     64k     64k
ADPCM      n/a     n/a     n/a     n/a     n/a     n/a     n/a     n/a


08

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

Figure System-2. E&M Card with Timeslot Selection Displayed

DACOM Timeslot Renumbering

The E&M Card timeslot selection screen shown above can be modified for DACOM format. The timeslot data will be translated into DACOM format using a new assigned vendor code. This will allow the renumbering of timeslots so they will be displayed into Korean format.

If Vendor Code indicates DACOM, then renumbered timeslots will be displayed using the Korean format. Timeslots 1 through 15 will be unchanged. Timeslots 17 through 31 will be renumbered as 16 through 30, and timeslot 16 will be renumbered as 31.

Note: ONLY use this option to reassign the timeslots on the E&M Card to DACOM. Otherwise, DO NOT change your vendor code.

HSU Card

Figure System-3 shows the HSU card screen for the example in Figure System-1, from which you can define a timeslot map as follows:

1. From the Main Screen, select the HSU card.
2. Select the WAN port to which you want to assign the HSU port. In our example, this would be WAN w1-1.
3. Select the TS table and all 24 timeslots will appear at the bottom of the screen. **Place an "X" under all appropriate timeslots using the space bar to either select or delete timeslot assignment, and then press the <Enter> key.** In the example, the HSU port is assigned eight timeslots (numbers 9-16).
4. Change the STATE for each port you intend to use from **stdby** to **actv**.
5. Select **Save** from the menu of actions at the bottom of the screen to save your changes.

```
Node_1          | U2 HSU-530x2   8202  Rev C0-0  Ser 00054  | 12-31-99
14:33

                   1               2
STATE             stdby           stdby
WAN/SRV           w1-1            w1-1
MODE              dce             dce
TS                table           table
RATE              64K             64K
Tx CLOCK          int             int
CLOCK PLRTY       norm            norm
DATA PLRTY        norm            norm
CTS               perm            perm
CTS DELAY         0               0
LOCAL LB          off             off
LB GEN MODE       dds             dds
LB GEN            off             off
LB DET            w/to            w/to
ISDN CONN         no              no



                  1 1 1 1 1 1 1 1 1 1 2 2 2 2 2
1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4
                    x x x x x x


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

Figure System-3. HSU Card Screen with the Timeslot Selection Displayed

DACOM Timeslot Renumbering

The HSU Card timeslot selection screen shown above can be modified for DACOM format. The timeslot data will be translated into DACOM format using a new assigned vendor code. This will allow the renumbering of timeslots so they will be displayed into Korean format.

If Vendor Code indicates DACOM, then renumbered timeslots will be displayed using the Korean format. Timeslots 1 through 15 will be unchanged. Timeslots 17 through 31 will be renumbered as 16 through 30, and timeslot 16 will be renumbered as 31.

Note: ONLY use this option to reassign the timeslots on the HSU Card to DACOM. Otherwise, DO NOT change your vendor code.

Cross-Connect Model

The difference between bus-connect and cross-connect model 8801 is that the cross-connect model allows you to access two T1/E1 links for each of four WAN cards for a total of eight T1/E1 links. Since there is no **d-i** or **term** mode setting, all WAN card connections to other WAN cards are accomplished through the cross-connect option on the main screen and must be individually specified (see later section in this chapter). User cards on systems equipped with the cross-connect CPU are assigned to WAN timeslots in exactly the same manner as bus-connect versions.

Using the Configuration Option

Both bus-connect and cross-connect systems support the ability to automatically assign timeslots to E&M, FXS and FXO cards using the configuration option from the main screen. Figure System-4 shows a picture of the timeslot assignments for four E&M cards using E1 operations. The configure option automatically assigns the 8 ports from E&M card #1 to timeslots 1-8, seven ports from E&M card #2 to timeslots 9-15, and the 8 ports from E&M card #3 to timeslots 17-24, timeslots 25-31 are assigned to E&M card #4, ports 1-7. The configuration option only works with WAN ports 1-1 and 1-2.

With a T1 WAN port, the configuration option would automatically assign the eight ports from the first E&M card to timeslots 1-8, the eight ports from the second E&M card to timeslots 9-16 and the eight ports from the third E&M card to timeslots 17-24.

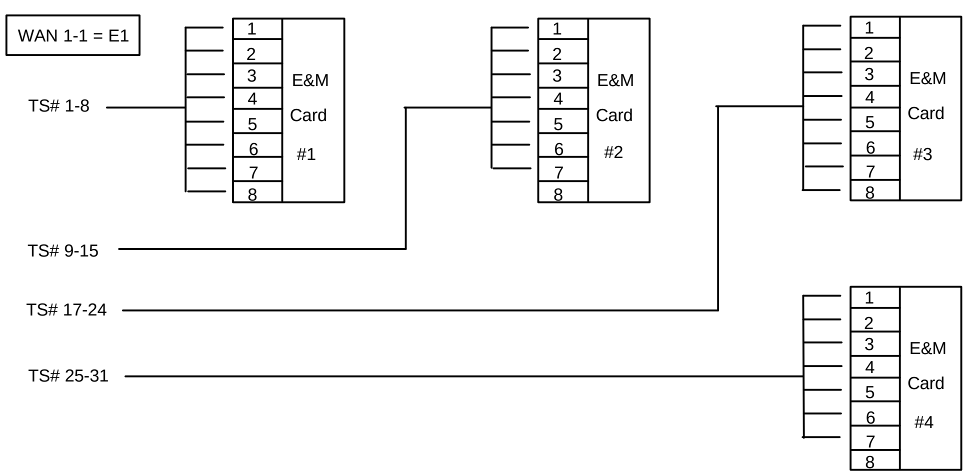


Figure System-4. Timeslot Map Using Configuration Option in E1 Operation

In order to use the Configuration Option, the following constraints apply:

- You must be configuring 3 vacant adjacent user slots for T1 operation or 4 vacant adjacent user slots for E1 operation. Cards must be sequentially in order (i.e. U1, U2, U3).
- You need to set the MODE on the WAN port to **term**.
- The 3 or 4 cards you intend to configure must be the same type (see below).

The following steps and series of figures demonstrate the Configuration Option in E1 operation:

1. Place the cursor on the first of the 4 slots you intend to install. In Figure System-5, slots U5-U8 will be assigned to the 30 user timeslots on the E1 WAN port. Press **c** to initiate the configuration option.
2. Select the type of card (E&M-600Ω, E&M (extended range), FXS-900Ω, FXS-600Ω, FXO-900Ω or FXO-600Ω as shown in Figure System-5.
3. Select the WAN port to which you wish to assign the voice cards (W1-1 or W1-2) as shown in Figure System-6.
4. The system automatically builds the necessary timeslot structure, but since the user slots are vacant, the system will register Out Of Service alarms for each of the 4 cards, as shown in Figure System-7. Inserting the four E&M cards will turn off the alarm condition.
5. Figure System-8 shows the WAN Xconnect screen with the correctly assigned timeslots.

```
Node_1        |                                               | 12-31-99
14:33

Slot     Installed   Status     Slot    Installed      Status
C1       CPU XCON               IF      INTF+modem
C2                              U1      ALR
P1       ADPCM-64               U2      E&M 4Wx8-6
P2       ADPCM-64               U3      FXS 2Wx8-9
P3       ADPCM-64               U4      FXS 2Wx8-9
W1       CEPT+CEPT              U5
W2       CEPT+CEPT              U6
W3       CSU+CSU                U7
W4       CSU+CSU                U8
F1       PS1                    R1      RINGER
F2       PS2

e&m-6   e&mer   fxs-9    fxs-6    fxo-9    fxo-6

Alarms | Config | Del | accepT | Xcon | sYs| Logout | cpuSwtch
```

Figure System-5. Configuration Screen (select operation)

```
Node_1        |                                               | 12-31-99
14:33

Slot     Installed   Status     Slot    Installed       Status
C1       CPU XCON               IF      INTF+modem
C2                              U1      ALR
P1       ADPCM-64               U2      E&M 4Wx8-6
P2       ADPCM-64               U3      FXS 2Wx8-9
P3       ADPCM-64               U4      FXS 2Wx8-9
W1       CEPT+CEPT              U5
W2       CEPT+CEPT              U6
W3       CSU+CSU                U7
W4       CSU+CSU                U8
F1       PS1                    R1      RINGER
F2       PS2

w1-1   wan1-2

Alarms | Config | Del | accepT | Xcon | sYs| Logout | cpuSwtch
```

Figure System-6. Configuration Screen (select WAN card)

```
Node_1          |                                               | 12-31-99
14:33

Slot     Installed  Status      Slot    Installed     Status     OOS     U8
C1       CPU XCON               IF      INTF+modem               OOS     U7
C2                              U1      ALR                      OOS     U6
P1       ADPCM-64               U2      E&M 4Wx8-6               OOS     U5
P2       ADPCM-64               U3      FXS 2Wx8-9
P3       ADPCM-64               U4      FXS 2Wx8-9
W1       CEPT+CEPT              U5      E&M 4Wx8-6    OOS
W2       CEPT+CEPT              U6      E&M 4Wx8-6    OOS
W3       CSU+CSU                U7      E&M 4Wx8-6    OOS
W4       CSU+CSU                U8      E&M 4Wx8-6    OOS
F1       PS1                    R1      RINGER
F2       PS2

Alarms | Config | Del | accepT | Xcon | sYs| Logout | cpuSwtch
```

Figure System-7. Configuration Screen (with Alarms noted)

```
Node_1          | W1  CEPT+CEPT  8010  Rev A6-2  Ser 00101   | 12-31-99
14:33

TS   XCON   TS     CIRCUIT_ID    TS    XCON   TS     CIRCUIT_ID    OOS     U8
 0   frame align   64k           16    cas           64k           OOS     U7
 1   U5-1   A-01   user_circuit  17    U7-1   A-17   user_circuit  OOS     U6
 2   U5-2   A-02   user_circuit  18    U7-2   A-18   user_circuit  OOS     U5
 3   U5-3   A-03   user_circuit  19    U7-3   A-19   user_circuit
 4   U5-4   A-04   user_circuit  20    U7-4   A-20   user_circuit
 5   U5-5   A-05   user_circuit  21    U7-5   A-21   user_circuit
 6   U5-6   A-06   user_circuit  22    U7-6   A-22   user_circuit
 7   U5-7   A-07   user_circuit  23    U7-7   A-23   user_circuit
 8   U5-8   A-08   user_circuit  24    U7-8   A-24   user_circuit
 9   U6-1   A-09   user_circuit  25    U8-1   A-25   user_circuit
10   U6-2   A-10   user_circuit  26    U8-2   A-26   user_circuit
11   U6-3   A-11   user_circuit  27    U8-3   A-27   user_circuit
12   U6-4   A-12   user_circuit  28    U8-4   A-28   user_circuit
13   U6-5   A-13   user_circuit  29    U8-5   A-29   user_circuit
14   U6-6   A-14   user_circuit  30    U8-6   A-30   user_circuit
15   U6-7   A-15   user_circuit  31    U8-7   A-31   user_circuit

Refresh | Test | Main
```

Figure System-8. WAN Card Timeslot Screen

Cross-Connecting WAN Timeslots

After assigning user cards to timeslots, the remaining WAN bandwidth may be assigned to pass-through connections between T1/E1 links.

Bus-Connect Model

In bus-connect mode, the choice of Mode from the WAN card will automatically determine how WAN timeslot cross-connects are made. Whatever mode is selected will apply to both T1 and E1 links. In the **d-i** mode, all timeslots on one T1/E1 link that are not assigned to user ports will be cross-connected to the other link on a one-to-one basis. In the **term** mode, no cross-connect circuits are possible. *Note that if a Model 8804 CPU is used, then a Dual WAN card in slot W3 can only be used in* ***term*** *mode. W3 Does Not support voice cards 8212, 8220 and 8221.*

If the Dual WAN card in slot W1 is optioned with one T1 port (DSX or CSU) and one E1 port (CEPT), and if that card is set to operate in **d-i** mode, then the cross-connect map used by the system for unassigned ports will be as shown in Table System-1.

Table System-1. T1 to E1 Cross-Connect Map in d-i Mode

T1 DS0	E1 DS0	T1 DS0	E1 DS0
1	1	13	17
2	2	14	18
3	3	15	19
4	5	16	21
5	6	17	22
6	7	18	23
7	9	19	25
8	10	20	26
9	11	21	27
10	13	22	29
11	14	23	30
12	15	24	31

Cross-Connect Model

Cross-connecting WAN timeslots with the cross-connect model is performed from the Main screen. To access this function, select "**X**" from the Menu of Actions on the Main screen. Choosing "Add" from the Menu of Actions provides the fields used to program all of the "pass through" circuits in your network. Figure System-9 shows the "Add" fields. Table System-2 lists the circuit parameters along with the possible and default values.

```
Node_1          | C1 CPU  XCON  8801  Rev  C01-0  Ser  00101  | 12-31-99  14:33

page:    1  of  1

CIRCUIT ID   W/U    TS/BW   TEST   W/U    TS/BW    TEST   TYPE    TC    CNV









new_circuit  w1-1   00x64   off    w1-1   00x64    off    d       n/a   n/a

Save
```

Figure System-9. The CPU Cross-Connect Screen

Table System-2. Cross-Connect Card Setting Options and Defaults

Parameter	User Options	Default
CIRCUIT ID	Any combination of letters or numbers up to 14 characters including spaces	new_circuit
W/U	w1-1 w1-2 w2-1 w2-2 w3-1 w3-2 w4-1 w4-2	w1-1
TS/BW	table	00
TEST	off all0 all1 m_oos 1:1 1:7 lpbk 300Hz 1kHz 3kHz	off
W/U	w1-1 w1-2 w2-1 w2-2 w3-1 w3-2 w4-1 w4-2	w1-1
TS/BW	table	00
TEST	off all0 all1 m_oos 1:1 1:7 lpbk 300Hz 1kHz 3kHz	off
TYPE	v v&s d	d
TC		
v	n/a	no
v&s	e&m fxsl fxsg fxsd plar dpo fxol fxog fxod dpt user* mrd	e&m
d	n/a	n/a
CNV		
pcm conv	none A-mu mu-A	none
sig conv	none ANSI-CCITT CCITT-ANSI ABCD-ABAB ABCD-AB01	none

*selection of user will require user bit pattern information to be entered

Circuit Identification

A "circuit" is defined as a group of one or more DS0s that are cross-connected from one WAN link to another. Each circuit can carry voice or data traffic, and each is given its own name to facilitate cross-connect management within the system. The "CIRCUIT ID" field allows the user to define and name individual pass-through circuits. The default value is "new circuit" and can be changed to show any pertinent title for the pass-through connection, although each circuit ID must be unique. The title can contain up to fourteen letters or numbers, of upper and lower case, including spaces and underscore (_), dash (-). In Figure System-10, the circuit is identified as SF01-NY01.

Warning: When cross-connecting multiple independent data DS0s (not a superrate circuit) between WAN aggregates in a cross-connect system, you must program each data DS0 cross-connect independently of the others. ***Note: Crossconnecting multiple DS0s in v mode maintains DS0 integrity***. Attempting to save time by cross-connecting those independent data DS0s as one superrate circuit could cause data errors. This limitation does not apply to voice DS0s.

```
Node_1                 | C1  CPU  XCON  8801  Rev  C01-0  Ser  00101  | 12-31-99  14:33

page:    1  of  1

CIRCUIT  ID  W/U   TS/BW   TEST   W/U   TS/BW   TEST   TYPE   TC    CNV











new_circuit   w1-1  00x64   off    w1-1  00x64   off    d      n/a   n/a

SF01-NY01


Save
```

Figure System-10. New Circuit Selection

W/U (WAN Unit)

The first WAN Unit column is the T1/E1 link from which the pass-through connection begins. (Since these circuits are bi-directional, the concept of beginning or ending is used for illustrative purposes only.) The options are all of the WAN cards and ports, and the identification uses the same convention (w1-1, w1-2, etc.) seen earlier. If a WAN card is not present in the W/U selected, an error message is generated. The example shown in Figure System-11, shows the selection of WAN 1-1.

```
Node_1            | C1  CPU  XCON  8801  Rev  C01-0  Ser  00101  | 12-31-99  14:33

page:    1  of  1

CIRCUIT  ID  W/U   TS/BW   TEST   W/U   TS/BW   TEST   TYPE   TC    CNV

new_circuit   w1-1  00x64   off    w1-1  00x64   off    d      n/a   n/a

SF01-NY01

Save
```

Figure System-11. The WAN Unit Options

TS/BW

The first Timeslot/Band Width column shows the different timeslots from WAN 1-1 that will be assigned to this pass-through connection. Figure System-12 shows the selection of timeslots 8-12 from WAN 1-1 assigned to the start of the connection. Any number of timeslots from **1-24** would be acceptable for T1 operations and from **1-15 and 17-31** for E1 operations. *The bandwidth is automatically assigned.* Selection is made using the space bar and the arrow keys. The arrow key moves from slot to slot and the space bar toggles between selecting and deselecting the timeslot.

```
Node_1      | C1  CPU  XCON  8801  Rev  C01-0  Ser  00101  | 12-31-99  14:33

page:    1  of  1

CIRCUIT  ID  W/U    TS/BW  TEST  W/U    TS/BW  TEST  TYPE  TC   CNV










SF01-NY01    w1-1   00x64  off   w1-1   00x64  off   d     n/a  n/a
                  1 1 1 1 1 1 1 1 1 1 2 2 2 2 2
1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4
              x x x x x
Save
```

Figure System-12. The Timeslot/Bandwidth Options

Test (for Data Circuits)

The first Test column allows the user to select the test pattern to be applied to this circuit in the direction of the first WAN link specified. Figure System-13 shows the options which are selected by highlighting the choice and pressing the return key. The choices are **off** (no testing), **all 0** (all zeros), **all 1** (all ones), **m_oos** (Multiplexer Out Of Synchronization), **1:1** ("one to one" pattern where a 1 is followed by one zero), **1:7** ("one to seven" pattern where a 1 is followed by seven zeros), **lpbk** (loopback), **300 Hz** (steady 300 cycle tone), **1kHz** (steady 1000 cycle tone), and **3kHz** (steady 3000 cycle tone). When the circuit is saved, the system will send the selected pattern toward the first end of the circuit on each DS0 to facilitate testing. When circuit testing is finished, "Test" should be returned to the "off" position. The loopback (**lpbk**) option places the circuit in loopback in the direction of the first WAN link specified.

If you are dealing with a voice cross-connect circuit (with or without signaling), test capabilities are accessed from the WAN cross-connect screen. This feature is discussed at the end of this section.

```
Node_1        | C1  CPU  XCON  8801  Rev  C01-0  Ser  00101  | 12-31-99  14:33

page:    1  of  1

CIRCUIT  ID  W/U   TS/BW   TEST   W/U    TS/BW   TEST   TYPE   TC    CNV










SF01-NY01     w1-1   05x64   off   w1-1    00x64   off    d      n/a   n/a

off    all 0   all 1   moos    1:1    1:7   lpbk   300Hz   1kHz    3kHz


Save
```

Figure System-13. The Test Options

W/U (WAN Unit)

The second WAN Unit column is the T1/E1 link in which the pass-through connection ends. The options are all of the WAN cards and ports. If a WAN card is not present in the W/U selected, an error message is generated. The example shown in Figure System-14, shows the selection of WAN 3-2.

TS/BW

The second Timeslot/Band Width column shows the different timeslots from WAN 3-2 that will be assigned to this pass-through connection. Figure System-14 shows the selection of 5 timeslots from WAN 3-2 assigned to the end of the connection. Any number of timeslots from **1-24** would be accepted for T1 operations and from **1-15 and 17-31** for E1 operations. The bandwidth is automatically assigned. Selection is made using the space bar and the arrow keys. The arrow key moves from slot to slot and the space bar toggles between selecting and deselecting the timeslot. *The number of DS0s assigned to this half of the cross-connect circuit must equal the number assigned to the other. If not, the system will reject the connections and generate an error message.*

Test (for Data Circuits)

The second Test column allows the user to select the test pattern to be applied to this circuit in the direction of the second WAN link specified. Figure System-14 shows the option set at **off**. Like the previous Test column, the choices are: **off** (no testing), **all 0** (all zeros), **all 1** (all ones), **m_oos** (Multiplexer Out Of Synchronization), **1:1** ("one to one" pattern where a 1 is followed by one zero, and then another one), **1:7** ("one to seven" pattern where a zero is followed by a 1 and 7 zeros, and then another one), **lpbk** (loopback), **300 Hz** (steady 300 Hz tone), **1kHz** (steady 1000 Hz tone), and **3kHz** (steady 3000 Hz tone). When the circuit is saved, the system will send the selected pattern toward the second end of the circuit on each DS0 to facilitate testing. When circuit testing is finished, "Test" should be returned to the "off" position. The Loopback (**lpbk**) option places the circuit in loopback in the direction of the first WAN link specified.

If you are dealing with a voice cross-connect circuit (with or without signaling), test capabilities are accessed from the WAN cross-connect screen. This feature is discussed at the end of this section.

Type

The Type column selects the mode of operation for the pass-through circuit. Figure System-14 shows the selection of Type. The choices are **v** (voice) requiring no trunk conditioning; **v&s** (voice with signaling) which will preserve A/B (robbed bit) signaling on the selected timeslots and provide trunk conditioning; and **d** (data) which also supports trunk conditioning.

```
Node_1      | C1  CPU  XCON  8801  Rev  C01-0  Ser  00101  | 12-31-99  14:33

page:    1  of  1

CIRCUIT  ID  W/U   TS/BW  TEST  W/U   TS/BW  TEST  TYPE  TC   CNV











SF01-NY01    w1-1  05x64  off   w3-2  05x64  off   d     n/a  n/a

v     v&s    d


Save
```

Figure System-14. The Type Options

TC

The operator may define the pattern to be transmitted on a cross-connected circuit should one of the two WAN links that define that circuit fail. This is known as Trunk Conditioning and the selections available are based upon the selection in the Type column.

For **d** (data), no choice is available and the system automatically shows **n/a** (not applicable). An example of this is shown above as Figure System-14.

For **v&s** (voice with signaling) the choices shown in Figure System-15 are **user** (a user defined bit pattern, as shown in Figure System-16, that is requested when **user** is selected), **e&m**, **fxsl** (foreign exchange station-loop start), **fxsg** (foreign exchange station-ground start), **fxsd** (foreign exchange station-defined network), **plar** (private line-automatic ringdown), **dpo** (dial pulse-originating), **fxol** (foreign exchange office-loop start), **fxog** (foreign exchange office-ground start), **fxod** (foreign exchange office-defined network), **dpt** (dial pulse-terminating), and **mrd** (manual ringdown).

```
Node_1       | C1  CPU  XCON  8801  Rev  C01-0  Ser  00101  | 12-31-99  14:33

page:    1  of  1

CIRCUIT  ID  W/U    TS/BW  TEST  W/U   TS/BW  TEST  TYPE  TC    CNV











SF01-NY01    w1-1  05x64  off   w3-2  05x64  off   v&s   e&m   no
TC CGA       e&m   idle         e&m  idle

e&m  fxsl  fxsg  fxsd  plar  dpo  fxol  fxog  fxod  dpt  user
     mrd

Save
```

Figure System-15. The User Option Screen

```
Node_1      | C1  CPU  XCON  8801  Rev  C01-0  Ser  00101  | 12-31-99  14:33

page:    1  of  1

CIRCUIT  ID  W/U     TS/BW  TEST  W/U    TS/BW  TEST   TYPE   TC    CNV









SF01-NY01    w1-1    05x64  off   w3-2   05x64  off    v&s    e&m   no
TC CGA       user    0x00         user    0x00

Enter 2 hex digits:  0x00

Save
```

Figure System-16. The User Bit Pattern Selection Screen

For **v** (voice options) , no choice is available and the system automatically shows **n/a** (not applicable). An example of this is shown as Figure System-17.

```
Node_1      | C1  CPU  XCON  8801  Rev  C01-0  Ser  00101  | 12-31-99  14:33

page:    1  of  1

CIRCUIT  ID  W/U   TS/BW  TEST  W/U   TS/BW  TEST  TYPE  TC   CNV









SF01-NY01    w1-1  05x64  off   w3-2  05x64  off   v&s   e&m  no



Save
```

Figure System-17. The Voice Options Screen

CNV

The Conversion (CNV) parameter allows the user to request that PCM companding and signaling conversion be performed on this cross-connect circuit. Since these conversions only apply to voice circuits, if the TYPE selected is data (**d**), then the only acceptable value here is **n/a**. Similarly, if the TYPE selected is voice without signaling (**v**), the system will only allow you to request PCM companding conversion. If the TYPE is voice with signaling (**v&s**), then you can select any combination of companding and/or signaling conversion.

If the TYPE is **v** or **v&s**, the system will first ask you to "Select PCM CONV:" for defining the type of companding conversion you require. (See Figure System-18.) The options are no companding conversion (**none**), convert the incoming A-law signal to mu-law (**A-mu**) and convert the incoming mu-law signal to A-law (**mu-A**).

If the TYPE is **v&s**, the system will prompt you to "Select SIG CONV:" for selecting the type of signaling conversion needed. (See Figure System-19.) The first option is default signaling conversion (**none**) where a bit pattern of "0000" will automatically be converted to "0001" in the T1 to CEPT direction.

The second option (**ANSI-CCITT**) will convert the incoming ANSI signaling to CCITT signaling. The third option (**CCITT-ANSI**) convert the incoming CCITT signaling to ANSI signaling. These two options are complementary (i.e. if either one is selected in one direction, the other is automatically selected for the reverse direction). When convert is selected then the TC field is used to select what type of conversion is used from the TABS field on the interface card.

The fourth option (**ABCD-ABAB**) will convert the incoming CEPT signaling to T1 signaling for an ESF or D4 cross-connect. The fifth option (**ABCD-AB01**) will convert the incoming T1 signaling to CEPT signaling for a ESF or D4 cross-connect. These two options are complementary (i.e. if either one is selected in one direction, the other is automatically selected for the reverse direction).

Because of space limitations in the CNV column on the screen, the system will display a summary notation of the choices just made. The possible values are **no** (no conversion), **sig** (signaling is converted, but not the PCM), **pcm** (PCM is converted, but not the signaling) and **p&s** (both signaling and PCM are converted). Figure System-20 illustrates those options.

```
Node_1      | C1  CPU  XCON  8801  Rev  C01-0  Ser  00101  | 12-31-99  14:33

page:    1  of  1

CIRCUIT  ID  W/U    TS/BW   TEST   W/U    TS/BW   TEST  TYPE   TC    CNV








SF01-NY01    w1-1   05x64   off    w3-2   05x64   off   v&s    e&m   pcm


Select PCM CONV:  none     A-mu    mu-A

Save
```

Figure System-18. Selecting PCM Conversion

```
Node_1      | C1  CPU  XCON  8801  Rev  C01-0  Ser  00101  | 12-31-99  14:33

page:    1  of  1

CIRCUIT  ID  W/U    TS/BW   TEST   W/U   TS/BW   TEST   TYPE   TC    CNV








SF01-NY01    w1-1   05x64   off   w3-2  05x64   off    v&s    e&m   pcm


Select SIG CONV:  none    ANSI-CCITT   CCITT-ANSI   ABCD-ABAB   ABCD-AB01

Save
```

Figure System-19. Selecting Signaling Conversion

```
 Node_1          | C1 CPU  XCON  8801  Rev  C01-0  Ser  00101  | 12-31-99  14:33

 page:    1  of  1

 CIRCUIT  ID   W/U    TS/BW  TEST   W/U   TS/BW   TEST   TYPE   TC    CNV
 SF01-NY01     w1-1   05*64  off    w3-2  05*64   off    v      n/a   no
 SF01-PHX11    w1-1   01*64  off    w2-1  01*64   off    v&s    e&m   sig
 SEA4AX        w2-1   01*64  off    w3-1  01*64   off    v&s    e&m   pcm
 Test          w2-2   01*64  off    w3-2  01*64   off    v&s    e&m   p&s

 Add | uPdate | dElete | pgUp | pgDn | View all | Tads | Main
```

Figure System-20. Completed Circuits

Menu of Actions

Table System-3 shows the Menu of Actions for the Completed Circuits screen.

Table System-3. Menu of Actions

Action	Function
Add	**Add** allows you to program additional pass-through cross-connects in the system. If mistakes are made during the add process, pressing the up arrow or down arrow key will terminate this operation.
u**P**date	The uPdate action is initiated by pressing the "**p**" key. With this command, you can change any of the parameters of a pass-through connection. As shown in Figure System-22. Use the arrow keys to highlight the area to be changed and close the transaction using the "**S**" (Save) command.
d**E**lete	The dElete action is initiated by pressing the "**e**" key. Use this command to delete existing pass-through connections. As shown in Figure System-21, the system will prompt you to delete the circuit, and the "**y**" key must be pressed to complete the transaction.
pg**U**p	The pgUp (page up) action is initiated by pressing the "**u**" key. Since the system can handle many different cross-connect circuits, you may exceed a single screen. New pages will be added automatically to accommodate additional circuits. The page count feature at the top of the screen shows you the current page and the total amount of cross-connect pages. Use this command to scroll up through the pages of cross-connect information.

pg**D**n	The pgDn (page down) action is initiated by pressing the "**d**" key. This action is similar to the pageUp command. Use this command to scroll down through the pages of cross-connect information.
View all	The View all action is initiated by pressing the "**v**" key. This action is used to access the Broadcast screen discussed in a later section.
Tads	The Test Access Digroups (TADs) function is a remote test access for data cross connects that pass through the system according to publication TR-TSY-000343, Issue #1, June 1986. A test center can access the Integrated Access Controller and assign a non-intrusive testing circuit between the unit and the test center via another WAN link. See the TADs section later in this chapter.
Main	Pressing "m" (Main) will return the user to the main cross-connect screen.

```
 Node_1          | C1 CPU  XCON  8801  Rev  C01-0  Ser  00101  | 12-31-99  14:33

 page:    1  of  1

 CIRCUIT  ID  W/U    TS/BW  TEST   W/U   TS/BW   TEST   TYPE   TC    CNV
 SF01-NY01    w1-1   05*64  off    w3-2  05*64   off    v      n/a   no









 Delete Selected Circuit (y/n)?

 Add  |  uPdate  |  dElete  |  pgUp  |  pgDn  |  View all  |  Tads  |  Main
```

Figure System-21. The Delete Cross-Connect Screen

```
Node_1           | W1  CSU+CSU   8010  Rev A6-2  Ser 00101    | 12-31-99
14:33

TS   XCON   TS     CIRCUIT_ID     TS    XCON   TS     CIRCUIT_ID
 1                                13
 2                                14
 3                                15
 4                                16
 5                                17
 6                                18
 7                                19
 8   w3-2   1      SF01-NY01      20
 9   w3-2   2      SF01-NY01      21
10   w3-2   3      SF01-NY01      22
11   w3-2   4      SF01-NY01      23
12   w3-2   5      SF01-NY01      24

Refresh | Test | Main
```

Figure System-22. The Updated WAN Card Screen

Using the Test Option for Voice Cross-Connects

Voice and data circuits differ in the way in which the test function is accessed. While the user can set up test patterns on data circuits on the cross-connect screen from the main screen, users testing voice circuits must use a subscreen of the WAN Xconnect card screen. Figure System-23 shows the error message that appears when the user attempts to access testing of voice circuits from the CPU Xconnect screen.

```
 Node_1          | C1  CPU  XCON  8801  Rev  C01-0  Ser  00101  | 12-31-99  14:33

 page:    1  of  1

 CIRCUIT  ID     W/U     TS/BW    TEST    W/U    TS/BW   TEST    TYPE    TC    CNV
 SF01-HSTN4C     w3-1    02*64    off     w2-2   02*64   off     v&s     e&m   p&s
 MIFL42A-SF01    w2-1    01*64    off     w3-1   01*64   off     d       n/a   n/a
 NY66-WDC18a     w2-1    01*64    off     w2-2   01*64   off     v&s     e&m   p&s










 SF01-HSTN4C     w3-1    02*64    off     w2-2   02*64   off     v&s     e&m   p&s



 Channel test is available from WAN XCON screen.  Press any key to continue . . .
 Save
```

Figure System-23. Message on CPU Xconnect Screen

Figure System-24 shows the WAN Xconnect screen for the voice circuit used in this example. Place the cursor over the selected circuit and press the "t" key to bring up the Test Screen shown in Figure System-25. This screen splits the circuit into two parts with your location as the midpoint. The first column of test parameters will apply to that portion of the circuit on WAN 2-1, timeslot 13. The second column of test parameters will apply to that portion of the circuit on WAN 2-2, timeslot 13.

Table System-4 lists the test parameters along with the possible and default values.

```
Node_1         | W1  CSU+CSU  8010  Rev A6-2  Ser 00101     | 12-31-99  14:33

TS   XCON   TS     CIRCUIT_ID    TS    XCON   TS     CIRCUIT_ID
 1   u2-1   A-01   user_circuit  13    w2-2   13     NY66-WDC18a
 2   u2-2   A-02   user_circuit  14
 3   u2-3   A-03   user_circuit  15
 4   u2-4   A-04   user_circuit  16
 5   u2-5   A-05   user_circuit  17
 6                               18
 7                               19    w3-1   5      MIFL42A-SF01
 8                               20
 9                               21
10   u2-6   A-06   user_circuit  22
11   u2-7   A-07   user_circuit  23
12   u2-8   A-08   user_circuit  24









Refresh | Test | Main
```

Figure System-24. Highlighted Circuit on WAN Xconnect Screen

```
Node_1         |                                            | 12-31-99  14:33

               w2-1 ts13                    w2-2 ts13
TX ABCD           mon                          mon
PATTERN           off                          off

MON Tx ABCD       0000                         0101
MON Rx ABCD       1111                         1111
CONVERSION        p&s                          p&s
TYPE              v&s                          v&s
WAN STATE         stdby                        stdby








mon    set

Refresh | Test | Main
```

Figure System-25. Test Screen and ABCD Bit Set Option

Table System-4. WAN Cross-Connect Test Screen Options

Parameter	User Options	Default
Tx ABCD	mon set	mon
PATTERN	off all 0 all 1 m_oos 1:1 1:7 lpbk 300Hz 1kHz 3kHz	off
MON Tx ABCD	information only - no user options	
MON Rx ABCD	information only - no user option	
CONVERSION	information only - no user option	
TYPE	information only - no user option	
WAN STATE	information only - no user option	

Tx ABCD

The Transmit ABCD bit parameter allows the user to observe the bit pattern being sent on the transmit side of the line (**mon**) or to set a different pattern for testing that portion of the circuit (**set**). Choosing set brings up a small four character window at the bottom of the screen and allows the user to type in a new pattern of ones and zeros. Figure System-26 shows a diagram of the process. When Tx ABCD for WAN 2-1 is set to **mon**, the WAN 2-1 column reflects the ABCD bits being sent out on WAN 2-1. This pattern should be identical to the Rx ABCD on WAN 2-2 (unless the conversion table is used). When Tx ABCD for WAN 2-1 is set to **set**, the user supplies a bit pattern of four 1s and 0s for the new ABCD bits. The Rx ABCD stream from WAN 2-2 is broken at circle #1, and the new pattern is inserted into the Tx ABCD stream. The same applies for **mon** and **set** for WAN 2-2. The bit stream will be broken at circle #2.

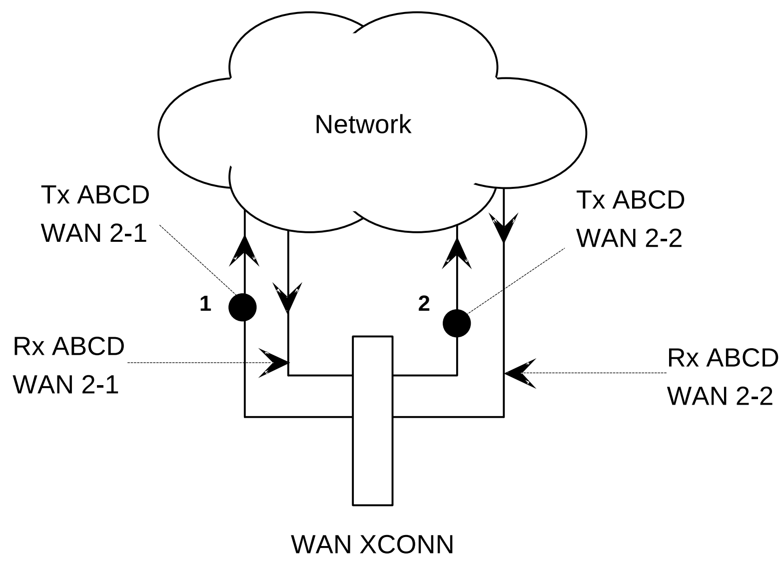


Figure System-26. Voice Test Diagram

PATTERN

The Pattern parameter allows the user to choose a test pattern to be transmitted as PCM data on the selected side of the circuit. The options are **off**, **all 0** (zeros), **all 1** (ones), **m_oos** (multiplexer out of synchronization), **1:1** (a one followed by a zero and then another one), **1:7** (a zero followed by a one and seven zeros, then another one), **lpbk** (loopback), **300 Hz** (300 Hz tone), **1kHz** (1000 Hz tone) and **3kHz** (3000 Hz tone). Since the Tx ABCD only changes signaling bits, this option allows the user to choose the test pattern. A different pattern can be sent on either side of the circuit.

MON Tx ABCD

The Monitor Transmit ABCD bit information field shows the bit pattern being transmitted on the outbound circuit. It can be changed by using the **set** command. *This parameter is for information only.*

MON Rx ABCD

The Monitor Receive ABCD bit information field allows the bit pattern being received on the inbound circuit. *This parameter is for information only, it is not changeable by the user.*

CONVERSION

The Conversion information field shows the user the conversion setting selected from the cross-connect screen. The possible values are **no** (no conversion), **sig** (signaling is converted, but not the PCM), **pcm** (PCM is converted, but not the signaling) and **p&s** (both signaling and PCM are converted). *This parameter is for information only, it is not changeable by the user on this screen.*

WAN STATE

The WAN State information field shows the current status of the port. The possible values are **stdby**, **actv**, **test** (the operator is actively controlling the circuit), **OOS** (the WAN port is Out of Service) and **CGA** (the WAN port assigned has a CGA alarm). *This parameter is for information only, it is not changeable by the user on this screen.*

Broadcast

One of the special features of WAN timeslot assignment in cross-connect systems is the ability to copy a data signal and send it to multiple locations without disturbing the original circuit. This feature is called Broadcast (**meaning multi-cast, not to be confused with broadcast quality video**).

An example of this feature would be a major company that transmits data lecture from the corporate headquarters in Denver to the sales office in San Francisco. Sales offices in Salt Lake City, Houston and Phoenix would like to be in the data lecture as well.

The master circuit (Denver to San Francisco) is a two-way circuit (i.e., both ends can send and receive data). The other ends of the broadcast circuits (the sales offices in Salt Lake City, Houston and Phoenix) can only receive the output of the Denver end of the master circuit (i.e., they will not be able to take part in the discussion in “real time”).

The following series of figures shows how the process works.

Figure System-27 shows the main cross-connect screen. In this example, T1 circuits connected at the Denver office go to San Francisco (w1-1), Houston (w1-2), Salt Lake City (w2-1) and Phoenix (w2-2). *This screen only shows the cross-connects made from WAN cards to WAN cards, not User cards to WAN cards.*

```
 DENVER01    | C1  CPU  XCON  8801  Rev  C01-0  Ser  00101  | 12-31-99
14:33

 page:    1  of  1

 CIRCUIT  ID  W/U    TS/B   TEST   W/U   TS/BW   TEST   TYPE   TC    CNV
                     W
 SF-SLC       w1-1   01*6   off    w2-   01*64   off    v      n/a   no
                     4             1
 HST-PHX      w1-2   01*6   off    w2-   01*64   off    v      n/a   no
                     4             2

 Add | uPdate | dElete | pgUp | pgDn | View all | Tads | Main
```

Figure System-27. Main Cross-Connect Screen

Broadcast circuits can be initiated, updated or deleted only from the broadcast screen.

To access the Broadcast option, press the "V" (View all) selection from the menu of options and the All Circuits screen (Figure System-28) is displayed. In addition to the WAN to WAN cross-connects, this screen also shows User card to WAN card timeslot assignments **for all WAN cards.**

Because this screen shows all WAN timeslots that are either assigned to user cards or cross-connected to other timeslots, it could be quite full.

```
 DENVER01     | C1 CPU  XCON  8801  Rev  C01-0  Ser  00101  | 12-31-99
14:33

 page:    1  of  1

 CIRCUIT  ID   W/U    TS/B   TES    W/U    TS/BW   TEST   TYPE   TC    CNV
                      W      T
 user_circui   w4-1   06*5   off    w1-    06*56   off    d      n/a   n/a
 t                    6             1
 user_circui   w4-2   06*5   off    w2-    06*56   off    d      n/a   n/a
 t                    6             2
 SF-SLC        w1-1   01*6   off    w2-    01*64   off    v      n/a   no
                      4             1
 HST-PHX       w1-2   01*6   off    w2-    01*64   off    v      n/a   no
                      4             2

 Bcast | uPdate | dElete | pgUp | pgDn | Main
```

Figure System-28. All Circuits Screen

In addition to the two WAN to WAN cross-connects shown in Figure System-28, an HSU circuit from slot u4-1 to the San Francisco T1 circuit on WAN 1-1 and an HSU circuit from slot u4-2 to Phoenix on WAN 2-2 are shown in Figure System-29.

To select the broadcast option, place the cursor over the User card circuit that will be copied (in this case, it will be the Denver end of the Denver to San Francisco link on WAN 1-1) and press the "**b**" (Broadcast) key from the menu of options. The screen shown in Figure System-29 will show the dynamics of the first copy of that circuit. Pressing the "**Enter**" key allows users to access and modify connection options.

```
 DENVER01    | C1  CPU  XCON  8801  Rev  C01-0  Ser  00101  | 12-31-99
14:33

 page:    1  of  1

 CIRCUIT  ID   W/U   TS/BW  TEST  W/U   TS/BW  TEST  TYPE  TC   CNV
 user_circui   w4-1  06*56  off   w1-1  06*56  off   d     n/a  n/a
 t
 user_circui   w4-2  06*56  off   w2-2  06*56  off   d     n/a  n/a
 t
 SF-SLC        w1-1  01*64  off   w2-1  01*64  off   v     n/a  no
 HST-PHX       w1-2  01*64  off   w2-2  01*64  off   v     n/a  no









 user_circui   w4-1  06*56  off   w1-1  00*56  off   b/d   n/a  no
 t

 Lecture

 Save
```

Figure System-29. Add Broadcast Screen

In this example, the broadcast circuit is labeled "Lecture" for easier identification later when the circuit will be disconnected.

Figure System-30 shows the selection of a second destination for the broadcast circuit. In this example, that destination is Salt Lake City, which is accessed through WAN w2-1. The timeslot selection is shown in Figure System-31. Selecting "**S**" (Save) from the Menu of Actions will save the parameters of the new circuit. Figure System-32 shows the new circuit. Note that the circuit type is "**b/d**" (broadcast/data).

Similar actions will duplicate this circuit for the other destinations. Figure System-33 shows the completed circuits.

To disconnect the circuits when the program is finished, highlight the circuit to be disconnected with the cursor and press the "**e**" key and the screen shown in Figure System-34 will appear. Selecting "**y**" will permanently delete the copied circuit while leaving the original circuit intact.

```
 DENVER01      | C1  CPU  XCON  8801  Rev  C01-0  Ser  00101  | 12-31-99
14:33

page:    1  of  1

CIRCUIT  ID   W/U    TS/BW  TEST  W/U    TS/BW  TEST   TYPE   TC    CNV
user_circuit  w4-1   06*56  off   w1-1   06*56  off    d      n/a   n/a
user_circuit  w4-2   06*56  off   w2-2   06*56  off    d      n/a   n/a
SF-SLC        w1-1   01*64  off   w2-1   01*64  off    v      n/a   no
HST-PHX       w1-2   01*64  off   w2-2   01*64  off    v      n/a   no







Lecture       w4-1   06*56  off    w1-1  06*56  off     b/d    n/a   no

w1-1   w1-2   w2-1   w2-2   w3-1  w3-2  w4-1   w4-2

Save
```

Figure System-30. "To" Destination Selection

```
 DENVER01      | C1  CPU  XCON  8801  Rev  C01-0  Ser  00101  | 12-31-99
14:33

page:    1  of  1

CIRCUIT  ID     W/U     TS/BW   TEST   W/U    TS/BW   TEST   TYP   TC    CNV
                                                             E
user_circuit    w4-1    06*56   off    w1-1   06*56   off    d     n/a   n/a
user_circuit    w4-2    06*56   off    w2-2   06*56   off    d     n/a   n/a
SF-SLC          w1-1    01*64   off    w2-1   01*64   off    v     n/a   no
HST-PHX         w1-2    01*64   off    w2-2   01*64   off    v     n/a   no







Lecture         w4-1    06x56   off    w2-1   01x64   off    b/d   n/a   no
                  1 1 1 1 1 1 1 1 1 1 2 2 2 2 2
1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4
              x x x x x x

Save
```

Figure System-31. Timeslot Selection

```
DENVER01      | C1  CPU  XCON  8801  Rev  C01-0  Ser  00101  | 12-31-99  14:33

page:    1  of  1

CIRCUIT  ID   W/U    TS/BW   TEST   W/U    TS/BW   TEST   TYPE   TC    CNV
user_circuit  w4-1   06*56   off    w1-1   06*56   off    d      n/a   n/a
user_circuit  w4-2   06*56   off    w2-2   06*56   off    d      n/a   n/a
SF-SLC        w1-1   01*64   off    w2-1   01*64   off    v      n/a   no
HST-PHX       w1-2   01*64   off    w2-2   01*64   off    v      n/a   no
Lecture       w4-1   06*56   off    w2-1   06*56   off    b/d    n/a   no

Bcast | uPdate | dElete | pgUp | pgDn | Main
```

Figure System-32. Completed Broadcast Circuit

```
DENVER01      | C1  CPU  XCON  8801  Rev  C01-0  Ser  00101  | 12-31-99  14:33

page:    1  of  1

CIRCUIT  ID   W/U    TS/BW   TEST   W/U    TS/BW   TEST   TYPE   TC    CNV
user_circuit  w4-1   06*56   off    w1-1   06*56   off    d      n/a   n/a
user_circuit  w4-2   06*56   off    w2-2   06*56   off    d      n/a   n/a
SF-SLC        w1-1   01*64   off    w2-1   01*64   off    v      n/a   no
HST-PHX       w1-2   01*64   off    w2-2   01*64   off    v      n/a   no
Lecture       w4-1   06*56   off    w2-1   06*56   off    b/d    n/a   no
Lecture       w4-1   06*56   off    w1-2   06*56   off    b/d    n/a   no
Lecture       w4-1   06*56   off    w2-2   06*56   off    b/d    n/a   no

Bcast | uPdate | dElete | pgUp | pgDn | Main
```

Figure System-33. Three Broadcast Circuits

```
 DENVER01      | C1  CPU  XCON  8801  Rev  C01-0  Ser  00101  | 12-31-99  14:33

 page:    1  of  1

 CIRCUIT  ID   W/U    TS/BW   TEST   W/U    TS/BW   TEST   TYPE   TC    CNV
 user_circuit  w4-1   06*56   off    w1-1   06*56   off    d      n/a   n/a
 user_circuit  w4-2   06*56   off    w2-2   06*56   off    d      n/a   n/a
 SF-SLC        w1-1   01*64   off    w2-1   01*64   off    v      n/a   no
 HST-PHX       w1-2   01*64   off    w2-2   01*64   off    v      n/a   no
 Lecture       w4-1   06*56   off    w2-1   06*56   off    b/d    n/a   no
 Lecture       w4-1   06*56   off    w1-2   06*56   off    b/d    n/a   no
 Lecture       w4-1   06*56   off    w2-2   06*56   off    b/d    n/a   no







 Delete Selected Circuit (y/n)?
 Bcast | uPdate | dElete | pgUp | pgDn | Main
```

Figure System-34. Delete Broadcast Circuit

WAN Link to WAN Link

Circuits from a WAN link to a WAN link can also be duplicated from the broadcast screen. The same procedure is used to establish multiple connections for WAN to WAN circuits.

Back in Figure System-30, highlighting the WAN link circuit on slot w1-1 will allow you to cross-connect duplicate information to any other WAN link needed.

Menu of Actions

Table System-5 shows the Menu of Actions for the Broadcast screen.

Table System-5. Menu of Actions

Action	Function
Bcast	Bcast allows you to program additional broadcast cross-connects in the system. If mistakes are made during the add process, pressing the up arrow or down arrow key will terminate this operation.
u**P**date	The uPdate action is initiated by pressing the "p" key. With this command, you can change any of the parameters of a broadcast connection. Use the arrow keys to highlight the area to be changed and close the transaction using the "s" (Save) command.
d**E**lete	The dElete action is initiated by pressing the "e" key. Use this command to delete existing broadcast connections. As shown in Figure System-34 earlier, the system will prompt you to delete the circuit, and the "y" key must be pressed to complete the transaction.
pg**U**p	The pgUp (Page Up) action is initiated by pressing the "u" key. Since the system can handle many different circuits, you may fill the screen allotment for data. New pages will be added automatically to accommodate additional circuits. The page count feature at the top of the screen shows you the current page and the total amount of pages of information. Use this command to scroll up through the pages of cross-connect information.
pg**D**n	The pgDn (Page Down) action is initiated by pressing the "d" key. This action is similar to the pgUp command. Use this command to scroll down through the pages of cross-connect information.
Main	Pressing "m" (Main) will return you to the cross-connect screen.

Test Access Digroups (TADS)

The Test Access Digroups (TADS) is a remote test access for data cross connects that pass through the system according to publication TR-TSY-000343, Issue #1, June 1986.

A test center can access the system and assign a non-intrusive testing circuit between the unit and the test center via another WAN link. For the purposes of this discussion on Test Access Digroups, the figures show a 64kbps data circuit between Fremont, CA. and Jacksonville, FL. Figure System-35 shows the cross-connect screen with the data circuits connected.

```
Node_1       | C1 10161 CPU XCON COM 407535038 Ser 00101  | 12-31-99
14:33

page:    1  of  1

CIRCUIT ID    FACILITY      TEST    EQUIPMENT    TEST   TYPE   TC     CNV
Jacksonville  w1-1  01*64   off    w1-2   01*64  off    d      moos   n/a

moNitor | spLit | Release | Tla | pgUp | pgDn | Main
```

Figure System-35. The TADS Screen

In Figure System-35, the data circuit called "Jacksonville" is connected on a single time slot between WAN1-1 and W1-2.

Monitor Circuit

With the monitor circuit, the data test center (by remote access) creates a "hitless" monitor connection (i.e., one that can be created, maintained and dropped without affecting the information on the circuit being tested) between the data test center and the Node_1 Device.

Highlighting the desired circuit and pressing the "N" key, brings up the add monitor circuit screen shown in Figure System-36.

```
Node_1        | C1 10161 CPU XCON COM 407535038 Ser 00101  | 12-31-99
14:33

page:    1  of  1

CIRCUIT ID     FACILITY      TEST    EQUIPMENT    TEST   TYPE   TC     CNV
Jacksonville   w1-1   01*64  off    w1-2   01*64  off    d      moos   n/a



new_circuit    w1-1   00*64  off    w1-1   00*64  off    m/d    moos   n/a

moNitor | spLit | Release | Tla | pgUp | pgDn | Main
```

Figure System-36. The Add Monitor Circuit Screen

Cross connect information is added in a similar fashion to the Add Broadcast screen mentioned in the last section. Figure System-37 shows the completed monitor circuit.

```
Node_1      | C1 10161 CPU XCON COM 407535038 Ser 00101  | 12-31-99  14:33

page:    1  of  1

CIRCUIT ID    FACILITY      TEST    EQUIPMENT   TEST   TYPE   TC     CNV
Jacksonvill   w1-1   01*64  mon    w1-2   01*64  off    d      moos   n/a
e
monitor ckt   w1-1   01*64  off    w2-1   01*64  off    m/d    moos   n/a
monitor ckt   w1-2   01*64  off    w2-1   01*64  off    m/d    moos   n/a

moNitor | spLit | Release | Tla | pgUp | pgDn | Main
```

Figure System-37. Completed Monitor Circuit

Figure System-38 shows a diagram of how the Monitor circuit splits the original cross connect circuit for testing.

Notice how the test circuit uses two 64kbps WAN timeslots, one for the transmit side and one for the receive side of the line.

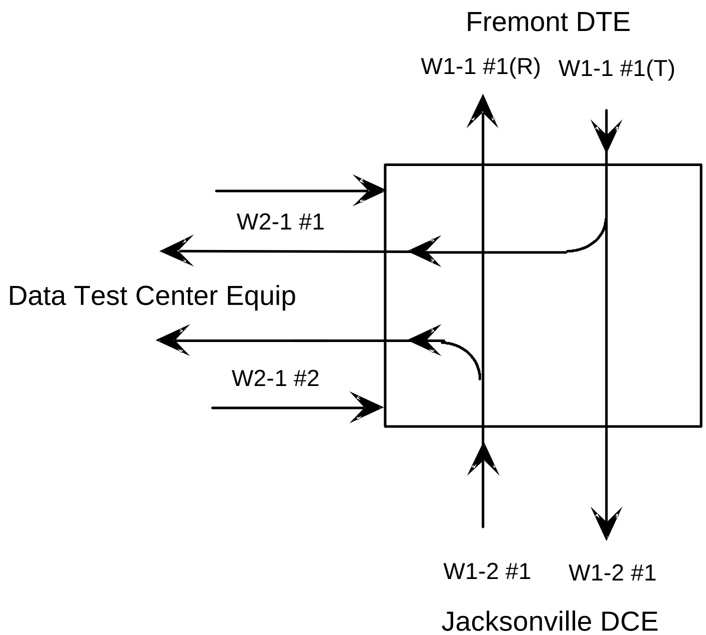


Figure System-38. Monitor Circuit Diagram

Split Circuit

Pressing the "L" command from the Menu of Actions allows you to split the circuit through the data test center equipment. New circuit information is added in the same way as with the monitor circuit.

With the Split Circuit, the data test center splits the circuit and connects it to their equipment. Unlike the Monitor test circuit, the Split test circuit is intrussive and all transmit and receive data must pass through the equipment at the data test center.

Figure System-39 shows the TADS screen with a split circuit completed. It uses two 64kbps timeslots (like the Monitor circuit). Figure System-40 shows a diagram of the split test circuit.

```
Node_1       | C1 10161 CPU XCON COM 407535038 Ser 00101  | 12-31-99
14:33

page:    1  of  1

CIRCUIT ID    FACILITY       TEST    EQUIPMENT   TEST   TYPE   TC    CNV
Jacksonvill   w1-1   01*64  spl   w1-2   01*64  off    d      moos  n/a
e
split ckt     w1-1   01*64  off   w2-1   01*64  off    s/d    moos  n/a
split ckt     w1-2   01*64  off   w2-1   01*64  off    s/d    moos  n/a

moNitor | spLit | Release | Tla | pgUp | pgDn | Main
```

Figure System-39. TADS Screen with Split Circuits

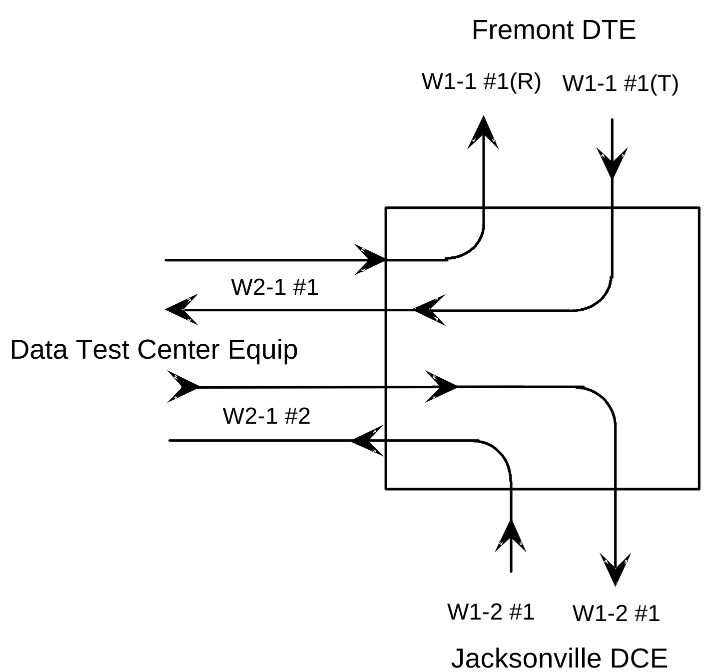


Figure System-40. Split Circuit Diagram

Release

Pressing the "R" command from the Menu of Actions allows you to release the circuit from the data test center equipment. The system will verify the action desired with a yes/no question.

With the Release Circuit, the Data Test Center removes the connection between the circuit being tested and restores the circuit to its preaccessed state.

Figure System-41 show the TADS screen with the release verification.

```
Node_1        | C1 10161 CPU XCON COM 407535038 Ser 00101  | 12-31-99
14:33

page:    1  of  1

CIRCUIT ID    FACILITY      TEST   EQUIPMENT    TEST   TYPE   TC    CNV
Jacksonvill   w1-1  01*64  spl   w1-2   01*64  off    d      moos  n/a
e
split ckt     w1-1  01*64  off   w2-1   01*64  off    s/d    moos  n/a
split ckt     w1-2  01*64  off   w2-1   01*64  off    s/d    moos  n/a



Restore Selected Circuit (y/n)?
moNitor | spLit | Release | Tla | pgUp | pgDn | Main
```

Figure System-41. TADS Restore Circuit Screen

Terminate and Leave Access

The Terminate and Leave Access (TLA) circuit gives the data test center the capability to terminate one or both directions of transmission on a circuit by inserting an unassigned channel code (01111111) in the outgoing transmission path(s). The TLA feature is useful in circuit provisioning to turn circuits up and down remotely, and in testing multipoint circuits to isolate and remove noisy bridge legs from service.

Figure System-42 shows the TLA screen with the choice of Monitor (**mon**) or Unassigned Channel Code (**uca**) to be applied to the highlighted circuit. (If TLA had been applied to a Split circuit, the choices would have been **spl** or **uca**.)

```
Node_1         | C1 10161 CPU XCON COM 407535038 Ser 00101  | 12-31-99
14:33

page:    1  of  1

CIRCUIT ID    FACILITY      TEST    EQUIPMENT   TEST   TYPE   TC     CNV
Jacksonville  w1-1   01*64  mon    w1-2   01*64  off    d      moos   n/a
monitor ckt   w1-1   01*64  off    w2-1   01*64  off    m/d    moos   n/a
monitor ckt   w1-2   01*64  off    w2-1   01*64  off    m/d    moos   n/a









Jacksonville  w1-1   01*64  mon    w1-2   01*64  off    d      moos   n/a

mon    uac

moNitor | spLit | Release | Tla | pgUp | pgDn | Main
```

Figure System-42. TLA Circuit State Screen

Menu of Actions

Table System-6 shows the Menu of Actions for the TADS screen.

Table System-6. Menu of Actions

Action	Funtion
mo**N**itor	The Monitor command allows the user to create a monitor circuit at the WAN interface. See section above.
sp**L**it	The Monitor command allows the user to create a split circuit at the WAN interface. See section above.
Release	The Release command allows the user to release and restore a split circuit or a monitor circuit. See section above.
Tla	The Terminate and Leave Access (TLA) command is the capability to terminate one or both directions of transmission on a circuit. See section above.
pg**U**p	The pgUp) action is initiated by pressing the "u" key. Since the system can handle many different TADS circuits, you may fill the screen allotment for data. New pages will be added automatically to accommodate additional circuits. Use this command to scroll up through the pages of TADS information.
pg**D**n	The pgDn (Page Down) action is initiated by pressing the "d" key. This action is similar to the pgUp command. Use this command to scroll down through the pages of cross-connect information.
Main	Pressing "m" (Main) will return you to the cross-connect screen.

Signaling and Companding Conversion in Bus-Connect Systems

User card ports may or may not have a signaling mode applied to them when assigned to a timeslot. Typically, analog voice cards (i.e., E&M, FXO, FXS) will have their analog signaling information converted to digital signaling bits which are then inserted into the digital bitstream. Data card circuits (i.e., HSU, SRU, etc.), on the other hand, do not require the system to perform any signaling processing or conversion.

Unlike DS0s terminating on voice or data cards in the system that will have controlled signaling parameters, circuits that "pass through" your system must have signaling assigned to them by the user. This ensures that the WAN cards either maintain existing signaling patterns as in T1-T1 circuits or change and convert them for circuits going from a T1 to an E1 environment.

In Figure System-43, timeslots 1-8 and 13-18 are connected to user cards and therefore will have signaling automatically turned off or on by the system depending on the type of user ports that are assigned to them. Of the pass-through connections on the other timeslots, you can either select signaling or no signaling depending the type of equipment or channel facility on which it is ultimately terminated. For voice circuits, you would probably want to enable signaling, and for data equipment, you would probably want to disable signaling (the default). Further, this screen allows you to request that signaling conversion and/or companding conversion be performed on pass-through circuits.

```
 Node_1          |    W1   CSU+CSU    8010    Rev  A6-2    Ser  00101    |  12-31-99  14:33

 TS   XCONNECT        BW                   TS   XCONNECT          BW         CNV
 CNV
  1   u2-1    voice   64k    sig           13   u5-1     data     06x56k
  2   u2-2    voice   64k    sig           14   u5-1     data     06x56k
  3   u2-3    voice   64k    sig           15   u5-1     data     06x56k
  4   u2-4    voice   64k    sig           16   u5-1     data     06x56k
  5   u2-5    voice   64k    sig           17   u5-1     data     06x56k
  6   u2-6    voice   64k    sig           18   u5-1     data     06x56k
  7   u2-7    voice   64k    sig           19   w1-2     ts-19    64k        no
  8   u2-8    voice   64k    sig           20   w1-2     ts-20    64k        no
  9   u1-2    ts-9    64k           no     21   w1-2     ts-21    64k        no
 10   u1-2    ts-10   64k           no     22   w1-2     ts-22    64k        no
 11   u1-2    ts-11   64k           no     23   w1-2     ts-23    64k        no
 12   u1-2    ts-12   64k           no     24   w1-2     ts-24    64k        no

 Save |  Undo |  Refresh  |  sIgnaling  |  Main
```

Figure System-43. WAN Cross-Connect Screen

To change the signaling and/or companding options of a voice circuit on a WAN card using the drop-and-insert mode, place the cursor over the timeslot you wish to change and select I (sIgnaling) from the Menu of Actions. Table System-7 shows the matrix of choices for the handling of signaling, signaling conversion and companding conversion.

Table System-7. Signaling and Companding Options

Select Signaling	Select PCM CONV	Select SIG CONV	Select SIG TYPE
yes	none, A-mu, mu-A	none	(no choice)
		ANSI-CCITT, CCITT-ANSI, ABCD-ABAB, ABCD-AB01	e&m, fxs, plar, fxo
no	none, A-mu, mu-A	(no choice)	(no choice)

The first option is Select Signaling. The choices are either **yes** or **no**, depending upon the type of circuit passed through the system (voice or data). *Whichever choice is made, the system will then prompt you to select PCM companding conversion.* The choices for Select PCM CONV are **none**, **A-mu** (A-Law to Mu-Law, E1 to T1 conversion) and **mu-A** (Mu-Law to A-Law, T1 to E1 conversion).

On a normal data service, you would probably choose **no** and **none**. A voice circuit on a T1-T1 "pass through" might require signaling enabled but not converted, so the choices would be **yes** (to pass voice signaling through), and **none** (the PCM does not have to be converted), and **none** (the signaling does not have to be converted).

If, for instance, you have an international voice circuit passed through your system to a North American T1 circuit, you would probably need to have both signaling and PCM conversion converted. Choosing **yes** for Select Signaling will bring up your Select PCM CONV options, followed by a prompt to select the signaling conversion for this circuit.

The first option is default signaling conversion (**none**) where a bit pattern of "0000" will automatically be converted to "0001" in the T1 to CEPT direction.

The second option (**ANSI-CCITT**) will convert the incoming ANSI signaling to CCITT signaling. The third option (**CCITT-ANSI**) converts the incoming CCITT signaling to ANSI signaling. These two options are complementary (i.e. if either one is selected in one direction, the other is automatically selected for the reverse direction).

The fourth option (**ABCD-ABAB**) will convert the incoming CEPT signaling to T1 signaling for an ESF or D4 cross-connect. The fifth option (**ABCD-AB01**) will convert the incoming T1 signaling to CEPT signaling for a ESF or D4 cross-connect. These two options are complementary (i.e. if either one is selected in one direction, the other is automatically selected for the reverse direction).

If signaling conversion is enabled for that circuit, you will then be asked to Select SIG TYPE. The choices are **e&m**, **fxs**, **plar** and **fxo**. After this final choice, the screen updates the signaling and conversion information on that circuit.

Figure System-44 shows the WAN card cross-connect screen for a bus-connect system. Timeslots 19-24 show all of the possible choices for pass through circuits. The values are **no** (signaling is not passed through and neither PCM nor SIG are converted), **pcm** (signaling is not passed through, PCM is converted, SIG is not converted), **sig-no** (signaling is passed through and there is no PCM or SIG conversion), **sig-sig** (signaling is passed through, PCM is not converted, SIG is converted), **sig-pcm** (signaling is passed through, PCM is converted, SIG is not converted) and **sig-p&s** (signaling is passed through, both PCM and SIG are converted).

```
Node_1            |    W1   CSU+CSU    8010    Rev  A6-2    Ser  00101    |  12-31-99  14:33

TS   XCONNECT      BW                     TS   XCONNECT       BW              CNV
CNV
 1   u2-1   voice  64k   sig              13   u5-1   data    06x56k
 2   u2-2   voice  64k   sig              14   u5-1   data    06x56k
 3   u2-3   voice  64k   sig              15   u5-1   data    06x56k
 4   u2-4   voice  64k   sig              16   u5-1   data    06x56k
 5   u2-5   voice  64k   sig              17   u5-1   data    06x56k
 6   u2-6   voice  64k   sig              18   u5-1   data    06x56k
 7   u2-7   voice  64k   sig              19   w1-2   ts-19   64k             no
 8   u2-8   voice  64k   sig              20   w1-2   ts-20   64k             pcm
 9   u1-2   ts-9   64k               no   21   w1-2   ts-21   64k             no
10   u1-2   ts-10  64k               no   22   w1-2   ts-22   64k             sig
11   u1-2   ts-11  64k               no   23   w1-2   ts-23   64k             pcm
12   u1-2   ts-12  64k               no   24   w1-2   ts-24   64k             p&s

Save |  Undo |  Refresh  |  sIgnaling  |  Main
```

Figure System-44. Signaling and Companding Options

Checking the Timeslot Map

Once the timeslots are selected and assigned, the list of all DS0 connections (the timeslot map) can be viewed through the WAN card Xconnect screen for both bus-connect and cross-connect systems. (In the bus-connect version, changes of signaling status [trunk conditioning] can also be done from this screen [see previous section]).

You can see the results of your assignment selections by checking the timeslot map as follows:

1. From the Main Screen, select the WAN card in slot W-1.

2. Type <**x**> to bring up the timeslot screen (see Figure System-45).

3. Selecting <**m**> for Main will return you to the WAN card screen.

4. Selecting <**m**> for Main again will return you to the Main screen.

```
Node_1            | W1  CSU+CSU  8010  Rev A6-2  Ser 00101      | 12-31-99
14:33

TS   XCON  TS      CIRCUIT ID    TS    XCON  TS      CIRCUIT ID
 1   u2-1  D-01                  13
     user_circuit
 2   u2-1  D-02                  14
     user_circuit
 3   u2-1  D-03                  15
     user_circuit
 4   u2-1  D-04                  16
     user_circuit
 5   u2-1  D-05                  17
     user_circuit
 6   u2-1  D-06                  18
     user_circuit
 7   u2-1  D-07                  19    u2-1  A-01    user_circuit
     user_circuit
 8                               20    u2-1  A-02    user_circuit
 9                               21    u2-1  A-03    user_circuit
10                               22    u2-1  A-04    user_circuit
11                               23    u2-1  A-05    user_circuit
12                               24    u2-1  A-06    user_circuit

Save | Undo | Refresh | Main
```

Figure System-45. Timeslot Screen in T1 Operation

Figure System-46 shows the same example displayed on a bus-connect system using E1 connections in **d-i** mode. **(Timeslot #16 will not be available for assignment on either the HSU table or the voice card timeslots.)** Like T1 operation in **d-i** mode, unspecified timeslots are **automatically** assigned to corresponding slots on the other WAN port on the same card.

DACOM Timeslot Renumbering

The WAN Card timeslot selection screen shown above can be modified for DACOM format. The timeslot data will be translated into DACOM format using a new assigned vendor code. This will allow the renumbering of timeslots so they will be displayed into Korean format.

If Vendor Code indicates DACOM, then renumbered timeslots will be displayed using the Korean format. Timeslots 1 through 15 will be unchanged. Timeslots 17 through 31 will be renumbered as 16 through 30, and timeslot 16 will be renumbered as 31.

Note: ONLY use this option to reassign the timeslots on the WAN Card to DACOM. Otherwise, DO NOT change your vendor code.

```
Node_1          | W1  CEPT+CEPT  8010  Rev A6-2  Ser 00101   | 12-31-99
14:33

TS   XCON   TS     CIRCUIT_ID    TS    XCON   TS     CIRCUIT_ID
 0   frame align   64k           16    cas           64k
 1   U5-1   A-01   user_circuit  17    U7-1   A-17   user_circuit
 2   U5-2   A-02   user_circuit  18    U7-2   A-18   user_circuit
 3   U5-3   A-03   user_circuit  19    U7-3   A-19   user_circuit
 4   U5-4   A-04   user_circuit  20    U7-4   A-20   user_circuit
 5   U5-5   A-05   user_circuit  21    U7-5   A-21   user_circuit
 6   U5-6   A-06   user_circuit  22    U7-6   A-22   user_circuit
 7   U5-7   A-07   user_circuit  23    U7-7   A-23   user_circuit
 8   U5-8   A-08   user_circuit  24    U7-8   A-24   user_circuit
 9   U6-1   A-09   user_circuit  25    U8-1   A-25   user_circuit
10   U6-2   A-10   user_circuit  26    U8-2   A-26   user_circuit
11   U6-3   A-11   user_circuit  27    U8-3   A-27   user_circuit
12   U6-4   A-12   user_circuit  28    U8-4   A-28   user_circuit
13   U6-5   A-13   user_circuit  29    U8-5   A-29   user_circuit
14   U6-6   A-14   user_circuit  30    U8-6   A-30   user_circuit
15   U6-7   A-15   user_circuit  31    U8-7   A-31   user_circuit

Refresh | Test | Main
```

Figure System-46. Timeslot Screen in E1 Operation

Recording the Configuration on Paper

After you set up your initial system configuration and define your timeslot map, take the time to record this information on paper. Recording the initial configuration in a logical manner will pay for itself if you have a problem later.

Record the information in any way that makes sense to you and your colleagues. Whatever your approach, it is suggested that you also note the initial settings for each card in copies of the T1 or E1 operation tables provided as Tables System-8 and -9. Store all the initial configuration information in a safe place where anyone needing to service the system can easily find it.

Table System-8. Timeslot Recording Form (T1 Operation)

WAN Port # _______ - _______

TS Number	Card Type	Port Number
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		

Table System-9. Timeslot Recording Form (E1 Operation)

WAN Port # _______ - _______

TS Number	Card Type	Port Number
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		

Introduction

The system can be configured with redundant features that will switch operations from failed critical components to "backup" replacements with the minimum loss of service possible in the event of equipment failure.

The four areas of redundant operations are the power system (load share), the CPU card, the WAN card and the ADPCM network.

Power System

Each of the power supply components is designed to switch to alternative units (if available) in the event the primary unit fails. Additionally, the defective unit will create a system alarm upon failure to alert the operator of the condition so that suitable diagnostic and repair work may be initiated. The units covered by these redundancy parameters are:

- 8901 AC Power Supply
- 8902 DC Power Supply
- 8906 Ringing Generator (Master only, see below)
- 8907 DC Power Supply

Upon failure, the LED on the 8903 or 8905 AC to DC Power Converter will be turned off but **will not generate a system alarm** (unless the system is equipped with the 8902 External Alarm card).

If the "Master" 8906 Ringing Generator fails, an alarm will be generated and the LED will turn off. If a "slave" Ringing Generator fails, the LED will turn off but no alarm will be generated by the system.

Figure RDNT-1 shows the main screen of a cross-connect system in which Power Supply #1 (PS1) has failed. The Power Supply failure is noted in the alarm message in the top right hand corner of the screen.

```
Node_1           |                                      |   12-31-99   14:33

Slot     Installed     Status     Slot     Installed     Status     PS1
                                                                    OOS
C1       CPU  XCON                IF       INTF+modem
C2       CPU  XCON     RDNT       U1       ALR
P1       ADPCM-64                 U2       E&M  4Wx8-6
P2       ADPCM-64                 U3       FXS  2Wx8-9
P3       ADPCM-64                 U4       FXO  2Wx8-9
W1       CSU+CSU                  U5       HSU  366x2
W2       CSU+CSU                  U6       OCU-DPx5
W3       CEPT+CEPT                U7       FRAD-18
W4       CEPT+CEPT                U8       SRU-232x10
F1       PS1           OOS        RI       RINGER
F2       PS2

Alarms | Config | Del | accepT | Xcon | sYs | Logout | Oos | cpusWtch
```

Figure RDNT-1. Redundant Power Systems (Two-Sided Chassis)

CPU Card

CPU Card redundancy is valuable to the user because of the criticality of the CPU card to the operation of the entire system. CPU redundancy is supported in both cross-connect and enhanced bus-connect units using two 8801 or 8804 models respectively. A CPU card installed in slot C2 will become the redundant mate of the one in slot C1, **if they are both of the same type.**

Switching from one CPU card to the other is triggered by any one of the following conditions:

- A software command issued by the operator
- Removal of the active CPU card
- Failure or malfunction of the active CPU card

During a CPU redundancy switch over, disruptions to voice and data traffic are momentary and traffic will recover automatically.

Figure RDNT-2 shows the Main screen of a cross-connect system. The CPU in slot C1 is active and the CPU in slot C2 is the redundant mate. When the command "cpusWtch" is selected from the Menu of Actions, the system will prompt the user with the yes/no question.

Figure RDNT-3 shows the same screen after the switch. The CPU card in slot C1 now shows redundant and the CPU in slot C2 now shows as the active mate. *Note: This switch is intrusive and will cause an outage.*

```
Node_1                    |                                          |  12-31-99   14:33

                    Slot        Installed       Status
                    C1          CPU  RCON
                    C2          CPU  RCON       RDNT
                    P1/U1       E&M  4Wx8-6
                    P2/U2       FXS  2Wx8-9
                    P3/U3       FXO  2Wx8-9
                    P4/U4       HSU  366x2
                    W1/U5       CSU+CSU
                    W2/U6       CSU+CSU
                    W3/U7       CEPT+CEPT
                    W4/U8       CEPT+CEPT
                    IF          INTF+modem
                    S1          PS1
                    S2          PS2
                    RI          RINGER


OK  to  switch  to  redundant  CPU  (y/n)?
Alarms | Config | Del | accepT | Xcon | sYs | Logout | Oos | cpusWtch
```

Figure RDNT-2. Redundant CPU Cards (Front-Loading Chassis)

```
Node_1                    |                                          |  12-31-99   14:33

                    Slot        Installed       Status
                    C1          CPU  RCON       RDNT
                    C2          CPU  RCON
                    P1/U1       E&M  4Wx8-6
                    P2/U2       FXS  2Wx8-9
                    P3/U3       FXO  2Wx8-9
                    P4/U4       HSU  366x2
                    W1/U5       CSU+CSU
                    W2/U6       CSU+CSU
                    W3/U7       CEPT+CEPT
                    W4/U8       CEPT+CEPT
                    IF          INTF+modem
                    S1          PS1
                    S2          PS2
                    RI          RINGER


Alarms | Config | Del | accepT | Xcon | sYs | Logout | Oos | cpusWtch
```

Figure RDNT-3. CPU Switchover (Front-Loading Chassis)

WAN Card

T1 and E1 WAN redundancy is supported in enhanced bus-connect systems (Model 8804 CPU) and in cross-connect systems (Model 8801 CPU). It is not supported in the standard bus-connect systems (Model 8800 CPU).

In both cases, the user may define in software, one or more events that can trigger a WAN redundancy switchover from among the following options:

- A software command issued by the operator
- The removal of the active WAN port or card
- The failure or malfunction (OOS) of the active WAN port or card
- CGA alarm declaration on the active WAN port or card

During a WAN redundancy switchover, disruptions to voice and data traffic are momentary and traffic will recover automatically.

Enhanced Bus-Connect WAN Redundancy

In enhanced bus-connect systems, a single or dual WAN card that is installed in slot W2 automatically becomes the redundant mate of the WAN card in slot W1. Similarly, a WAN card in slot W4 automatically becomes the redundant mate of the WAN card in slot W3. This is known as 1x1 redundancy and a "Y-adapter" (Model 1239) is required to bring the outputs of each pair of WAN ports onto the same facility. The "master" WAN card and its redundant mate must be equipped with the same mix of DSX, CSU or CEPT modules and those must be placed in the same positions on both cards. If an incompatible WAN card is installed in a redundant slot, then the system will "reject" that card. If a Dual WAN is used in "terminate" mode, only the failed WAN port will switch to its redundant mate. If the Dual WAN card is programmed for "drop and insert" mode, both ports will switch even if only one has failed.

Figure RDNT-4 shows the Main screen (status screen selected) of the enhanced bus-connect system. In this example, the two ports on WAN-1 are paired with the two ports on WAN-2, while the two ports on WAN-3 are paired with the two ports on WAN-4.

Figure RDNT-5 shows the main WAN card screen for the card in slot W3 with port 1 selected. The software command "sWitch" is selected from the choices in the Menu of Actions and the system delivers the prompt shown in the same figure. Pressing "y" will complete the transaction and the traffic on WAN port 3-1 will be switched to WAN port 4-1. The main screen (Figure RDNT-6) now shows WAN port 4-1 as the active port and WAN port 3-1 as the redundant port.

Note: There are no internal test functions available for WAN #3 or #4.

```
Node_1              |                                                     |      12-31-99
14:33

Slot       Installed        Status        Slot        Installed      Status
C1         CPU  RCON                      IF          INTF+modem
C2                                        U1          ALR            s s s s
P1                                        U2          E&M  4Wx8-6    s s s s s s s
                                                                     s
P2                                        U3          FXS  2Wx8-9    s s s s s s s
                                                                     s
P3                                        U4          FXO  2Wx8-9    s s s s s s s
                                                                     s
W1         CSU+CSU          a a           U5          HSU  366x2     s s
W2         CSU+CSU          r r           U6          HSU  366x2     s s
W3         CEPT+CEPT        a a           U7          HSU  366x2     s s
W4         CEPT+CEPT        r r           U8          OCU-DPx5       s s s s s
F1         PS1                            RI          RINGER
F2         PS2

Alarms | Config | Del | accepT | Xcon | sYs | Logout | Oos | cpusWtch
```

Figure RDNT-4. RCON WAN Cards (Two-Sided Chassis)

```
Node_1              |                                                     |      12-31-99
14:33

                             CSU                                       CSU
STATE                        actv             STATE                    actv
MODE                         term             MODE                     term
FORMAT                       esf              FORMAT                   esf
LINE  CODE                   b8zs             LINE  CODE               b8zs
PULSE                        n/a              PULSE                    n/a
LINE  LEN                    0                LINE  LEN                0
SLIP  LIM                    126              SLIP  LIM                126
AIS                          none             AIS                      none
LINE  LB                     off              LINE  LB                 off
LOCAL  LB                    off              LOCAL  LB                off
CH  LB                       off              CH  LB                   off
LB  ADDR                     01               LB  ADDR                 01
LB  DET                      w/to             LB  DET                  w/to
ESF/NMS  RP                  at&t             ESF/NMS  RP              at&t
EER  THRHD                   10e-4            EER  THRHD               10e-4
RDNT  RULES                  none             RDNT  RULES              none

OK  to  switch  to  the  redundant  WAN  (y/n)?

Save | Undo | Refresh | Xcon | Perf | Test | sWitch | Main
```

Figure RDNT-5. RCON WAN Card Switchover

```
 Node_1                   |                                                 |      12-31-99
14:33

 Slot        Installed       Status       Slot        Installed     Status
 C1          CPU  RCON                    IF          INTF+modem
 C2                                       U1          ALR            s s s s
 P1                                       U2          E&M  4Wx8-6    s s s s s s s
                                                                     s
 P2                                       U3          FXS  2Wx8-9    s s s s s s s
                                                                     s
 P3                                       U4          FXO  2Wx8-9    s s s s s s s
                                                                     s
 W1          CSU+CSU         r a          U5          HSU  366x2     s s
 W2          CSU+CSU         a r          U6          HSU  366x2     s s
 W3          CEPT+CEPT       r r          U7          HSU  366x2     s s
 W4          CEPT+CEPT       a a          U8          OCU-DPx5       s s s s s
 F1          PS1                          RI          RINGER
 F2          PS2

 Alarms | Config | Del | accepT | Xcon | sYs | Logout | Oos | cpusWtch
```

Figure RDNT-6. RCON WAN Cards (Two-Sided Chassis)

Cross-Connect WAN Redundancy

In cross-connect systems, WAN redundancy requires the installation of a Dual WAN card with Relays (Model 8014) in slot W4. That WAN card with Relays acts as the redundant card for the WAN cards installed in slots W1 through W3 provided it is equipped with matching DSX, CSU or CEPT plug-in modules and that the plug-in modules are installed in the correct positions. This is known as 1xN redundancy and, following a redundancy switchover, the relay module on the 8014 switches the output of the redundant WAN card to the correct pins on the WAN connector of the Interface card. Note that if a Model 8014 Dual WAN card with Relays is installed in slots W1, W2 or W3, then it will function as a standard Dual WAN card. **Also, if the plug-ins of a Model 8014 installed in slot W4 do not match those of a WAN card in slot W1, W2 or W3, then it cannot act as that card's redundant mate.** Even though the system will not reject the card, it will simply not switch even if the active WAN card fails. Finally, if a standard WAN card is installed in slot W4, then WAN redundancy cannot be supported by the system. **In cross-connect systems redundancy switchovers occur on a WAN card (not port) basis and the whole card must match the redundant card in slot W4 for the switchover to occur.** ***Note:*** *In the 8014 there must never be a physical T-1 connection to WAN 4 that is being used as a Redundant WAN.*

Figure RDNT-7 shows the main screen (status screen selected) of a cross-connect system. In this example the two CSU ports in WANs 1, 2 and 3 are backed-up by the two ports in W4.

```
Node_1                    |                                            |  12-31-99   14:33

                     Slot      Installed      Status
                     C1        CPU  XCON

                     P1/U1     E&M  4Wx8-6    s s s s s s s s
                     P2/U2     FXS  2Wx8-9    s s s s s s s s
                     P3/U3     FXO  2Wx8-9    s s s s s s s s
                     P4/U4     HSU  366x2     s s
                     W1/U5     CSU+CSU        a a
                     W2/U6     CSU+CSU        a a
                     W3/U7     CSU+CSU        a a
                     W4/U8     CSU+CSU        r r
                     IF        INTF+modem
                     S1        PS1
                     S2        PS2
                     RI        RINGER

 Alarms | Config | Del | accepT | Xcon | sYs | Logout | Oos | cpusWtch
```

Figure RDNT-7. XCON WAN Cards (Front-Loading Chassis)

Figure RDNT-8 shows the main WAN card screen for the card in slot W1 with port 1-1 selected. The software command "s**W**itch" is selected from the choices in the Menu of Actions and the system delivers the prompt shown. Pressing "**y**" will complete the transaction and the traffic on the card in slot W1 will be switched to the 8014 card in slot W4. The main screen (Figure RDNT-9) now shows both ports on the card in slot W4 as active port and the ports on the card in slot W1 as redundant.

```
Node_1                    |                                                  |  12-31-99   14:33

                              CSU                                         CSU
STATE                         actv          STATE                         actv
MODE                          xcon          MODE                          term
FORMAT                        esf           FORMAT                        esf
LINE  CODE                    b8zs          LINE  CODE                    b8zs
PULSE                         n/a           PULSE                         n/a
LINE  LEN                     0             LINE  LEN                     0
SLIP  LIM                     126           SLIP  LIM                     126
AIS                           none          AIS                           none
LINE  LB                      off           LINE  LB                      off
LOCAL  LB                     off           LOCAL  LB                     off
CH  LB                        off           CH  LB                        off
LB  ADDR                      01            LB  ADDR                      01
LB  DET                       w/to          LB  DET                       w/to
ESF/NMS  RP                   at&t          ESF/NMS  RP                   at&t
EER  THRHD                    10e-4         EER  THRHD                    10e-4
RDNT  RULES                   n/a           RDNT  RULES                   none

OK  to  switch  to  the  redundant  WAN  (y/n)?

Save  |  Undo  |  Refresh  |  Xcon  |  Perf  |  Test  |  sWitch  |  Main
```

Figure RDNT-8. Switchover in Cross-Connect System

```
Node_1                    |                                             |   12-31-99   14:33

                    Slot       Installed       Status
                    C1         CPU  XCON

                    P1/U1      E&M  4Wx8-6     s s s s s s s s
                    P2/U2      FXS  2Wx8-9     s s s s s s s s
                    P3/U3      FXO  2Wx8-9     s s s s s s s s
                    P4/U4      HSU  366x2      s s
                    W1/U5      CSU+CSU         r r
                    W2/U6      CSU+CSU         a a
                    W3/U7      CSU+CSU         a a
                    W4/U8      CSU+CSU         a a
                    IF         INTF+modem
                    S1         PS1
                    S2         PS2
                    RI         RINGER

Alarms | Config | Del | accepT | Xcon | sYs | Logout | Oos | cpusWtch
```

Figure RDNT-9. XCON WAN Cards (Front-Loading Chassis)

ADPCM Card

This system can employ ADPCM cards that use voice compression technology to effectively increase the digital voice transmission capabilities of voice cards (E&M, FXS or FXO) or WAN links. See the ADPCM chapter in the Server Cards section for complete technical details about the ADPCM card.

Each system allows one, two, or three ADPCM cards located in slots P1 through P3, depending on slot availability. In systems with two or three ADPCM cards, any one of the cards can be selected as the redundant backup. No restrictions exist about slot order.

Figure RDNT-10 shows a console with three ADPCM cards. The ADPCM card in slot P1 is highlighted. Pressing the "Enter" key will bring up the ADPCM main screen shown as Figure RDNT-11.

```
 Node_1                  |                                              |   12-31-99   14:33

Slot        Installed      Status           Slot      Installed       Status
C1          █                               IF        INTF+modem
C2                                          U1        ALR             s s s s
P1          ADPCM-64       s s s s s s s s  U2        E&M  4Wx8-6     s s s s s s s s
P2          ADPCM-64       s s s s s s s s  U3        FXS  2Wx8-9     s s s s s s s s
P3          ADPCM-64       s s s s s s s s  U4        FXO  2Wx8-9     s s s s s s s s
W1          CSU+CSU        s s              U5        HSU  366x2      s s
W2          CSU+CSU        s s              U6        OCU-DPx5        s s s s s
W3          CEPT+CEPT      s s              U7        FRAD-18         s s s s s s s s
W4          CEPT+CEPT      s s              U8        SRU-232x10      s s s s s s s s s s
F1          PS1                             RI        RINGER
F2

Alarms | Config | Del | accepT | Xcon | sYs | Logout | Oos | cpusWtch
```

Figure RDNT-10. Selecting the Redundant ADPCM Card

```
 Node_1                    |                                            | 12-31-99    14:33

                     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                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  WAN         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        v        v        v        v        v        v        v
RATE               32k      32k      32k      32k      32k      32k      32k      32k
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

stdby      actv       rdnt

Save  |  Undo  |  Refresh  |  pg_Left  |  pg_riGht  |  Main
```

Figure RDNT-11. The ADPCM Card Main Screen

Highlighting the STATE parameter and pressing the "Enter" key shows a new option "**rdnt**." Selecting "**rdnt**" as the STATE for any of the ADPCM ports and saving the changes will cause the entire card to become the redundant ADPCM card for the system. The main screen will change and look like the one shown in Figure RDNT-12.

```
Node_1                    |                                         | 12-31-99    14:33

                    1        2        3        4        5        6        7        8
STATE              rdnt     rdnt     rdnt     rdnt     rdnt     rdnt     rdnt     rdnt
USER               n/a      n/a      n/a      n/a      n/a      n/a      n/a      n/a
WAN                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  WAN         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        v        v        v        v        v        v        v
RATE               32k      32k      32k      32k      32k      32k      32k      32k
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  |  pg_Left  |  pg_riGht  |  Main
```

Figure RDNT-12. The ADPCM Card Main Screen

Should either card in slots P2 or P3 fail for any reason, the entire voice compression network will switch to the redundant card in slot P1. When the Out of Service condition is repaired, the card in the slot that previously failed will become the redundant card for the system.

The system does not have to have any of the ADPCM cards redundant. All three slots (P1-P3) can be used for traffic on ADPCM voice networks.

Introduction

This section discusses the installation and operation of the CPU card. It describes the three types of CPU Cards and includes the following main topics:

- CPU Card Settings
- Printing Alarms Remotely
- TCP/IP Network Management
- Network Statistics
- Routing

The CPU Card controls all operations of the system. One CPU Card is required for all installations. Two Models 8801 or 8804 CPUs can be used for CPU redundancy.

8800 CPU Card

The 8800 is the base model CPU Card. It supports up to two T1 or E1 WAN ports (on one WAN Card). The 8800 requires that you install the WAN Card in slot W1 and that all channels be assigned to time slots on links W1-1 and W1-2. A system that uses an 8800 CPU card is said to operate in "standard bus-connect" mode. *The 8800 CPU does not support redundant operations.*

8801 CPU Card

The 8801 CPU card supports complex applications requiring more than two WAN ports and the ability to cross-connect DS0s between WANs. The 8801 supports up to four WAN Cards for a total of eight T1 or E1 WAN ports and has a built-in cross-connect module. A system that uses an 8801 CPU card is said to operate in "cross-connect" mode. Two Model 8801 CPUs can be installed in slots C1 and C2 to achieve CPU redundancy. The 8801 also supports 1xN WAN redundancy. (See the Redundant Systems chapter.)

8804 CPU Card

The 8804 CPU supports two T1 or E1 WAN links in slot W1-1 and W 1-2 with a redundant card (similarly configured) in slot W2. It supports another two T1 or E1 WAN links in slot W3-1 and W3-2 with a redundant card (similarly configured) in slot W4. If the T1/E1 link in w1-1 fails for any reason, the system will automatically switch to the similarly configured card in slot w2-1 (W1-2 would switch to W2-2 in the same way).

Slot W3 can support either a Single or a Dual T1/E1 WAN card. If the T1/E1 link in w3-1 fails for any reason, the system will automatically switch to the similarly configured card in slot w4-1 (w3-2 would switch to w4-2 in the same way).

Note that WAN ports in slot W3 can operate only in "terminate" mode and can only support 8202, 8213 or 8215 HSU card ports and OCU-DP ports from an 8247 5 or 10-port OCU-DP card. No other voice or data ports can be assigned to the WAN card in slot W3 in this mode.

A system that uses an 8804 CPU is said to operate in "enhanced bus-connect" mode. Two Model 8804 CPUs can be installed in slots C1 and C2 to achieve CPU redundancy. The 8804 also supports 1x1 WAN redundancy. (See the Redundant Systems chapter.)

CPU Card Settings

Figure CPU-1 shows the main CPU card screen. Fill in the fields on the screen to configure the CPU for your site and system. Use the commands at the bottom of the screen to perform various system functions. Table CPU-1 lists the commands.

```
Node_1         | C1  CPU XCON   8801  Rev C3-0  Ser 00202  | 12-31-99
14:33


NODE ID          Node_1
SUPERUSER        **************
MANAGER          Manager
OPERATOR         Operator
VIEWER           Viewer
SYS CONT         System Contact
SYS LOC          System Location

SYS PH#          5106231574
ALRM SEQ         all
ACO              cur



C1   Active      Host 3.60  Voice 3.60







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

Figure CPU-1. CPU Card Screen

The CPU screen has ten setting fields: Node ID, four passwords, System Contact Person, System Location, System Phone Number, Alarm Sequence and Alarm Cutoff. The Node ID must be unique within each user's network for each unit. The "Superuser" password level is reserved for use by factory personnel only.

The other three levels are referred to as "manager," "operator" and "viewer" respectively. The user sets these values on the CPU card screen, shown in Figure CPU-1. Each password can be up to 14 characters long (alphabetic and numeric only). Note that passwords are case-sensitive. For more information about passwords, and changing the settings on this card, refer to "Logging On" in the Basic Operations chapter.

The System Contact Person is the name of the person to contact.

The System Location is where the system resides.

The System Phone Number is the phone number used by a remote user to engage the system in a VT-100 session (using either ISDN D channel dialing or the Remote Integrated Terminal System described in the Interface chapter). Up to ten numeric characters can be placed in this field.

The Alarm Sequence establishes how the sequence number for alarms is generated. If this parameter is set to **all**, any alarm generated by the system will be assigned a sequence number. If this parameter is set to **report** , only those alarms set to report will be assigned a sequence number. See the Basic Operations chapter for additional information on setting alarm reporting characteristics.

The Alarm Cut Off (ACO) option reports a status to the user based on the setting **latch** (condition held) or **cur** (current condition).

The CPU screen also displays the status of each CPU (Active or Redundant), the type of CPU installed and the version of the voice and host software.

Changing Passwords

Depending on the security procedures for your network, you may need to change passwords frequently. The best passwords are at least 6 and no more than 12 characters long, are not found in a dictionary, and contain both letters and numbers. Because the system is case-sensitive, you can capitalize some of the letters in the passwords to give you more possible combinations. Perform the following steps to change the system passwords:

1. Log on to the system at the **Manager** access level and select the CPU card from the main screen.
2. Highlight the password you want to change and press the <Enter> key.
3. Type the new password (up to 14 characters, alphanumeric, case sensitive (no spaces allowed)) over the old password and press the <Enter> key.
4. Make sure the password appears as you want it (**passwords are case-sensitive**) and save your changes.

Entering Values in Fields

To change the value in a field:

1. Use the arrow keys to scroll to the field.
2. Press the <Enter> key to open the entry area at the bottom of the screen.
3. If the system offers a set of choices, use the arrow keys to scroll to your choice and press <Enter> again.
   If data entry is required, type in the data and press <Enter>.
4. When desired entries have been made press **s** (Save) to save the entries.

Menu of Actions

Table CPU-1 shows the Menu of Actions for the CPU Card.

Table CPU-1. CPU Card Screen Menu of Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e. performance and test data).
Prt	Initiates alarm printing to remote device. Refer to "Printing Alarms Remotely" in this section.
tcp/**I**p	Sets up communications with a Network Management System via SNMP or TELNET. Refer to "TCP/IP Network Management" in this section.
Main	Returns to the main terminal screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Printing Alarms Remotely

Often integrated access controllers are placed in unsupervised locations (equipment closets, etc.). With no one present to detect alarms that might occur, the system administrators have no way of knowing that the unit is not operating properly.

The basic solution to the Network Management problem is the Print Alarm feature. Each system can be programmed to call a predetermined telephone number at specific intervals and report the presence of selected system alarms. Alarms are chosen to print remotely by selecting the **Report** option in the alarm filters (see Basic Operations chapter).

The user can employ either an external modem (with faster transmission rates) or the internal modem (2.4kbps) on many of the Interface cards to send system alarms to a remote logging device such as a printer or personal computer. If using the internal modem, the user should connect the remote device to a V.22 bis 2.4kbps asynchronous modem set to auto-answer, eight data bits, one stop bit, and no parity. When the modem connected to the remote logging device answers, the system sends the alarm messages as a string of ASCII characters formatted with carriage returns and line feeds and hangs up the call. More information on this process can be found later in this chapter.

The network administrator can also call the phone number associated with the system modem and initiate a two-way, interactive VT-100 session with the system to determine the nature of the problem and dispatch technicians if necessary.

Another Network Management solution is the TCP/IP feature discussed later in this chapter. **If the TCP/IP network management system is active, the Print Alarm feature will not operate.**

Using the TCP/IP feature automatically converts alarm messages into SNMP traps for forwarding to downstream NMS equipment.

Figure CPU-2 shows the Print Alarm screen. Table CPU-2 lists the settings controlled on the screen along with their possible and default values.

```
Node_1     | C1   CPU XCON     8801   Rev C3-0   Ser 00202      |    12-31-99    14:33

                          1
PRT  ALARMS              off
PRT  PHONE#
PRT  RETRY               1
PRT  ATTEMPTS            1
PRT  MAJOR&CRIT          1
PRT  MINOR&INFO          1
ELEMENT  1               number
ELEMENT  2               alarm
ELEMENT  3               model
ELEMENT  4               address
ELEMENT  5               time
ELEMENT  6               severity

Save  |  Undo  |  Refresh  |  Main
```

Figure CPU-2. Print Alarm Screen

Table CPU-2. Print Alarm Options and Defaults

Parameter	User Options	Notes	Default
PRT ALARMS	off direct modem	1	off
PRT PHONE#	telephone number (up to 14 numbers)		
PRT RETRY	1-60		1
PRT ATTEMPTS	1-99		1
PRT MAJOR&CRIT	1-500		1
PRT MINOR&INFO	1-32000		1
ELEMENT 1	alarm model address time severity number empty	2	number
ELEMENT 2	alarm model address time severity number empty	2	alarm
ELEMENT 3	alarm model address time severity number empty	2	model
ELEMENT 4	alarm model address time severity number empty	2	address
ELEMENT 5	alarm model address time severity number empty	2	time
ELEMENT 6	alarm model address time severity number empty	2	severity

NOTES

1. The Print Alarms option must be **off** if TCP/IP is **on**.

2. The choice of “empty” will eliminate that element from the NMS report.

PRT ALARMS

The Print Alarms option sets parameters for alarm output to a remote device. The system uses the modem on the Interface card to call a remote device or Network Management System. The system sends the alarm information for all alarm filters set to **Report** (see “Alarms” in the Basic Operations chapter). Set the Printout Alarms setting to **off** to disable all external alarm-generated messages. The **direct** setting sends all alarms reported since the last report cycle to a local device through the DB-9 computer port. The **modem** setting sends all alarms reported since the last report cycle to a remote device through the modem port.

The remote device may be any asynchronous ASCII device which can accept lines of text up to 80 characters long. It must support XON/XOFF flow control and be capable of attaching to an asynchronous dial-up modem. Figure CPU-3 shows an OOS alarm reported to a remote device.

The device’s modem must be compatible with CCITT Rec. V.22 bis and support connections at **2.4**kbps. Set the modem for auto answer mode. **Both the device and modem should be set for 8 data bits, 1 stop bit, and no parity.**

PRT PHONE#

The Print Phone Number is the number the modem dials when sending alarms to the remote device. The number may be up to 14 digits long.

PRT RETRY

The Print Retry field determines the number of time the system will wait between attempts to redial the remote device. The retry interval can be from **1-60** minutes.

PRT ATTEMPTS

1. The Print Attempts is the maximum number of times the system attempts to contact the remote device before giving up. The number of attempts can range from **1-99**.

PRT MAJOR

The Print Major field is the maximum number of time the system will wait from the occurrence of a major alarm until it places a call to the remote device to report it. The interval-cycle can be from **1-500** seconds. All alarm reports designated as "**Major**" (see “Alarms” in the Basic Operations chapter) will be reported at that time. For example, if the user specifies an interval-cycle of 300 seconds (5 minutes), every major alarm that occurs during a 5 minute period will be reported at the end of that cycle.

The Print Major interval-cycle starts from the most recent of:

1. The end of the last Major cycle (if no alarms occur).
2. When parameters are saved using the Save command from the Menu of Actions.
3. 40 seconds after the last alarm message is reported.

PRT MINOR

The Print Minor field is the maximum number of time the system will wait from the occurrence of a minor alarm until it places a call to the remote device to report it. The interval-cycle can be from **1-32,000** seconds. All alarm reports designated as "**Minor**" (see “Alarms” in the Basic Operations chapter) will be reported at that time. For example, if the user specifies an interval-cycle of 3,600 seconds (60 minutes), every minor alarm that occurs during a 60 minute period will be reported at the end of that cycle.

The Print Minor interval-cycle starts from the most recent of:

1. The end of the last Minor cycle (if no alarms occur).
2. When parameters are saved using the Save command from the Menu of Actions.
3. 40 seconds after the last alarm message is reported.

When the specified interval-cycle for major or minor alarms is reached, the system will send a list of the accumulated alarms sorted by the elements below. To avoid congestion, alarm reporting is limited at the remote device or Network Management System to the first 40 lines of non-reported alarms. The system will then wait 40 seconds and send the next 40 lines, and continue sending in that way (i.e. 40 lines, wait 40 seconds) until finished with the entire list of non-reported alarms. **Forty seconds after the last alarm message is reported, the new interval-cycle starts.**

ELEMENT 1-6

The elements of the alarm configuration (see the Basic Operations Chapter), **alarm**, **model**, **address**, **time**, **severity**, **number**, or **empty** can be arranged in any order that is most helpful for the user. For instance, the user might want the order of the alarm configuration to be severity, time, model, address, alarm, and number, while another might want the sequence to be model, time, alarm, address, severity, and number. Elements 1-6 can order these variables in any way needed.

```
NO=Node_1
AK=7
NU=00038
AL=OOS
ML=8840
UN=P2
ON=07-20-95 14:44:12
OF=07-20-95 16:12:16
SV=C
END
```

Figure CPU-3. Remote Printout of Alarms

For example, Figure CPU-3 shows the Node Name, "Node_1," Acknowledgment Number 7, Alarm Number 38, Alarm type is Out of Service, Model 8840, Address Number P2, Time on 7/20/95 at 14:44:12, Time off 7/20/95 at 16:12:16, and Severity is Critical.

Menu of Actions

Table CPU-3 shows the Menu of Actions for the Print Alarms Screen.

Table CPU-3. Print Alarms Screen Menu of Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Used on Testing and Monitoring screens to update statistics and on other screens to redraw the screen.
Main	Returns to the CPU card main screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

TCP/IP Network Management

This section presents another type of Network Management System supported by this unit for diagnosing and reporting trouble at unsupervised locations. SNMP alarm traps and TELNET configuration can transmit over this path. Both formats can use the 4kbps FDL (Facility Data Link) on a T1 link using ESF format, the SA4 on an E1 link, a full DS0 on a T1/E1 link, or the computer port of the Interface card using SLIP protocol.

If you do not understand the NMS concepts of IP addressing, SNMP, SLIP, TELNET and Ping, please consult with your network administrator before attempting to install or repair components presented in this section.

If the FDL is used to transmit and receive information, a Lucent Technologies DACSII (6.1 or higher) or DACSII ISx (3.0 or higher) is used to convert the FDL/IP information to a full DS0. (On a point-to-point circuit, a DACSII is not needed.)

If you have a small number of remote units to supervise, one of the Network Management System options is to use a B7R (Bit-7 Redundant) card at the NMS site. One through eight remote units send alarm information on the FDL/SA4 of a DS1 to either a DACSII on eight individual DS0s and multiplex the contents into a single 38.4kbps asynch circuit using SLIP protocol for use by a communication server or terminal server for routing to a Local Area Network. (See B7R card chapter.)

Using IP addresses, the network management center can communicate directly with the affected unit, diagnose the problem, and dispatch a technician if necessary.

Figure CPU-4 shows how a typical system might be set up to make use of this feature. This figure shows eight integrated access controllers (from different geographic locations) reporting alarms through the TCP/IP interface to workstations at the network site using the procedure mentioned above.

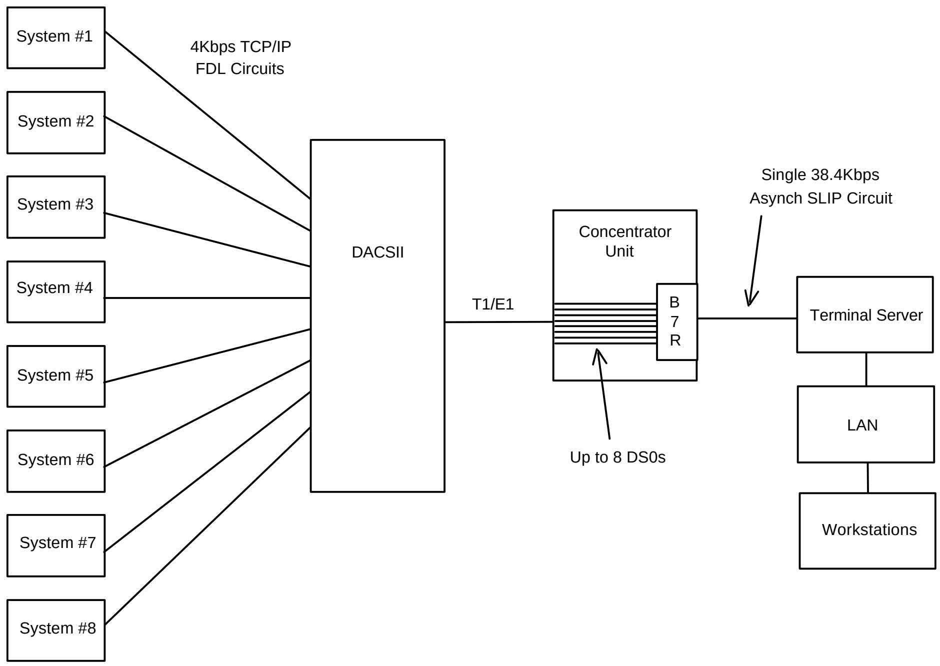


Figure CPU-4. Typical TCP/IP Network Management System

Figure CPU-5 shows the TCP/IP screen. Table CPU-4 shows the TCP/IP screen parameters and options.

```
Node_1           |   C1  CPU XCON  8801  |    Rev  A2-0    Ser  01103    |     12-31-99    14:33

                            1
HOST IP STATUS           stdby
HOST IP ADDR             0.0.0.0
HOST NETMASK             0.0.0.0
DEFAULT IP PORT          n/a
DEFAULT IP SLOT          n/a
DEFAULT IP UNIT          n/a
RPT1  IP  ADDR           0.0.0.0
RPT1  COMMUN  STR
RPT2  IP  ADDR           0.0.0.0
RPT2  COMMUN  STR
RPT3  IP  ADDR           0.0.0.0
RPT3  COMMUN  STR

Ping   |   Netstat   |   rOute   |   Save   |   Undo   |   Refresh   |   Main
```

Figure CPU-5. TCP/IP Screen

Table CPU-4. TCP/IP Screen Parameters and Options

PARAMETER	User Options	Notes	Default
HOST IP STATUS	stdby actv		stdby
HOST IP ADDR	IP address		0.0.0.0
HOST NETMASK	IP address		0.0.0.0
DEFAULT IP PORT	off local wan serv	1	off
DEFAULT IP SLOT	n/a	1	n/a
DEFAULT IP UNIT	n/a	1	n/a
RPT1 IP ADDR	IP address		0.0.0.0
RPT1 COMMUN STR			blank
RPT2 IP ADDR	IP address		0.0.0.0
RPT2 COMMUN STR			blank
RPT3 IP ADDR	IP address		0.0.0.0
RPT3 COMMUN STR			blank

NOTES

1. The user options depend upon the selection in the Default IP Port selection. All user options are explained below.

HOST IP STATUS

The Host IP Status is the IP address status for this specific integrated access controller.

HOST IP ADDR

The Host IP Address is the IP address for this specific integrated access controller. If the B7R is used for this NMS, the Port IP address must be the same as the one entered in the **ADDR** field of that card.

HOST NETMASK

The Host Netmask is used to indicate how much of the IP address is used for host addressing and how much is used for network addressing. If the B7R card is used for this NMS, this address must be the same as the one entered in the **NETMSK** field of that card.

DEFAULT IP PORT

The Default IP Port setting tells the CPU card where IP packets will be sent or received. The options are **off** (to disable Network Management System), **local** (information will be sent over the DB-9 computer serial port to NMS equipment), **wan** (information will be sent over the WAN FDL or a DS0 [chosen on the WAN card main screen with ESF/NMS RPT option]), or **serv** (information sent over WAN DS0s through the Ethernet connection to the NMS equipment).

*If this parameter is set to **local**, **wan** or **serv** the Print Alarms feature (mentioned in the previous section) must be set to **off**. If **local** is chosen for this setting, the internal modem will not operate.*

DEFAULT IP SLOT

The Default IP Slot options are determined by the choice of Default IP Port. If **off** or **local** is selected for that parameter, this option will show **n/a**. If **wan** is selected, the options for this parameter will show **W1-W4** (the WAN card slot that transmits and receives NMS information). If **serv** is selected, the options for this parameter are P1-P3 (the Server card slot that transmits and receives NMS information).

DEFAULT IP UNIT

The Default IP Unit options are determined by the choice of Default IP Port. If **off** or **local** is selected for that parameter, this option will show **n/a**. If **wan** or **serv** is selected above, the options for this parameter will be **1-2** (corresponding with the WAN or Server port).

RPT1 IP ADDR

The RPT1 IP Address is the IP address of the first Network Management System host running a SNMP trap server.

RPT1 COMMUN STR

The RPT1 Community String holds the community string for the first NMS host running a SNMP trap server. The community string provides additional security by rejecting messages that do not contain the correct string. *There must be some entry in this field to enable RPT1.*

RPT2 IP ADDR

The RPT2 IP Address is the IP address of the second Network Management System host running an SNMP trap server.

RPT2 COMMUN STR

The RPT2 Community String holds the community string for the first NMS host running an SNMP trap server. The community string provides additional security by rejecting messages that do not contain the correct string. *There must be some entry in this field to enable RPT2.*

RPT3 IP ADDR

The RPT3 IP Address is the IP address of the third Network Management System host running an SNMP trap server.

RPT3 COMMUN STR

The RPT3 Community String holds the community string for the first NMS host running an SNMP trap server. The community string provides additional security by rejecting messages that do not contain the correct string. *There must be some entry in this field to enable RPT3.*

Menu of Actions

Table CPU-5 shows the Menu of Actions for the TCP/IP screen.

Table CPU-5. TCP/IP Screen Menu of Actions

Action	Function
Ping	Test to see if the connected device responds to an echo request message. After entering the IP address of the host device, the status line will display, "Testing . . ." The next message will tell if the host is alive or down.
Netstat	Displays the Network Statistics. See below.
r**O**ute	Shows the Routing screen. See Routing section below.
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Used on Testing and Monitoring screens to update statistics and on other screens to redraw the screen.
Main	Returns to the CPU card main screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Network Statistics

The Network Statistics screens provide maintenance and diagnostic information for the different protocols supported by this equipment. Statistics begin to accumulate when the TCP/IP Port is changed from **off** to **local** or **wan** and will continue to store information until it is turned off. Figure CPU-6 shows the first of four network statistics screens. Figures CPU-7 through -9 show the other three screens.

```
Node_1     | C1  CPU XCON    8801  Rev C3-0  Ser 00202     |    12-31-99   14:33

                                     NETSTAT    Page 1 of 4
                                          SLIP
MTU  Size                                 240
Bytes  Received                           0
Packets  Received                         0
Packets  Discarded                        0
Packets  Dropped  -  Buffer               0
Buffer  Overflow                          0
Packets  Sent  Out                        0
Bytes  Sent  Out                          0
                                          FDL
MTU  Size                                 240
Frames  Received                          0
Frames  Aborted  on  Receive              0
Frames  To  Transmit  from  Above         0
Frames  Transmitted                       0
Frames  Aborted  on  Transmit             0


pgUp  |  pgDn  |  Refresh  |  Main
```

Figure CPU-6. TCP/IP Network Statistics Screen

SLIP

The MTU (Maximum Transmission Unit) Size field shows the largest number of user-data (e.g., the largest size of an packet) that can be sent in a single frame. The MTU for this system is 210 with overhead = 240.

The Bytes Received field shows the number of bytes received by the local system from the network host.

The Packets Received field shows the number of packets (unit of bytes, roughly similar to an IP datagram) received by the local system from the network host.

The Packets Discarded field shows the number of packets sent by the network host that were discarded by the local system. Packets are discarded because they either exceed the MTU or are not complete.

The Packets Dropped - buffer field shows the number of incoming packets that were dropped because there was not enough free memory to buffer them.

The Buffer Overflow field shows the occurrences of buffer overflow at the local system.

The Packets Sent Out field shows the number of packets transmitted by the local system to the network host.

The Bytes Sent Out field shows the number of bytes transmitted to the network host by the local system.

FDL

The MTU (Maximum Transmission Unit) Size field shows the largest number of bytes that can be sent in a single frame. The default MTU is 210 with overhead = 240.

The Frames Received field shows the number of frames received by the local system from the network host.

The Frames Aborted on Receive field shows the number of frames that were aborted when received by the local system from the network host. Frames are aborted because they either exceed the MTU or are not complete.

The Frames to Transmit from Above field shows the number of frames that were sent by the local system to the TCP layer of the network host.

The Frames Transmitted field shows the number of frames sent from the local system to the network host.

The Frames Aborted on Transmit field shows the number of frames aborted when transmitted by the local system to the network host. Frames are aborted because they either exceed the MTU or are not complete.

```
Node_1     | C1  CPU XCON    8801  Rev C3-0  Ser 00202      |   12-31-99   14:33

                                    NETSTAT    Page 2 of 4
                                          IP
Default  TTL                              255
Datagrams  Received                       0
Datagrams  Discarded                      0
Datagrams  Delivered  Above               0
Datagrams  From Above                     0
Datagrams  Sent                           0
TX  Wait  for  RAM                        0
TX  Aborted  -  mailbox short             0
                                          ICMP
Messages  Received                        0
Messages  Discarded                       0
Messages  Sent                            0
Echo  Requests  Received                  0
Echo  Replies  Sent                       0
Echo  Requests  Sent                      0
Echo  Replies  Received                   0
Dest Unreachable  Sent                    0

pgUp  |  pgDn  |  Refresh  |  Main
```

Figure CPU-7. TCP/IP Network Statistics Screen

IP

The Default TTL field shows the Time To Live for information packets from transmission to delivery. The TTL for this system is 255 seconds.

The Datagrams Received field shows the number of IP datagrams (packets) received by the local system from the network host.

The Datagrams Discarded - checksum field shows the number of datagrams that were discarded by the local system.

The Datagrams Discarded - protocol field shows the number of IP datagrams that were discarded by the local system because the protocol used is not supported. The supported transmit protocols are IP, ICMP, TCP and UDP. The supported receive protocols are IP and TCP.

The Datagrams Delivered Above field shows the number of datagrams sent to the TCP layer of the network host to the local system.

The Datagrams From Above field shows the number of information or traps sent by the local system to the UDP or TCP layer of the network host.

The Datagrams Sent field shows the total number of datagrams sent by the local system to the network host.

The TX Waits for RAM field shows the total number of datagrams sent by the local system which were delayed by lack of free RAM memory.

The TX Aborted - mailbox short field shows the total number of datagrams aborted by the local system because of a mail subsystem overflow.

ICMP

The Messages Received field shows the number of ICMP messages received by the local system from the network host.

The Messages Discarded field shows the number of ICMP messages by the network host that were discarded (for any reason) by the local system.

The Messages Sent field shows the number of ICMP messages sent by the local system to the network host.

The Echo Requests Received field shows the number of "ping" message requests received by local system by the network host. This figure is part of the total messages received.

The Echo Replies Sent field shows the number of "ping" message requests transmitted to the network host. This figure is part of the total messages sent.

The Echo Requests Sent field shows the number of "ping" requests sent to the network host by the local system. This figure is part of the total messages sent.

The Echo Replies Received field shows the number of "ping" message replies received by the local system. This figure is part of the total messages received.

The Destination Unreachable Sent field shows the number of ICMP messages that were discarded upon receipt by the network host because they were improperly addressed.

```
Node_1     | C1  CPU XCON    8801  Rev C3-0  Ser 00202      |    12-31-99   14:33

                                    NETSTAT    Page 3 of 4
                                         TCP  State  =  LISTEN
Packets  Received                        0
Packets  Discarded  -  Checksum          0
Packets  Discarded  -  Port              0
Packets  Discarded  -  Window            0
Bytes  Delivered  Above                  0
Bytes  From  Above                       0
Packets  Sent                            0
ACKs  Received                           0
Packets  Sent  -  reset                  0
Packets  Sent  -  ACK                    0
Packets  Retransmitted                   0
RTT  Increased                           0
RTT  Decreased                           0
Connections  Opened                      0
Connections  Closed                      0
Connections  Aborted                     0
Packets  Tx  Aborted  -  RAM             0

pgUp  |  pgDn  |  Refresh  |  Main
```

Figure CPU-8. TCP/IP Network Statistics Screen

TCP

Transmission Control Protocol is a transport layer, connection-oriented, end-to-end protocol. It provides reliable, sequenced, and unduplicated delivery of bytes to a remote or local user. TCP provides reliable byte stream communication between pairs of processes in hosts attached to interconnect networks.

The Packets Received field shows the number of TCP packets received by the local system from the network host.

The Packets Discarded - Checksum field shows the number of TCP packets that were discarded by the local system because the checksum failed.

The Packets Discarded - Port field shows the number of TCP packets that were discarded by the local system because the port assignment was incorrect.

The Packets Discarded - Window field shows the number of TCP packets that were discarded by the local system because the window data was incorrect.

The Bytes Delivered Above field shows the number of information or traps sent from TCP layer of the network host to the local system.

The Bytes From Above field shows the number of information or traps sent to the TCP layer of the network host from the local system.

The Packets Sent field shows the total number of TCP packets that were transmitted to the network host by the local system.

The ACKs Received field shows the total number of acknowledgments that were received by the local system from the network host.

The Packets Sent - reset field shows the total number of TCP packets that were transmitted by the network host to the local system.

The Packets Sent - ACK field shows the total number of TCP acknowledgment packets that were transmitted by the network host to the local system.

The Packets Retransmitted field shows the total number of TCP packets that were retransmitted by the local system to the network host.

The RTT Increased field shows the number of times the retransmission time-out was increased because the system was busy.

The RTT Decreased field shows the number of times the retransmission time-out was decreased because the system was not busy.

The Connections Opened field shows the total number of connections that were opened by the local system to the network host.

The Connections Closed field shows the total number of connections that were closed by the local system to the network host.

The Connections Aborted field shows the number of times the connection was aborted because either the number of consecutive retransmission's was equal to 10 or retransmission time-out was equal to 15 minutes.

The Packets TX Aborted - RAM field shows the total number of packets sent by the local system which were aborted because of the lack of free RAM memory.

```
Node_1     | C1  CPU XCON    8801  Rev C3-0  Ser 00202    |    12-31-99    14:33

                                    NETSTAT    Page 4 of 4
                                         UDP
Packets  From  Above                     0
Packets  Sent                            0
                                         TELNET
Bytes  Received                          0
Bytes  Received  as  Commands            0
Bytes  Delivered  Above                  0
Bytes  Replied  as  Commands             0
Bytes  From  Above                       0
Bytes  Sent                              0
Sessions  Opened                         0
Sessions  Closed                         0
TX  Wait  for  Buffer                    0
                                         SNMP
PDUs  Sent                               0
Traps  Sent                              0

pgUp  |  pgDn  |  Refresh  |  Main
```

Figure CPU-9. TCP/IP Network Statistics Screen

UDP

User Datagram Protocol is a transport layer, connectionless mode protocol, providing a datagram mode of communication for delivery of packets to a remote or local user.

The Packets From Above field shows the number of UDP packets sent by the local system to the network host.

The Packets Sent field shows the number of UDP packets transmitted from the local system to the network host.

TELNET

The Bytes Received field shows the total number of bytes that were received by the local system from the network host.

The Bytes Received as Commands field shows the total number of bytes that were received as commands by the local network from the network host.

The Bytes Delivered Above field shows the total number of bytes that were transmitted by the network host to the local system.

The Bytes Replied as Commands field shows the total number of bytes that were transmitted as commands by the local system to the network host.

The Bytes From Above field shows the total number of bytes that were received by the network host from the local system.

The Bytes Sent field shows the total number of bytes that were transmitted by the local system to the network host.

The Sessions Opened field shows the total number of sessions that were opened by the local system with the network host.

The Sessions Closed field shows the total number of sessions that were closed by the local system with the network host.

The TX Wait for Buffer field shows the total number of transmissions that were delayed by the local system for free memory in the buffer.

SNMP

The PDUs Sent field shows the number of Protocol Data Units sent from the local system. A Protocol Data Unit is a data object exchanged by protocol machines, usually containing both protocol control information and user data.

The Traps Sent field shows the total number of SNMP traps that were transmitted by the local system to the network host.

Menu of Actions

Table CPU-6 shows the Menu of Actions for the Network Statistics screen.

Table CPU-6. Network Statistics Screen Menu of Actions

Action	Function
pg**U**p	Scrolls forward through network statistics one page at a time.
pg**D**n	Scrolls backward through network statistics one page at a time.
Refresh	Since the system does not update statistics automatically, the Refresh command must be used to update information in statistics fields.
Main	Returns to the CPU card IP screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Routing

The system supports multi-point routing of Internet Protocol (IP) packets to either a local Network Management System over the computer port or to a remote NMS over the B7R card, timeslot #24 or the Facilities Data Link (FDL) of a T1 link. (For E1 links, the information is sent on the B7R card, timeslot #31 or the SA4.)

If you want to use an entire timeslot (either 24 or 31) for remote NMS routing, no action needs to be taken. If a B7R card is used or you want to use the FDL or SA4, an additional selection must be made on the WAN card. For T1 links the selection is made on the ESF/NMS RP parameter and on E1 links it is made on the COM/NMS RP parameter. (See the WAN card and B7R card chapters for further information.)

All packets arriving on any of the optional paths or the local port will be treated by the IP stack as follows:

- If the packet's destination address matches that system's address, the packet is processed locally.
- If the address is not the same, the unit will search the routing table to find a remote address that matches the destination of the packet.
- If a match is not found for the packet, it is routed to the interface specified in the DEF DEST field. If the default destination matches the interface the packet arrived from, the packet is dropped.

All IP addresses between the Remote Start and Remote End addresses must go to the same WAN link. *If you are unclear about IP Addresses, please consult with your Network Administrator.*

Figure CPU-10 shows a typical routing application. Even though 24 integrated access controllers are used in this example, the number of remote units is virtually unlimited except for bandwidth and link-down considerations.

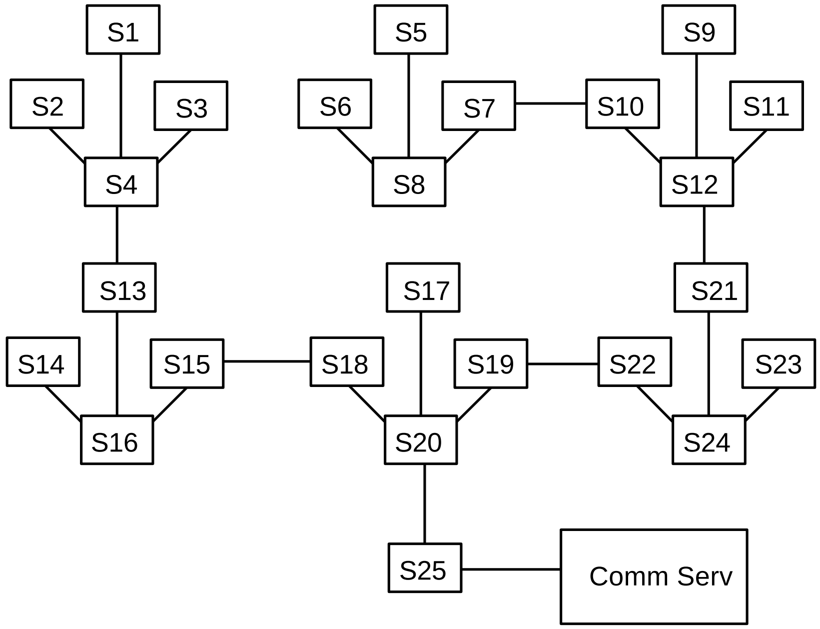


Figure CPU-10. Routing Feature Diagram

In the diagram above, 24 integrated access controllers will transmit alarm information to an IP routing Controller (System 25) by the optional paths of separate WAN links. The network administrator assigns IP addresses for each system on the TCP/IP screen of each unit's interface card (PORT IP ADDR). System 20 is connected by any of the optional paths to System 25 which supports NMS equipment (the communications server) by either a local SLIP connection directly from the CPU card or any of the optional paths of a WAN link. In this example, all alarms received by any of the 24 Controllers will be forwarded to Controller 25 on a single WAN link.

Each of the 24 reporting units use System 25's IP address as the RPT1 IP ADDR on the TCP/IP screen of its interface card. First routing is initiated by the **off/on** command for each sub-unit. The IP address for REM STRT is the lowest IP address of the sub-units controlled by that port. The IP address for REM END is the highest IP address of the sub-units controlled by that port. The local port is included to be able to transmit the IP packets generated by the routing unit to the same destination. In most cases, the DEF DEST of all units controlled by this router will be the same place (either the local port or optional WAN paths to a distant location).

The column headings are associated with the incoming WAN link associated with the IP location of the remote systems. For example, if you expect incoming information from system #1 on WAN 1-1, you would assign the IP address for system #1 between the REM STRT and REM END for WAN 1-1.

Figure CPU-11 shows the Routing screen and Table CPU-6 lists the options for that screen.

```
Node_1     | C1  CPU XCON    8802  Rev C3-0  Ser 00672    |    12-31-99   14:33

page: 1 of 1          IP STATIC ROUTING

IP Net                SubNetMask          SLOT/UNIT

Save  |  Refresh  |  Add  |  dEl  |  Get  |  pgUp  |  pgDn  |  Main  |
```

Figure CPU-11. Routing Screen

Table CPU-6. Settings for Routing Parameters

Parameter	User Options	Default
IP NET	a valid SubNet or Gateway address	ip
SUBNETMASK	a valid Netmask IP address	ip
SLOT/UNIT	wan: W1-1 through W2-4 serv: P1-P3 user: not supported local: COMP	w1-1

IP NET

The IP Net field shows a valid SubNet or Gateway address of a device located on this system unit.

SubNetMask

The Remote Netmask field shows the Netmask of a device located remotely from this system. Any valid Netmask is acceptable. The remote netmask information is the same as that placed on the remote unit's TCP/IP screen.

Slot/Unit

The Default Destination specifies where to route packets received from a remote device and the routing device to downstream NMS equipment (either the optional paths of a WAN link or the local SLIP port).

Menu of Actions

Table CPU-7. Routing Screen Menu of Actions

Action	Function
Save	Saves changes to settings.
Refresh	Used on Testing and Monitoring screens to update statistics and on other screens to redraw the screen.
Add	Open the data entry screen to add a route
d**El**	Delete a route
Get	Get information on routing destinations
Pg**U**p	Go to a previous page of routing paths
Pg**D**n	Go to the next page of routing paths
Main	Returns to the CPU card main screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Adding Routes

In the Routing Screen, type **a (Add)** to present a data entry screen. A data line appears near the bottom of the screen for the four address parameters of Table CPU-6. Use the right/left arrow keys to scroll to the desired field. Press <Enter> to present the corresponding data entry field (Figure CPU-11). Type in the correct address parameters, up to three digits (0-255) in each segment of the address, using the right arrow key to move to the next segment. Press <Enter> again to move the entered address into the data line. Use the left/right arrow keys to move on to the next address to be entered and repeat the process. The Slot/Unit field offers the entry categories shown in Figure CPU-12. Scroll to the desired category and press<Enter> to present one of the choices shown in Table CPU-6. Scroll to the desired value and press <Enter>. When valid address and destination parameters have been added, type **s** to save the address. The system will not save an invalid address. To exit the Add screen without saving press the up or down arrow key.

Delete a Route

In the Routing Screen, scroll to the route to be deleted. With the route highlighted, press **e** to delete.

Get Information

To obtain addressing information, press **g** for Get. The system displays the destination variables wan, serv, user, and local across the bottom of the screen. Use the left/right arrow keys to scroll to the desired destination and press <Enter> to select. The choices available under each of these options are then displayed. Now highlight the desired option and press <Enter> again to initiate the search. The system responds:

```
Sending RIP Request. Please wait ...
 Press any key to cancel
```

After the system sends RIP request, the IP Static Routing screen will return, displaying valid IP Net (address), SubNetMask, and Slot/Unit information.

```
Node_1     | C1  CPU XCON    8802  Rev C3-0  Ser 00672    |    12-31-99    14:33

page: 1 of 1         IP STATIC ROUTING

IP Net               SubNetMask          SLOT/UNIT

0.0.0.0              0.0.0.0             w1-1

Save
```

Figure CPU-12. Routing Address Entry

```
Node_1     | C1  CPU XCON    8802  Rev C3-0  Ser 00672    |    12-31-99    14:33

page: 1 of 1         IP STATIC ROUTING

IP Net               SubNetMask          SLOT/UNIT

0.0.0.0              0.0.0.0             w1-1

wan    serv    user    local
Save
```

Figure CPU-13. Slot/Unit Options

Table CPU-8. Slot Unit Options

Slot/Unit Options	Description	Default
WAN	w1-1 through w4-2	w1-1
SERV	P1 through P3	P1
USER	not supported	
LOCAL		

Introduction

The 8871 ADPCM card is a plug-in resource card for the system. The card has 32 pairs of voice compression engines that accept input directly from voice, SRU or BRI cards in the same system unit or voice traffic on WAN links through the system. ADPCM cards require a matching card at the other end to decompress the voice channels to normal 64K operation. Except for SRU which uses h link to extract data from timeslot.

Each pair of compression engines utilize one 64Kbps DS0 for two compressed channels. In Figure ADPCM-1 the eight numbers at the top of the screen represent the first four pairs of compression engines. Each engine can compress 64Kbps voice traffic to either 24Kbps, 32Kbps or 40Kbps (depending upon compression quality needed).

The rate of any DS0 is 64Kbps, so the sum of the compression rates for engine #1 and #2 must equal that figure. If, for instance, you assign a 32Kbps circuit to engine #1, engine #2 can only accept a 32Kbps circuit. A 40Kbps circuit can only be paired with a 24Kbps circuit and vice-versa.

The compression engines work in pairs. Engine numbers 1 and 2, 3 and 4, 5 and 6, 7 and 8, are paired. Each member of the pair must have the same ADPCM WAN and ADPCM TS. Additionally, both members of the compression engine pair must be active before either port will operate.

The ADPCM card can compress low speed asynchronous data transmission (19.2Kbps or less) from an SRU port that will occupy a 24Kbps engine. Each data circuit must be paired with a 40Kbps voice channel. It can also compress B channel voice traffic from the BRI card without restriction of compression rates.

Each unit can have up to three ADPCM cards installed (two normal ADPCM cards and one redundant card). See the Redundant Operations chapter for further information about redundant ADPCM cards.

The ADPCM card supports Transition Signaling as defined by ANSI T1.302-1989 with the exception of the Alarm bits. ANSI T1.302 specifies signaling at the 32Kbps compression rate. The ADPCM card uses this scheme for 24Kbps and 40Kbps although it is not included in the standard. Table ADPCM-1 summarizes the signals supported by each transcoder data rate. User channel configuration must adhere to these specifications.

Table ADPCM-1. Signal Compression Rates

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

* MOS - Mean Opinion Score based upon subjective evaluation

ADPCM Card Settings

Figure ADPCM-1 shows the ADPCM screen. Table ADPCM-2 lists the settings controlled on this screen along with their possible and default values.

```
Node_1        |  P1 ADPCM-64x1 8871  Rev D0-0  Ser 00259  |  12-31-99  14:33
Version #:0.1
               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       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
ADPCM W/S      none   none   none   none   none   none   none   none
ADPCM TS       n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a
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 ADPCM-1. The ADPCM Card Screen

Table ADPCM-2. ADPCM Card Setting Options and Defaults

Parameter	User Options	Default
STATE	stdby actv rdnt	stdby
USER	n/a uX-1 through uX-8	n/a
WAN/SERV	none w1-1 through w4-2 MORE BACK P1 P2 P3	w1-1
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	w1-1
ADPCM TS	n/a 01-24 01-31	01
TYPE	v&s v trnsp	v&s
RATE	24K 32K 40K	24K
SIG MODE	n/a e&m fxs plar fxo	e&m
CODING	u-law a-inv	u-law
TC CGA	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 you are not using or have 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 (not compressed) voice, sub-rate data or B channel traffic. If assigned from a voice card, SRU or BRI card port, this selection will show the user slot and port number (i.e. u5-2 for the card in slot U5, port #2). If you are assigning a WAN timeslot, this setting will show n/a.

WAN/SERV

The WAN/SERV setting identifies the incoming WAN or server link connected to this engine. This is the place where the ADPCM card will expect incoming (not compressed) voice. This option shows the choices: none, w1-1through w4-2 and MORE on the first line of choices. If you select MORE it offers the choices of P1, P2, or P3. Choose none if you are assigning from a voice card or SRU card port; choose from w1-1 - w2-4 if assigning from a WAN card, and P1-P3, if assigning from a server card.

TS

The Timeslot parameter selects the specific timeslot on the WAN link chosen in the previous setting that the ADPCM card can expect incoming voice traffic. The options are determined by the equipment on the WAN link selected in the previous setting. If WAN 1-1 is equipped with either a CSU or DSX module, the options are 1-24. If a CEPT module is installed on that link, the options are 1-15 and 17-31 . If you are assigning from a voice card, SRU card or BRI card port, this setting will show n/a.

ADPCM W/S

The ADPCM W/S setting identifies the outgoing WAN link to which the engine is connected. This option shows the choices: none, w1-1through w4-2. If you are assigning either from a voice card, SRU or BRI card port or voice traffic from a WAN timeslot, this setting will show w1-1 through w4-2. This is the WAN link to which the ADPCM card will route outgoing (compressed) traffic.

ADPCM TS

The ADPCM Timeslot parameter selects the specific timeslot 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 either a CSU or DSX module, the options are 1-24. If a CEPT module is installed on that link, the options are 1-15 and 17-31 .

TYPE

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

The trnsp setting allows the user to map the output of SRU ports to the ADPCM channel. Sub-Rate Data will be clocked into the ADPCM channel at an input rate equal to 24Kbps and then passed transparently (non-compressed) through the ADPCM card to the appropriate WAN timeslot. This could be useful when the user has an odd number of voice channels and wants to utilize the empty engine pair of the last ADPCM channel.

B channel traffic from the BRI card also uses the trnsp Type setting but is not restricted in its compression rates.

If the engine is assigned from a voice card, this selection will show v&s. If assigned by an SRU or BRI card, it will show trnsp . It cannot be changed from this screen.

RATE

The Rate parameter identifies the compression requirements for the incoming circuit. The options are 24K, 32K and 40K (the pair of engines must be equal to 64Kbps).

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

If this engine is assigned from a user card, the selections are uX-1 through uX-8. The default is n/a.

CODING

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

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

TC CGA

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

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

Menu of Actions

Table ADPCM-3 shows the Menu of Actions for the ADPCM Card.

Table ADPCM-3. The ADPCM Card Screen Menu of Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e. performance and test data).
<	Scroll to the left
>	Scroll to the right
s**W**itch	Switches an active ADPCM card to its redundant mate.
Main	Returns to the main screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Introduction

This section discusses the WAN cards and the plug-in modules that define their communications functions. It covers physical configuration of the plug-in modules and their installation as well as the software configuration, monitoring and testing of the cards after installation.

WAN cards manage the flow of data through your network. They are also the point of T1/E1 termination and generate or receive clocking. Both CSU and DSX modules are used to connect to T1 facilities operating at 1.544 Mbps. The CEPT module is used internationally for connection to a 2.048 Mbps E1 facility.

WAN cards equipped with CSU or DSX modules will also act as the "near end" termination point for Subscriber Loop Carrier (SLC96) facilities as outlined in publication TR-TSY-000008, Issue 2, August 1987.

Additional information about WAN card functions is included in the Installation chapter, System Operations chapter and Redundancy chapter.

811 DSX/CEPT Plug-in Module

The DSX/CEPT plug-in module supports either DSX or CEPT modes. It is mounted on the WAN Card. DSX is a T1 operation and CEPT is an E1 operation. Jumper settings on the module specify DSX or CEPT operation. Information about installing the module and changing jumper settings is included in this chapter.

812 CSU Plug-in Module

The CSU plug-in module is required for Channel Service Unit (CSU) operation in a T1 environment. Like the 811, it is mounted on the WAN Card.

820 HDSL E1 Plug-in Module

The HDSL E1(High-bit-rate Digital Subscriber Line) module is a plug-in for the 8011 HDSL E1 WAN card. It provides transport for E1 rate (2.048 mbps) data over copper cable without mid-span repeaters or conditioning.

8000 Single T1/E1 Link Card

The single T1/E1 Link Card is the basic WAN Card. It has a single port for DSX/CEPT or CSU operation.

8010 Dual T1/E1 Link Card

The dual T1/E1 Link Card has two ports for either DSX/CEPT or CSU operation or a combination of the two. The Dual T1/E1 Link Card will work with only one plug-in module as long as the WAN port without the plug-in module remains in the standby state. **However, a CGA_RED alarm will be generated for that port.**

8014 Dual T1/E1 Link Card (with Relays)

In Cross-Connect systems, the dual T1/E1 Link Card (with relays), when placed in slot W-4, acts as a redundant card for up to three standard WAN Cards located in slots W-1, W-2 and W-3. This is known as 1xN redundancy. The relay module on this card will switch its output to the correct pins on the WAN connector on the Interface Card. If placed in any other slot, it will behave like an ordinary WAN card.

Note: If the plug-ins of the Model 8014 installed in slot w4 do not match those of a WAN card in slot w1, w2 or w3, then it cannot act as that card's redundant mate.

8011 HDSL E1 WAN Card

The 8011 HDSL E1 WAN Card is a dual-port card that provides HDSL services by incorporating the 820 HDSL E1 plug-in module.

811 WAN Module

When installing the 811 CSU/DSX module on the 8000 WAN or 8010 WAN, there are situations in which the plastic standoffs do not allow the module to seat correctly on the WAN board (see Figure WAN-1).

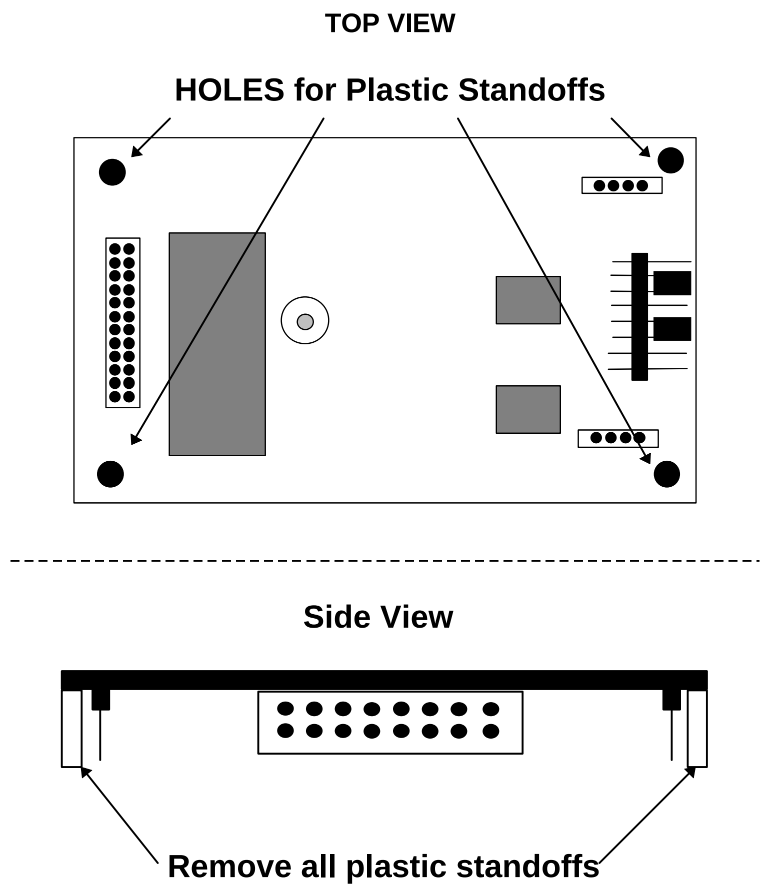


Figure WAN-1. Removal of Plastic Standoffs - 811 WAN Module

When assembling and installing the module on the WAN card, **it is our advice that the plastic standoffs be removed to eliminate the** possibility **of errors on the associated T1 or E1 lines.** For this reason, the plastic standoffs are no longer being supplied by the manufacturer for new WAN modules.

Configuring the DSX/CEPT Plug-in Module (811) Rev E1+

The Model 811 DSX/CEPT Revision E1+ plug-in module (see Figure WAN-2 and WAN-3) provides jumper settings for impedance compensation. The 811 offers either T1 or E1 (75Ω or 120Ω operation). To configure the 811, change the jumper positions on the pins according to Figures WAN-4 through WAN-6. The unit is shipped as shown in Figure WAN-4.

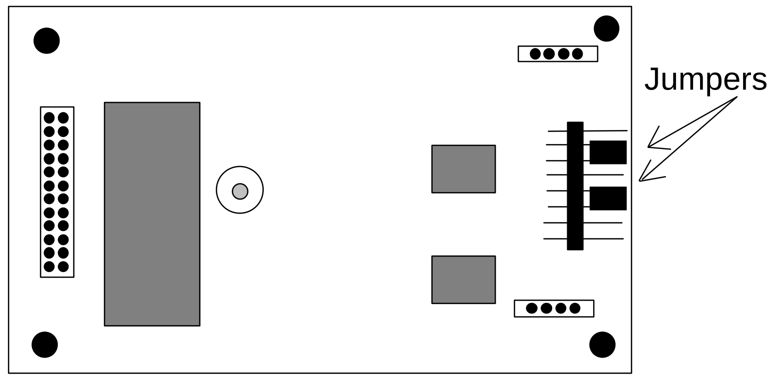


Figure WAN-2. 811 DSX/CEPT Module (Top View)

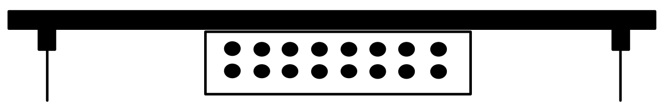


Figure WAN-3. 811 DSX/CEPT Module (End View)

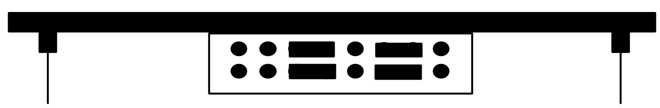


Figure WAN-4. Jumper Settings for T1 Operation

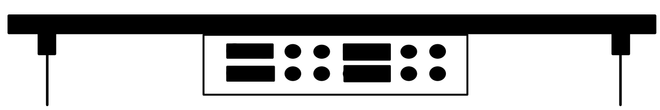


Figure WAN-5. Jumper Settings for E1 (75Ω)

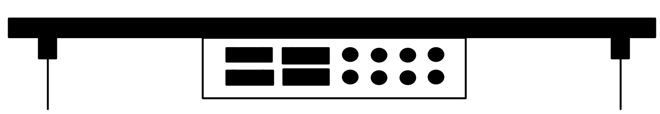


Figure WAN-6. Jumper Settings for E1 (120Ω)

Configuring the DSX/CEPT Plug-in Module (811) Rev A1-D1

The Model 811 DSX/CEPT Revision A1-D1 plug-in module (see Figure WAN-7 and WAN-8) provides jumper settings for impedance compensation. The 811 offers either T1 or E1 (75Ω or 120Ω operation). To configure the 811, change the jumper positions on the pins according to Figures WAN-9 through WAN-11. The unit is shipped as shown in Figure WAN-9.

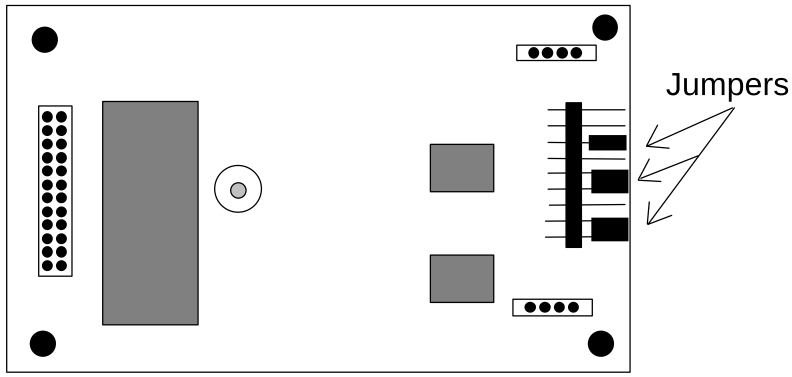


Figure WAN-7. 811 DSX/CEPT Module (Top View)

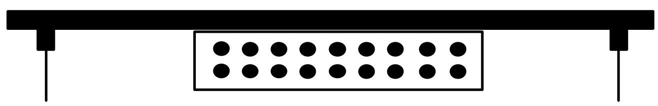


Figure WAN-8. 811 DSX/CEPT Module (End View)

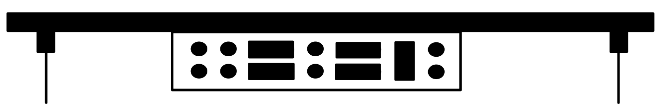


Figure WAN-9. Jumper Settings for T1 Operation

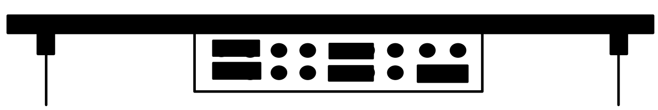


Figure WAN-10. Jumper Settings for E1 (75Ω)

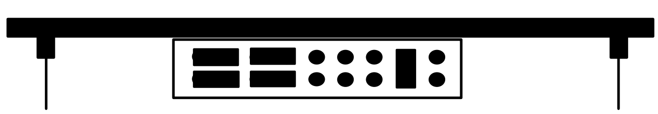


Figure WAN-11. Jumper Settings for E1 (120Ω)

Configuring the DSX/CEPT Plug-in Module 811-F

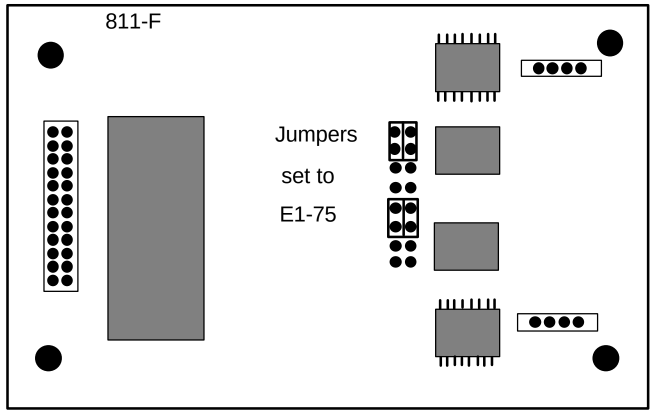


Figure WAN-12. 811 DSX/CEPT Module (Top View)

The DSX/CEPT 811-F module is shown above in Figure WAN-12. This module may be optioned for T1, E1/120 Ohms or E1/75 Ohms. The specific jumper option configuration is shown on the card itself. The jumpers shown on this graphic are set to E1/75 Ohms.

Setting Jumpers for Balanced/Unbalanced E1 Operation

E1 links can be set either to be balanced or unbalanced by setting jumpers on the DSX/CEPT Plug-in Module (811) or the 1183 external distribution panel, or both. (See Table WAN-1 for information on which revisions of the DSX/CEPT Plug-in Module have jumpers.) The 1183 and 118320 connector block mounts in place of the cover on the 8916 and 891620 front-loading chassis (see Figure WAN-13) and connects to the Interface Card via a 50-pin cable. Each BNC connector has its own jumper. The 1184 connector block mounts on the 8918xx chassis.

Table WAN-1.
Selectability of Bal/Unbal jumpers on the DSX/CEPT module (by revision)

Revision ➢ / ⮟ DSX/CEPT Module	A	B	C	D	E	F
811	**Yes**	**Yes**	n/a	**Yes**	**No**	**No**
81120	**No**	**No**	n/a	n/a	n/a	n/a

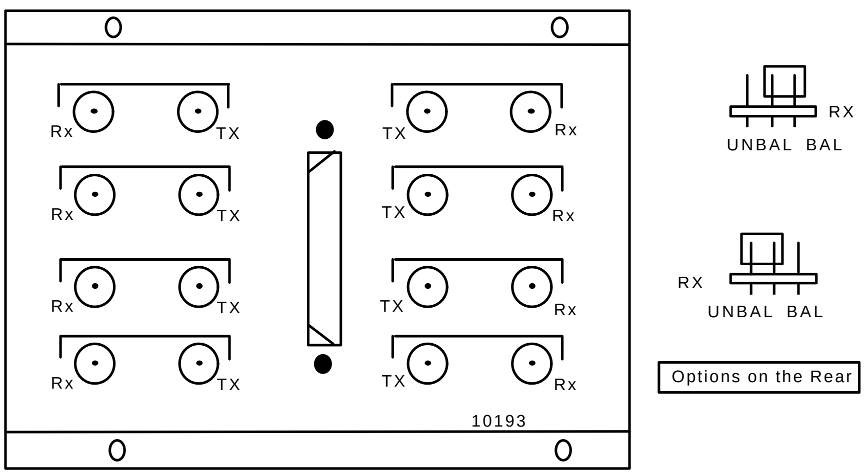


Figure WAN-13. 1183 E1 Interface Adapter

Balanced Operation

For balanced E1 operation, the jumpers on both the 1183 panel and **each** DSX/CEPT Plug-in Module should be set to "balanced" prior to installation.

Unbalanced Operation

For unbalanced E1 operation, the jumpers should be set to "unbalanced" **in one location only**, and set to "balanced" in all other cases. When multiple cards with jumpers are installed, the unbalanced jumper should be set on the card nearest the E1 line.

When the 1183 or 1184 panel is present, it is considered nearest to the E1 line, and the corresponding jumper on the rear of the panel would be set to "unbalanced" while all other module jumpers would be set to "balanced."

Installing CSU, DSX/CEPT Modules (811, 812, 820)

Plug-in modules used to activate WAN cards must be installed prior to insertion of the WAN card into the unit. Figure WAN-13 shows a diagram of the WAN card and the correct placement of these modules. If, for example, your system had a T1 link (DSX) and an E1 link (CEPT), you would receive two DSX/CEPT modules. Using Figure WAN-14 as a guide, place the DSX module in the slot reserved for WAN 1-1 (reference only, not shown this way on actual card). Insert the pins for TX in JP #10, while simultaneously inserting the pins for RX in JP #9 and the 24-pin end connector pins in JP #6. After changing the jumpers to convert the DSX module to CEPT, place the CEPT module in the slot reserved for WAN 1-2. Insert the TX pins into JP #15, the RX pins into JP #14, and the 24-pin end connector pins into JP #13.

The CSU module connectors are inserted in the same manner.

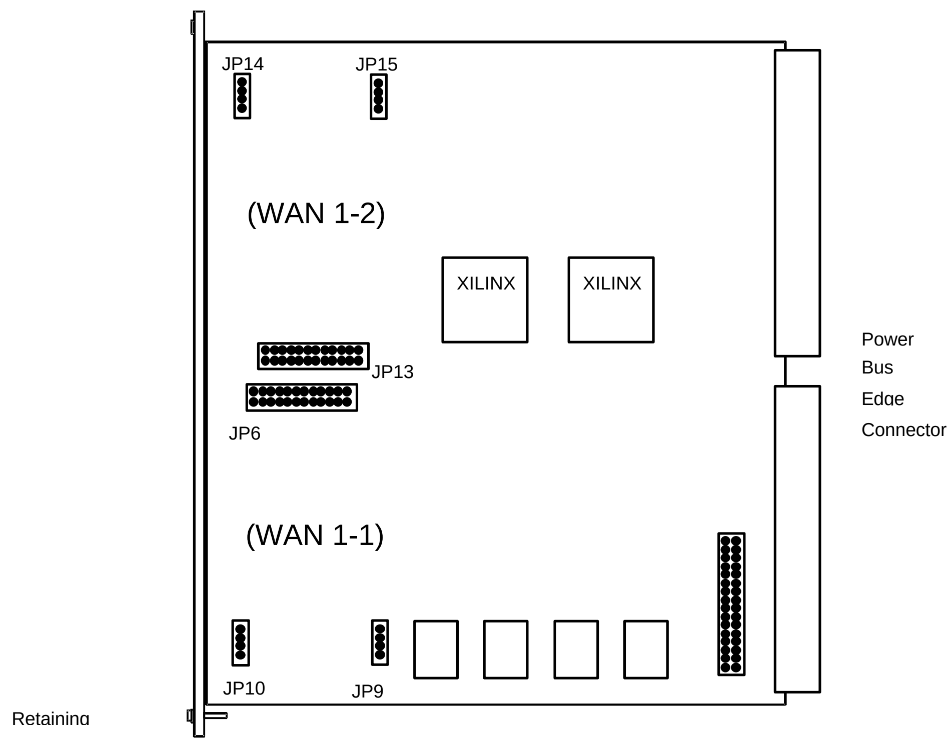


Figure WAN-14. Inserting DSX/CEPT/CSU Modules

WAN Card Settings for CSU/DSX

Since both CSU and DSX configurations are T1 operations, Figure WAN-15 shows the WAN card screen for CSU/DSX operation. Table WAN-2 lists the CSU/DSX settings controlled on the screen along with their possible and default values. For information about cross-connects and the timeslot map used to connect your WAN to voice and data ports or equipment, see the System Operations chapter.

In addition to the Local and Line Loopbacks described below, a Single or Dual Link card that is equipped with a CSU plug-in module will recognize and respond to industry-standard T1 loop-up and loop-down codes that are generated from the network or from a remote device. It will ignore those codes if the Single or Dual Link card is equipped with a DSX plug-in module.

```
Node_1        | W1  CSU+DSX   8010  Rev A6-2  Ser 00101    | 12-31-99
14:33

                 CSU                                  DSX
STATE         stdby            STATE             stdby
MODE          xcon             MODE              xcon
FORMAT        esf              FORMAT            esf
LINE CODE     b8zs             LINE CODE         b8zs
PULSE         n/a              PULSE             n/a
LINE LEN      0                LINE LEN          133
SLIP LIM      126              SLIP LIM          126
AIS/ALM       none             AIS/ALM           none
LINE LB       off              LINE LB           off
LOCAL LB      off              LOCAL LB          off
CH LB         off              CH LB             off
LB ADDR       01               LB ADDR           01
LB GEN        off              LB GEN            off
LB DET        w/to             LB DET            w/to
ESF/NMS RP    at&t             ESF/NMS RP        at&t
EER THRHD     10e-4            EER THRHD         10e-4
RDNT RULES    n/a              RDNT RULES        n/a
GROUP         none             GROUP             none

Save | Undo | Refresh | Xcon | Perf | Farstat | Test | sWitch | Main
```

Figure WAN-15. Typical WAN Card Main Screen for T1 CSU or DSX

Table WAN-2. Parameter Options and Defaults for CSU/DSX Operations

Parameter	User Options	Notes	Default
STATE	stdby act		stdby
MODE	term d-i xcon	1	xcon
FORMAT	d4 esf slc96 slcd4		esf
LINE CODE	ami b8zs	2	b8zs
PULSE	n/a trnsp Z15s		n/a
LINE LEN	0 7.5 15.0	3	0
SLIP LIM	126 138		126
AIS/ALM	none tcodr	4	none
LINE LB	off on		off
LOCAL LB	off on		off
CH LB	off clr		off
LB ADDR	01-24		01
LB GEN	off llb plb nlb		off
LB DET	w/to on off		w/to
ESF/NMS RP	none at&t ansi c-fdl c-b7r efdl	5	at&t
EER THRHD	10e-4 thru 10e-9 none		10e-4
RDNT RULES	n/a none OOS CGA	6	n/a
GROUP	none 1 2 3 4	7	none

NOTES

1. Valid options for Bus Connect systems are **term** and **d-i**. The only valid option for Cross-Connect systems is **xcon**.
2. These options are valid only if you have a CSU and the Line Code is **ami**. If you have a CSU and the Line Code is **b8zs**, then this setting will default to **n/a**. If you have a DSX module, then this setting will always default to **n/a**.
3. These options are valid only if you have a CSU. If you have a DSX module, then the possible options are **0** (default), **133**, **266**, **399**, **533**, **655**, and **csu**.
4. The settings for AIS/ALM vary greatly by the settings of other parameters. A complete matrix of AIS/ALM settings is shown as Table WAN-4 later in this chapter.
5. If the format is d4 or slc96, the only option to appear will be **none**.
6. If there is no redundant WAN card in the appropriate slot the only option that will appear is **n/a**.
7. Selection of GROUP is a two-step process. After identifying the group number (1-4), the user must select the secondary group (A, B or C). A which point TC ODR will then become available.

WAN Card Parameters

The following paragraphs describe the parameters for the DSU/DSX WAN cards shown in Figure WAN-15 and Table WAN-2.

STATE

In standby state, the WAN port is electrically disconnected from the external network. Set the State setting to standby (**stdby**) when setting up your WAN links, then change it to active (**actv**) when starting normal operations.

MODE

In bus-connect systems, WAN cards have two possible modes of operation, Terminal and Drop-and-Insert. Terminal (**term**) mode is for channel bank applications. All timeslots must connect to a port on a user card or remain unconnected. Drop-and-Insert (**d-i**) mode automatically connects all timeslots on WAN link #1 to the corresponding timeslots on WAN link #2 of the same card. You can assign any or all of the timeslots to voice and data ports by overriding the automatic setup. See the Systems Operations chapter for more information about using these two modes, and about timeslot maps in general. In cross-connect systems, the Mode automatically defaults to (**xcon**).

FORMAT

The Format setting specifies the framing to be used on the WAN link so that it matches the framing used by your T1 carrier. Set the Format parameter based on the type of framing your T1 carrier requires. If you are using an external Channel Service Unit (CSU), the framing format must match that of the CSU. The options are **d4** (normal superframe), **esf** (extended superframe) and **slc96** (subscriber loop carrier).

Table WAN-3 (on the next page) lists the DS0 time slots and the corresponding SLC assignments (taken from TR-TSY-000008).

LINE CODE

The Line Code setting matches the coding used by your T1 interface to that used by your T1 carrier or CSU. Set the Line Code setting based on the type of encoding your T1 carrier uses. If you are using an external CSU, the line coding must match that of the CSU. The options are **ami** and **b8zs**.

PULSE

For CSU modules configured for **ami** mode only, the user must also specify if the system should ensure pulse density (also known as ones density) or if that responsibility belongs to the attached customer equipment. In **z15s** mode, the system will monitor the outbound data stream and will place a “1” in the 16th bit position whenever it detects fifteen consecutive zeros. Obviously, this can lead to data corruption. In Transparent mode (**trnsp**), the system will pass all incoming data transparently (the DTE must provide 1s density). If the Line Code parameter for the CSU is **b8zs**, then Pulse will default to **trnsp**. If the WAN link is equipped with a DSX plug-in, then this option will automatically default to **n/a**.

Table WAN-3. DS0-SLC Conversion Table

DS0 Time Slot	SLC Channel Number			
	Shelf A	Shelf B	Shelf C*	Shelf D*
1	1	25	49	73
2	13	37	61	85
3	2	26	50	74
4	14	38	62	86
5	3	27	51	75
6	15	39	63	87
7	4	28	52	76
8	16	40	64	88
9	5	29	53	77
10	17	41	65	89
11	6	30	54	78
12	18	42	66	90
13	7	31	55	79
14	19	43	67	91
15	8	32	56	80
16	20	44	68	92
17	9	33	57	81
18	21	45	69	93
19	10	34	58	82
20	22	46	70	94
21	11	35	59	83
22	23	47	71	95
23	12	36	60	84
24	24	48	72	96
* Shelf C and D not supported in this release				

LINE LEN

Use the Line Length setting to adjust the T1 signal strength to the distance that it must travel before it encounters the next T1 device or repeater. For the DSX module, the options are **133**, **266**, **399**, **533**, **655** feet or **csu** which is used to connect to the equipment side of a co-located external CSU. In addition, there is an option called **0** that allows the DSX module to talk to the network side of a co-located external CSU over a short-distance four-wire cable. For a CSU module, the three options are **0**, **7.5** and **15.0** which define the amount of **attenuation** (in dB) that will be applied to the T1 signal before it is transmitted. Provisioning the circuit for **0** will result in the strongest possible signal whereas a setting of **15.0** will generate the weakest possible signal.

SLIP LIM

Slip Limit defines how many bits of wander the T1 aggregate card will tolerate before forcing a frame slip. The options are **126** and **138** bits which correspond to all old and more recent versions of the relevant specification.

AIS/ALM

The AIS/ALM setting, allows the user to specify the type of “keep-alive” signal known as AIS/ALM (Alarm Indication Signal/Alarm) that the system will generate on one T1/E1 should the other fail. The AIS/ALM setting is dependent upon the format selected for this WAN unit. Table WAN-4 shows AIS/ALM settings for Bus Connect and Cross-Connect systems using the different FORMAT settings.

Table WAN-4. AIS/ALM Settings

System	Format	AIS/ALM
Bus Connect/RB Connect	D4	none
	ESF	none, frm, unfrm
	SLC-96	note, orb13, orb16
Cross-Connect	D4	none, tcodr
	ESF	none, frm, unfrm
	SLC-96	note, orb13, orb16

In Bus Connect and Redundant Bus Connect systems, the only option available for D4 framing is **none** (no AIS signal is to be generated). The options for ESF framing are **none**, **frm** for a framed alarm signal and **unfrm** for an unframed alarm signal. The options for SLC-96 framing are **note** (network office terminating equipment), **orb16** (Office Repeater Bay - 16 frames) and **orb13** (Office Repeater Bay - 13 frames).

In Cross-Connect systems, the options available for D4 framing are **none** (no AIS signal is to be generated) and **tcodr** (transcoder operations). Selection of **tcodr** can only be assigned after selection of the Group option. The options for ESF framing are **none**, **frm** for a framed alarm signal and **unfrm** for an unframed alarm signal. The options for SLC-96 framing are **note** (network office terminating equipment), **orb16** (Office Repeater Bay - 16 frames) and **orb13** (Office Repeater Bay - 13 frames).

LINE LB

The Line Loopback setting controls looping of the **full** T1/E1 line back to the network, as shown in Figure WAN-16. The options are **off** and **on**. When **on**, this setting allows end-to-end testing of the line.

LOCAL LB

The Local Loopback setting controls looping of the **full** T1/E1 line back to the PCM bus, as shown in Figure WAN-16. The options are **off** and **on**. When **on**, this setting allows testing of local equipment.

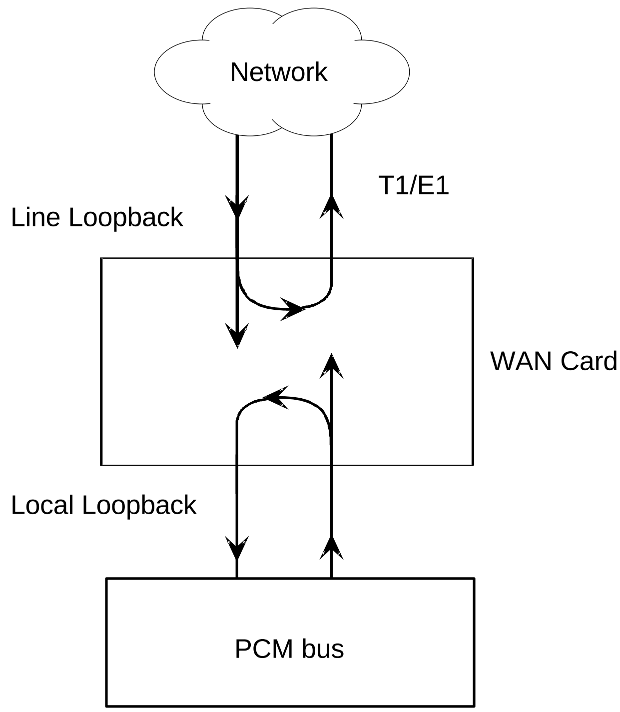


Figure WAN-16. WAN Card Line and Local Loopbacks

CH LB

The Channel Loopback setting allows you to select the type of **local loopback** for **individual DS0** channels or the WAN aggregate. A channel loopback loops a single DS0 channel back towards the PCM bus (see Figure WAN-17) and **cannot** be used to loop multiple DS0s or a portion of a DS0. Refer to user cards for other loopback options which may allow you to loop part of a channel or multiple channels.

The loopback can be **off** or clear (**clr**). "Clear" means that the entire 64kbps clear channel will be looped back, but without the Robbed Bit Signaling (RBS), if any, that is embedded in this channel.

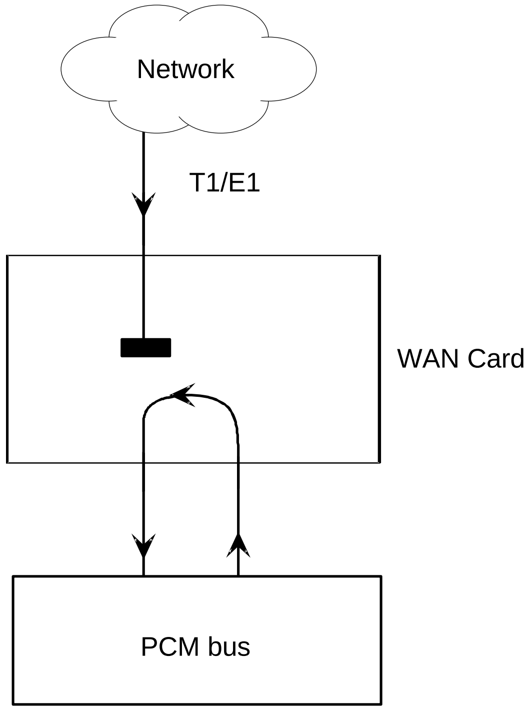


Figure WAN-17. WAN Card Channel Loopback

LB ADDR

The Loopback Address setting, in conjunction with the Channel Loopback setting, specifies which channel is to be looped back. Only one channel may be looped back at any one time for each T1 link. The valid selections for T1 lines are **1-24**.

LB GEN

The Loopback Generate setting generates in-band diagnostic codes that are sent to the remote equipment These codes are ANSI T1.403 compatible with DS1 networks and allow you to command a latching loopback at remote DS1 equipment. The options are off, **llb** (Local Loopback), **plb** (payload Loopback [when the entire signal, *excluding the framing bit,* is looped back]) and **nlb** (Network Loopback).

LB DET

This option allows the card to detect DS1 channel loopbacks. When set to **off**, no T1 loopbacks can be detected. When set to **on**, T1 loopbacks will be detected and maintained until a loop down is detected. The with/time-out (**w/to**) is the same as **on** except that if no loop down is detected after 10 minutes, the loopback will self-terminate.

ESF/NMS RP

This setting specifies the format in which performance statistics for the T1 link will be gathered and stored in the system. In ESF mode, these performance statistics are accessible to the carrier over the Facilities Data Link (FDL) as well as to you through the user interface. The options are **none**, **at&t**, **ansi**, **both**, **c-fdl** and **c-b7r**. The **at&t** option means that the statistics are gathered in accordance with AT&T Publication 54016 whereas the **ansi** option means that the ANSI T1.403 specification will be used. You can also specify that the information should be stored in both AT&T and ANSI modes simultaneously by selecting **both**. Performance statistics are also available for D4 formatted T1 lines. See the section on T1 Performance Monitoring in this chapter for more detailed information on this topic.

The choice of **c-fdl** disables telco-side capability to access performance monitoring information. The **c-fdl** option sends and receives network management information over the facility data link. The **c-b7r** option sends and receives the same information over timeslot #24 on the WAN link highlighted.

EER THRHD

The Excessive Error Rate Threshold selects the error rate at which an alarm is declared. This setting interacts with the EER setting in the Alarm Filters of your system. (See Basic Operations chapter.) The options are **10e-4** through **10e-9** or **none**.

RDNT RULES

The selection of Redundancy Rules will define the method of determining what event will trigger a WAN port to switch to its redundant mate. The options are **none**, **OOS** or **CGA**. See the Redundancy Chapter for more information about redundant WAN operations. If there is no redundant WAN card in the appropriate slot or there is an ISDN or ADPCM card in the system, the only option that will appear is **n/a**.

GROUP

The Group setting identifies a method of link-fail alarm propagation from upstream trunks to downstream tributaries when the system is configured for transcoder.

Selection of group is a two-step process. After identifying the group number (**1-4**), the user must select the secondary group (**A** [child group], **B** [child group] or **C** [parent group]).

Figure WAN-18 shows two Integrated Access Controllers with "parent-child" groupings. Child groups are designated as "A" and "B." Parent groups are designated "C." At this time TCODR may be turned on if alarms are to be propagated to distant end.

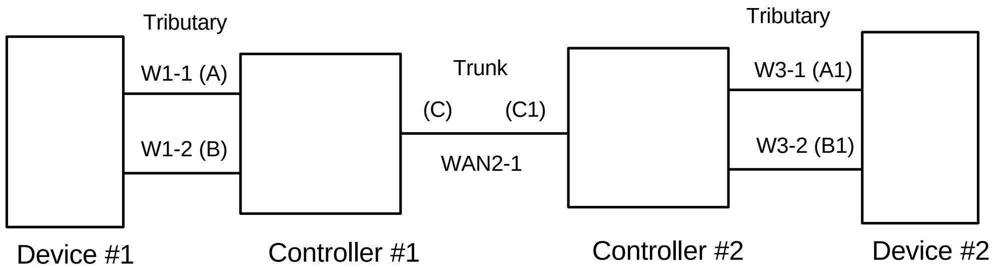


Figure WAN-18. Using WAN Groups

For the purposes of this discussion, the WAN links between the Device and the Integrated Access Controller (A, B, A1, and B1) will be called "tributaries" and the WAN link between the two Controller Units (C and C1) will be referred to as a "trunk."

In the normal condition (no WAN groups selected), a failure on any of the tributaries supplying Device #1 would be reported at Integrated Access Controller #1 and Device #1 only. A failure of the trunk (C to C1) would be reported at Controller #1 and #2 only.

When Groups are created at both systems, a trunk failure (C to C1) will inform all of the associated tributaries (A and B, A1 and B1) of that condition.

When Groups are used in conjunction with the Network Management option (mentioned earlier) and the AIS/ALM is set to **tcodr**, a failure of any of the tributaries will propagate the failure through the trunk to the associated tributary at the other end (A to A1 or B to B1).

The following notification procedure is followed:

1. A Loss of Signal, Loss of Frame, Error Rate Exceeded or AIS failure of the transmit leg of W1-1(A) between Device #1 and Integrated Access Controller #1 occurs.
2. Controller #1 detects the failure on the receive leg and declares an alarm for W1-1(A).
3. Controller #1 sets the A Bit (Yellow Alarm) in the transmit leg of W1-1(A). Device #1 detects this condition and knows not to use W1-1(A).
4. Controller #1(C) sends an alarm message to Controller #2 (C1) that W1-1(A) is either CGA_RED or AIS.
5. Controller #2 sets the transmit leg of W3-1(A1) into AIS (CGA_RED). Device #2 detects this condition and knows not to use W3-1(A1).

When the original failure is corrected, the alarm is also cleared for downstream tributaries.

Menu of Actions

Table WAN-5 shows the Menu of Actions for the CSU/DSX main WAN card screen.

Table WAN-5. WAN Card Screen Menu of Actions

Action	Function
Save	Saves changes to settings
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e. performance and test data).
Xcon	Shows the cross-connect map for each WAN port. See the System Operations section for a detailed description of cross-connect features.
Perf	Brings up the performance monitoring screen for the near end system. See the Performance Monitoring section below.
Farstat	Opens performance monitoring screen for Far-end Statistics
Test	Initiates and monitors testing of all WAN card ports. Refer to Test section below.
S**W**itch	Allows the user to switch wan port operations to the redundant mate. See the Redundant Operations section.
p**A**rs	Not supported in this release. Reserved for future use.
Main	Returns to the main terminal screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Cross-Connect (XCON)

The Cross-Connect (Xcon) command in the Main WAN screen allows you to view the Cross-Connections that have been set up in the system. Highlight one of the WANs on the card and type **x** (Xcon) to select Cross-Connect. Either an E1 screen (Figure WAN-19) or a T1 screen (Figure WAN-20) will appear, depending upon the WAN highlighted. This is a display-only screen. Timeslot and cross-connect configuration are discussed in the System Operations chapter of this manual.

```
Node_1        | W2  CSU+CEPT   8010  Rev A6-2  Ser 11132    | 12-31-99
14:33


TS   XCON     TS        CIRCUIT_ID     TS     XCON    TS    CIRCUIT_ID
 0   frame    align     64k            16     cas           64k
 1   u5-1     A-01      user_circuit   17     u7-1    A-17  user_circuit
 2   u5-2     A-02      user_circuit   18     u7-2    A-18  user_circuit
 3   u5-3     A-03      user_circuit   19     u7-3    A-19  user_circuit
 4   u5-4     A-04      user_circuit   20     u7-4    A-20  user_circuit
 5   u5-5     A-05      user_circuit   21     u7-5    A-21  user_circuit
 6   u5-6     A-06      user_circuit   22     u7-6    A-22  user_circuit
 7   u5-7     A-07      user_circuit   23     u7-7    A-23  user_circuit
 8   u5-8     A-08      user_circuit   24     u7-8    A-24  user_circuit
 9   u6-1     A-09      user_circuit   25     u8-1    A-25  user_circuit
10   u6-2     A-10      user_circuit   26     u8-2    A-26  user_circuit
11   u6-3     A-11      user_circuit   27     u8-3    A-27  user_circuit
12   u6-4     A-12      user_circuit   28     u8-4    A-28  user_circuit
13   u6-5     A-13      user_circuit   29     u8-5    A-29  user_circuit
14   u6-6     A-14      user_circuit   30     u8-6    A-30  user_circuit
15   u6-7     A-15      user_circuit   31     u8-7    A=31  user_circuit



Refresh | Test | Main
```

Figure WAN-19. E1 Cross-Connect Display

```
Node_1        | W2  CSU+CEPT   8010  Rev A6-2  Ser 11132    | 12-31-99
14:33


TS   XCON     TS        CIRCUIT_ID     TS    XCON   TS    CIRCUIT_ID
 1                                     13
 2                                     14
 3                                     15
 4                                     16
 5                                     17
 6                                     18
 7                                     19
 8                                     20
 9                                     21
10                                     22
11                                     23
12                                     24

Refresh | Test | Main
```

Figure WAN-20. T1 Cross-Connect Display

Performance Monitoring

Performance monitoring is supported on all WAN aggregates. The performance monitoring screen is accessed by typing the **p** (Perf) command from the WAN card main screen Menu of Actions. Performance statistics are accumulated for 15 minute increments that include the current period and the previous 96 periods that are accessed by the **pgUp** and **pgDn** commands from the Menu of Actions.

In the T1 environment, an error is defined as any CRC6, Controlled Slip or Out of Frame error for "**esf**" format and any Bipolar Violation (BPV), Controlled Slip or Out of Frame error for the "**d4**" format. In the E1 environment, an error is defined as any CRC4, Controlled Slip or Out of Frame error.

Figure WAN-21 shows the T1 performance monitoring screen (the E1 screen is similar except for the Menu of Actions). The performance statistics are gathered and displayed in fifteen-minute intervals. Periods when no seconds have accumulated are represented by lines in each of the columns. Table WAN-8 identifies the error conditions.

Two sets of registers accumulate performance data for T1 WAN links. The *user registers* and the *network registers* are driven by the same errored events. However, they can be cleared at separate times. The user may view both the user and network registers but may only clear the user registers. The network has access to only the network registers and can clear only network registers. E1 WAN links have only one set of registers.

Table WAN-9 shows the Menu of Actions for the Performance Monitoring Screen.

```
Node_1        | W1  CSU+DSX   8010  Rev A6-2  Ser 00101    | 12-31-99
14:33

Unit 1  PERFORMANCE  USER REGISTERS  Sec. 167 of 900

        ES     UAS    SES    BES    LOFC   SLIP   DM    STATUS
CUR     0      0      0      0      0      0      0     . . T . . .
01      0      0      0      0      0      0      0     . . T . . .
02      0      0      0      0      0      0      0     . . T . . .
03      0      0      0      0      0      0      0     . . T . . .
04      0      0      0      0      0      0      0     . . T . . .
05      0      0      0      0      0      0      0     . . T . . .
06      0      0      0      0      0      0      0     . . T . . .
07      0      0      0      0      0      0      0     . . T . . .
08      0      0      0      0      0      0      0     . . T . . .
09      0      0      0      0      0      0      0     . . T . . .
10      0      0      0      0      0      0      0     . . T . . .
11      0      0      0      0      0      0      0     . . T . . .
12      0      0      0      0      0      0      0     . . T . . .
TOTAL   0      0      0      0      0      0      0     . . T . . .


STATUS:   Y=YEL   N=NOS   T=Test   L=LOS   O=OOS   B=BPV   E=ERR


Refresh | pgUp | pgDn | uSerregs | Networkregs | Clearregs | Main
```

Figure WAN-21. Performance Monitoring Screen

Table WAN-8. Performance Monitoring Displays

Parameter	Display
ES	Errored Seconds (ES) registers the number of seconds with one or more CRC6 (ESF), BPV (D4) or CRC4 (E1) errors, **OR** one or more OOFs, **OR** one or more Controlled Slips.
UAS	Unavailable Seconds (UAS) shows the number of seconds during which service is unavailable. An unavailable signal state is declared after ten consecutive Severely Errored Seconds (SESs) are logged. An unavailable state is cleared after ten consecutive non-Severely Errored Seconds are logged. Unavailable Seconds are also accumulated if the card has an out-of-service (OOS) condition.
SES	A Severely Errored Second (SES) is any second with 320 or more CRC6 (ESF), BPV (D4) or CRC4 (E1) errors, **OR** one or more OOF errors.
BES	A Bursty Errored Second (BES) is any second with more than one and less than 320 CRC6 (ESF), BPV (D4) or CRC4 (E1) errors.
LOFC	The Loss of Frame Count (LOFC) is the accumulation of Loss Of Frame (LOF) conditions. LOF is declared after 2.5 seconds of continuous Loss Of Synchronization (LOS) or Out-Of-Frame (OOF) condition. LOF is cleared after no more than fifteen consecutive seconds without an LOS or OOF condition.
SLIP	A Slipped Second contains one or more Controlled Slips. A Controlled Slip is the deletion or replication of a DS1/E1 frame by the receiving equipment.
DM	A Degraded Minute (DM) is any minute during the reporting period that contains more than 10^{-6} errors as described in CCITT G.821. The count for this field is 1-15 rather than 1-900 for the other fields.
STATUS	Status displays error codes for conditions that occur during a fifteen minute interval. Identifying codes are displayed at the bottom of the screen. Values are **Y** (Yellow Alarm received), **N** (No Signal), **T** (Test Mode - line loop, local loop, payload loop or standby), **L** (Loss of Synchronization - 2 out of 4 frame bits in error), **O** (Out of Service), **B** (Bipolar Violation) and **E** (Excessive Error Rate).

Menu of Actions

Table WAN-9. Performance Monitoring Screen Menu of Actions

Action	Function
Refresh	Because statistics are not calculated in real time, the Refresh command must be used to update the screen with new inforamtion.
pg**U**p	Pages through the performance statistics for the current 15 minute period and periods 96-1.
pg**D**n	Pages through the performance statistics for the current 15 minute period and periods 1-96.
u**S**erregs	Allows the user to view the User Registers. Not shown for CEPT operation because it is the only set of registers for that mode.
Networkregs	Allows the user to view the Network Registers. When a user is viewing the network registers, the Clear Registers option disappears. (This action is not available in D4 mode or CEPT operation.)
Clearregs	Clears the User Registers. Network statistics remain the same.
Main	Returns to the main WAN card screen.

Far End Statistics

The Far End Statistics (Farstat) screen (Figure WAN-22) reports the same impairlments as the Performance Monitoring screen. The same statistics are collected in the same manner for the far end system for both T1 and E1 systems. Since there are no registers for this option at the near end, the register commands are not available in the Menu of Actions.

```
Node_1  |  W1  H_E1+H_E1  8011   Rev A1-0   Ser 00101  |  12-31-99  14:33

Unit 1  AT&T FAREND STATISTICS NETWORK REGISTERS   Sec. 240 of 900

        ES      UAS     SES     BES     LOFC    SLIP
CUR     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

Retrieving message.   Please wait...



Refresh | Clear | pgUp | pgDn | Main
```

Figure WAN-22. Far-End Statistics

Test

Selecting "Test" from the WAN Screen Menu of Options brings up the screen shown in Figure WAN-23. From this screen, users are allowed to create test situations between WAN cards or between a single WAN card and data test equipment at a remote site. Table WAN-10 lists the user options and display field definitions on this screen. Defaults are shown in **bold** type. Table WAN-11 shows the Menu of Actions for the Test Screen.

In a system using an enhanced bus-connect 8804 CPU card, the test feature cannot be accessed by cards in WAN slot #3 or #4.

```
Node_1        | W1  CEPT+CEPT  8010  Rev A6-2  Ser 00101   | 12-31-99
14:33

                     CSU                 CSU
BERT                 off                 off
SYNC                 no                  no
BE                   0                   0
ES                   0                   0
SES                  0                   0
CSES                 0                   0
OSS                  0                   0
BER                  0.0e+1              0.0e+1
ELAP                 0                   0
LB STATE             none                none






Save | Undo | Refresh | InsertErr | Clear | Main
```

Figure WAN-23. The WAN Card Test Screen

Table WAN-10. Test Screen Options

Parameter	User Options	Default
BERT	off mark space 1:1 1:7 3:24 qrss lp-up lp-dn	off
SYNC	yes no	no
BE	see description below	
ES	see description below	
SES	see description below	
CSES	see description below	
OSS	see description below	
BER	see description below	
ELAP	see description below	
LB STATE	pl-lb l-lb none.	

BERT

Bit Error Rate Tester (BERT) sends a data pattern and measures the bit error rate (BER) on the selected WAN port. The patterns that can be selected are **off**, **mark** (all ones), **space** (all zeros), **1:1** (one-zero-one-zero), **1:7** (zero-one-6 zeros), **3:24** (3 ones-24 zeros), **qrss** (quasi-random pseudo signal), **lp-up** (which sends a T1 loop-up code to the remote end) and **lp-dn** (which sends a loop-down code to the remote end). Loop-up (**lp-up**) and loop down (**lp-dn**) codes are not supported for CEPT WANs.

SYNC

Synchronization (SYNC) displays **yes** if the integrated BERT has achieved synchronization either with itself via a remote loopback or with the remote test equipment, **no** if it has not.

BE

Bit Error (BE) displays the total number of bit errors logged.

ES

Errored Seconds (ES) displays the total number of seconds in which errors were detected.

SES

Severely Errored Seconds (SES) shows the total number of seconds in which the bit error rate exceeded one bit per thousand (1×10^{-3}).

CSES

Consecutive Severely Errored Seconds (CSES) is triggered by the occurrence of ten consecutive Severely Errored Seconds. Once triggered, the CSES field will increment (by one) for each elapsed second until the system logs ten consecutive non-Severely Errored Seconds.

OSS

Out of Synchronization Seconds (OSS) shows the number of seconds that the BRI BERT has been out of synchronization.

BER

Bit Error Rate (BER) shows the rate at which errors are being logged. BER equals the number of bit errors (BE) divided by the total number of bits transmitted during the test.

ELAP

Elapsed time (ELAP) is the total number of seconds elapsed during the test.

LB STATE

The Loopback State indicates that a loopback from a remote device is both present and operational. The field will show **pl-lb** (payload loop-back) when the entire signal, *excluding the framing bit,* is looped back. The field will show **l-lb** (line loop-back) when the entire signal is looped back. It will show **none** if the WAN port is not in loopback.

Menu of Actions

Table WAN-11. Test Screen Menu of Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e. performance and test data).
Insert**E**rr	Allows the user to manually insert a single error into the clear data signal.
Clear	Clears the testing screen and resets all counters to zero.
Main	Returns to the WAN card main screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

WAN Card Settings for HDSL E1

Figure WAN-24 shows the WAN card screen for HDSL E1 operation. Table WAN-12 lists the HDSL E1 settings controlled on the screen along with their possible and default values. For information about cross-connects and the timeslot map used to connect your WAN to voice and data ports or equipment, see the System Operations chapter.

```
Node_1  |  W1  H_E1+H_E1  8011   Rev A1-0   Ser 00101  |  12-31-99  14:33

            H_E1                    H_E1
STATE       stdby       STATE       stdby
MODE        xcon        MODE        xcon
FRAME       crc         FRAME       crc
TS16        cas         TS16        cas
EVEN BIT    norm        EVEN BIT    norm
AIS/ALM     none        AIS/ALM     none
LINE LB     off         LINE LB     off
LOCAL LB    off         LOCAL LB    off
CH LB       off         CH LB       off
LB ADDR     01          LB ADDR     01
LB GEN      off         LB GEN      off
COM/NMS RP  none        COM/NMS RP  none
EER THRHD   10-e-4      EER THRHD   10-e-4
RDNT RULES  none        RDNT RULES  none
GROUP       none        GROUP       none


Save | Undo | Refresh | Xcon | Perf | Farstat | Test | sWitch | Hdsl | Main
```

Figure WAN-24. The WAN Card Screen for HDSL_E1 Operations

Table WAN-12. Parameter Options for CEPT Operations

Parameter	User Options	Default
STATE	stdby actv	stdby
MODE	term d-i xcon	xcon
FRAME	crc d-frm	crc
TS16	cas ccs nos	nos
EVEN BIT	norm inv	norm
AIS/ALM	none tcodr	none
LINE LB	off on	off
LOCAL LB	off on	off
CH LB	off clr	off
LB ADDR	00-31	00-31
LB GEN	off llb plb nlb	off
COM/NMS	none c-sa4 c-br7	none
EER THRHD	10e-4 - 10e-9	10e-4
RDNT RULES	none OOS CGA	none
GROUP	none 1 2 3 4	none

STATE

Leave the card in standby (**stdby**) when setting up your WAN links; then change it to active (**actv**) when starting normal operations.

MODE

In bus-connect systems, WAN cards have Terminal (**term**) and Drop-and-Insert (**d-i**) modes of operation. In Terminal mode, used for channel bank applications, all timeslots must connect to a port on a user card or remain unconnected. Drop-and-Insertmode automatically connects all timeslots on WAN link #1 to the corresponding timeslots on WAN link #2 of the same card. You can assign any or all of the timeslots to voice and data ports by overriding the automatic setup. See the Systems Operations chapter for more information about using these two modes, and about timeslot maps in general. In cross-connect systems, Mode automatically defaults to **xcon**, the only available option.

FRAME

Selects frame types: Cyclic Redundancy Check, 4th level (**crc**) or Dual Frame (**d-frm**).

TS16

Selects signaling usage of slot 16: Channel Associated Signaling (**cas**), Common Channel Signaling (**ccs**) or No Signaling (**nos**). In the CAS and CCS, timeslot 16 is used to carry signaling information for all channels on the E1. If **nos** is selected, then timeslot 16 becomes available for user data.

EVEN BIT

Setting the Even Bit parameter for **inv** causes the system to invert every even bit in every DS0 timeslot, insuring ones-density. This option should be used only if the entire E1 stream is composed of PCM voice.

AIS/ALM

Specifies the type of "keep-alive" signal known as AIS/ALM (Alarm Indication Signal/Alarm) that the system will generate on one E1 should the other fail. AIS/ALM will show **none** until the GROUP is selected

LINE LB

Controls looping the full E1 line back to the network. On enables, off disables end-to-end testing of the line.

LOCAL LB

Controls looping the full E1 line back to the PCM bus. The options are **off** and **on**. On allows testing of local equipment; off disables testing. The system generates a "Keep Alive - Type 1" pattern on the E1 line.

CH LB

Enables individual DS0 channel loopback toward the PCM bus (see Figure WAN-16 earlier in this chapter). A channel loopback loops a single DS0 channel and cannot be used to loop multiple DS0s or a portion of a DS0. Refer to user cards for other loopback options which may allow you to loop part of a channel or multiple channels. Clr enables, off disables loopback.

LB ADDR

The Loopback Address specifies which channel is to be looped back in the Channel Loopback. Valid selections for E1 lines are **0-31**. Do not loop timeslot 16 unless the E1 interface is in no signaling (**nos**) mode.

LB GEN

LB GEN generates in-band diagnostic codes that are sent to the remote equipment These codes are compatible with DDS networks and allow you to command a latching loopback at remote DDS equipment. The options are off, **llb** (Local Loopback), **plb** (payload Loopback) and **nlb** (Network Loopback).

COM/NMS

Communications/Network Management System Report tells the system where to send TCP/IP packets from the NMS configuration selected on the Interface card. The options are **none** (no NMS), **c-sa4** (use SA4 channel for NMS information) and **c-b7r** (send NMS information to a B7R card on timeslot 31).

EER THRHD

Excessive Error Rate Threshold selects the error rate at which an alarm is declared. This setting interacts with the EER setting in the Alarm Filters of your system. (See Basic Operations chapter.) The options are **10e-4** through **10e-9** or **none**.

RDNT RULES

Redundancy Rules define the method of determining what event will trigger a WAN port to switch to its redundant mate. The options are **none**, **OOS** or **CGA**. See the Redundancy Chapter for more information about redundant WAN operations. If there is no redundant WAN card in the appropriate slot, or there is an ISDN or ADPCM card in the system, the only option that will appear is **none**.

GROUP

Group identifies a path of link-fail alarm propagation from upstream trunks to downstream tributaries. Selection of group is a two-step process. After identifying the group number (1-4), the user must select the secondary group (A [child group], B [child group] or C [parent group]). The group setting is normally used for transcoder applications.

Menu of Actions

Table WAN-13 shows the Menu of Actions for the E1 HDSL WAN Card. Relevant actions are described below.

Table WAN-13. WAN Card Screen Menu of Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e. performance and test data).
Xcon	Shows the cross-connect map for each WAN port. See the System Operations section for a detailed description of cross-connect features.
Perf	Brings up the performance monitoring screen. See the Performance Monitoring section of this chapter.
Farstat	Opens performance monitoring screen for Far-end Statistics
Test	Initiates and monitors testing of all WAN card ports. Refer to Test section below.
s**W**itch	Allows the user to switch wan port operations to the redundant mate. See the Redundant Operations section.
Hdsl	Sets HDSL options
Main	Returns to the main terminal screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Cross-Connect (XCON)

The Cross-Connect (Xcon) command in the E1 HDSL WAN Main WAN screen allows you to view the Cross-Connections that have been set up in the system. Functionality and screens are the same as those for the WAN cards (CEPT) discussed earlier in this chapter.

Performance Monitoring

Performance monitoring for the HDSL E1 WAN card is essentially the same as for the T1 WAN, except that only a single set of registers is used. Therefore only the Clearregs command appears in the menu of actions, as shown in Figure WAN-25.

```
Node_1       | W1  CSU+DSX   8010  Rev A6-2  Ser 00101    | 12-31-99
14:33

Unit 1  PERFORMANCE  USER REGISTERS  Sec. 167 of 900

       ES     UAS    SES    BES    LOFC   SLIP   DM     STATUS
CUR    0      0      0      0      0      0      0      . . T . . .
01     0      0      0      0      0      0      0      . . T . . .
02     0      0      0      0      0      0      0      . . T . . .
03     0      0      0      0      0      0      0      . . T . . .
04     0      0      0      0      0      0      0      . . T . . .
05     0      0      0      0      0      0      0      . . T . . .
06     0      0      0      0      0      0      0      . . T . . .
07     0      0      0      0      0      0      0      . . T . . .
08     0      0      0      0      0      0      0      . . T . . .
09     0      0      0      0      0      0      0      . . T . . .
10     0      0      0      0      0      0      0      . . T . . .
11     0      0      0      0      0      0      0      . . T . . .
12     0      0      0      0      0      0      0      . . T . . .
TOTAL  0      0      0      0      0      0      0      . . T . . .


STATUS:   Y=YEL   N=NOS   T=Test   L=LOS   O=OOS   B=BPV   E=ERR


Refresh | pgUp | pgDn | uSerregs | Networkregs | Clearregs | Main
```

Figure WAN-25. HDSL_E1 Performance Monitoring Screen

HDSL Screen

Figure WAN-26 displays the HDSL Screen for the 8011 Dual HDSL E1 WAN card. Table WAN-14 lists the actions on the bottom line of this screen, and Table WAN-15 shows the screen options and defaults.

```
Node_1  | W1  H_E1+H_E1 8011 Rev A0-0 Ser 00101 | 12-31-99 14:33

                     1                  2
TRAIN MODE          ltu                ntu
ES THRSHLD          0                  0
SES THRSHLD         0                  0
UAS THRSHLD         0                  0
LOOP                off                off

LOSS LP1            0                  0
LOSS LP2            0                  0
QLTY LP 1           loss               loss
QLTY LP 2           10                 10
LB STATUS           none               none





Save | Undo | Refresh | Perf | Main
```

Figure WAN-26. HDSL Screen

Table WAN-15. HDSL Screen Options and Defaults

Parameter	User Options
TRAIN MODE	This parameter determines the master/slave relationship between the units. The setting for the central office local unit is **ltu** (default). Remote units should be set to **ntu**.
LOOP	This parameter sets loopbacks on the remote unit. Selecting **r-loc** will cause the remote link to loop back to the PCM buses of the remote unit. Selecting **r-net** will cause the remote link to loop back to the network. The default is **off**.
LOSS LP 1	Displays the loss in loop 1 within ±2 dB. (display only)
LOSS LP 2	Displays the loss in loop 2 within ±2 dB. (display only)
QLTY LP 1	This parameter indicates the measure of signal quality correlated to noise margin in loop 1. Possible readouts are **loss** (no sync), or a number from **1** to **10**, where 10 is the best signal. (display only)
QLTY LP 2	This parameter indicates the measure of signal quality correlated to noise margin in loop 2. Possible readouts are **loss** (no sync), or a number from **1** to **10**, where 10 is the best signal. (display only)
LB STATUS	No user input - display only.

Menu of Actions

Table WAN-14. HDSL Screen Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Redraws the screen.
Perf	Brings up the HDSL Performance Monitoring screen
Main	Returns to the 8011 Dual HDSL E1 WAN card screen.

HDSL Performance Monitoring Screen

Figure WAN-27 shows the HDSL Performance Monitoring Screen for the 8011 Dual HDSL E1 WAN card. The screen displays statistics for either Unit 1 (HDSL module 1) or Unit 2 (HDSL module 2), depending on which unit you choose in the HDSL Screen.

```
Node_1        | W1 H_E1+H_E1 8011  Rev A0-0  Ser 00000    | 12-31-99  14:33

Unit 1  HDSL PERFORMANCE (15 Min Interval)     *Local*

        ES     SES    UAS    ES     SES    UAS           STATUS
CUR     0      0      0      0      0      0             . . T . . .
01      0      0      0      0      0      0             . . T . . .
02      0      0      0      0      0      0             . . T . . .
03      0      0      0      0      0      0             . . T . . .
04      0      0      0      0      0      0             . . T . . .
05      0      0      0      0      0      0             . . T . . .
06      0      0      0      0      0      0             . . T . . .
07      0      0      0      0      0      0             . . T . . .
08      0      0      0      0      0      0             . . T . . .
09      0      0      0      0      0      0             . . T . . .
10      0      0      0      0      0      0             . . T . . .
11      0      0      0      0      0      0             . . T . . .
12      0      0      0      0      0      0             . . T . . .
TOTAL   0      0      0      0      0      0             . . T . . .


STATUS: L=LOS   R=REVERSED  T=TEST


Refresh | Clearregs | 24 HR | 15 mIn | rEmote | Local | pgUp | pgDn | Main
```

Figure WAN-27. Typical HDSL Performance Monitoring Screen (local 15-minute interval)

The above screen shows the number of error conditions detected in loops 1 and 2 (local or remote), in either 15-minute or 24-hour increments. This allows for four different possible displays:

- 15-minute intervals, Local Loop (**default**)
- 15-minute intervals, Remote Loop
- 24-hour intervals, Local Loop
- 24-hour intervals, Remote Loop

You can alternate between screens by selecting from the actions at the bottom of the screen. When 15-minute intervals are active, pressing "**h**" (**24 Hr**) switches to 24-hour intervals (see Figure WAN-25). Pressing "**i**" (**15 mIn**) in the 24-hour interval mode switches to 15-minute intervals. Similarly, pressing "**e**" (**rEmote**) from the Local screen switches to the Remote screen, and pressing "**l**" (**Local**) from the Remote screen switches to the Local screen.

The only difference between the 15-minute and 24-hour interval screens is the historical time periods shown on the left side of the screen. In 24-hour intervals, seven historical time periods appear, corresponding to the activity over the past seven twenty-four hour monitoring periods, providing one week of historical monitoring data. (Note that these will be blank if monitoring has just started.)

In 15-minute intervals, 12 historical time periods are shown on the left side of the screen. By selecting 'D' (pg**D**n) from the Menu of Actions, the user can view historical time periods 13 through 24. Pressing 'D' again will display historical time periods 25 through 32. These periods correspond to the activity over the past thirty-two 15-minute monitoring periods, thus providing eight hours of historical data.

Table WAN-16 lists the actions available from these screens. The display parameters are described in Table WAN-17.

Menu of Actions

Table WAN-16. HDSL Performance Monitoring Screen Actions

Action	Function
Refresh	Redraws the screen and updates information.
Clearregs	Clears the user registers and starts over.
24 **H**r	Switches to 24 hour interval monitoring
15 m**I**n	Switches to 15 minute interval monitoring
r**E**mote	Switches to remote loop monitoring
Local	Switches to local loop monitoring
pg**U**p	Scrolls up through historical intervals (n/a for 24 hour intervals)
pg**D**n	Scrolls down through historical intervals
Main	Returns to the 8011 Dual HDSL card screen.

Table WAN-17. HDSL Performance Display Parameters

Parameter	Display
ES	Errored Seconds (ES) registers the number of seconds with one or more CRC6 (ESF), BPV (D4) or CRC4 (E1) errors, **OR** one or more OOFs, **OR** one or more Controlled Slips.
SES	A Severely Errored Second (SES) is any second with 320 or more CRC6 (ESF), BPV (D4) or CRC4 (E1) errors, **OR** one or more OOF errors.
UAS	Unavailable Seconds (UAS) shows the number of seconds during which service is unavailable. An unavailable signal state is declared after ten consecutive Severely Errored Seconds (SESs) are logged. An unavailable state is cleared after ten consecutive non-Severely Errored Seconds are logged. Unavailable Seconds are also accumulated if the card has an out-of-service (OOS) condition.

Introduction

The interface card provides all communications connections to the system. This section discusses general Interface Card information, as well as specific settings for the Interface Card.

All Interface cards must be installed in the IF slot on all chassis.

8920 Interface Card

The 8920 Interface Card has communications, control and network interface ports (see Figure Interface-1). It features an internal modem that facilitates remote communication with the system unit. The 8920 has a DB9 (DTE-male) serial port for network management and two RJ48 jacks that connect to the node port for alarm notification and VT-100 control terminal port. Additionally, an RJ11 jack is available for the modem port. The 8920 supports eight T1 or E1 WAN links.

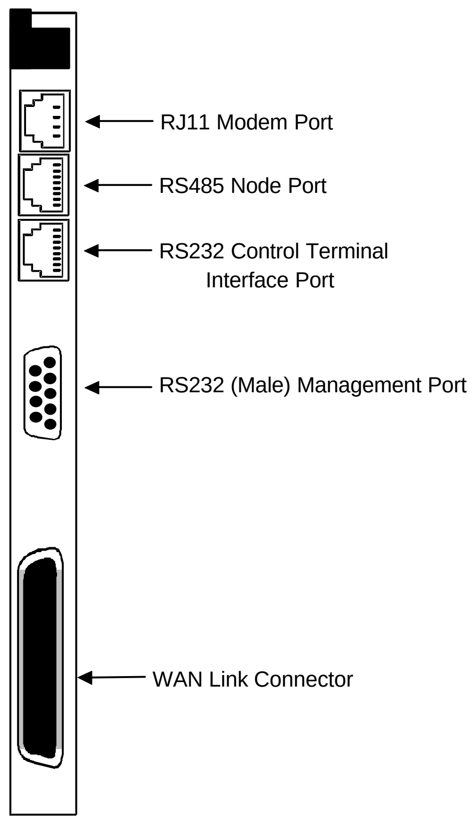


Figure Interface-1. 8920 Interface Card Front Panels

8921 Interface Card

The 8921 Interface Card is similar to the 8920 except there is **no modem** for remote access or alarm printing (see Figure Interface-2). All other fittings and functions are the same.

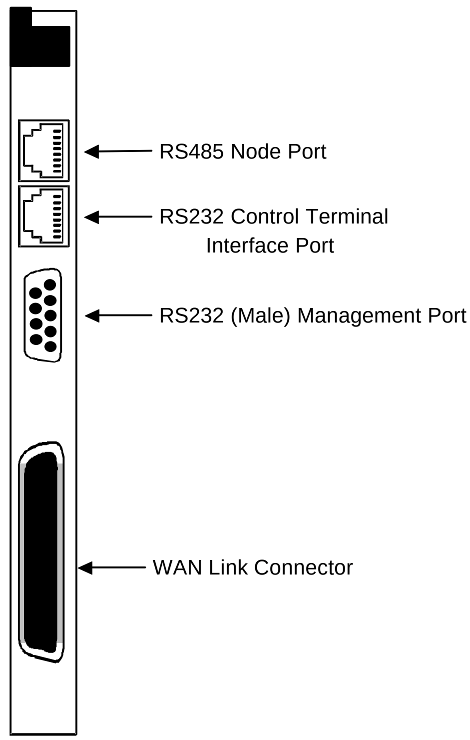


Figure Interface-2. 8921 Interface Card Front Panels

Interface Card (8925)

The 8925 Interface Card uses RJ48 jacks to terminate two (2) T1's and Bantam connectors to terminate two T1 WAN links and an RS232 control terminal interface port or balanced 120 ohm E1. The computer port, modem port and node port are not available on this interface card. The interface card connectors are arranged as shown in Figure Interface-3.

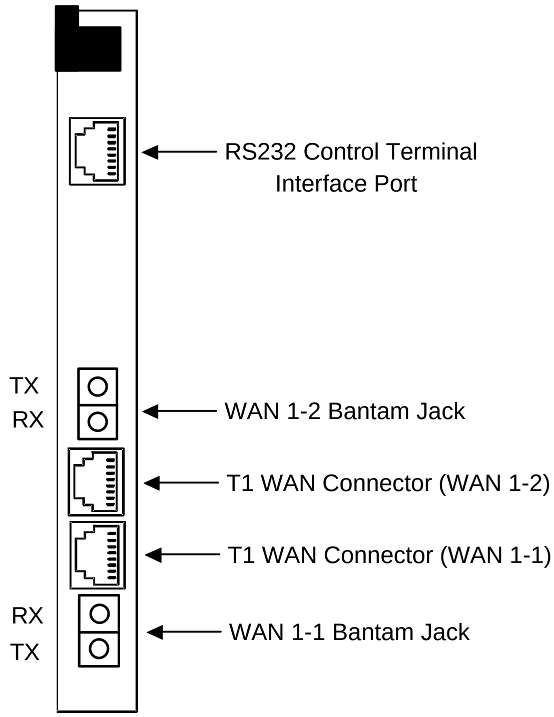


Figure Interface-3. 8925 Interface Card Ports

Interface Card (8926)

The 8926 Interface card is similar to the 8925 Interface card with the addition of the computer port, node port and modem port. The interface card connectors are arranged as shown in Figure Interface-4.

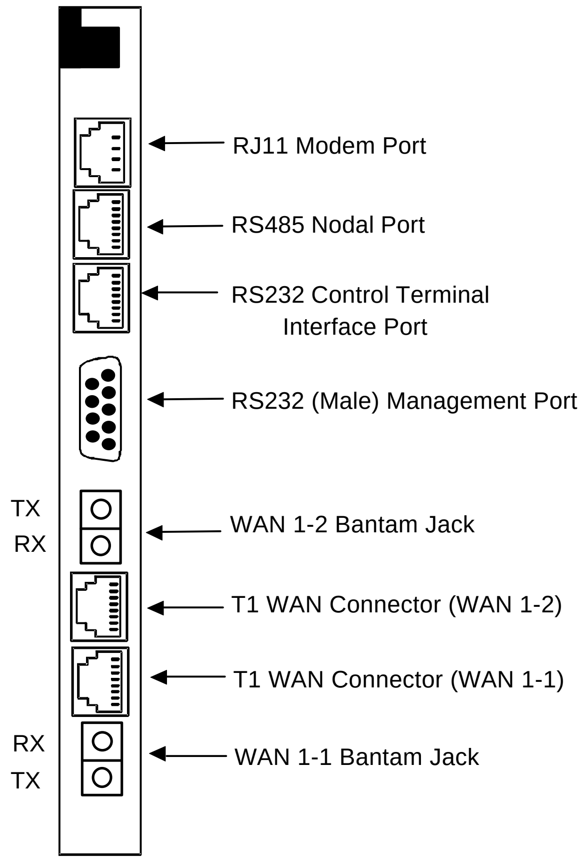


Figure Interface-4. 8926 Interface Card Port

Interface Card (8927)

The 8927 Interface Card uses BNC connectors to terminate two E1 WAN links, a DB9 computer port, an RJ48 control terminal interface port and an RJ48 node port. The interface card connectors are arranged as shown in Figure Interface-5.

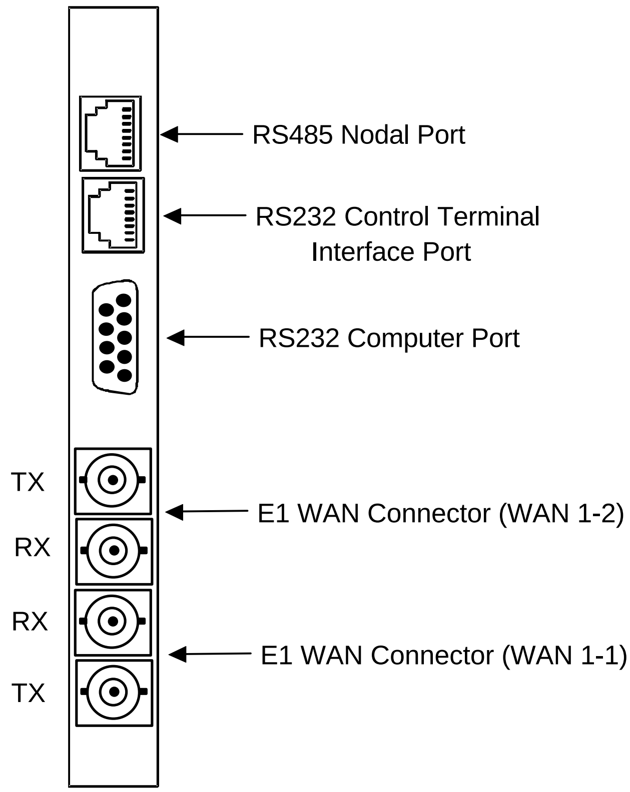


Figure Interface-5. 8927 Interface Card Port

Interface Card Ports and Functions

The Interface card controls many critical functions in the system. It provides interfaces to external control devices, terminates all T1 and E1 WAN links, and holds the nonvolatile RAM and the internal modem. Table Interface-1 lists the interface ports and functions. Figure Interface-6 shows the component layout and labels the ports. See the Pinouts chapter for electrical specifications and pin assignments.

Table Interface-1. Interface Ports and Functions

Interface Ports	Function
Modem	Connects the internal modem to a phone line.
Node	Provides contacts to report ACO alarms.
Control Terminal	Connects the system to a VT-100 compatible terminal.
Computer	Connects a local device for printing alarms; or to NMS..
T1/E1 WAN link	Connects the system to T1 and E1 lines.

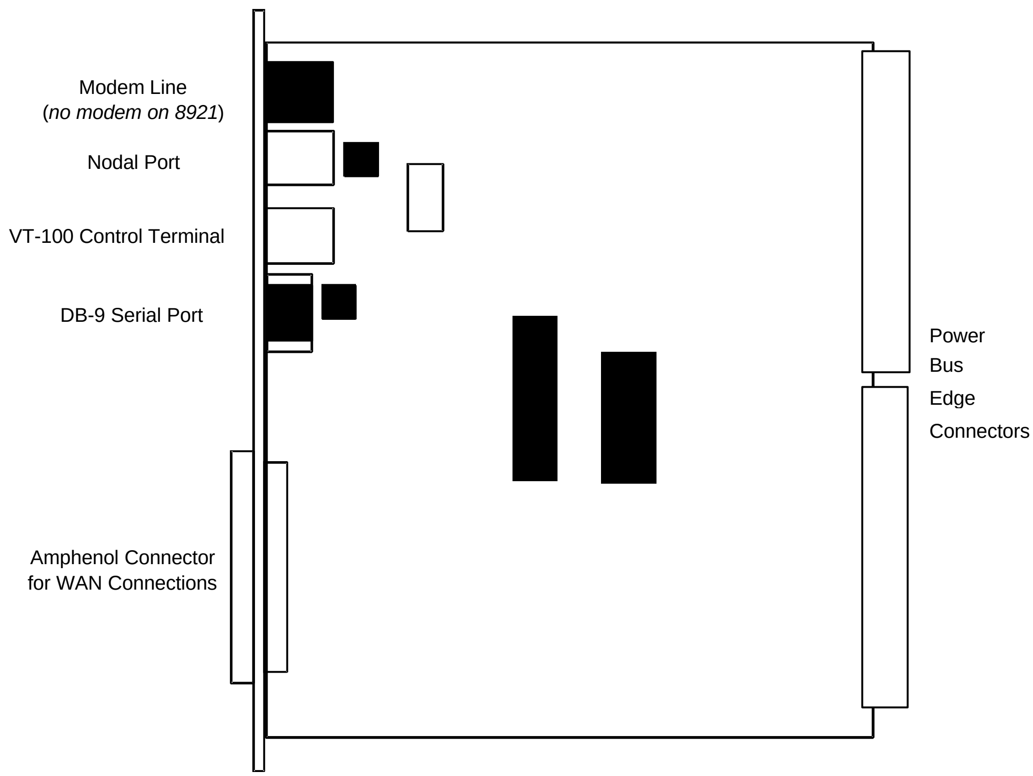


Figure Interface-6. Component Layout for the 8920 and 8921 Interface Card

Internal Modem

The internal modem is an asynchronous CCITT V.22 bis modem. It allows remote access to the terminal interface and automatic logging of alarm messages to a remote device. Table Interface-2 lists the parameters and rating specifications of the internal modem.

Table Interface-2. Modem Specifications

Parameter	Rating
Compatibility	CCITT V.22 bis
Modulation	16 point QAM
Line Interface	2-wire balanced 600 ohms
Approval	FCC Part 68
Equalization	receive automatic adaptive transmit fixed compromise
Receiver Sensitivity	ON to OFF threshold -45 dBm OFF to ON threshold -48 dBm
Dialing Mode	DTMF Tone
Speed Supported	2400 bps asynchronous
Code Set	8-bit characters plus one stop bit with no parity
Ringer Equivalence	0.2 A
Transmit Level	-9.5 dBm

Logging On Remotely

Normally a local network operator uses a VT-100 terminal to directly access the terminal interface. But where central control or service access is required, the internal modem provides an access method to the terminal interface from a remote location. . The modem automatically answers any incoming calls. The modem communicates at 2.4kbps using 8 data bits, one stop bit and no parity

To initiate a call, the remote operator dials in using a VT-100 compatible terminal. The remote operator can press the <Enter> key to display the log-on screen. After entering a valid password, the remote operator has complete access to the terminal interface as described in the Basic Operations chapter.

To disconnect, the remote operator logs off and hangs up the line. The modem automatically resets and waits for another call.

If an operator is logged on to the system with a local terminal when a modem call is received, he will automatically be logged off the system and will not be able to restore local access until the modem connection is broken.

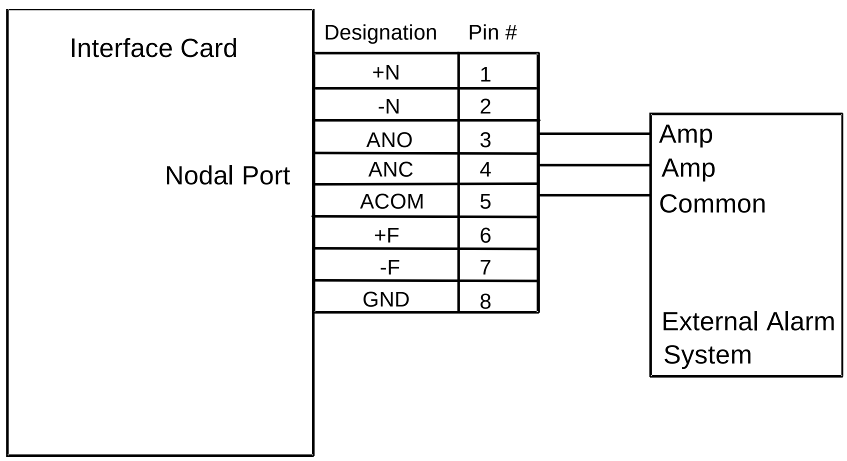
Using the Node Port

The node port allows the system to report ACO (Alarm Cutoff) alarms to an external system to alert the operator to critical situations. Using the ACO function, (see Basic Operations chapter), keeps the alarm active until manually cleared from the terminal.

The node port uses an RJ48 connector. Pins 3, 4 and 5 form an RS485 compatible c-contact closure that can be used to report ACO alarms to an external system. Pins 1, 2, 6 and 7 are reserved for future use. Pin 8 is a ground.

Connecting the ACO alarm interface to an external alarm device (such as a buzzer or light) alerts you to problems with the system. Figure Interface-7 shows a possible configuration connecting a unit to a generic external alarm system. The nominal input is 5V and the short-circuit current is 250mA. See the Pinouts chapter for pin assignments.

The alarm interface is activated by the ACO setting discussed in the Basic Operations chapter. This will activate the device when a designated alarm occurs. The Basic Operations chapter fully discusses conditions and settings necessary to enable this feature.



ANO = Open to ACOM on Alarm

ANC = Closed to ACOM on Alarm

Figure Interface-7. Node Port ACO Alarm Interface

Interface Card Settings

Figure Interface-8 shows the interface card Main screen. Table Interface-3 lists the settings controlled on the screen along with their possible and default values.

```
Node_1   |   IF  INTF+modem  8920  Rev  A2-0  Ser 01103   |  12-31-99 16:46

                      1
PRIMARY  CLK        int
SECONDARY  CLK      w1-1
EXTERNAL  CLK       rcv

CURRENT  CLK        int

Save  | Undo | Refresh  | Time |  ACO  |  proFiles  |  taBs  |  Ports  |  Main
```

Figure Interface-8. Interface Card Main Screen

Table Interface-3. Main Screen Options and Defaults

Parameter	User Options	Default
PRIMARY CLK	int w1-1 through w4-2 ext (not used)	int
SECONDARY CLK	int w1-1 through w4-2 ext (not used)	w1-1
EXTERNAL CLK	rcv gen	rcv
CURRENT CLK	unchangeable	int

PRIMARY CLK

The Primary Clock provides all internal timing for the system. Two clock sources are possible: a network source or the internal crystal oscillator.

A network clock source provides the best Primary Clock source. If you use a network clock source, you must specify the WAN link to which the clock source is connected; for example, **w1-1**. A WAN clock source will be either 1.544 or 2.048 Mbps depending on whether you are using a T1 or E1 line and must be accurate to ±50 parts per million (or $\pm 50 \times 10^{-6}$).

Alternatively, the system can generate a clock from its own crystal. If you select **int**, the crystal provides the clock source for this unit. The stability of this Stratum 4 clock is ±25 parts per million (or ±25 x 10^{-6}). If you use the system internal crystal as a clock source, all other devices attached to the network should derive their clocking from the internal clock as well. The Primary Clock can be set to external (**ext**), but this feature is not supported in this release.

SECONDARY CLK

Should the Primary Clock signal fail, the system automatically reverts to the defined Secondary Clock source. This source may also be a WAN link or the internal crystal. Although a secondary clock source is not required, good network design dictates that you have a backup if one is available. This clock cannot be external. Selection of **ext** will generate an error message.

EXTERNAL CLK

Reserved for future use.

CURRENT CLK

The current clock shows the clock now in operation. This field is not accessible by the user.

Menu of Actions

Table Interface-4 shows the Menu of Actions for the Interface Card.

Table Interface-4. Interface Card Screen Menu of Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Used on Testing and Monitoring screens to update statistics and on other screens to redraw the screen.
Time	Sets the system time and date. Use the up and down arrows to make changes.
ACO	ACO alarm. See the Alarm section of the Basic Operations chapter.
proFiles	Profiles function unoperable with this release.
taBs	Conversion tables for ABCD bits from ANSI to CCITT for voice circuits. See “Conversion Tables” later in this chapter.
Ports	Allows users to update and set the protocol, rate, communication configuration, and handshake of the communications ports on the interface card.
Main	Returns to the Main screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Signaling Conversion Tables

The Signaling Conversion Tables are especially useful when cross-connecting a T1 (ANSI) voice circuit to E1 (CCITT). Changing the ABCD signaling bits to facilitate proper signaling between the two carrier types may be necessary for proper system operation.

All types of voice circuits (E&M, FXS, FXO and PLAR) can access the ABCD Signaling Bit Conversion Tables for changes to their respective patterns.

The user can accept the default bit pattern changes or manually override those settings and choose a different bit pattern and insert it into the table. Figure Interface-9 shows the Conversion Tables accessed by pressing the "B" (taBs). Each voice circuit type is represented by two columns corresponding to CCITT to ANSI (C->A) and ANSI to CCITT (A->C) conversion of ABCD bits.

```
Node_1  b |  IF   INTF+modem  8920  Rev  A2-0  Ser 01103  |  12-31-99 16:46
```

	E&M		FXS		FXO		PLAR	
ABCD	C->A	A->C	C->A	A->C	C->A	A->C	C->A	A->C
0000	0000	1101	0101	0101	0101	0101	1111	0101
0001	0000	1101	0101	0101	0101	0101	1111	0101
0010	0000	1101	0101	1101	0101	1101	1111	1101
0011	0000	1101	0101	1101	0101	1101	1111	1101
0100	0000	1101	0101	1101	0101	1101	1111	1101
0101	1111	1101	0000	1101	1111	1101	0000	1101
0110	0000	1101	0101	1101	0101	1101	1111	1101
0111	0000	1101	0101	1101	0101	1101	1111	1101
1000	0000	1101	0101	1101	0101	1101	1111	1101
1001	0000	1101	0101	0101	0101	1101	1111	1101
1010	0000	1101	0101	0101	0101	1101	1111	1101
1011	0000	1101	0101	1101	0101	1101	1111	1101
1100	0000	1101	0101	1101	0101	1101	1111	1101
1101	0000	0101	0101	0101	0101	1101	1111	1101
1110	0000	1101	0101	1101	0101	1101	1111	1101
1111	0000	0101	0101	0101	0101	1101	1111	1101

```
Save  |  Undo  |  Refresh  |  Default  |  Main
```

Figure Interface-9. Conversion Tables Screen

For instance, an E&M circuit in the "0101" state will send "0101" from the CCITT end of the circuit and the ANSI end would receive "1111" Conversely, the same state would be sent as "1111" from the ANSI end and received at the CCITT end as "0101." Either receive bit pattern can be manually overridden by the user.

The E&M portion of the conversion table is also used for DN, PLAR-D3, DPO and DPT. The FXS portion of the conversion table is used for FXS from FXO. The FXO portion of the conversion table is used for FXO to FXS. The PLAR portion of the conversion table is also used for PLAR-D4 to PLAR and MRD.

Menu of Actions

Table Interface-5 shows the Menu of Actions for the Conversion Tables screen.

Table Interface-5. Conversion Tables Screen Menu of Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Used on Testing and Monitoring screens to update statistics and on other screens to redraw the screen.
Default	Returns columns to default settings, one column at a time. The user must save changes after using this command.
Main	Returns to the Interface card main screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Remote Terminal System (RTS)

The Remote Terminal System (RTS) is a special application for users using microwave transmission. Using communication software, a user can log into any number of different systems from a single control station (PC, MAC, Sun, or HP Workstation) to download alarm information, change card settings, and perform maintenance.

Systems are connected from the Interface card's COM port to a wireless control network through the RS232 input on one of the four service channels on the wireless network. The Control Station (PC) is connected to pin #2 out and #3 in. Each of the integrated access controllers is connected to RS232 pin #2 in and pin #3 out.

The actual number of the systems that can be connected together is determined by the amount of different numbers that can fit in the "SYS PH#" field in the CPU sub menu. The CPU sub menu is accessed by selecting a CPU through the user interface and pressing the <ENTER> key.

Identification

Each system has a unique identification number on the integrated access controller network (phone number). The unique identification number is used to determine which Controller can be accessed remotely on a serial line. The identification number for each console needs to be entered in the "SYS PH#" field in the CPU sub menu. No two systems can have the same number in the "SYS PH#" on the same network. If that field is the same on more than one integrated access controller, race conditions will occur. Therefore each console on a single network must have an individual number in the "SYS PH#" field.

The identification numbers for the integrated access controllers cannot be entered through a control station. This safeguard is provided to ensure a reliable connection between a control station and an integrated access controller. Attempts to change an identification number of a system remotely will be denied.

Network Priorities

All integrated access controllers on the wireless network have equal priorities. Because of this equality, no Controller can interrupt a remote session between another Controller and a control station. This is why the control station always initiates all communication on the RTS network.

Intra-Network Communications

Integrated access controllers cannot communicate with each other. Communication on the network is only between the control station and a single Controller. Since the communications on the network of integrated access controllers is always initiated by the control station, the Controller systems cannot communicate with each other.

Figure Interface-10 shows a diagram of three RTS units.

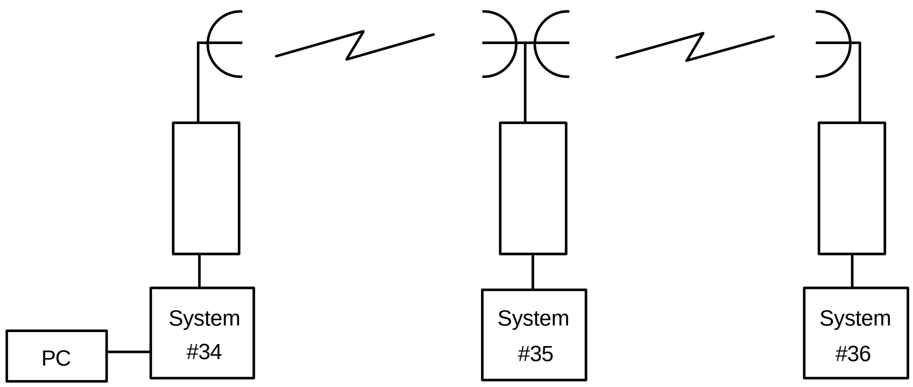


Figure Interface-10. Typical RTS Configuration

The PC associated with integrated access controller #34 can engage any of the two other units by using "AT" commands from the communications software used. If a local VT-100 is active at any of the remote locations, the user will be logged off and the master PC will control the system unit. When the master PC logs off, the local user will be able log into the unit again. Connections at all units are done through the DB9 computer port.

Terminal Security

No user may log into any integrated access controller on the network without knowing the individual password of each system.

Table Interface-6 lists the "AT" commands and the associated function. All "AT" commands are followed by pressing the <Enter> key.

Table Interface-6. "AT" Commands Used by RTS

AT Command	Function
ATDTxxx	Establish a user interface connection.
ATDTxxxR	Establish an alarm reporting connection. (Connection only lasts for the length of time necessary to upload and display all alarms that are being reported by the system that have not yet been displayed.)
ATDTxxxC	Establish a current alarm reporting connection. (Connection only lasts for the length of time necessary to upload and display all active alarms that are being reported by the system.)
ATDTxxxH	Establish a historical alarm reporting connection. (Connection only lasts for the length of time necessary to upload and display the alarm history reported by the system.)
ATDTxxxCH	Establish a current and historical alarm reporting connection. (Connection only lasts for the length of time necessary to upload and display the current alarms and alarm history reported by the system.)
+++	Disconnects a remote session.
"L" (letter L)	Disconnects a remote session.
xxx indicates the phone number on the CPU card of the desired system unit.	

Changing the 8927 from Balanced to Unbalanced

The jumpers on the 8927 dual E1 Interface card change the operation of the E1 link from balanced to unbalanced. Figure Interface-11 shows the card layout with the position of jumper JP2, JP3, JP5, and JP4. The card is shipped with the jumpers open (the **balanced** position). To change the E1 link for WAN 1-1 to unbalanced, close jumpers JP2 and JP3. To change the E1 link for WAN 1-2 to unbalanced, close jumpers JP5 and JP4.

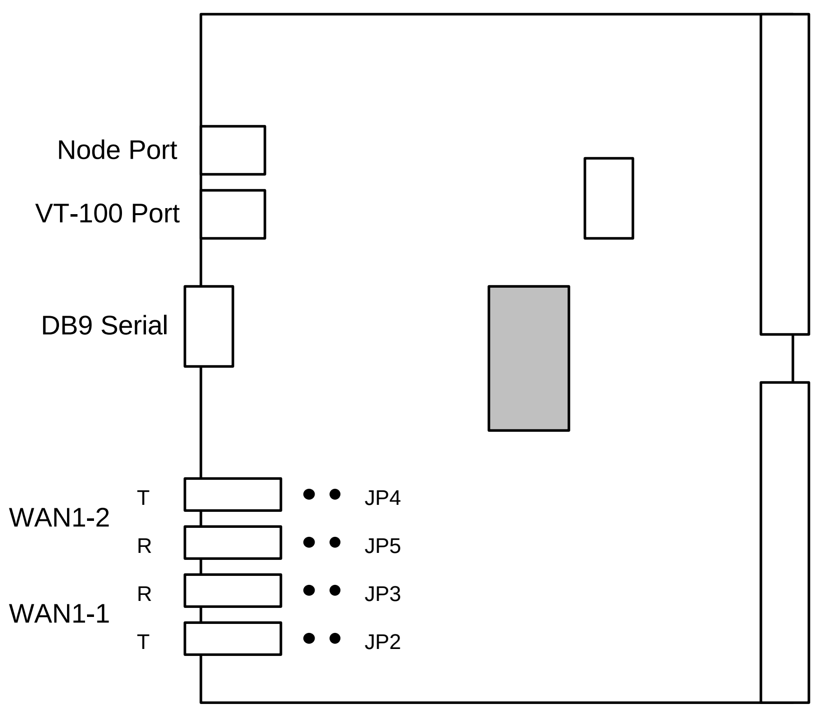


Figure Interface-11. Jumpers on the 8927 Card

Introduction

The External Alarm card performs two alarm-notification functions. The "Switch/Act On" (outbound) function allows the system to report internal alarms to external devices such as buzzers, bells or lights. The "Sensor/Trig On" (inbound) function allows externally generated alarms to be reported to the system through sensors that are located on the card.

This chapter discusses the three External Alarm cards available for use with the integrated access system: the 8401, 8402, and 8403. Only one External Alarm card may reside in the integrated access system at a time. The 8401 and 8402 offer 4 and 3 inbound and outbound alarm circuits, respectively, and have a similar architecture. They will be discussed together at the start of the chapter. The 8403, which offers additional capabilities (28 inbound and 14 outbound), is discussed at the end of the chapter.

8401 External Alarm Card

The 8401 External Alarm card supports four (4) outbound switches and four (4) inbound sensors. The outbound switches are used to report internal alarms to external devices by triggering form-C contact closures (120VAC - 0.5A), and the inbound sensors are used to bring foreign alarm indications into the system. External alarms that are reported by a sensor are listed in the alarm history file.

8402 External Alarm Card

The 8402 External Alarm card supports three (3) outbound switches and three (3) inbound sensors. This card is similar to the 8401 except the fourth alarm port can only be used as an **outbound** alarm to show that the system's power unit has failed. This card would be especially helpful when used in locations where loss of power to any of the units would be a critical problem.

A -48VDC power source is required with this card. It may be provided by the 8905 Converter or from an external source.

IMPORTANT NOTE

To enable the reporting of alarms originating from sensors the SENSOR variable in the Alarm Filters menu must be set to **report** (see “Filters” in Chapter 2C, “Basic Operations”). From the system Main Menu, select **Alarms**, and choose **Filters** to display a menu of alarm filters shown below. Use the arrow keys to highlight the first column of the SENSOR line. Press <Enter> to display the options **ignore**, **log**, and **report**. The option chosen here will act as the highest level option for all alarm card sensors. If this variable is set to **ignore**, ***any alarm conditions from the alarm sensors will be ignored***, even if individual sensors are set to **report** at the alarm card. Likewise, if this variable is set to **log**, all of the sensors on the alarm card that are set to anything but **ignore** will be logged, but not reported. For this reason, it is crucial that the SENSOR Alarm Filter be set to **report**.

```
Node_1        |                        |    12-31-99  14:33
                                              1           2           3
OOS        Out of Service               log       major    aco-off
NOS        No Signal                    log       minor    aco-off
LOS        Loss of Sync                 log       minor    aco-off
YEL        Yellow Alarm                 log       minor    aco-off
AIS        Alarm Info Signal            log       minor    aco-off
CGA_RED    Carrier Group–Red            log       major    aco-off
CGA_YEL    Carrier Group–Yellow         log       major    aco-off
EER        Excessive Error Rate         ignore    minor    aco-off
SENSOR     Alarm card sensor            report    minor    aco-on
DCHAN      D-chan out of service        ignore    minor    aco-off
SWITCH     Switch to redundant card     report    major    aco-off
UCA        User card/port alarm         ignore    minor    aco-off
RESET      System reset                 report    major    aco-off
ACO        Alarm Cut-Off                log       minor    n/a
SYNC       Clock Sync Alarm             ignore    minor    aco-off
EER-3      Error rate above 10e-3       ignore    minor    aco-off
PLC_OOF    DS3 PLCP Out of Framing      ignore    minor    aco-off
PLC_LOF    DS3 PLCP Loss of Frame       ignore    minor    aco-off
PLC_YEL    DS3 PLCL Yellow Alarm        ignore    minor    aco-off


 Save | Undo | Refresh | Main
```

External Alarm Card Screens (8401 and 8402)

Figure Alarm-1 shows the External Alarm Card screen for the 8401; the 8402, with only 3 ports would have only 3 columns of options. Table Alarm-1 shows the settings and options.

```
Node_1   | U1  ALR 8401 Rev B0-0  Ser 00101 | 12-31-99  14:33

               1          2        3        4
SWITCH         stdby      stdby    stdby    stdby
ACT ON         minor      minor    minor    minor
SENSOR         stdby      stdby    stdby    stdby
TRIG ON        close      close    close    close







Major = 0     Minor = 0



Save | Undo | Refresh | Main
```

Figure Alarm-1. External Alarm Card Screen

Table Alarm-1. External Alarm Card Setting Options and Defaults

Parameter	User Options	Default
SWITCH	stdby actv	stdby
ACT ON	minor major any	minor
SENSOR	stdby actv	stdby
TRIG ON	close open	close

SWITCH

The Switch setting indicates if the outbound alarm switch is on (**actv**) or off (**stdby**).

ACT ON

The Act On parameter defines the type of system alarm that will cause the switch to trigger. You can program each alarm switch to trigger on **minor** (info and minor) alarms, **major** (major and critical) alarms or **any** alarm message. See the Alarms section of the Basic Operations chapter for more information on how you define an alarm as major or minor.

SENSOR

The Sensor setting indicates if the inbound alarm sensor is on (**actv**) or off (**stdby**).

TRIG ON

The Trigger On parameter defines if the sensor should report an external alarm upon sensing the opening (**open**) or the closure (**close**) of the C-form contact to which it is connected.

Major=

The Major= accumulation register shows the current number of reported alarms that are designated either Major or Critical.

Minor=

The Minor= accumulation register shows the current number of reported alarms that are designated either Minor or Informational.

Menu of Actions

Table Alarm-2 shows the Menu of Actions for the External Alarm Card.

Table Alarm-2. Alarm Card Screen Menu of Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e. performance and test data).
Main	Returns to the main terminal screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

8403 External Alarm Card

Introduction

The 8403 External Alarm Card supports 28 sensor inputs and 14 external device ports. Of the 14 external device controls, 8 are Form C contacts (normally open or closed based on user configuration), 4 are Form A contacts (normally open), and 2 are Form B contacts (normally closed).

In addition, the card provides an FXS type telephone interface (RJ-11 jack, loop start only, no ringer interface) and an on-board piezoelectric buzzer with either internally generated and customer-selected alarm sounds or sounds transmitted by the network. In the on-hook condition, ring signaling turns on the buzzer with either a locally stored ringback pattern or a network-provided signal. In the off-hook conditions, voice output of the transcoder is routed to the transformer. In an alarm condition, if the sound option is enabled, a 3,000 Hz signal is routed to the buzzer.

All sensor inputs are current loop type (4-20 ma current detection). All sensors can be either active (surge protection only) or optically isolated passive current detectors. Active sensors can be powered by either the network battery (-48 VDC) or by the main power supply (+12VDC).

The 8403 External Alarm Card is shown in Figure Alarm-3, emphasizing the positions of switches and jumpers used to configure the card. All switches and jumpers should be set prior to installation.

Alarm Sensors

Figure Alarm-2 shows page 1 of 3 Alarm Sensors Card screens. Table Alarm-3 lists the settings controlled on the screen along with the possible and default values.

```
Node_1  |  U1   ALR   8403   Rev  B0-0   Ser  00101  |  12-31-99
14:33

page:  1 of 3             ALARM SENSORS

#    SENSOR NAME        TRIG ON   STATUS   ALARM TYPE   BUZZER
1                       close     log      major        on
2                       close     log      major        on
3                       close     log      major        on
4                       close     log      major        on
5                       close     log      major        on
6                       close     log      major        on
7                       close     log      major        on
8                       close     log      major        on
9                       close     log      major        on
10                      close     log      major        on

Refresh  | dEfault  |   pgUp  |  pgDn   |   sWitches  |   Voice |
Main
```

Figure Alarm-2. External Alarm Card (8403) Sensors Screen

Table Alarm-3. External Alarm Card (8403) Sensors Screen Options and Defaults

Parameter	User Options	Default
#	[Alarm Sensor number 1-28]	fixed
SENSOR NAME	[user-input sensor name]	blank
TRIG ON	close open	close
STATUS	ignore log report	ignore
ALARM TYPE	info minor major crit	minor
BUZZER	off on	off

SENSOR NAME

A user input field of up to six (6) characters to identify the specific alarm. (Note: The sensor name is a local identifier, and is not transmitted with alarm conditions.)

TRIG ON

The Trigger On parameter defines if the sensor should report an external alarm upon sensing the opening (**open**) or the closure (**close**) of the contact to which it is connected. The default value is **close**.

STATUS

This value indicates what action should be taken in the event of an alarm for each individual sensor. This variable may be set to **log** the alarm in the alarm register, or to **report** the alarm. (Reported alarms are also logged.) The default value is **ignore**.

ALARM TYPE

This user-definable parameter indicates the severity of the incoming alarm. The options are **info**, **minor**, **major**, and **crit**. The default value is **minor**.

BUZZER

This variable indicates whether the onboard buzzer should be activated when the sensor indicates an alarm. The default value is **off**.

Menu of Actions

Table Alarm-4. External Alarm Card (8403) Sensors Screen Menu of Actions

Action	Function
Refresh	Redraws the screen.
d**E**fault	Returns all settings to the default state.
pg**U**p	Use to return to previous page.
pg**D**n	Use to go to next page
s**W**itches	Changes to the Switches screen.
Voice	Changes to the Voice screen.
Main	Returns to the main sensor screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Alarm Switches

Figure Alarm-3 shows the first of two pages of the Alarm Switches screen. Table Alarm-5 lists the settings controlled on the screen along with the possible and default values.

```
Node_1  |   U1   ALR   8403   Rev  B0-0   Ser  00101  |  12-31-99  14:33

page:  1 of 2              ALARM SWITCHES

#     SWITCH NAME         SW. CTRL   ACT ON    SENSOR #      STATUS
1                         act_on     major     n/a           off
2                         act_on     major     n/a           off
3                         act_on     major     n/a           off
4                         act_on     major     n/a           off
5                         act_on     major     n/a           off
6                         act_on     major     n/a           off
7                         act_on     major     n/a           off











Refresh  |  dEfault  |  pgUp  |  pgDn  |  Main
```

Figure Alarm-3. External Alarm Card (8403) Switches Screen

Table Alarm-5. External Alarm Card (8403) Switch Screen Options and Defaults

Parameter	User Options	Default
#	[Alarm Switch number 1-14]	fixed
SWITCH NAME	[user-input switch name]	blank
SW. CTRL	off on act_on	act_on
ACT ON	info minor major crit sensor	major
SENSOR #	n/a 1-28 Note 1	n/a
STATUS	off on	displayed

Notes: 1. Sensor numbers are assignable if the ACT ON parameter is set to sensor numbered 1 -28, the default is 1.

SWITCH NAME

A user-input field up to six (6) characters to identify the specific switch. (Note: The switch name is a local identifier, and is not transmitted with alarm conditions.)

SW. CTRL

This variable indicates the initial state of the switch. The possibilities are **off** (which unconditionally turns the switch off), **on** (which unconditionally turns the switch on) or **act_on** (which relies on the state of the switch). The default value is **off**.

As noted above, 12 of the switches are Form C (which may be either open or closed), one is Form A (always open), and one is Form B (always closed).

In the event of system power failure, switch #1 can be used as a fail-safe switch to activate a device that notifies the user. In order for this to occur, a jumper must be set on jumper pair JP63. located towards the center of the card. The contact for switch #1 will close if the system loses power, establishing a circuit that can be used to power an external warning device. The current source must be provided by the external device.

ACT ON

This parameter defines the condition that will cause the switch to trigger. The user can program each alarm switch to trigger on **info, minor**, **major**, or **crit** alarms. Alternatively, the switch trigger can also be assigned to a particular **sensor**. When **sensor** is selected, SENSOR # allows the user to indicate the number of the sensor that will trigger the alarm. The default value is **major**.

SENSOR

When the ACT ON field is set to **sensor**, the user can input a value from 1 to 28, indicating the number of the sensor that will trigger the switch. The default value is **n/a**.

STATUS

This is a display-only field. The user cannot access it.

Menu of Actions

Table Alarm-6. External Alarm Card (8403) Switches Screen Menu of Actions

Action	Function
Refresh	Updates certain time-related information fields that are not automatically updated.
d**E**fault	Returns all settings to the default state.
pg**U**p	Returns user to previous page.
pg**D**n	Advances user to next page.
Main	Returns to the main sensor screen.

Voice

An RJ11 FXS voice port is situated on the front of the card between the two Amphenol connectors. The initial voice screen is shown in Figure Alarm-4. The options and defaults are shown in Table Alarm-7.

```
Node_1 |  U1    ALR    8403     Rev A0-0    Ser 0101    |  12-31-99 14:33



                       1
STATE                 actv
WAN/SRV               w1-1
TS                    20
MODE                  plar
TYPE                  d3-m1
Rx TLP                -5.0
Tx TLP                2.0
CODING                u-law
RINGBK                off






Save | Undo | Refresh | Main
```

Figure Alarm-4. External Alarm Card (8403) Voice Screen

Table Alarm-7. External Alarm Card (8403) Voice Screen Options and Defaults

Parameter	User Options	Default
STATE	stdby actv	stdby
WAN/SRV	none w1-1 through w4-2	none
TS	1-24 (1-31)	n/a
MODE	fxs plar	fxs
TYPE	loop d3-m1 d4-m1 d3-m2 d4-m2 d3-m3 d4-m3	loop
RX TLP	-10.0 to +2.0	-5.0
TX TLP	-10.0 to +5.0	2.0
CODING	u-law a-inv a-law	u-law
RINGBK	off on	off

STATE

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

WAN

The WAN setting identifies the WAN link assigned to this port. It is not necessary for all ports on the same card to be assigned to the same WAN link, or to contiguous time slots on a WAN link. The default value is **none**.

TS

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

MODE

The Mode setting should be determined by the type of equipment to which you are connecting the port. All options use two-wire balanced connections. The **fxs** (Foreign Exchange Station) option allows you to connect a telephone to the system.

The **plar** (private line automatic ringdown) option provides point-to-point unswitched connections between two telephone sets. This configuration is usually not attached to an exchange or switch; rather, it provides a “hot line” between two locations.

TYPE

The Type setting matches the signaling behavior of the FXS equipment and the remote switch. The **loop** (Loop Start) option, which is used with POTS stations and simple PBX trunks, is only available when the MODE setting is **fxs**. If the MODE setting is **plar**, then the TYPE options are **d3-m1**, **d4-m1**, **d3-m2**, **d4-m2**, **d3-m3**, and **d4-m3**.

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

Rx TLP

The Receive Transmission Level Point setting controls the amount of gain or attenuation added to signals after they are decoded to analog signals. To increase the signal level, set the Rx TLP setting to a positive number (i.e., the larger the number, the more gain is added). To decrease the signal level, set the Rx TLP setting to a negative number (i.e., the more negative the number, the more the signal level is decreased). For example, an incoming signal at -5 dBm can be increased to -3 dBm by setting Rx TLP to +2 dB. Acceptable values range from **-10.0 dB** to **+2.0 dB**. The default value is **-5.0**.

Tx TLP

The Transmit Transmission Level Point setting controls the amount of gain or attenuation added to signals after they are received from the local analog port and before they are encoded to digital PCM signals. To increase the signal level, set the Tx TLP setting to a negative number (i.e., the more negative the number, the more gain is added). To decrease the signal level, set the Tx TLP setting to a positive number (i.e., the more positive the number, the more the signal level is decreased). For example, an incoming signal at -5 dBm can be increased to -2 dBm by setting Tx TLP to -3 dB. Acceptable values range from **-10.0 dB** to **+5.0 dB**. The default value is +**2.0**.

CODING

The Coding setting sets the PCM companding method used for a port. In general, in the T1/North American environment use **µ-law** coding. In the E1/International environment, use **a-inv** (inverted A-law) or **a-law** coding; **a-inv** provides greater 1s density than **a-law**. The coding default is determined by the type of card in the WAN port you select. The default value is **u-law** (Note: On the system screens, "u" is used in place of "µ" because of ASCII character limitations, but should be read as "mu-law.").

RINGBK

The ringback setting specifies whether a ringback tone is generated by the system and sent towards the network. This option should be turned on when the network does not provide an audible ringing tone to the calling party. The default value is **off**.

Menu of Actions

Table Alarm-8. External Alarm Card (8403) Voice Screen Menu of Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated on the screen.
Main	Returns to the main terminal screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Features

Diagrams of the 8403 External Alarm Card are shown in Figure Alarm-5. Earlier versions of the card have the alarm sensor jumpers set at angles, as shown in the diagram on the left, while later versions have the alarm sensor jumpers grouped in pairs, as shown in the diagram on the right. Otherwise, the two cards are functionally equivalent.

The features identified in the drawings are discussed in detail below.

Earlier Version **Later Version**

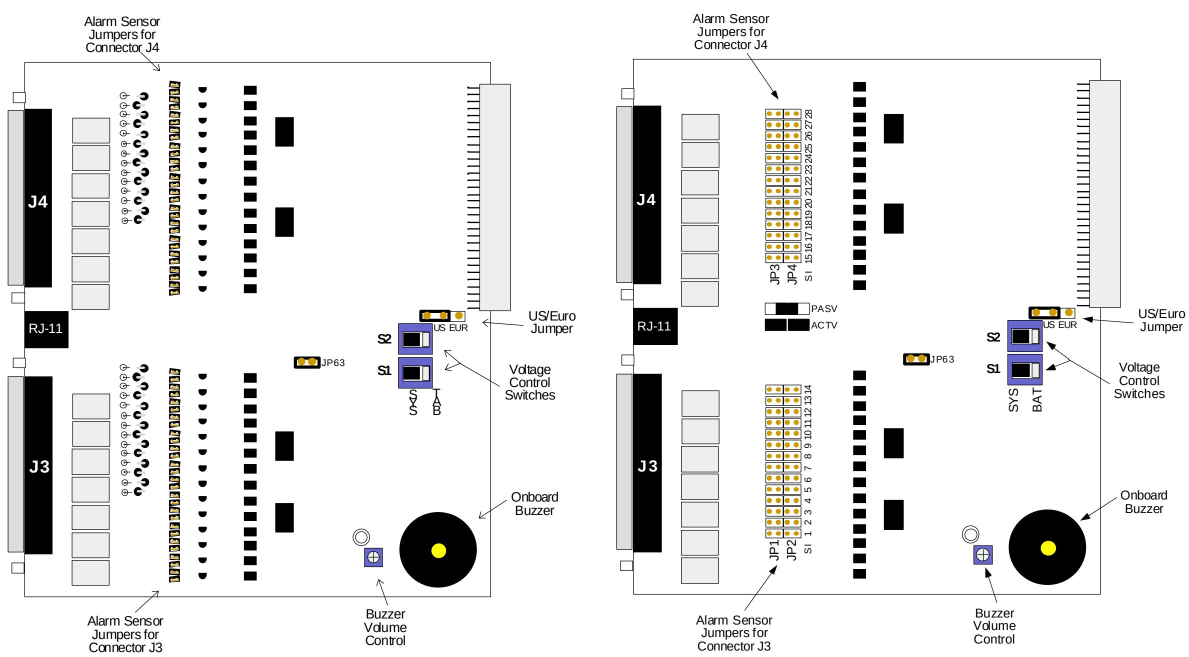


Figure Alarm-5. External Alarm Card (8403).

Onboard Buzzer

The 8403 alarm card contains an onboard buzzer for audible alarms. The buzzer can be set to activate when a particular sensor signals an alarm condition. The buzzer volume is set by a control dial marked "VOL," which can be adjusted using a small screwdriver.

US/Euro Jumper

The card may be set either to US or European configuration by moving a jumper located on J64. Setting the jumper on the left two pins establishes US configuration. On the right two pins, the jumper is configured for European voltage. This property should match the configuration of your particular chassis, or the card will not operate properly. The factory default is **US** position.

Voltage Control Switches

Switches S1 and S2 are used to control the voltage supplied to each group of active sensors. When either of these switches are set to "SYS," the board supplies ±12vDC system power to the sensor group specific to that Amphenol connector. When either of the switches are set to "BAT," the board supplies telco power to the sensors in that group.

The switches can be set individually (meaning one can be set to "SYS" and the other to "BAT") but doing so will affect all 14 sensors in the respective group.

Switch S1 controls the sensors on the J3 (lower) connector, while Switch S2 controls the sensors on the J4 (upper) connector.

The factory default for these switches is **SYS**.

Alarm Sensor Jumpers

Each sensor relates to a pair of jumpers on the board, which controls whether the sensor is powered from the card (active mode) or from an external device (passive mode). Passive mode provides 2500V isolation. Figure Alarm-6 displays these options.

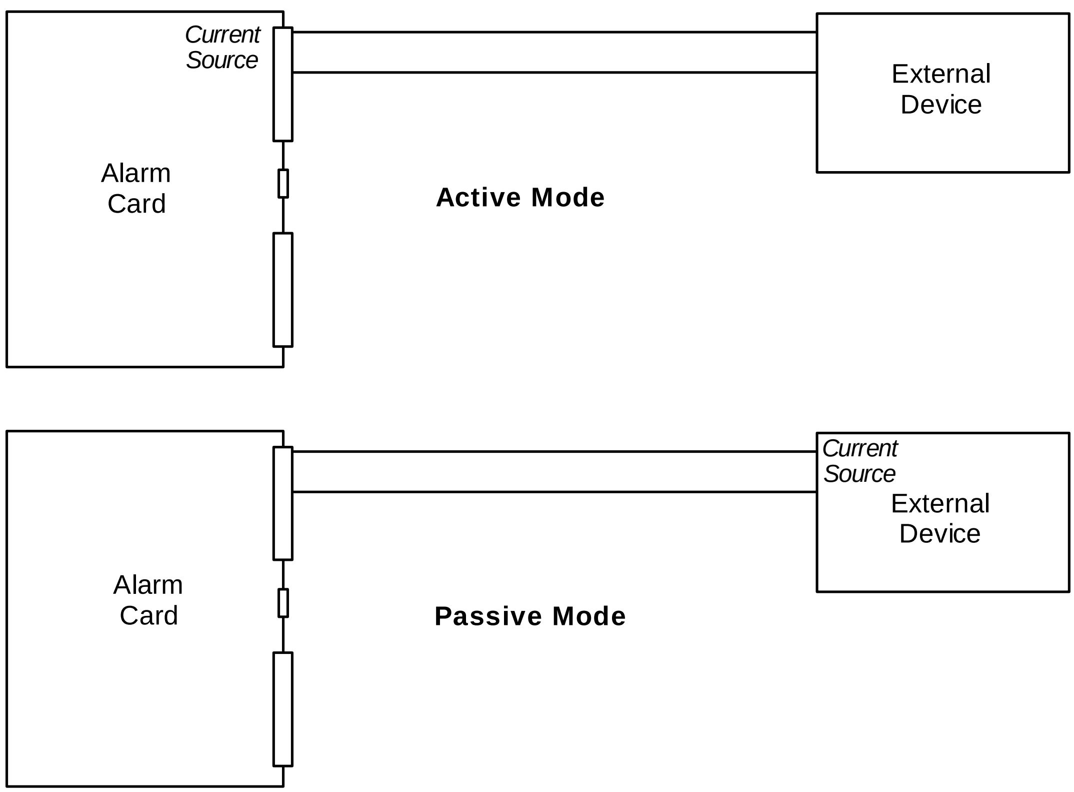


Figure Alarm-6. Active Mode vs. Passive Mode.

The jumper pairs are set at a slight angle (see Figure Alarm-7). The jumpers are separated into two groups of 28 jumpers each. The upper group is associated with the sensors on the upper Amphenol connector (J4), while the lower group is associated with the sensors on the lower Amphenol connector (J3).

Figure Alarm-7. Jumper Pair (Active Mode).
Note: All jumper pairs are set by factory default to active mode.

The default setting, as shown above, is active mode, in which the sensors are powered by the card. This setting provides surge protection for the sensors.

To set the jumper pair to passive mode, users must remove both jumpers and then insert a single jumper across the pair, as shown in Figure Alarm-8. The other jumper should be stowed on one of the unused pins. (The pairs are set at an angle so that the extra jumper **will not** fit across the outside pins.) This provides full isolation (to 2500V) for the sensor.

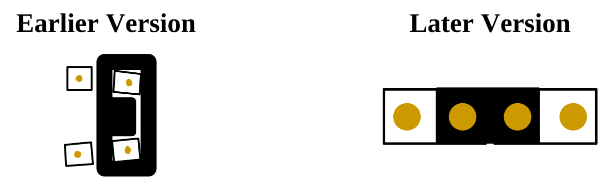


Figure Alarm-8. Jumper Pair (Passive Mode).

Introduction

E&M cards manage the flow of voice traffic over the network. The E&M card translates an analog signal to a digital bitstream at the local system and digital to analog at the remote system. E&M signaling types I, II, IV and V are supported. Each card controls four or eight units or channels. Normal E&M, Transmission Only and E&MR2 modes are supported. E&M cards can use voice-compression features of the ADPCM server card.

8118 E&M Card

The 8118 is a 4-wire 600 Ω E&M/TO card with eight ports. This card has the same extended range feature as the 8115. All normal E&M features are supported by this card.

8119 E&M Card

The 8119 is a 4-wire 600 Ω E&M/TO card with eight ports. This card has an extended TX TLP range (-17.5 to +14.5dB) to support dedicated 4-wire modem applications (***this is especially important for data transmission speeds of 19.2kbps or higher***). This card supports all normal E&M features.

UL Statement

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

In addition to the cards shown above, whose operation will be discussed in this chapter, the following discontinued models are supported by v3.6 software:

8104 E&M Card

The 8104 is a 2-wire E&M car with four ports and 600Ω impedance.

8108 E&M Card

The 8108 is a 2-wire E&M card with eight ports and 600Ω impedance.

UL Statement

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

8112 E&M Card

The 8112 is a 4-wire E&M card with two ports and 600Ω impedance.

8113 E&M Card

The 8113 is a 4-wire E&M card with two ports and 600Ω.

8114 E&M Card

The 8114 is a 4-wire E&M card with four ports and 600Ω impedance.

8115 E&M Card

The 8115 is a 4-wire E&M card with four ports and 600Ω.

E&M Card Settings

E&M voice cards require hardware and software setup. Each E&M card has four switches (see Figure E&M-1), labeled S1 through S4, that control the type of E&M signaling the card uses. All ports on a card must use the same type of signaling. Table E&M-1 defines the switches.

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

Switch	Definition
S1	Source of the Earth lead; can be either internal (INT) or external (EXT).
S2	Type of internal source for the Earth lead; can be either battery (-48VDC) or ground (GND).
S3	Type of internal source for the Magnetic lead; can be either battery (-48VDC) or ground (GND).
S4	Normal state of the Earth lead; can either be grounded (ON) or open (OFF). Each card port number is designated on the 8 place rocker switch. All eight switches must be set to the same position (i.e., all ON or all OFF).

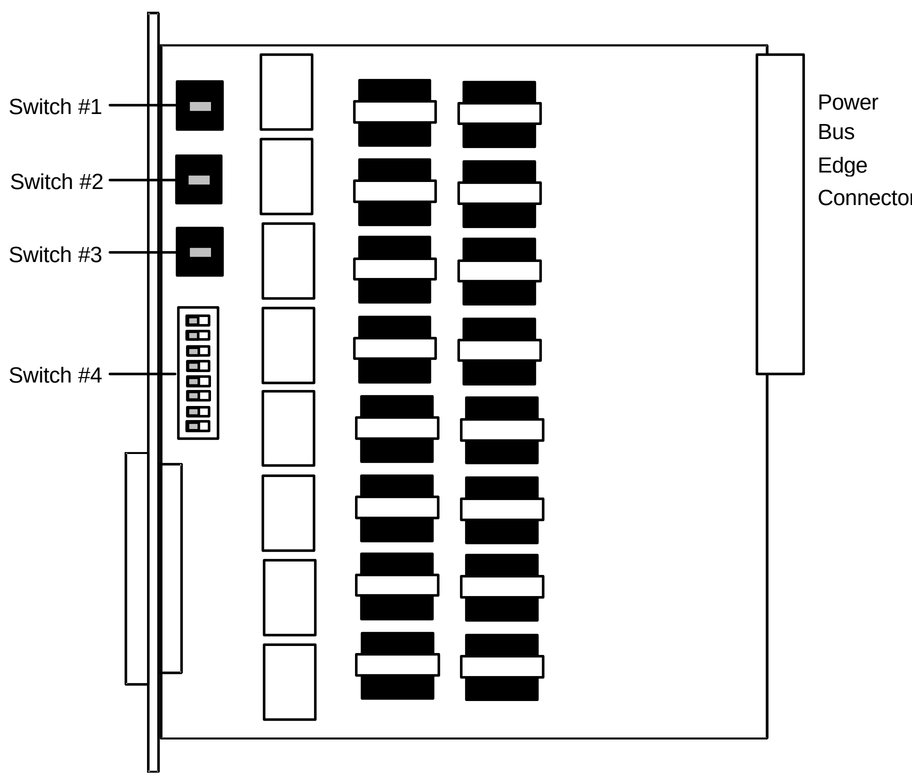


Figure E&M-1. Positions of the four E&M Card Switches

Table E&M-2 lists the switch settings based on the E&M type and the signaling direction.

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

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

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

**Indicates the port is attached to a device that does not generate signaling, such as a channel bank. In this case, the system emulates a PBX and generates signaling. Also called Reverse E&M or Pulse Link Repeater (PLR) orientation.

The eight units or channels that each E&M card can control are listed on the screen in columns, as shown in Figure E&M-2. Table E&M-3 lists the setting on the E&M voice card screen along with the possible and default values.

```
Node_1    |  U1   E&M   4Wx8ER    8119    Rev  A2-0    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             01      01      01      01      01      01      01      01
MODE           e&m     e&m     e&m     e&m     e&m     e&m     e&m     e&m
R2 TYPE        n/a     n/a     n/a     n/a     n/a     n/a     n/a     n/a
Rx TLP         0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
Tx TLP         0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
CODING         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
LB             off     off     off     off     off     off     off     off
PATTRN         none    none    none    none    none    none    none    none
HYBRID         n/a     n/a     n/a     n/a     n/a     n/a     n/a     n/a
SIG CONV       off     off     off     off     off     off     off     off
RATE           64k     64k     64k     64k     64k     64k     64k     64k
ADPCM          n/a     n/a     n/a     n/a     n/a     n/a     n/a     n/a

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

Figure E&M-2. E&M Card Screen

Table E&M-3. E&M Card Setting Options and Defaults

Parameter	User Options	Notes	Default
STATE	stdby act		stdby
WAN	w1-1 w1-2 w2-1 w2-2 w3-1 w3-2 w4-1 w4-2		w1-1
TS	01-24 01-31	1	01
MODE	e&m to e&mR2 R2mod		e&m
R2 TYPE	n/a	2	n/a
RX TLP	-16.3 dB to +7.5 dB		0
TX TLP	-16.3 dB to +7.5 dB	3	0
CODING	u-law a-inv a-law	4	u-law
TC CGA	idle busy		idle
LB	off dgtl anlg		off
PATTERN	none D-mW quiet		none
HYBRID	n/a set1 to set8 user	5	n/a
SIG CONV	off on		off
RATE	64K 24K,1 32K,1 40K,1 24K,2 32K,2 40K,2		64K
ADPCM	n/a P1 P2 P3	6	n/a

NOTES

1. Time slot 16 is not available if the port is assigned to an E1 WAN link whose TS 16 is programmed for **cas** or **ccs**.
2. The default is **sl-1** if the mode selected is **e&mR2** or **R2mod**.
3. Extended settings for 8119 card are **-17.5** to **+14.5dB**.
4. The default is **a-inv** for E1 and **μ-law** for T1.
5. Only the 8108 E&M card (which provides a two-wire interface) supports the **HYBRID** parameter.
6. Choosing a RATE other than 64K allows the user to select an ADPCM slot.

STATE

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

WAN

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

TS

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

MODE

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

R2 TYPE

The R2 Type setting is reserved for future use. The value of **n/a** is unchangeable by the user. Signaling type for all eight E&M ports on a card is selected by setting hardware switches S1-S4 as described earlier. If the Mode selected for the port is **e&mR2**, then the R2 Type will automatically default to **sl-1**.

Rx TLP

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

Tx TLP

The Transmit Transmission Level Point setting controls the amount of gain or attenuation added to signals after they are received from the local analog port and before they are encoded to digital PCM signals. To increase the signal level, set the Tx TLP setting to a negative number (i.e., the more negative the number, the more gain is added). To decrease the signal level, set the Tx TLP setting to a positive number (i.e., the more positive the number, the more the signal level is decreased). For example, an incoming signal at -5 dBm can be increased to -2 dBm by setting Tx TLP to -3 dB. Acceptable values for the extended range 8119 E&M Card comprise **-17.5 dB to +14.5 dB**. Acceptable values for normal range E&M Cards comprise **-16.5 dB to +7.3 dB**.

CODING

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

TC CGA

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

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

LB

The LB setting sets the loopback for this circuit to **off**, digital (**dgtl**), or analog (**anlg**). Figure E&M-3 illustrates the loopback options.

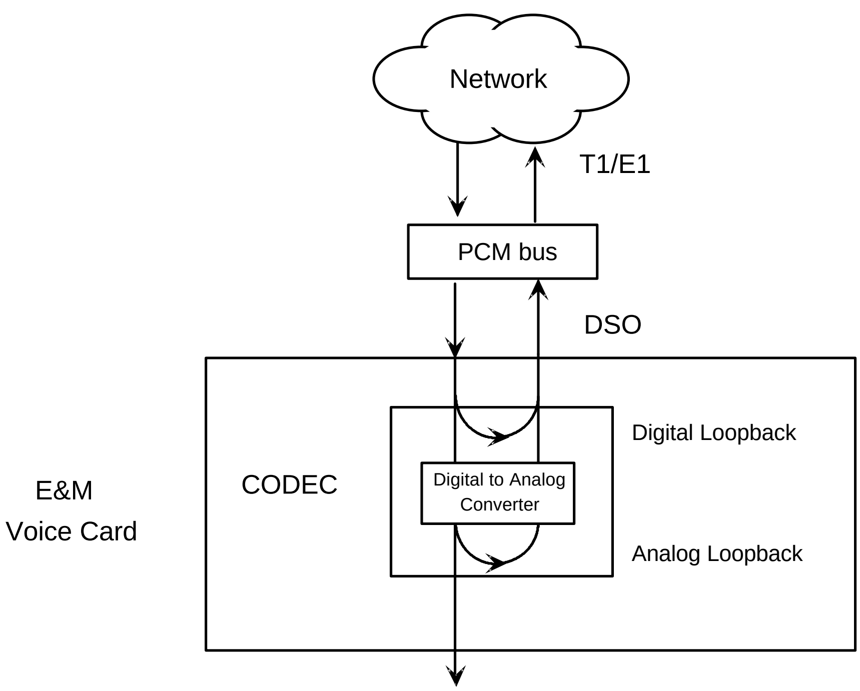


Figure E&M-3. E&M Card Loopbacks

PATTRN

The Pattern setting sets the outgoing test pattern, generated by the system, that is sent to the selected port. A different pattern can be set for each port. The **none** option disables sending a test pattern. The **D-mW** (Digital milliwatt) option sends a 1 kHz tone at 0.0 dBm. The setting of the Rx TLP setting affects the D-mW signal level. The **quiet** option places a 600Ω termination on the line so that no analog signal is sent.

HYBRID

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

SIG CONV

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

The options are **off** (which means that ANSI signaling is used) and **on** (which converts transmit signaling from ANSI to CCITT format according to the Interface Card Conversion Table for E&M signaling, and also converts receive signaling from CCITT to ANSI).

RATE

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

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

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

ADPCM

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

Menu of Actions

Table E&M-4 shows the Menu of Actions for the E&M Card.

Table E&M-4. E&M Card Screen Menu of Actions

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

Test

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

The Test screen also shows the signaling type assigned to this card via the switch settings described earlier.

Figure E&M-4 shows the E&M Card Test parameters and Table E&M-5 shows the settings for each.

```
Node_1     | U1   E&M    4Wx8ER    8119    Rev  A2-0   Ser  00101  |    12-31-99  14:33
SIG MON = OFF
                 1       2       3       4       5       6       7       8
TEST            n/a     n/a     n/a     n/a     n/a     n/a     n/a     n/a
Tx  ABCD        mon     mon     mon     mon     mon     mon     mon     mon
Rx  ABCD        mon     mon     mon     mon     mon     mon     mon     mon
E-lead          mon     mon     mon     mon     mon     mon     mon     mon
TO  USER        n/a     n/a     n/a     n/a     n/a     n/a     n/a     n/a
TO  NTWK        n/a     n/a     n/a     n/a     n/a     n/a     n/a     n/a

Tx  ABCD        n/a     n/a     n/a     n/a     n/a     n/a     n/a     n/a
Rx  ABCD        n/a     n/a     n/a     n/a     n/a     n/a     n/a     n/a
E-lead          off     off     off     off     off     off     off     off
M-lead          off     off     off     off     off     off     off     off
MODE            e&m     e&m     e&m     e&m     e&m     e&m     e&m     e&m
STATUS          W stb   W stb   W stb   W stb   W stb   W stb   W stb   W stb

E&M  Signaling  Type:    I-t




Save  |  Undo  |  Refresh  |  Main  |  siG mon
```

Figure E&M-4. E&M Card Test Screen

Table E&M-5. E&M Card Test Screen Options

Parameter	User Options	Default
SIG MON	off on	off
TEST	off on	off
TX ABCD	mon set	mon
RX ABCD	mon set	mon
E-LEAD	mon set	mon
TO USER	PCM 300Hz 1kHz 3kHz quiet	PCM
TO NTWK	PCM 300Hz 1kHz 3kHz quiet	PCM
TX ABCD	Information only - no user input	n/a
RX ABCD	Information only - no user input	n/a
E-LEAD	Information only - no user input	n/a
M-LEAD	Information only - no user input	n/a
MODE	Information only - no user input	n/a
STATUS	Information only - no user input	n/a

SIG MON

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

TEST

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

Tx ABCD

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

Rx ABCD

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

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

E-lead

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

TO USER

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

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

TO NTWK

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

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

Tx ABCD

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

Rx ABCD

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

E-Lead

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

M-Lead

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

MODE

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

STATUS

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

Table E&M-6. Status Information Field Settings

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

E&M Signaling Type

The E&M signaling type that was set by the switch configuration mentioned earlier is displayed in this field. The user can check the switch settings without having to remove the card. The E&M Signaling types are I, II, IV and V, followed by a "**-t**" if the card is set to provide trunk signaling.

Menu of Actions

Table E&M-7 shows the Menu of Actions for the E&M card test screen.

Table E&M-7. E&M Card Test Screen Menu of Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e. performance and test data).
Main	Returns to the E&M card main screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.
si**G** mon	Works with the user card alarm system (see Basic Operations section) to detect excessive signaling bit transitions. The options are **off** and **on**. They are toggled using the "G" command in the Menu of Actions.

Introduction

Foreign Exchange Station Cards manage the flow of FXS voice traffic over the network. The FXS card translates an analog signal to a digital bitstream at the local system and digital to analog at the remote system.

All cards have a two-wire interface that supports Foreign Exchange Station, Private Line Automatic Ringdown, Foreign Exchange Software Defined Network, Dial Pulse Originating and Wink operations. FXS cards can use the voice-compression features of the ADPCM server card.

FXS Cards also support digital to analog conversion as outlined in TR-TSY-000008 for circuits using Subscriber Loop Carriers (SLC™96) facilities.

8129 FXS Card

The 8129 FXS Card has eight ports and provides 600Ω terminating impedance. All FXS features are supported by this card.

UL Statement

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

In addition to the card shown above, whose operation will be discussed in this chapter, the following discontinued models are supported by v3.6 software:

8122 FXS Card

8122 FXS Card has two ports and provides 900Ω terminating impedance.

8123 FXS Card

8123 FXS Card has two ports and provides 600Ω terminating impedance.

8124 FXS Card

8124 FXS Card has four ports and provides 900Ω terminating impedance.

8125 FXS Card

8125 FXS Card has four ports and provides 600Ω terminating impedance.

8128 FXS Card

8128 FXS Card has eight ports and provides 900Ω terminating impedance.

FXS Card Settings

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

```
Node_1          |  U1   FXS   2Wx8-9   8129   Rev A8-0   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             01      01      01      01      01      01      01      01
MODE           fxs     fxs     fxs     fxs     fxs     fxs     fxs     fxs
TYPE           loop    loop    loop    loop    loop    loop    loop    loop
Rx TLP         0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
Tx TLP         0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
CODING         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
LB             off     off     off     off     off     off     off     off
PATTRN         none    none    none    none    none    none    none    none
HYBRID         set1    set1    set1    set1    set1    set1    set1    set1
RINGBK         off     off     off     off     off     off     off     off
SIG CONV       off     off     off     off     off     off     off     off
RATE           64k     64k     64k     64k     64k     64k     64k     64k
ADPCM          n/a     n/a     n/a     n/a     n/a     n/a     n/a     n/a

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

Figure FXS-1. FXS Card Screen

Table FXS-1. FXS Card Setting Options and Defaults

PARAMETER	USER OPTIONS	NOTES	DEFAULT
STATE	stdby act		stdby
WAN	w1-1 w1-2 w2-1 w2-2 w3-1 w3-2 w4-1 w4-2		w1-1
TS	01-24 01-31	1	01
MODE	fxs fxsdn wink plar dpo slc96	2	fxs
TYPE	loop lp-fd gs gs-i gs-a ls-R2		loop
RX TLP	-10.0 dB to +2.0 dB		0.0
TX TLP	-10.0 dB to +5.0 dB		0.0
CODING	u-law a-inv a-law	3	u-law
TC CGA	idle busy		idle
LB	off dgtl anlg		off
PATTERN	none D-mW quiet		none
HYBRID	set1 to set8 user		set1
RINGBK	off on		off
SIG CONV	off on		off
RATE	64k 24k,1 32k,1 40k,1 24k,2 32k,2 40k,2		64k
ADPCM	n/a P1 P2 P3	4	n/a

NOTES

1. Time slot 16 is not available if the port is assigned to an E1 WAN link whose TS 16 is programmed for **cas** or **ccs**.
2. These options are only valid if the Mode selected is **fxs** or **wink**. If the Mode is **fxsdn**, then the Type options are the same as above with the addition of **fgd** and **boa**. If the Mode is **plar**, then the Type options are **d3** or **d4**. If the Mode is **dpo**, then the Type setting will automatically default to **dpo**.
3. The default is **a-inv** for E1 and **μ-law** for T1. These values will change depending upon the WAN link selected.
4. Choosing RATE other than 64k allows the user to select an ADPCM slot.

STATE

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

WAN

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

TS

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

MODE

The Mode setting should be determined by the type of equipment to which you are connecting the port. All options use two-wire balanced connections. The **fxs** (Foreign Exchange Station) option allows you to connect the system to a 2 way (both inbound and outbound calls) PBX trunk or a key system trunk. The system requires a ringing generator for this option. The **fxsdn** (Foreign Exchange Software Defined Network) option provides access to new services offered by advanced networks from many major carriers. The system requires a ringing generator for this option. The **wink** option uses the same type of signaling as **fxsdn** and provides a 150MS delay, then a 200MS "wink" back to the central office when the FXS card sees an off-hook condition from the central office. The system requires a ringing generator for this option.

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

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

The **slc96** (Subscriber Loop Carrier 96) option allows the unit to attach to out-going one-way trunks from a PBX, CENTREX, key system, or a telephone set to a SLC™96 channel. The **slc96** mode must be active on the WAN card selected.

TYPE

The Type setting matches the signaling behavior of the FXS equipment and the remote switch. Use the **loop** (Loop Start) option with POTS stations and simple PBX trunks. Use the **lp-fd** (Loop Start **-** Forward Disconnect) option with automated answering equipment. Use the **gs** (Ground Start) option with two-way PBX trunks because it helps to prevent glaring or call collisions. Use the **gs-i** (Ground Start Immediate) option for equipment requiring fast-response time to the station or PBX. Use the **gs-a** (Ground Start Automatic) option for equipment requiring fast-response time to the central office. The selection you choose must match the behavior of both the station equipment and the remote central office or PBX equipment.

If you selected the **fxsdn** mode, the choice of **fgd** is offered to make the circuit compatible with Feature Group "D" high-speed modem services that require special software. An additional choice of **boa** (bill on answer) sends a signal back to the office when the customer answers the phone to start billing for the call.

If you selected the **plar** option for the Mode of this port, then the two options that are supported under Type are **d3** and **d4** which meet the pre-1988 and post-1988 specifications for PLAR circuits. If you selected **dpo** as the Mode, the Type will automatically default to **dpo**.

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

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

Rx TLP

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

Tx TLP

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

CODING

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

TC CGA

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

LB

The Loopback setting sets the loopback for this circuit to **off**, digital (**dgtl**), or analog (**anlg**). Figure FXS-2 illustrates the loopback options.

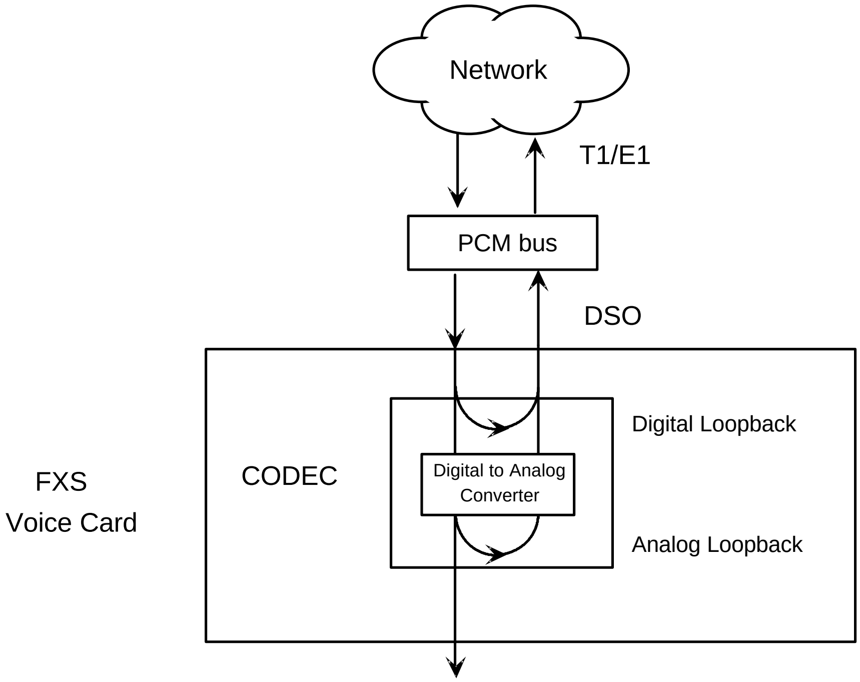


Figure FXS-2. FXS Card Loopbacks

PATTR

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

HYBRID

The Hybrid option assigns a three byte pattern to define the adjustment for return loss (similar to Build Out Capacitors). The default, **set1**, balances to the ideal termination of 900Ω @ 2.15mF in the case of the 8124 and 8128 cards 600Ω @ 2.15mF in the case of the 8125 and 8129 cards. The other settings are reserved for future use.

RINGBK

The ringback setting specifies whether a ringback tone is generated by the system and sent towards the network. The options are **off** and **on**. This option should be turned on when the network service does not provide an audible ringing tone to the calling party.

SIG CONV

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

The options are **off** (which means that ANSI signaling is used) and **on** (which converts transmit signaling from ANSI to CCITT format according to the Interface Card Conversion Table for FXS signaling, and also converts receive signaling from CCITT to ANSI).

RATE

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

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

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

ADPCM

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

Menu of Actions

Table FXS-2 shows the Menu of Actions for the FXS Card.

Table FXS-2. FXS Card Screen Menu of Actions

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

Test

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

Figure FXS-3 shows the FXS Card Test parameters and Table FXS-3 shows the settings for each.

```
Node_1          |  U1   FXS    2Wx8-9    8129    Rev A8-0    Ser 00101    |    12-31-99
14:33
SIG MON = OFF

             1       2       3       4       5       6       7       8
TEST        n/a     n/a     n/a     n/a     n/a     n/a     n/a     n/a
Tx ABCD     mon     mon     mon     mon     mon     mon     mon     mon
Rx ABCD     mon     mon     mon     mon     mon     mon     mon     mon
T-R-CNTL    mon     mon     mon     mon     mon     mon     mon     mon
TO USER     n/a     n/a     n/a     n/a     n/a     n/a     n/a     n/a
TO NTWK     n/a     n/a     n/a     n/a     n/a     n/a     n/a     n/a

Tx ABCD     n/a     n/a     n/a     n/a     n/a     n/a     n/a     n/a
Rx ABCD     n/a     n/a     n/a     n/a     n/a     n/a     n/a     n/a
T-R-CNTL    RbTo    RbTo    RbTo    RbTo    RbTo    RbTo    RbTo    RbTo
T-R-STAT    off     off     off     off     off     off     off     off
MODE        fxs     fxs     fxs     fxs     fxs     fxs     fxs     fxs
TYPE        loop    loop    loop    loop    loop    loop    loop    loop
STATUS      W stb   W stb   W stb   W stb   W stb   W stb   W stb   W stb




Save | Undo | Refresh | Main | siG Mon
```

Figure FXS-3. FXS Card Test Screen

Table FXS-3. FXS Card Test Parameters

Parameter	User Options	Default
SIG MON	off on	off
TEST	off on	off
Tx ABCD	mon set	mon
Rx ABCD	mon set	mon
T-R-CNTL	mon set	mon
TO USER	PCM 300Hz 1kHz 3kHz quiet	PCM
TO NTWK	PCM 300Hz 1kHz 3kHz quiet	PCM
Tx ABCD	Information only - no user input	n/a
Rx ABCD	Information only - no user input	n/a
T-R-CNTL	Information only - no user input	RbTo
T-R-STAT	Information only - no user input	off
MODE	Information only - no user input	fxs
TYPE	Information only - no user input	loop
STATUS	Information only - no user input	W stb

SIG MON

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

TEST

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

Tx ABCD

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

Rx ABCD

The Receive ABCD setting allows the user to either monitor the status of the ABCD signaling bits being received from the network or set a specific ABCD pattern for testing the receive side of the circuit. The options for this field are **mon** (monitor) or **set**. Choosing **set** will bring up a four digit field for you to input the ABCD pattern you want to receive. Any four digit combination of ones and zeros is acceptable for this setting. The Rx ABCD bits cannot be set in bus-connect systems and the only option is **mon** (monitor).

T-R-CNTL

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

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

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

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

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

TO USER

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

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

TO NTWK

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

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

Tx ABCD

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

Rx ABCD

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

T-R-CNTL

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

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

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

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

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

ring ringing voltage is applied between Tip and Ring

T-R-STAT

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

loop attached device is connecting Tip and Ring together

rgnd the Ring lead is grounded by the attached device

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

MODE

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

TYPE

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

STATUS

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

Table FXS-4. Status Information Field Settings

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

Menu of Actions

Table FXS-5 shows the Menu of Actions for the FXS Card Test Screen.

Table FXS-5. FXS Card Test Screen Menu of Actions

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

Introduction

Foreign Exchange Office Cards manage the flow of FXO voice traffic over the network. The FXO card translates an analog signal to a digital bitstream at the local system and digital to analog at the remote system. All FXO cards have a two-wire interface and support Foreign Exchange Office functions, Manual Ringdown, Foreign Exchange Defined Network and Dial Pulse Terminating operations. FXO cards can use the voice-compression features of the ADPCM server card.

8139 FXO Card

The 8139 FXO Card is an eight port card with 600Ω terminating impedance. All FXO features are supported by this card.

UL Statement

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

In addition to the card shown above, whose operation will be discussed in this chapter, the following discontinued models are supported by v3.6 software:

8132 FXO Card

The 8132 FXO Card is a two port card with 900Ω terminating impedance.

8133 FXO Card

The 8133 FXO Card is a two port card with 600Ω terminating impedance.

8134 FXO Card

The 8134 FXO Card is a four port card with 900Ω terminating impedance.

8135 FXO Card

The 8135 FXO Card is a four port card with 600Ω terminating impedance.

8138 FXO Card

The 8138 FXO Card is a four port card with 900Ω terminating impedance.

FXO Card Settings

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

```
Node_1      |  U1   FXO    2Wx8-9    8139   Rev  C2-0   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               01      01      01      01      01      01      01      01
MODE             fxo     fxo     fxo     fxo     fxo     fxo     fxo     fxo
SIGNAL           loop    loop    loop    loop    loop    loop    loop    loop
Rx  TLP          0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
Tx  TLP          0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
CODING           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
LB               off     off     off     off     off     off     off     off
PATTRN           none    none    none    none    none    none    none    none
HYBRID           set1    set1    set1    set1    set1    set1    set1    set1
WK  DLY          0       0       0       0       0       0       0       0
WINK             0       0       0       0       0       0       0       0
SIG  CONV        off     off     off     off     off     off     off     off
RATE             64k     64k     64k     64k     64k     64k     64k     64k
ADPCM            n/a     n/a     n/a     n/a     n/a     n/a     n/a     n/a

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

Figure FXO-1. FXO Card Screen

Table FXO-1. FXO Card Setting Options and Defaults

Parameter	User Options	Notes	Default
STATE	stdby act		stdby
WAN	w1-1 w1-2 w2-1 w2-2 w3-1 w3-2 w4-1 w4-2		w1-1
TS	01-24 01-31	1	01
MODE	fxo fxodn dpt mrd		fxo
SIGNAL	loop gs lp-fd R2 gs-a lp-em	2	loop
RX TLP	-10.0 dB to +2.0 dB		0.0
TX TLP	-10.0 dB to +5.0 dB		0.0
CODING	u-law a-law a-inv	3	u-law
TC CGA	idle busy		idle
LB	off dgtl anlg		off
PATTERN	none D-mW quiet		none
HYBRID	set1 to set8 user		set1
WK DLY	00-99	4	0
WINK	00-199	4	0
SIG CONV	off on		off
RATE	64k 24k,1 32k,1 40k,1 24k,2 32k,2 40k,2		64k

ADPCM	n/a P1 P2 P3	5	n/a

NOTES

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

2. These options are only valid if the Mode selected is **fxo**, or **fxodn**. If the mode is **dpt**, then the Type options are **dpt** (default), **R2** or **i-R2**. If the Mode is **mrd**, then the Type setting will automatically default to **mrd**.

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

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

5. Choosing a RATE other than 64k allows the user to select an ADPCM slot.

STATE

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

WAN

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

TS

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

MODE

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

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

SIGNAL

The Signal setting matches the signaling behavior of the FXO equipment and the remote switch. Use the **loop** (Loop Start) option with telephone sets and simple PBX trunks. Use the **gs** (Ground Start) option with two-way PBX trunks because it helps to prevent glaring or call collisions. Use the **lp-fd** (Loop Start - Forward Disconnect) option with automated answering equipment. The **R2** option is provided for a CCITT R2 interface. The selection you choose must match the behavior of the station equipment and the remote central office or PBX equipment.

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

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

Rx TLP

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

Tx TLP

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

CODING

The Coding setting sets the PCM companding method used for a port. In general, in the T1/North American environment use **m-law** coding. In the E1/International environment use **a-law** or **a-inv** (inverted A-law) coding;

a-inv provides greater 1s density than **a-law**. The coding default is determined by the type of card in the WAN port you select.

TC CGA

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

LB

The Loopback setting sets the loopback for this circuit to **off**, digital (**dgtl**), or analog (**anlg**). Figure FXO-2 illustrates the loopback options.

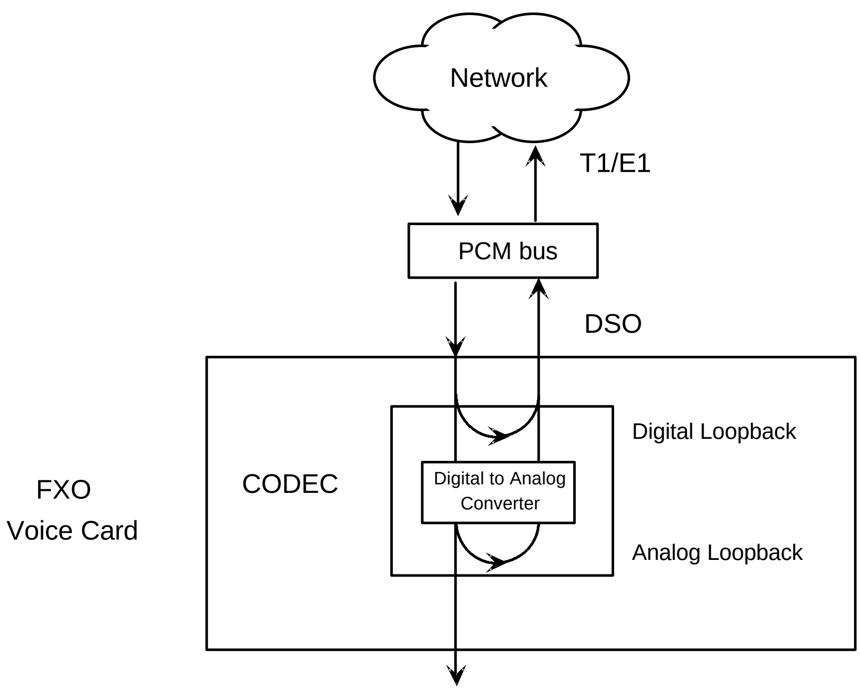


Figure FXO-2. FXO Card Loopbacks

PATTRN

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

HYBRID

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

WK DLY

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

WINK

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

SIG CONV

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

RATE

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

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

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

ADPCM

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

Menu of Actions

Table FXO-2 shows the Menu of Actions for the FXO Card.

Table FXO-2. FXO Card Screen Menu of Actions

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

Test

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

Figure FXO-3 shows the FXO Card Test parameters and Table FXO-3 shows the settings for each.

```
Node_1      | U1   FXO   2Wx8-9   8139   Rev  C2-0    Ser  00101   |    12-31-99  14:33
SIG  MON = OFF

                  1        2        3        4        5        6        7        8
TEST             n/a      n/a      n/a      n/a      n/a      n/a      n/a      n/a
Tx  ABCD         mon      mon      mon      mon      mon      mon      mon      mon
Rx  ABCD         mon      mon      mon      mon      mon      mon      mon      mon
T-R-CNTL         mon      mon      mon      mon      mon      mon      mon      mon
TO  USER         n/a      n/a      n/a      n/a      n/a      n/a      n/a      n/a
TO  NTWK         n/a      n/a      n/a      n/a      n/a      n/a      n/a      n/a

Tx  ABCD         n/a      n/a      n/a      n/a      n/a      n/a      n/a      n/a
Rx  ABCD         n/a      n/a      n/a      n/a      n/a      n/a      n/a      n/a
T-R-CNTL         n/a      n/a      n/a      n/a      n/a      n/a      n/a      n/a
T-R-STAT         n/a      n/a      n/a      n/a      n/a      n/a      n/a      n/a
MODE             fxo      fxo      fxo      fxo      fxo      fxo      fxo      fxo
TYPE             loop     loop     loop     loop     loop     loop     loop     loop
STATUS           W stb    W stb    W stb    W stb    W stb    W stb    W stb    W stb



Save  |  Undo  |  Refresh  |  Main  |  siG mon
```

Figure FXO-3. FXO Card Test Screen

Table FXO-3. FXO Card Test Screen Parameters

Parameter	User Options	Default
SIG MON	off on	off
TEST	off on	off
TX ABCD	mon set	mon
RX ABCD	mon set	mon
T-R-CNTL	mon set	mon
TO USER	PCM 300Hz 1kHz 3kHz quiet	PCM
TO NTWK	PCM 300Hz 1kHz 3kHz quiet	PCM
TX ABCD	Information only - no user input	n/a
RX ABCD	Information only - no user input	n/a
T-R-CNTL	Information only - no user input	n/a
T-R-STAT	Information only - no user input	n/a
MODE	Information only - no user input	n/a
TYPE	Information only - no user input	n/a
STATUS	Information only - no user input	n/a

SIG MON

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

TEST

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

Tx ABCD

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

Rx ABCD

The Receive ABCD setting allows the user to either monitor the status of the ABCD signaling bits being received from the network or set a specific ABCD pattern for testing the receive side of the circuit. The options for this field are **mon** (monitor) or **set**. Choosing **set** will bring up a four digit field for you to input the ABCD pattern you want to receive. Any four digit combination of ones and zeros is acceptable for this setting. The Rx ABCD bits cannot be set in bus-connect systems and the only option is **mon** (monitor).

T-R-CNTL

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

loop the Tip and Ring leads are tied together

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

TO USER

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

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

TO NTWK

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

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

Tx ABCD

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

Rx ABCD

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

T-R-CNTL

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

loop the Tip and Ring leads are tied together

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

rgnd the Ring lead is grounded

lpgnd the Tip and Ring leads are tied together and the Tip is grounded

ring ringing voltage is being applied between the Tip and Ring

T-R-STAT

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

ring attached device is applying ringing voltage between Tip and Ring

TbRg attached device is applying -48V battery to the Tip lead and is grounding the Ring lead

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

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

RbTg attached device is applying -48V battery to the Ring lead and is grounding the Tip lead

RbTo attached device is applying -48V battery to the Ring lead and is leaving the Tip lead open

TgR* attached device is grounding the Tip lead and the state of the Ring lead is unknown

ToR* attached device is leaving the Tip lead open and the state of the Ring lead is unknown

RoT* attached device is leaving the Ring lead open and the state of the Tip lead is unknown

n/a information is not available

MODE

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

TYPE

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

STATUS

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

Table FXO-4. Status Information Field Settings

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

Menu of Actions

Table FXO-5 shows the Menu of Actions for the FXO Card Test Screen.

Table FXO-5. FXO Card Test Screen Menu of Actions

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

Setting Jumpers on the FXO Card

Setting or resetting jumpers is necessary for conversion of individual ports on the FXO card to **mrd** (Manual Ringdown) mode. To make this conversion, remove the FXO card from its slot and connect shorting jumpers (ordered separately) vertically from #1 to #2 on both sets of pins next to the front edge of the card as shown in Figure FXO-4. **The numbers (#1 and #2) are not stenciled on the card, but they are shown here to clarify the procedure.**

Ports can be set individually for the **mrd** feature, but once set, remain in the **mrd** mode until the jumpers are removed. This information is repeated in the Installation chapter.

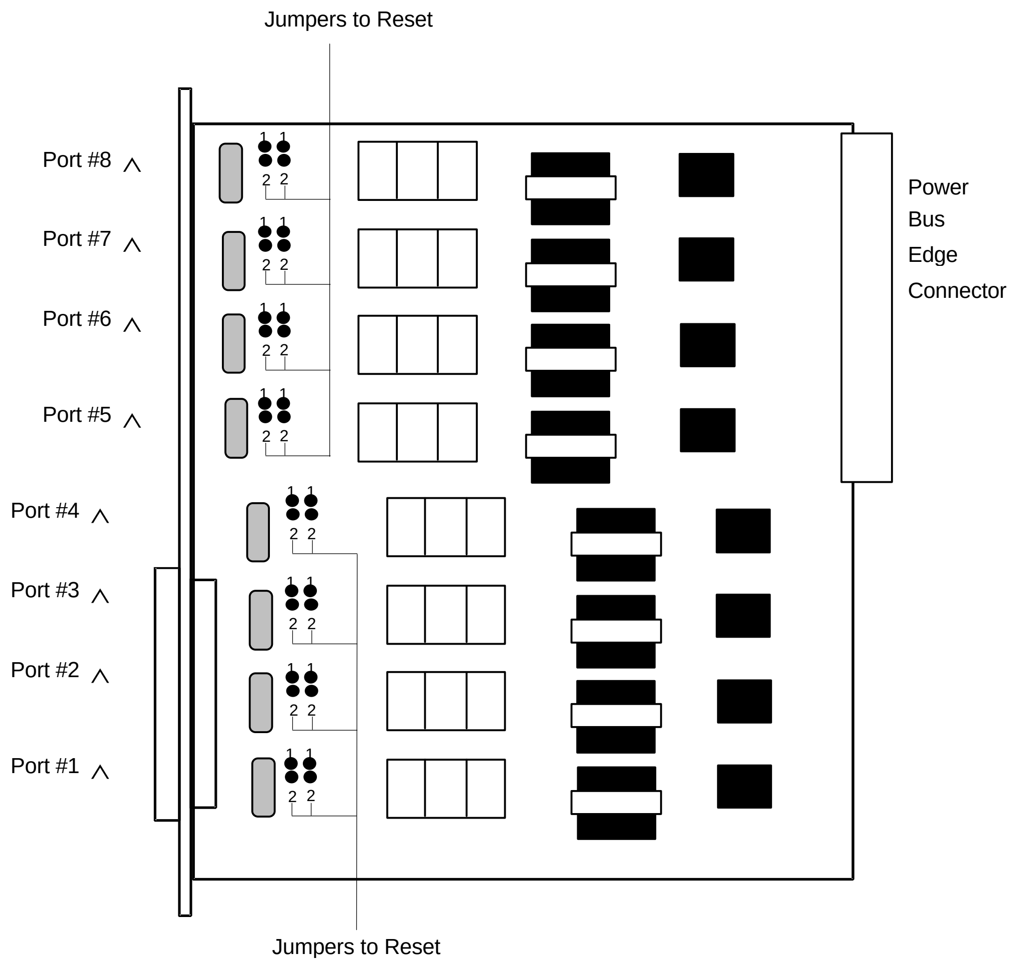


Figure FXO-4. Jumpers for mrd Mode

Introduction

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

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

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

8149 FXS Coin Card

The 8149 FXS Coin Card has six ports and two wires, providing a 600-ohm terminating impedance. The card consists of backplane interface circuitry, serial EEPROM for card identification and adjustment parameters storage, metering pulse interface extension between Coin Box Office (CO) and coin phone on the side of the coin phone, and six voice line interface circuits. Each line interface circuit consists of a codec, a hybrid circuit.

FXS Coin Card Settings

External Card Connectors and Pinouts

Refer to the Pinout Chapter in this manual.

Card Jumper/Switch Settings

The FXS Coin Card does not have any jumpers or switches on its motherboard.

Installing the FXS Coin Card

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

FXS Coin Card User Screens and Settings

Main Screen

You must configure the FXS Coin Card for operation after installing it into the system chassis. This is done from the FXS Coin Card Main Screen (see Figure FXSC-1). To go to that screen, highlight the desired card in the System Main Screen and press <Enter>. This screen shows one configuration column for each port on the card.

```
Node_1          | U2 FXSC 6-600    Rev D1-0  Ser 00061   |    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            01     01     01     01     01     01     01     01
MODE          fxsc   fxsc   fxsc   fxsc   fxsc   fxsc   fxsc   fxsc
TYPE          hf-a1  hf-a1  hf-a1  hf-a1  hf-a1  hf-a1  hf-a1  hf-a1
Rx TLP        0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
Tx TLP        0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
CODING        u-laq  u-law  u-law  u-law  u-law  u-law  u-law  u-law
TC CGA        idle   idle   idle   idle   idle   idle   idle   idle
LB            off    off    off    off    off    off    off    off
PATTRN        none   none   none   none   none   none   none   none
HYBRID        set1   set1   set1   set1   set1   set1   set1   set1
RINGBK        off    off    off    off    off    off    off    off
SIG CONV      off    off    off    off    off    off    off    off
RATE          64k    64k    64k    64k    64k    64k    64k    64k
ADPCM         n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a



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

Figure FXSC-1. Typical FXS Coin Card Main Screen

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

Menu of Actions

Table FXSC-1. Main Screen Actions

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

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

Table FXSC-2. Main Screen Option Settings and Defaults

Parameter	User Options	Notes	Default
STATE	stdby actv		stby
WAN	w1-1 w1-2 w2-1 w2-2 w3-1 w3-3 w4-1 w4-2	1	w1-1
TS	01-24 01-31	2	01
MODE	fxsc		fxsc
TYPE	hf-a1 hf-a2 hf-cb rb-a1 rb-a2 rb-cb		hf-a1
RX TLP	-10.0 dB to +2.0 dB		0.0
TX TLP	-10.0 dB to +5.0 dB		0.0
CODING	u-law a-law a-inv	3	u-law
TC CGA	idle busy		idle
LB	off dgtl anlg		off
PATTERN	none D-mW quiet		none
HYBRID	set1 to set8 user	4	set1
RINGBK	off on		off
RATE	64K, 24K,1 32K,1 40K,1 24K,2 32K,2 40K,2	5	64K
ADPCM	n/a P1 P2 P3		n/a

NOTES

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

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

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

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

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

STATE

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

WAN

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

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

TS

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

MODE

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

TYPE

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

Rx TLP

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

Tx TLP

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

CODING

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

TC CGA

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

LB

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

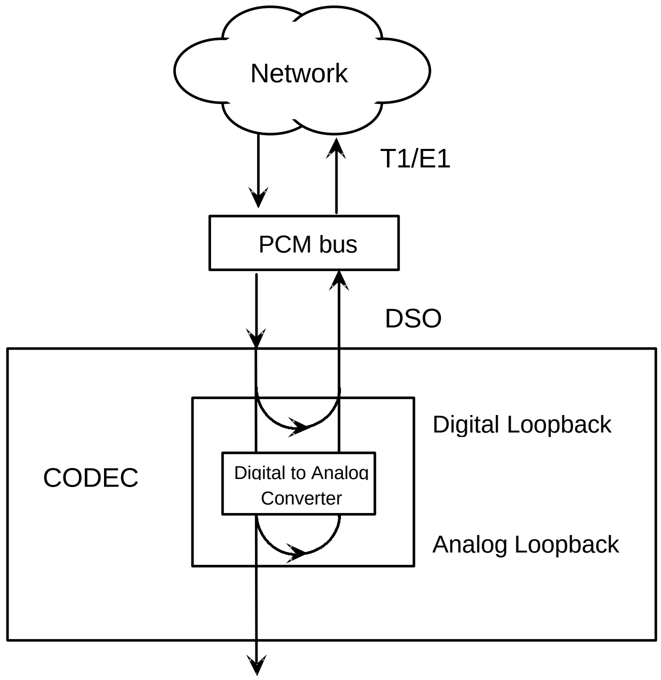


Figure FXSC-2. FXS Coin Card Loopbacks

PATTRN

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

HYBRID

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

RINGBK

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

RATE

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

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

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

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

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

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

For more information about voice port assignments to an ADPCM card, please consult Chapter 7A of this guide.

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

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

ADPCM

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

Test Screen

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

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

```
Node_1          | U2 FXSC 6-600      Rev D1-0  Ser 00061  | 12-31-99  14:33
SIG MON=OFF
                    1      2      3      4      5      6      7      8
TEST             off    off    off    off    off    off    off    off
Tx ABCD          mon    mon    mon    mon    mon    mon    mon    mon
Rx ABCD          mon    mon    mon    mon    mon    mon    mon    mon
T-R-CNTL         mon    mon    mon    mon    mon    mon    mon    mon
TO USER          n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a
TO NTWK          n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a

Tx ABCD          n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a
Rx ABCD          n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a
T-R-CNTL         RbTo   RbTo   RbTo   RbTo   RbTo   RbTo   RbTo   RbTo
T-R-STAT         off    off    off    off    off    off    off    off
MODE             fxsc   fxsc   fxsc   fxsc   fxsc   fxsc   fxsc   fxsc
TYPE             hf-a1  hf-a1  hf-a1  hf-a1  hf-a1  hf-a1  hf-a1  hf-a1
STATUS           noWAN  noWAN  noWAN  noWAN  noWAN  noWAN  noWAN  noWAN




Save | Undo | Refresh | Main | siG mon
```

Figure FXSC-3 Typical FXS Coin Card Test Screen

Menu of Actions

Table FXSC-3. Test Screen Actions

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

Table FXSC-4. Test Screen Option Settings and Defaults

Parameter	User Options	Default
SIG MON	off on	off
TEST	off on	off
TX ABCD	mon	mon
RX ABCD	mon	mon
T-R-CNTL	mon	mon
TO USER	n/a	n/a
TO NTWK	n/a	n/a
TX ABCD	Status information only; not editable	n/a
RX ABCD	Status information only; not editable	n/a
T-R-CNTL	Status information only; not editable	n/a
T-R-STAT	Status information only; not editable	n/a
MODE	Status information only; not editable	n/a
TYPE	Status information only; not editable	n/a
STATUS	Status information only; not editable	n/a

SIG MON

The Signaling Monitor feature works with the user card alarm system (see Chapter 3-A) to detect excessive signaling bit transitions. The system will generate alarms if the number of transitions of any signaling bit in transmit or receive direction for an active port exceeds 255 in any four second interval. The options are **off** and **on**, and they are toggled by pressing “**g**” (**siGmon** command) in the Test Screen.

TEST

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

Tx ABCD

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

Rx ABCD

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

T-R-CNTL

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

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

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

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

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

TO USER

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

TO NTWK

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

Tx ABCD

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

Rx ABCD

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

T-R-CNTL

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

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

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

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

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

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

T-R-STAT

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

loop (attached device is connecting Tip and Ring together)

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

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

MODE

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

TYPE

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

STATUS

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

Table FXSC-5. Status Information Field Settings

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

Introduction

The Foreign Exchange Office Coin Card manages the flow of FXOC voice traffic over the network. The FXOC card translates an analog signal to a digital bitstream at the local system and digital to analog at the remote system. All FXOC cards have a two-wire interface and support Foreign Exchange Office functions, Manual Ringdown, Foreign Exchange Defined Network and Dial Pulse Terminating operations. FXOC cards can use the voice-compression features of the ADPCM resource card.

8159 FXO Coin Card

The 8159 FXO Coin Card has eight ports and two wires, providing a 600-ohm terminating impedance. The card consists of backplane interface circuitry, serial EEPROM for card identification and adjustment parameters storage, metering pulse interface extension between Coin Box Office (CO) and coin phone on the CO side, and eight voice line interface circuits. Each line interface circuit consists of a codec, a hybrid circuit (2 to 4 wire converter), line feed circuitry and relays to control modes of operation.

FXO Coin Card Settings

External Card Connectors and Pinouts

Refer to the Pinout Chapter in this manual.

Card Jumper/Switch Settings

Setting or resetting jumpers is necessary for conversion of individual ports on the FXOC card to **mrd** (Manual Ringdown) mode. To make this conversion, remove the FXOC card from its slot and connect shorting jumpers (ordered separately) vertically from #1 to #2 on both sets of pins next to the front edge of the card as shown in Figure FXOC-1. **The numbers (#1 and #2) are not stenciled on the card, but they are shown here to clarify the procedure.**

Ports can be set individually for the **mrd** feature, but once set, remain in the **mrd** mode until the jumpers are removed. This information is repeated in the Installation chapter.

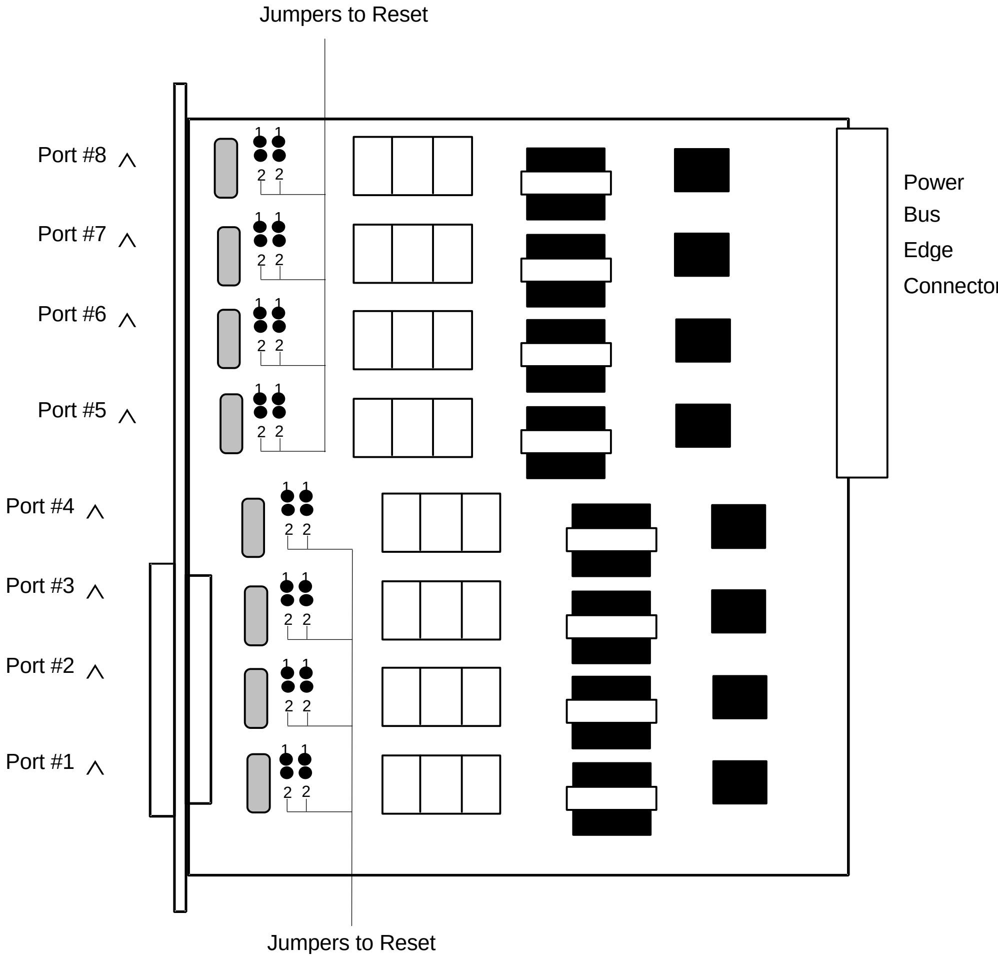


Figure FXOC-1. Jumpers for mrd Mode

Installing the FXO Coin Card

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

FXO Coin Card User Screens and Settings

Main Screen

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

```
Node_1        | U1 FXOC 8-600    Rev A2-0  Ser 00003  | 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           01     01     01     01     01     01     01     01
MODE         fxoc   fxoc   fxoc   fxoc   fxoc   fxoc   fxoc   fxoc
SIGNAL       hf-a1  hf-a1  hf-a1  hf-a1  hf-a1  hf-a1  hf-a1  hf-a1
Rx TLP       0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
Tx TLP       0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
CODING       n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a
TC CGA       idle   idle   idle   idle   idle   idle   idle   idle
LB           off    off    off    off    off    off    off    off
PATTRN       none   none   none   none   none   none   none   none
HYBRID       set1   set1   set1   set1   set1   set1   set1   set1
RATE         64k    64k    64k    64k    64k    64k    64k    64k
ADPCM        n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a

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

Figure FXOC-2. Typical FXO Coin Card Main Screen

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

Menu of Actions

Table FXOC-1. Typical FXO Coin Card Main Screen Actions

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

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

Table FXOC-2. Typical FXO Coin Card Main Screen Option Settings and Defaults

Parameter	User Options	Notes	Default
STATE	stdby actv		stdby
WAN	w1-1 w1-2 w2-1 w2-2 w3-1 w3-2 w41 w4-2	1	w1-1
TS	01-24 01-31	2	01
MODE	fxoc		fxoc
SIGNAL	hf-a1 hf-a2 hf-cb rb-a1 rb-a2 rb-cb	3	hf-a1
RX TLP	-10.0 dB to +2.0 dB		0.0
TX TLP	-10.0 dB to +5.0 dB		0.0
CODING	u-law a-inv a-law	4	u-law
TC CGA	idle busy		idle
LB	off dgtl anlg		off
PATTRN	none D-mW quiet		none
HYBRID	set1 to set8 user	5	set1
RATE		6	64K
ADPCM	n/a P1 P2 P3		n/a

NOTES

1. Choosing **wan** allows you to choose a WAN port (w1-1 through w4-2). The **user** option is not used.

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

3. The default is **hf-a1.**

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

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

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

STATE

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

WAN

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

TS

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

MODE

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

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

SIGNAL

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

Rx TLP

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

Tx TLP

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

CODING

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

TC CGA

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

LB

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

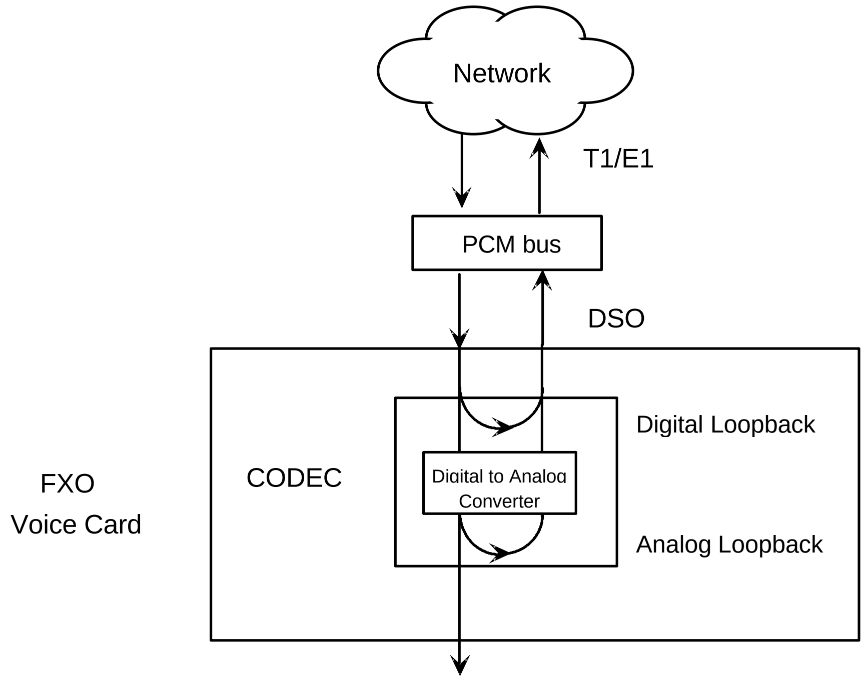


Figure FXOC-3. FXO Coin Card Loopbacks

PATTRN

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

HYBRID

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

RATE

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

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

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

ADPCM

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

Test Screen

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

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

```
Node_1         | U5 FXOC 8-600   Rev D6-0  Ser 05027  | 12-31-99  14:33
SIG MON=OFF
                  1      2      3      4      5      6      7      8
TEST           on     on     on     on     on     on     on     on
Tx ABCD        mon    mon    mon    mon    mon    mon    mon    mon
Rx ABCD        mon    mon    mon    mon    mon    mon    mon    mon
T-R-CNTL       mon    mon    mon    mon    mon    mon    mon    mon
TO USER        PCM    PCM    PCM    PCM    PCM    PCM    PCM    PCM
TO NTWK        PCM    PCM    PCM    PCM    PCM    PCM    PCM    PCM

Tx ABCD        n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a
Rx ABCD        n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a
T-R-CNTL       open   open   open   open   open   open   open   open
T-R-STAT       n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a
MODE           fxoc   fxoc   fxoc   fxoc   fxoc   fxoc   fxoc   fxoc
TYPE           hf-a1  hf-a1  hf-a1  hf-a1  hf-a1  hf-a1  hf-a1  hf-a1
STATUS         noWan  noWan  noWan  noWan  noWan  noWan  noWan  noWan

Save | Undo | Refresh | Main | siG mon
```

Figure FXOC-4. Typical FXO Coin Card Test Screen

Menu of Actions

Table FXOC-3. Test Screen Actions

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

Table FXOC-4. Test Screen Option Settings and Defaults

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

SIG MON

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

TEST

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

Tx ABCD

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

Rx ABCD

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

T-R-CNTL

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

TO USER

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

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

TO NTWK

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

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

Tx ABCD

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

Rx ABCD

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

T-R-CNTL

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

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

T-R-STAT

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

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

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

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

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

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

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

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

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

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

n/a (information is not available)

MODE

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

TYPE

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

STATUS

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

Table FXOC-5. Status Information Field Settings

Setting	Meaning
STDBY	The FXOC port is in standby.
W STB	The WAN that the FXOC port is assigned to is in standby.
W TST	The WAN that the FXOC port is assigned to is in test.
W OOS	The WAN that the FXOC port is assigned to is Out Of Service.
NOWAN	There is no WAN card configured in the slot to which the FXOC port is assigned.
CALL	Call set-up is in progress.
BUSY	A call is in progress.
IDLE	The FXOC circuit is not being used and is available.
TC	The FXOC circuit is undergoing Trunk Conditioning because of a CGA alarm on the WAN to which it is assigned.
TEST	The operator is actively controlling the circuit by setting values for Tx ABCD or Rx ABCD.
MAINT	The FXOC port is in maintenance condition.

Introduction

HSU cards allow you to connect high speed data terminal equipment (DTE) and data communications equipment (DCE) to WAN links, server cards (ADPCM) or another HSU card.

8202 High-Speed Unit Card

The 8202 HSU Card supports two RS530/RS449 data ports. It can also support V.35 and RS232 data through the use of the appropriate Personality Module (See the end of this chapter for instructions on the personality modules).

8203 High Speed Unit Card

The 8203 HSU Card supports two ANSI/EIA/TIA-530 ports. Each of the two ports can be configured to operate as DCE or DTE at data rates from 56 Kbps to 2.048 Mbps.

8212 High-Speed Unit Card

The 8212 HSU Card supports two V.35 data ports.

8214 High-Speed Unit Card V.35 Trunk / User

The 8214 HSU Card supports two V.35 data ports. Each of the two ports can be configured to operate as DCE or DTE at data rates from 56 Kbps to 2.048 Mbps in 56Kbps or 64 Kbps steps.

8215 High-Speed Unit Card

The 8215 HSU Card supports four RS530 or V.35 data ports. The selection of RS530 or V.35 is made on a port-by-port basis using on-board switches (see Installation chapter). It can also support RS232 data at 56kbps through the use of the 1252 and 1253 Personality Modules and 1240 cable adapter (See the end of this chapter for instructions on using the personality modules).

Caution: When using modes without B8ZS and Pulse set to transparent, HSU card ports assigned to multirate circuits greater than or equal to 4x64kbps must have DTE connected to the port prior to activation. Failure to attach DTE will cause a false carrier alarm. Using Alternate Channel AMI will avoid this problem.

HSU Card Settings

Figure HSU-1 shows the high-speed data unit (HSU) screen. Table HSU-1 lists the settings controlled on this screen along with their possible and default values.

```
Node_1         | U2 HSU-530x2   8202  Rev C0-0  Ser 00054  | 12-31-99
14:33

                    1               2
STATE            stdby           stdby
WAN/SRV          w1-1            w1-1
MODE             dce             dce
TS               table           table
RATE             64K             64K
Tx CLOCK         int             int
CLOCK PLRTY      norm            norm
DATA PLRTY       norm            norm
CTS              perm            perm
CTS DELAY        0               0
LOCAL LB         off             off
LB GEN MODE      dds             dds
LB GEN           off             off
LB DET           w/to            w/to
ISDN CONN        no              no

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

Figure HSU-1. HSU Card Screen

```
Node_1         | W1/U5  HSU-dte   8203  Rev D6-0  Ser 05027  | 12-31-99
14:33

                   1               2
STATE            stdby           stdby
WAN/SRV          w1-1            w1-1
MODE             dce             dce
TS               table           table
RATE             64K             64K
Tx CLOCK         int             int
CLOCK PLRTY      norm            norm
DATA PLRTY       norm            norm
CTS              perm            perm
CTS DELAY        0               0
LOCAL LB         off             off
LB GEN MODE      dds             dds
LB GEN           off             off
LB DET           w/to            w/to
ISDN CONN        no              no

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

Figure HSU-2. HSU Card Screen (dte)

```
Node_1       | W1/U5 HSU-trunk   8214  Rev D6-0  Ser 05027  | 12-31-99
14:33

                   1               2
STATE            stdby           stdby
WAN/SRV          w1-1            w1-1
MODE             dce             dce
TS               table           table
RATE             64K             64K
Tx CLOCK         int             int
CLOCK PLRTY      norm            norm
DATA PLRTY       norm            norm
CTS              perm            perm
CTS DELAY        0               0
LOCAL LB         off             off
LB GEN MODE      dds             dds
LB GEN           off             off
LB DET           w/to            w/to
ISDN CONN        no              no

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

Figure HSU-3. HSU Card Screen (trunk)

Table HSU-1. HSU Card Setting Options and Defaults

Parameter	User Options	Notes	Default
STATE	stdby actv		stdby
WAN/SRV	wan serv user	1	w1-1
MODE	dce dte		dce
TS	table	2	table
RATE	64k 56k		56k
TX CLOCK	int ext		int
CLOCK PLRTY	norm inv		norm
DATA PLRTY	norm inv		norm
CTS	perm rlocal ignor local		perm
CTS DELAY	0 30 60 100		0
LOCAL LB	off dte net		off
LB GEN MODE	dds v.54 ft1		dds
LB GEN	off ocu csu dsu ds0	3	off
LB DET	w/to on off		wto
ISDN CONN	no	4	no

NOTES

1. The WAN/SERVER parameter has three choices: **wan, serv and user.** In **wan** mode, the options are w1-1 through w4-2.

2. If the WAN selected above has a CSU or DSX module connected, the values range from **1-24**. If a CEPT module is installed the values are **1-31**.
3. These options are only valid if the Loopback Generation Mode selected is **dds**. If the Loopback Generation Mode is **v.54** or **ft1**, then the LB GEN options are **off** and **on**.
4. This is an information-only field, there are no user selections.

STATE

The State setting determines whether the port is active or inactive. An inactive port does not occupy time slots on a WAN link. Set the State setting to standby (**stdby**) for ports you are not using or have not yet configured. Set it to active (**actv**) for ports that are ready for use. The control leads assume the status shown in Table HSU-2 for the different states.

Table HSU-2. HSU Card State Status

Control Leads	Active	WAN Link Down	Standby
RLSD	High or follows remote RTS	Low	Low
DSR	High	High	Low
CTS	Definable	Definable	High

WAN/SRV

The WAN/SERVER setting identifies the card to which the output of this port is directed. If **wan** is chosen, the data from this port will be directed to a WAN port (the options are w1-1 through w4-2).

MODE

This parameter allows you to identify how the HSU port appears to the device on the other end of the circuit. The **dce** option causes the port to be recognized as a DCE (data circuit-terminating equipment) device. The **dte** option causes the port to be recognized as a DTE (data terminal equipment) device.

Note that the choices appearing for some of the parameters that follow will depend on whether you choose **dce** or **dte** as the Mode. Those parameters and their available settings are described below.

TS

The TS (time slot) setting identifies the time slots on the WAN link when **wan** is selected in the previous setting. Unlike the other user cards, the HSU card can use many time slots on a single WAN port to create a super-rate circuit for an individual HSU port. One or all DS0s on a single T1/E1 link can be assembled for use by the HSU port according to the speed requirements of the DTE.

Values range from **1-24** for T1 links and **1-31** for E1 links. Time slot 16 is not available for E1 links that are programmed for **cas** or **ccs** signaling. Figure HSU-4 shows the display when **table** is selected. Using the space bar to select and deselect the time slot, this example shows time slots 11-16 on WAN 1-1 assigned to this port. Time slot assignments do not need to be contiguous.

```
Node_1         | U2 HSU-530x2   8202  Rev C0-0  Ser 00054  | 12-31-99
14:33

                   1               2
STATE            stdby           stdby
WAN/SRV          w1-1            w1-1
MODE             dce             dce
TS               table           table
RATE             64K             64K
Tx CLOCK         int             int
CLOCK PLRTY      norm            norm
DATA PLRTY       norm            norm
CTS              perm            perm
CTS DELAY        0               0
LOCAL LB         off             off
LB GEN MODE      dds             dds
LB GEN           off             off
LB DET           w/to            w/to
ISDN CONN        no              no



                  1 1 1 1 1 1 1 1 1 1 2 2 2 2 2
1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4
                    x x x x x x

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

Figure HSU-4. HSU Table Option

RATE

The Rate setting allows you to select the bandwidth for all time slots assigned to this port. Choices are **56k** or **64k**. This choice, multiplied by the number of time slots assigned to the port define the port speed.

Tx CLOCK

The Transmit Clock setting identifies the clock source for the transmit data (SD) stream. The internal (**int**) option requires the DTE to synchronize its transmitted data with the clock on the SCT leads. The external (**ext**) option requires the DTE to synchronize the transmitted data with the clock on the SCTE leads.

Use the external option with a long V.35 cable to make sure the data and clock are in phase when they arrive at the system. The DTE must loop back the clock on the SCT leads to the SCTE leads. If the external option is selected and the system does not detect a clock on the SCTE leads, then the HSU automatically generates a clock internally. If this clock is not synchronized with the data, then the CLK PLRTY can be changed to attempt to synchronize.

CLOCK PLRTY

The Clock Polarity setting provides another way to compensate for long V.35 cables in those cases where the DTE equipment does not provide SCTE. When using inverted (**inv**) mode, the relationship between clock and data is altered to compensate for the long cable distance that the signals must travel. The other option, normal (**norm**), means that the relationship between clock and data is left unchanged. If you use inverted (**inv**) Clock Polarity, set the Transmit Clock (Tx CLK) to (**int**).

DATA PLRTY

The Data Polarity option allows you to invert all bits in the transmitted data stream. The default, normal (**norm**), means that the data is left untouched while inverted (**inv**) means that all bits will be inverted. This can be helpful in ensuring ones density on T1 links when the data is known to contain long strings of zeros. By inverting those zeros, you reduce the likelihood that the composite T1 stream will not meet the ones density requirement. Both systems must have this parameter set to the same option.

CTS

The Clear To Send setting controls when a CTS signal is sent. Some DTE equipment must receive a CTS signal before transmitting data. Change the CTS setting to permanent (**perm**) to make the CTS signal always High or on. The remote-local (**rlocal**) option allows RTS to control both the CTS of the local equipment and RLSD of the remote DTE equipment.

Set the CTS setting to ignore (**ignor**) to make the CTS signal always Low or off. The CTS signal is always High (enabled) when the port is in standby state, regardless of the CTS setting. Set the CTS setting to local (**locl**) to make the CTS signal follow the RTS signal from the local DTE.

CTS DELAY

The Clear To Send Delay setting delays the changes in the CTS signal in local mode. Enter the value that you need in milliseconds. The options are **0**, **30**, **60**, and **100** ms. If you do not know what value you need, start with **0** ms and increase the value if you experience problems. The CTS setting must be set to local before the CTS Delay setting has any effect.

LB

The **dte** option loops back data to the local DTE device. It tests the local cabling and most of the circuitry in the HSU card (see Figure HSU-5).

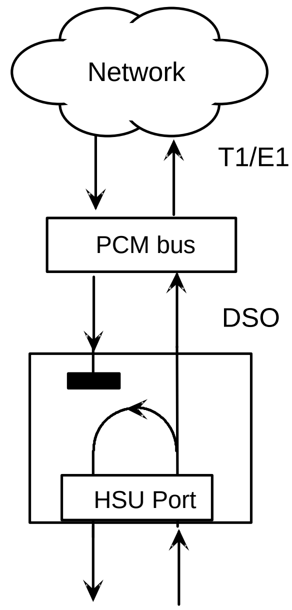
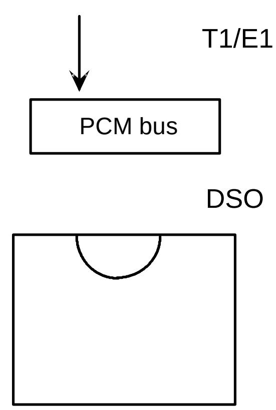


Figure HSU-5. Data Card DTE Loopback

The network (**net**) option loops back data toward the remote device. It tests some of the HSU card circuitry, the system common equipment, the WAN link card, the remote equipment, and the WAN line between the two sites (see Figure HSU-6). This option also drops the DSR control signal output on the HSU port.



LB GEN MODE

The Loopback Generation Mode setting defines the type of in-band loop-up and loop-down codes that will be sent to the remote equipment. Three industry-standard codes are supported: **dds**, which will send a DDS-compatible latching loopback code in each of the DS0s that make up the circuit; **v.54**, which is compatible with CCITT V.54 standard and **ft1**, which is compatible with ANSI Fractional T1 standard. The final option, **perf** (performance monitoring), activates an 8kbps performance monitoring channel (isolated from the total bandwidth of the circuit) that collects end-to-end performance statistics from a local HSU card to a remote HSU card. (See Performance Monitoring section later in this chapter.)

LB GEN

If you selected **v.54**, **ft1** or **perf** in the previous setting, the Loopback Generation setting allows you to send a loop-up command (**on**) or a loop-down command (**off**). If you selected **dds** as the Loopback Generation Mode, then this setting allows you to define the type of DDS loopback that you wish to generate. The four options are **ocu** (Office Channel Unit), **dsu** (Data Service Unit), **csu** (Channel Service Unit) and **ds0** (a full 64kbps loopback). Figures HSU-7, -8, and -9 illustrate where the loopbacks will take place. You can also turn all DDS remote loopbacks **off**.

Loop-up or loop-down commands cannot be implemented for two ports on the same card simultaneously. The user must finish all loopback operations on one port before attempting to perform any loopback operations on another port.

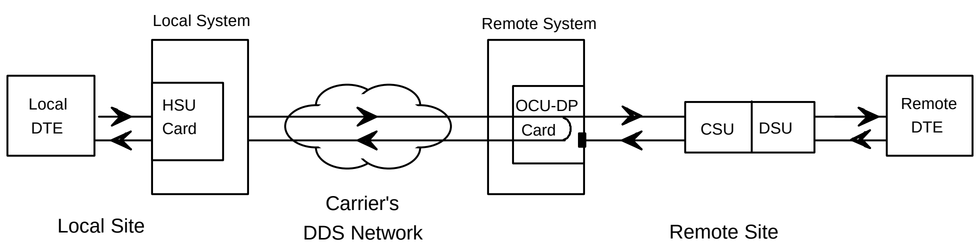


Figure HSU-7. A Remote OCU or DS0 Loopback Commanded by the System

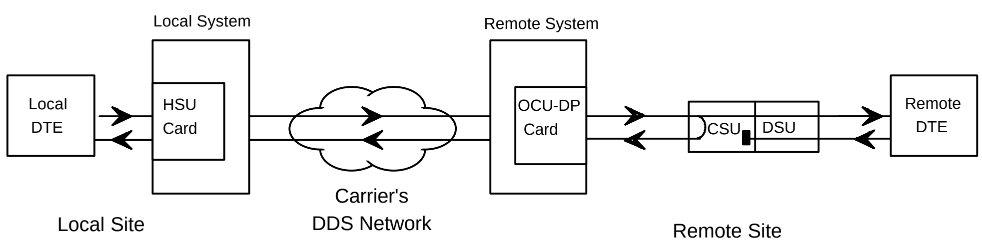


Figure HSU-8. A Remote CSU Loopback Commanded by the System

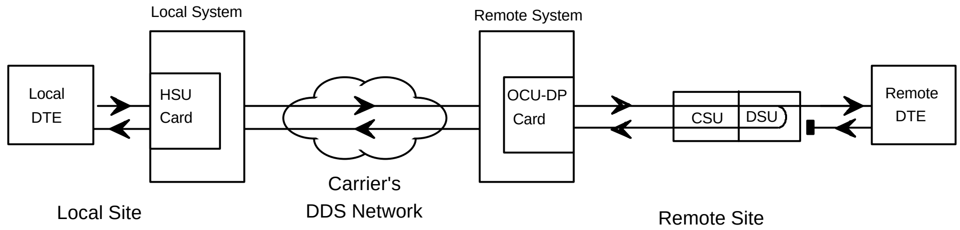


Figure HSU-9. A Remote DSU Loopback Commanded by the System

LB DET

Depending on the selection you made for Loopback Generation Mode above, the HSU port will respond to any of the loopback codes generated by a remote system. The Loopback Detection setting does not affect local loopback commands from the local control terminal.

The **off** option causes the system to ignore remote loopback commands. The **on** option causes the system to monitor ports for loopback commands from the remote equipment, but only in the format selected in LB GEN MODE. If the system detects a loopback code, it loops the data back until the remote equipment releases the loopback. The with time-out (**w/to**) option is the same as the **on** option, except that after ten minutes the system automatically releases loopbacks initiated by the remote equipment.

EER

The Excessive Error Rate parameter is only available on the 8213 HSU card. This option selects the error rate at which an alarm is declared. If the number of errors exceeds the value set by this option an "E" will be placed in the Status Column of the Performance Monitoring screen. The options are **10e-4** through **10e-9** or **none**.

Menu of Actions

Table HSU-3 shows the Menu of Actions for the HSU Card.

Table HSU-3. HSU Card Screen Menu of Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e. performance and test data).
Copy	Copies the contents of the current column to the next column. Useful if you change a lot of entries in one column and want to repeat those changes in subsequent columns.
Test	Initiates and monitors testing of all HSU card ports. Refer to Test section below.
Dial	Enables the user to identify the HSU port by telephone number, download and modify call profiles from the Interface card, dial and broadcast ISDN calls.
Perf	Not supported.
Main	Returns to the main terminal screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Test

Selection of "Test" from the Menu of Options will bring up the screen shown in Figure HSU-10. From this screen, users are allowed to create test situations between HSU Cards or between a single HSU Card and data test equipment at a remote site. Table HSU-4 lists the settings controlled on this screen along with their possible and default values.

```
Node_1            |  U2   HSU-530x2    8202    Rev  C0-0    Ser  00054    |    12-31-99  14:33

                           1                      2
BERT                      n/a                    n/a
CTS                       norm                   norm
RLSD                      norm                   norm
DSR                       norm                   norm
SYNC                      no                     no
BE                        *****                  *****
ES                        *****                  *****
SES                       *****                  *****
CSES                      *****                  *****
OSS                       *****                  *****
BER                       *****                  *****
ELAP                      *****                  *****
RTS                       *****                  *****
DTR                       *****                  *****
LB  ST                    *****                  *****



Save  |  Undo  |  Refresh  |  InsertErr  |  Clear  |  Main
```

Figure HSU-10. HSU Card Test Screen

Table HSU-4. HSU Card Test Screen Setting Options and Defaults

Parameter	User Options	Default
BERT	off mark space 1:1 1:7 511 qrss 2047 ds0 ff 7e 32 40 ocu-a csu-a dsu-a csu1a csu2a	off
CTS	norm off on	norm
RLSD	norm off on	norm
DSR	norm off on	norm
SYNC	information only - no user options	
BE	information only - no user options	
ES	information only - no user options	
SES	information only - no user options	
CSES	information only - no user options	
OSS	information only - no user options	
BER	information only - no user options	
ELAP	information only - no user options	
RTS	information only - no user options	
DTR	information only - no user options	
LB ST	information only - no user options	

BERT

Bit Error Rate Tester (BERT) sends a data pattern and measures the bit error rate (BER) on the selected HSU port. The patterns that can be selected are **off**, **mark** (1111), **space** (0000), **1:1** (1010), **1:7** (0100-0000), **511** (511 test pattern), **qrss** (quasi-random pseudo signal) and **2047** (2047 test pattern).

On the model 8215 HSU only, selection of BERT pattern **ds0** will display another set of BERT patterns. Additional nonlatching loopback patterns are **ff** (1111-0000), **7e** (0111-1110), **32** (0011-0010), **40** (0100-0000), **ocu-a** (ocu-alternating byte), **csu-a** (csu-alternating byte), **dsu-a** (dsu-alternating byte), **csu1a** (csu - one repeater - alternating byte) and **csu2a** (csu - two repeaters - alternating byte). The results of the alternating patterns (**ocu-a**, **csu-a**, **dsu-a**, **csu1a** and **csu2a**) will display on the test screen.

CTS

The Clear To Send (CTS) option allows you to define whether the CTS control lead should be held high (**on**) or low (**off**). Selecting either **on** or **off** will override the selection made in the HSU Card screen. The third option is normal (**norm**) which means that CTS will operate in the mode selected in the HSU Card screen.

RLSD

The Receive Level Signal Detect (RLSD) option allows you to define whether the RLSD control lead is held high (**on**) or low (**off**). The third option is normal (**norm**) which means that RLSD will behave as described in Table HSU-2.

DSR

The Data Set Ready (DSR) option allows you to define whether the DSR control lead should be held high (**on**) or low (**off**). The third option is normal (**norm**) which means that DSR will behave as described in Table HSU-2.

SYNC

The Synchronization (SYNC) field tells you if the integrated BERT has achieved synchronization either with itself via a remote loopback or with the remote test equipment. This is an information-only field, there are no user-selectable parameters.

BE

The Bit Error field shows the total number of bit errors logged. This is an information-only field, there are no user-selectable parameters.

ES

The Errored Seconds field shows the total number of seconds in which any errors were detected. This is an information-only field, there are no user-selectable parameters.

SES

The Severely Errored Seconds (SES) field shows the total number of seconds in which the bit error rate exceeded one bit per thousand (1×10^{-3}). Since this is an information-only field, there are no user-selectable parameters.

CSES

The Consecutive Severely Errored Seconds (CSES) field is triggered by the occurrence of ten consecutive Severely Errored Seconds. Once triggered, the CSES field will increment (by one) for each elapsed second until the system logs ten consecutive non-Severely Errored Seconds. This it an information-only field there ore no user-selectable parameters.

OSS

The Out of Synchronization Seconds field shows the number of seconds that the HSU BERT has been out of synchronization. This is an information-only field, there are no user-selectable parameters.

BER

The Bit Error Rate (BER) field shows the rate at which errors are being logged. The system calculates BER by dividing the number of bit errors (BE) by the total number of bits transmitted during the test. This is an information-only field, there are no user-selectable parameters.

ELAP

The Elapsed time setting shows the running tally of the total number of seconds during the test. This is an information-only field, there are no user-selectable parameters for this option.

RTS

The Request To Send (RTS) field shows the current status of the RTS control lead. The two values that can be displayed are "**on**" and "**off**." This is an information-only field, there are no user-selectable parameters for this option.

DTR

The Data Terminal Ready (DTR) field shows the current status of the DTR control lead. The two values that can be displayed are "**on**" and "**off**." This is an information-only field, there are no user-selectable parameters for this option.

The DTR field will always show "**on**" for the 8212 HSU card (Revision A and earlier) but it will toggle between "**off**" and "**on**" all other HSU cards.

LB ST

The Loopback State field indicates, whether there are any remotely-initiated loopbacks currently active on the HSU port. This field will display both latching and non-latching loopbacks that are initiated from a remote device via in band loop-up codes. In addition to "**none**," the six messages that can be displayed in that field are "**l-ocu**," "**l-dsu**" and "**l-csu**" for latching loopbacks, and "**ocu**," "**dsu**" and "**csu**" for non-latching loopbacks. This is an information-only field, there are no user-selectable parameters for this option.

Menu of Actions

Table HSU-5 shows the Menu of Actions for the Test Screen of the HSU Card.

Table HSU-5. Test Screen Menu of Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e. performance and test data).
Insert**E**rr	Allows the user to manually insert a single error into the clear data signal.
Clear	Clears the testing screen and resets all counters to zero.

Setting On-board Option Switches

Setting Switches on the 8215 HSU Card

Setting or resetting switches is necessary for conversion of the operation of all four ports on the 8215 HSU card from RS-530 to V.35. To make this conversion, remove the HSU card from its slot and toggle the slide switches between RS530 and V.35 as shown in Figure HSU-11.

Ports can be set individually for either RS530 or V.35 operation features, but once set, remain in that mode until the slide switches are reset. This information is repeated in the Installation chapter.

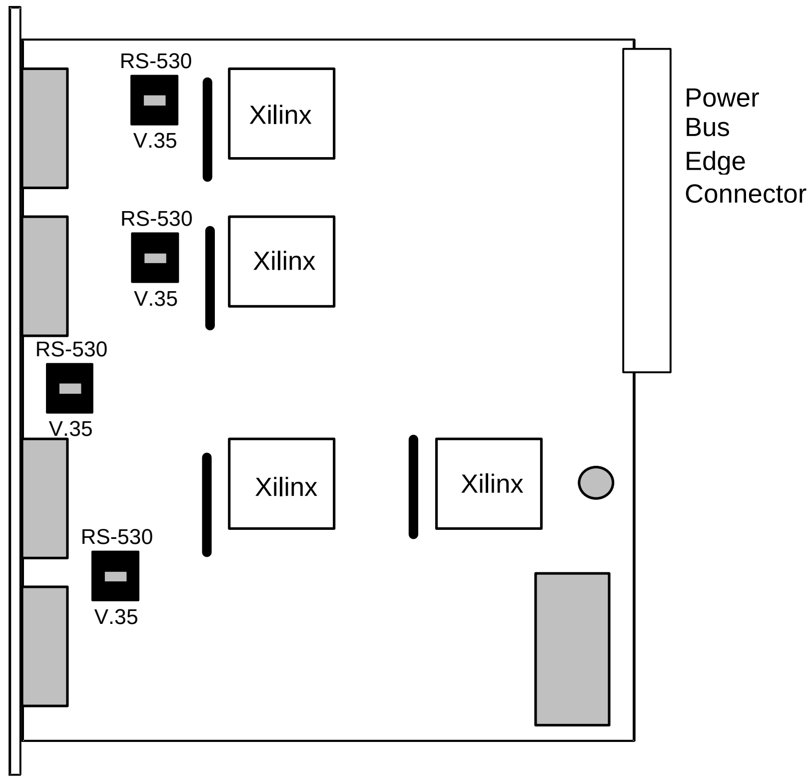


Figure HSU-11. Switches for Conversion from RS530 to V.35

Using the 1251, 1252 and 1253 Personality Modules

When using the 8202, and 8215 HSU cards, you may wish to connect the RS530 output to V.35 (for the 8202) or RS232 equipment (for the 8202, and 8215). The 1251 (V.35), 1252 (RS232) and 1253 (RS232-E) Personality Modules were developed to assist in this process. Shaped like a "gender changer," these modules plug into the female DB-25 port connector on the HSU card and then attach via a male cable connector to the other equipment. **For RS232 operation, the recommended length of cables should be less than 25' and the speed no greater than 56kbps.**

Figure HSU-12 shows a drawing with the dimensions (in inches) of a Personality Module.

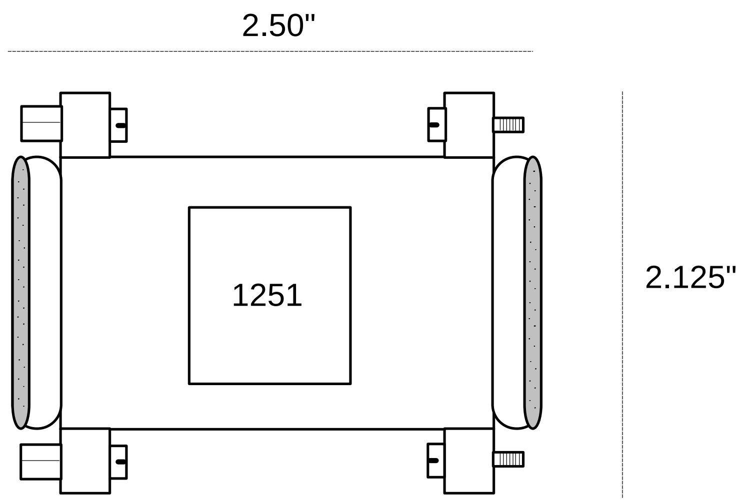


Figure HSU-12. The RS530 to V.35 Personality Module

The 8215 HSU cards have internal switch settings (see Figure HSU-11) for changing signals from RS530 to V.35.

RS232 Personality Module Description

Signals can be converted from RS530 to RS232 with the use of the 1252 Personality Module. Since the 8215 HSU card is equipped with DB-26 connectors, a special cable must be used to connect to the 1252 module (with DB-25 connectors).

Figure HSU-13 shows a drawing with the dimensions (in inches) of a Personality Module.

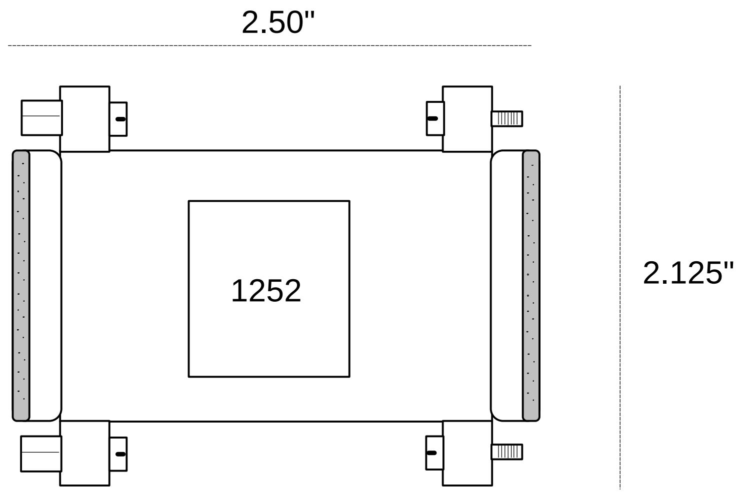


Figure HSU-13. The RS530 to RS232 Personality Module

RS232-E Personality Module Description

The RS232-E Personality Module similarly converts RS530-A (balanced signal) to RS232-E (unbalanced signal) format which allows the HSU cards to interoperate with equipment employing an interface conforming to the ANSI/EIA/TIA-232-E electrical characteristics. Figure HSU-14 shows this module.

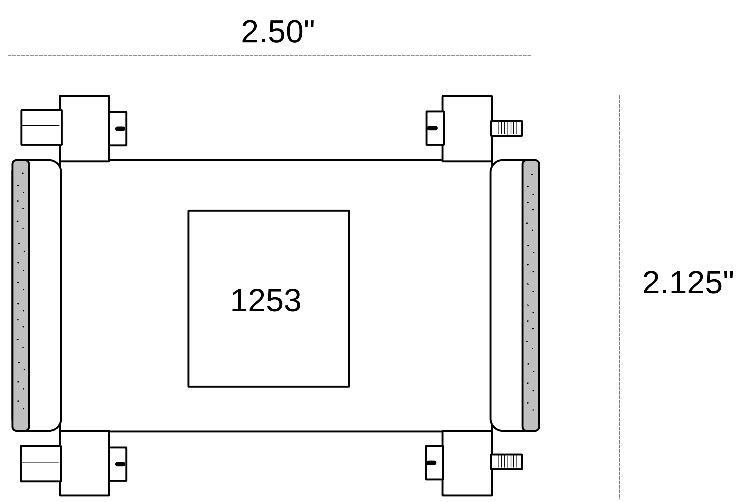


Figure HSU-14. RS530-A to RS232-E Personality Module

Introduction

8220 Sub-Rate Data Card

Each 8220 Sub-Rate Data card allows you to connect up to 10 low and medium speed (300bps-38.4Kbps) data equipment to the system. Since an SRU port does not require a complete 64Kbps time slot, the Sub-Rate card allows you to multiplex a number of devices into a single, subdivided time slot on a WAN card. SRU card ports can also be multiplexed with voice traffic on an ADPCM engine.

Each port can receive timing from either the DTE device or the system clock. If the DTE supplies the transmit clocking, it must be synchronized with the system clocking source.

SRU Card Settings

Figure SRU-1 shows the sub-rate data unit (SRU) screen. The ten ports correspond to the ten RJ-48C connectors on the back of the card. Table SRU-1 lists the settings controlled on this screen along with their possible and default values. ***Note:*** *BCON Systems will not allow same timeslot on two different WANS to reside on same SRU Card, XCON will allow this.*

```
Node_1      | U1  SRU-232x10  8220  RevAB-0  SER 00101  | 12-31-99   14:33

                1     2     3     4     5     6     7     8     9     10
STATE        stdby stdby stdby stdby stdby stdby stdby stdby stdby stdby
WAN          01    01    01    01    01    01    01    01    01    01
TS           n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a
FRAME        a     a     a     a     a     a     a     a     a     a
RATE         0.3   0.3   0.3   0.3   0.3   0.3   0.3   0.3   0.3   0.3
SR TS        01    01    01    01    01    01    01    01    01    01
INTF         01    01    01    01    01    01    01    01    01    01
COM CF       8,1,N 8,1,N 8,1,N 8,1,N 8,1,N 8,1,N 8,1,N 8,1,N 8,1,N 8,1,N
CTS          perm  perm  perm  perm  perm  perm  perm  perm  perm  perm
TX CLK       n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a
LB           off   off   off   off   off   off   off   off   off   off
LB GEN       off   off   off   off   off   off   off   off   off   off
LB DET       w/to  w/to  w/to  w/to  w/to  w/to  w/to  w/to  w/to  w/to
DL OPT       off   off   off   off   off   off   off   off   off   off
ADPCM        n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a
MAJ EC       off   off   off   off   off   off   off   off   off   off





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

Figure SRU-1. SRU Card Default Screen

Table SRU-1. SRU Card Setting Options and Defaults

Parameter	User Options	Notes	Default
STATE	stdby act		stdby
WAN	w1-1 through w4-2		w1-1
TS	01-24 01-31	1	01
FRAME	a b-5 b-10 b-20 x.50 adpcm hlink nlink		a
RATE	0.3 1.2 2.4 4.8 9.6 14.4 19.2 28.8 38.4	2	0.3
SR TS	n/a 1 1-5 1-10 1-20		1
INTF	asyn sync v.14		asyn
COM CF	8 7 6 5	3	8
	1 2		1
	none odd even space mark		none
CTS	perm l0 l30 l60 l100 rl0 rl3 rl6 rl10 off		perm
TX CLK	n/a int ext		n/a
LB	off dte net		off
LB GEN	n/a off ocu csu dsu		off
LB DET	n/a w/to on off		w/to
DL OPT	off on		off
ADPCM	n/a P1 P2 P3		n/a
MAJ EC	off on none 10e-3 10e-4 10e-5 10e-6 10e-7	4	off

NOTES

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

2. Speeds of **.3**, **1.2** and **14.4** are not supported for synchronous channels (except 14.4 **sync** with Frame of **adpcm**, **hlink** or **nlink**).

3. Communication Configuration is a three step process. This field will show **n/a** when **sync** is chosen for the INTF option.

4. Majority Error Correction is a two step process. The user will see only choices **off** and **on**. When **on** is chosen the other alternatives will appear.

STATE

The State setting determines whether the port is active or inactive. Set the State setting to standby (**stdby**) for ports you are not using or have not yet configured. Set it to active (**actv**) for ports that are ready for use. The control leads assume the status shown in Table SRU-2 for the different states.

Table SRU-2. SRU Card State Status

Control Leads	Active	WAN Link Down	Standby
RLSD	High or follows remote RTS	Low	Low
CTS	definable	definable	Low

WAN

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

TS

The Time Slot setting identifies the time slot on the WAN link to which this port is connected. Values range from **01-24** for T1 links and **01-31** (excluding #16 in **cas** or **ccs** mode) for E1 links. The Sub-Rate card can further subdivide the WAN time slot into smaller segments for transmission of low speed data. Each WAN time slot can be further divided into a maximum of 20 2.4Kbps time slots (see Figure SRU-2).

FRAME

The Frame setting allows you to define the sub-rate format that the port will use and to set the usable space allotted to each WAN time slot. The choices are DSO-A (**a**) that allows one sub-rate time slot, DSO-B with a limit of five sub-rate time slots (**b-5**), DSO-B with a limit of ten sub-rate time slots (**b-10**) and DSO-B with a limit of twenty sub-rate time slots (**b-20**). Figure SRU-2 shows the DS0-A and DS0-B framing sub-rate time slot interaction. In **b-20** frame, two or more SRU cards can be configured to occupy the same WAN time slot.

Additional choices include **x.50** (an ITU standard), **adpcm** (used to multiplex sub-rate data on an ADPCM card) and **hlink** (a proprietary format used when far end of the circuit has an ADPCM card while the near end does not). The **adpcm** frame uses a 24Kbps portion of the ADPCM engine. (See the ADPCM chapter for information on using the ADPCM engines.)

RATE

The Rate setting allows you to select the rate in thousands of bits per second (kbps) for transmission of data. The selection will change depending upon the framing mode and interface selected.

In no case can the maximum total bandwidth of any SRU card exceed 115.2Kbps.

The maximum bandwidth of the SRU card depends upon the mode of operations for each port. The maximum bandwidth for the **sync** Interface setting is 115.2Kbps and the host will not allow more than this to be assigned.

The maximum bandwidth for **async** and **v.14** is harder to compute because the computation depends upon the amount of data being sent.

At a minimum, **async** ports have a multiplication factor of 1.2 times a **sync** port and **v.14** has a multiplication factor of 1.6 times that of a **sync** port. Using the Delay Optimization feature will also degrade the maximum bandwidth by a factor of 1.5 times the maximum bandwidth figure.

These computation factors suggest a maximum of 96Kbps (96Kbps x 1.2 = 115.2Kbps) for **async** ports and 72Kbps (72Kbps x 1.6 = 115.2Kbps) for **v.14** ports be used. However, due to the nature of **async** and **v.14** data transmission, we do not enforce these limits because the user will not be transmitting data at the full rate. The Delay Optimization feature will also degrade the maximum bandwidth by a factor of 1.5 times the total bandwidth. BERT adds another 2x multiplication factor to the data rates shown above.

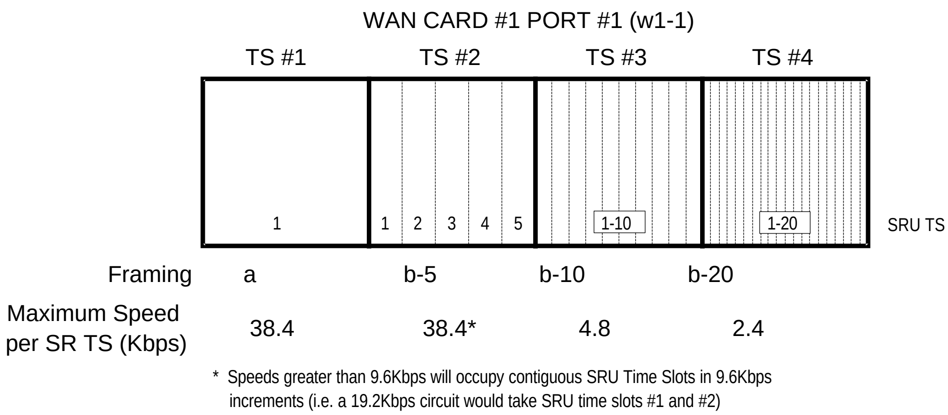


Figure SRU-2. Time Slot Integration

SR TS

The Sub-Rate Time Slot (SR TS) indicates the sub-rate position within the DS0 time slot that the port will occupy (see Figure SRU-2). If **a** framing is selected, only one sub-rate time slot is supported and the SR TS setting will default to 1. If **b-5** framing is selected, then the sub-rate time slots available are 1-5. If **b-10** framing is selected, then the sub-rate time slots available are 1-10. If **b-20** framing is selected, then the sub-rate time slots available are 1-20. Portions of sub-rate time slots can be assigned to any SRU port from any SRU card within the system (see Example later in this chapter). If **adpcm** or **hlink** are chosen for the frame parameter, this field will show **n/a**.

In **b-5** framing, if circuits with speeds greater than 9.6Kbps are assigned to the sub-rate time slot, adjacent sub-rate time slots must be available to accommodate their size. A 19.2Kbps circuit would occupy two contiguous sub-rate time slots (leaving space for up to three 9.6Kbps circuits) and a 38.4Kbps circuit would occupy four contiguous sub-rate time slots (leaving space for one 9.6Kbps circuit).

The SR TS number selected will be the first segment occupied by this circuit. If a 28.8Kbps circuit occupies three segments of the **b-5** frame, selecting SR TS #1 will assign it to segments 1, 2 and 3. Segments 4 and 5 may be assigned either independently to 9.6 (or less)Kbps circuits in SR TS #4 and #5 or combined for a 19.2Kbps circuit assigned to SR TS #4.

If a circuit exceeds the slots necessary to accommodate it, such as a 38.4Kbps circuit to SR TS #3 in **b-5** framing, the message, "Invalid SR TS," will be displayed. If a circuit requires more space than the SR TS has available, such as having a 38.4Kbps circuit in SR TS #1 and then attempting to assign a 19.2Kbps circuit to SR TS #4, the message "SR TS overlapping," will be displayed.

The number of sub-rate timeslots available for **x.50** will depend upon the Rate selected. If the **2.4** Rate is selected, the number available will be 20. If the **4.8** Rate is selected, the number available will be 10. If the **9.6** Rate is selected, the number available will be 5. When multiplexing different rate circuits on the same timeslot, the following formula is necessary to compute the position in the sub-rate timeslot: a 9.6 circuit will occupy slots n, n+5, n+10 and n+15; a 4.8 circuit will occupy slots n and n+10; a 2.4 circuit will occupy slots n (where n = the timeslot selected).

INTF

The Interface setting allows you to choose the protocol necessary for the terminal associated with this port. The choices are Asynchronous (**asyn**), Synchronous (**sync**) and v.14 (**v.14**). If Synchronous transmission is selected, the choices for STOP, DATA and PAR will show as not applicable (**n/a**).

Both **asyn** and **v.14** options provide asynchronous to synchronous conversion. The **v.14** option is an industry standard which will allow the SRU card to interoperate with many DSUs. The **asyn** option is a streamlined proprietary algorithm which will increase the performance of the SRU card.

COM CF

The Communication Configuration setting is a three step process that allows the user to choose the Data bits, Stop bits and Parity settings. The Data setting allows you to change the bits-per-byte number depending upon the type of terminal associated with this particular port. The options are **8**, **7**, **6**, **5**.

The second option allows you to select the number of Stop bits that check data sampling for the terminal associated with this port. The choices are **1** and **2**.

The third choice is the Parity setting that changes the data parity for the terminal associated with this particular port. The options are **none**, **odd**, **even**, **space** and **mark**.

CTS

The Clear To Send setting allows you to define how the port should respond to receipt of Request to Send (RTS) from the attached equipment. This setting also allows you to change the delay time (in milliseconds) from when the SRU receives the RTS until it issues the CTS. The local option allows RTS to control CTS. The remote-local options allows RTS to control both the CTS of the local equipment and RLSD of the remote equipment. The options are permanent (**perm**), local **-** immediate (**l0**), local **-**30 mS (**l30**), local -60 mS (**l60**), local **-**100 mS (**l100**), remote/local **-** immediate (**rl0**), remote/local **-** 30 mS (**rl3**), remote/local **-** 60 mS (**rl6**), remote/local **-** 100 mS (**rl10**) and **off**.

TX CLK

The Transmit Clock setting allows the user to select the clocking source for this port. The options are **n/a**, if **async** INTF is chosen and internal (**int**), if sync INTF is chosen. The **int** setting uses the system for the clock source and the **ext** setting allows the DTE to generate the transmit clocking information.

LB

The Loopback setting allows you to activate local loopbacks on the SRU. The settings are **off**, toward the DTE (**dte)** and toward the network (**net**). Figure SRU-3 shows a diagram of the two loopback conditions.

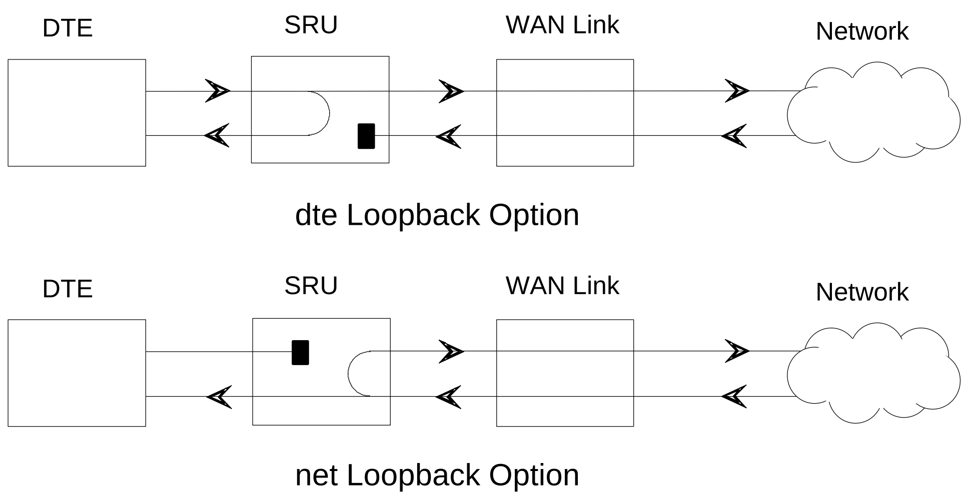


Figure SRU-3. SRU Card Loopbacks

LB GEN

The Loopback Generate setting generates in-band diagnostic codes that are sent to the remote equipment These codes are compatible with DDS networks and allow you to command a latching loopback at remote DDS equipment. You can start loopbacks at the remote **ocu** (Office Channel Unit), the **dsu** (Data Service Unit) or the **csu** (Channel Service Unit). Figures 8B-4, 8B-5 and 8B-6 show the loopback locations. You can also turn all of the loopbacks **off**. This field will show **n/a** if **adpcm** or **hlink** are chosen for the FRAME parameter.

Loop-up or loop-down commands cannot be implemented for two ports on the same card simultaneously. The user must finish all loopback operations on one port before attempting to perform any loopback operations on another port.

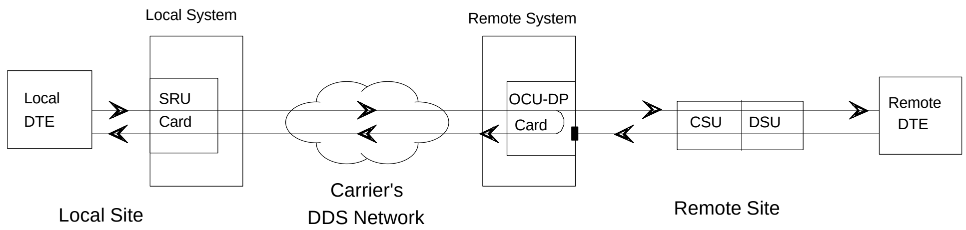


Figure SRU-4. A Remote SRU Loopback Commanded by the System

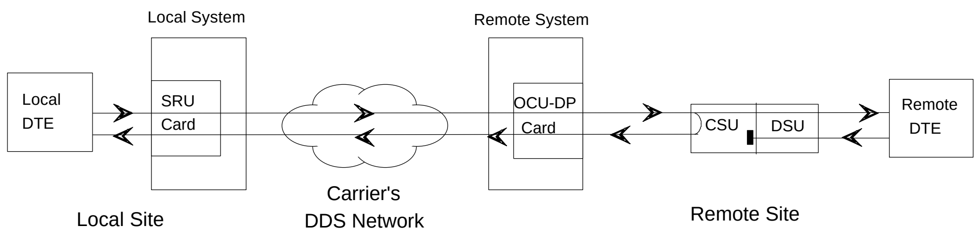


Figure SRU-5. A Remote CSU Loopback Commanded by the System

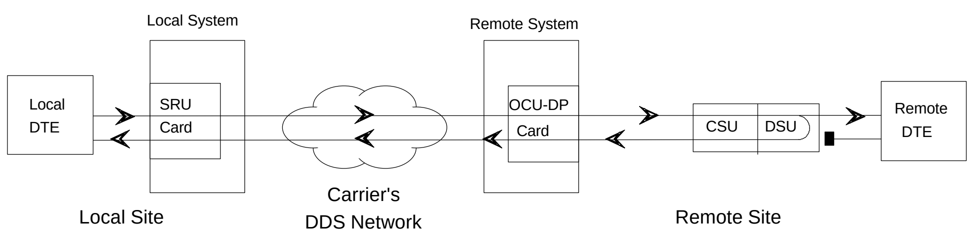


Figure SRU-6. A Remote DSU Loopback Commanded by the System

LB DET

The Loopback Detection setting determines how the SRU Card will respond to latching and non-latching loopback commands from remote equipment. The SRU reacts only to the in-band DDS format loopback commands for OCU Loop, CSU Loop, and DSU Loop. The Loopback Detection setting does not affect local loopback commands from the local control terminal.

The (**on**) option causes the SRU Card to monitor ports for DDS format loopback commands from the remote equipment. If the SRU Card detects a loopback command, it loops the data back until the remote equipment sends a stop loopback command. The with time-out (**w/to**) option is the same as the **on** option, except that after ten minutes the SRU Card automatically releases loopbacks commanded by the remote equipment. The **off** option causes the SRU Card to ignore all remote loopback commands. This field will show **n/a** if **adpcm** or **hlink** are chosen for the FRAME parameter.

DL OPT

Delay Optimization decreases the end-to-end delay time for applications that require lower delay time. The options are **off** and **on**.

The cost for using Delay Optimization is a decrease in total bandwidth for the card by a factor of 1.5. For example, a user that has 10 ports using the sync Interface will have 115.2Kbps maximum bandwidth available. If delay optimization is used on all 10 ports, the maximum bandwidth available will be 76.8Kbps.

ADPCM

If **adpcm** is chosen for the FRAME parameter, this field will allow the user to select the ADPCM card to direct this traffic. The options are **P1**, **P2** or **P3**. These are the communications server card slot designations that are stamped on the chassis. If any other option is selected this field will show **n/a**.

MAJ EC

The Majority Vote Error Correction parameter is available for ports using DSOA framing and having speeds of 9.6Kbps and lower. Option selection is done in a two step operation. The initial options are **off** and **on**. If the **on** option is chosen, a new set of options will appear at the bottom of the screen.

The new options are used to select the error threshold, above which the card will generate an alarm. The choices are **none**, **10e-3**, **10e-4**, **10e-5**, **10e-6** and **10e-7**. While the majority vote algorithm is capable of correcting error rates in excess of 10e-3, the Excessive Error Rate alarm is designed to give system administrators advanced notice of problems before users detect them. Table SRU-3 shows the bit error rates for Majority Vote error correction.

Table SRU-3. Bit Error Rates for Majority Vote Error Correction

Threshold	EER Set	EER Reset	Period
none	none	none	none
10e-3	64 or more errors	63 or fewer errors	1 second
10e-4	64 or more errors or any of the above	63 or fewer errors	10 seconds
10e-5	38 or more errors or any of the above	37 or fewer errors	60 seconds
10e-6	3 or more errors or any of the above	2 or fewer errors	60 seconds
10e-7	17 or more errors or any of the above	16 or fewer errors	three 15 minute time intervals

Menu of Actions

Table SRU-4 shows the Menu of Actions for the SRU Card.

Table SRU-4. The SRU Card Screen Menu of Actions

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

Examples

Figure SRU-7 shows some of the ways SRU cards can be used to network low-speed data using the DS0-A and DS0-B framing. In this diagram, five SRU Cards are connected to eight WAN time slots, on one WAN port, on one WAN card (many combinations of cards/ports/time slots are possible). Each SRU card is separated to show the ten ports on each card. Each port is assigned to a low-speed data device and the transmission speed of that device is shown in the center of the SRU port. *The diagram sometimes shows only one connection to eliminate unnecessary lines in the diagram. Each port is a direct connection and will not support interchange of data transmission between ports.*

The first time a WAN card/port/time slot is used, the framing selected on the SRU port will segregate that WAN time slot into SRU time slots. Once selected, those SRU TSs will apply to all ports assigned to that WAN time slot.

Once the framing is selected for the WAN card/port/time slot, low-speed data devices can be arranged and selected on the SRU card settings to maximize the system capabilities.

In this example, the first port on SRU #1 assigned **a** framing to WAN 1-1, TS 1, and selected a 38.4Kbps device for its use. The second port has **b-5** framing to WAN 1-1, TS 2. Of the five SRU time slots on that WAN time slot, the first three are used to support a 28.8Kbps device (three 9.6Kbps contiguous SRU time slots). The 9.6Kbps device on SRU #1 port #3 occupies the fourth SRU time slot and another 9.6Kbps from SRU #3, port #10, is placed in the fifth slot.

WAN 1-1, TS 3 was segregated into ten SRU time slots by the selection of **b-10** framing that supports either .3, 1.2, 2.4 or 4.8Kbps transmission. Six 4.8Kbps ports are assigned to the first six SRU time slots. *The diagram shows only one connection to eliminate unnecessary lines in the diagram. The six ports are six direct connections and will not support interchange of data transmission.* The other four SRU time slots are used by ports 1-4 on SRU #4. *Again, the single line does not imply interexchange.*

WAN 1-1, TS 4 has **b-20** framing and will support up to twenty .3, 1.2 or 2.4Kbps circuits from two (or more) SRU cards. In this example, SRU #1, port #10 is assigned to SRU TS #1, SRU #2, ports 1-10 are assigned to SRU TS 2-11. The nine SRU time slots left are used by SRU #3, ports 1-9. As mentioned earlier, SRU #3, port #10 is a 9.6Kbps circuit assigned to WAN 1-1, TS 2, SRU time slot #5. WAN 1-1, TS 5, has **a** framing. Only one device can transmit data in this SRU time slot. In this example, a 2.4Kbps circuit was assigned to SRU #4, port #5.

WAN 1-1, TS 6 has **b-5** framing, so five SRU time slots are available. The first two 9.6Kbps slots are used by a 19.2Kbps circuit on SRU #4, port #6, while the other three are used by 9.6Kbps circuits on SRU #4, ports 7-9.

WAN 1-1, TS 7 has the same characteristics as TS 6, except that the first SRU time slot is used by a 9.6Kbps circuit on SRU #4, port #10, SRU time slots 2-4 are assigned to the single 28.8 port on SRU #5. WAN 1-1, TS 8 was designated as **b-10** framing and the first eight SRU time slots are associated with the 2.4 and 4.8Kbps circuits on SRU #5, ports 3-10.

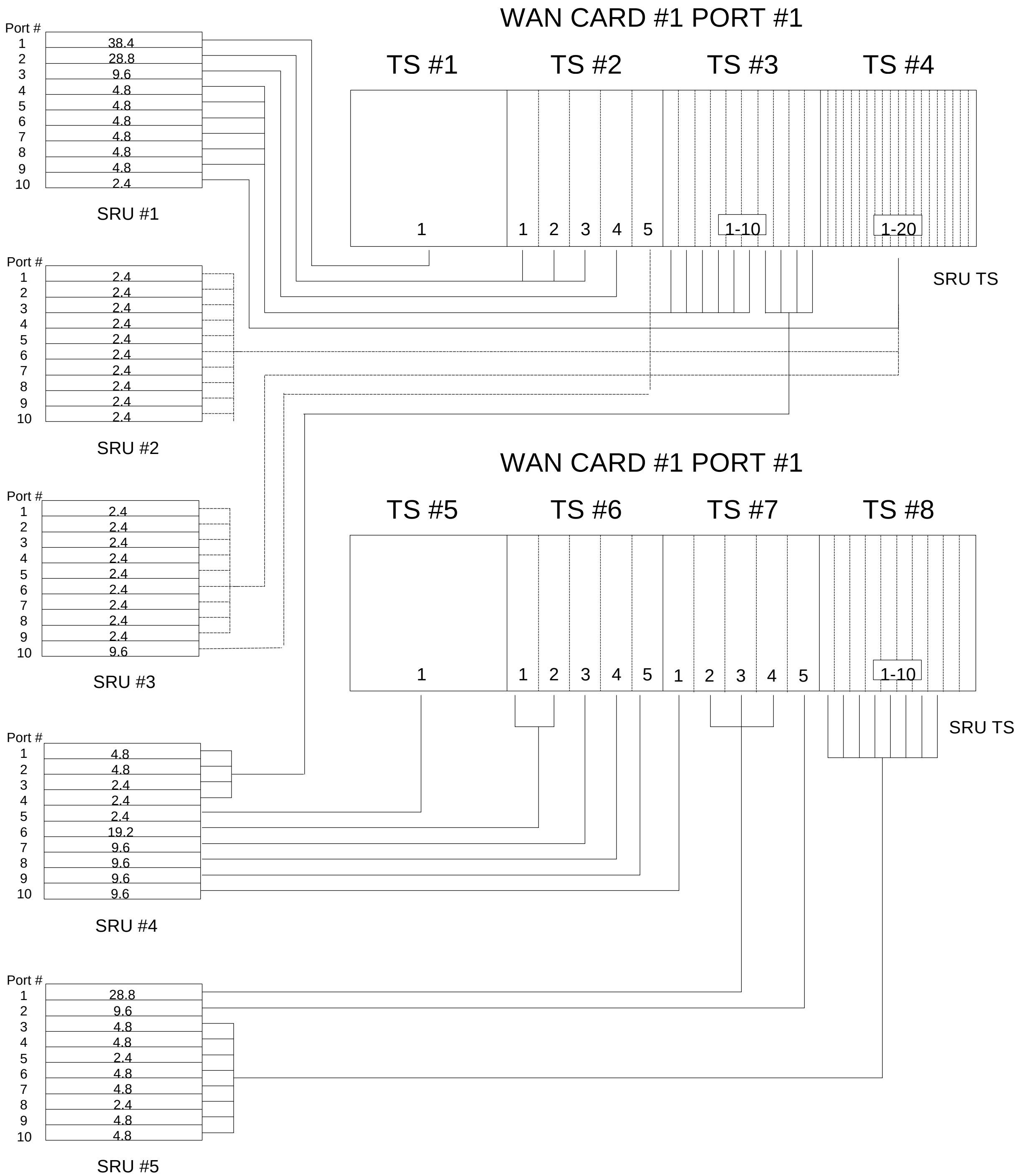


Figure SRU-7. SRU-WAN Timeslot Assignments

Test

Selection of "Test" from the Menu of Options will bring up the screen shown in Figure SRU-8. From this screen, users are allowed to create test situations between SRU Cards or between a single SRU Card and data test equipment at a remote site. Table SRU-5 lists the settings controlled on this screen along with their possible and default values.

```
Node_1      | U1  SRU-232x10  8220  Rev B-0  SER 00101  | 12-31-99   14:33

                1     2     3     4     5     6     7     8     9     10
BERT        n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a
DIR         net   net   net   net   net   net   net   net   net   net
CTS         norm  norn  norm  norn  norm  norn  norm  norn  norm  norn
RLSD        norm  norn  norm  norn  norm  norn  norm  norn  norm  norn
SYNC        no    no    no    no    no    no    no    no    no    no
BE          ***** ***** ***** ***** ***** ***** ***** ***** ***** *****
ES          ***** ***** ***** ***** ***** ***** ***** ***** ***** *****
SES         ***** ***** ***** ***** ***** ***** ***** ***** ***** *****
CSES        ***** ***** ***** ***** ***** ***** ***** ***** ***** *****
OSS         ***** ***** ***** ***** ***** ***** ***** ***** ***** *****
BER         ***** ***** ***** ***** ***** ***** ***** ***** ***** *****
ELAP        ***** ***** ***** ***** ***** ***** ***** ***** ***** *****
RTS         ***** ***** ***** ***** ***** ***** ***** ***** ***** *****
SR OSS      ***** ***** ***** ***** ***** ***** ***** ***** ***** *****
LB ST       ***** ***** ***** ***** ***** ***** ***** ***** ***** *****
EER         ***** ***** ***** ***** ***** ***** ***** ***** ***** *****

Save | Undo | Refresh | InsertErr | Clear | Main
```

Figure SRU-8. SRU Card Test Screen

Table SRU-5. SRU Card Test Screen Setting Options and Defaults

Parameter	User Options	Default
BERT	n/a off mark space 1:1 1:7 511 2047	n/a
DIR	net user	net
CTS	norm off on	norm
RLSD	norm off on	norm
SYNC	information only – no user options	
BE	information only – no user options	
ES	information only – no user options	
SES	information only – no user options	
CSES	information only – no user options	
OSS	information only – no user options	
BER	information only – no user options	
ELAP	information only – no user options	
RTS	information only – no user options	
SR OSS	information only – no user options	

LB ST	information only – no user options	
EER	information only – no user options	

BERT

Bit Error Rate Tester (BERT) sends a data pattern and measures the bit error rate (BER) on the selected SRU port. The patterns that can be selected are **off**, **mark** (all ones), **space** (all zeros), **1:1** (one-zero-one-zero), **1:7** (one-7 zeros-one-7 zeros), **511** (511 test pattern) and **2047** (2047 test pattern).

DIR

The Direction (DIR) setting allows you to specify where the BERT test signal should be directed. The first option is **net** (network) which means that the test signal will be transmitted through the system toward the Wide Area Network (WAN). The **user** option means that the signal will be directed toward the attached DTE device over the RS232 interface.

CTS

The Clear To Send (CTS) option allows you to define whether the CTS control lead should be held high (**on**) or low (**off**). Selecting either **on** or **off** will override the selection made in the SRU Card screen. The third option is normal (**norm**) which means that CTS will behave as described in Table SRU-2.

RLSD

The Receive Level Signal Detect (RLSD) option allows you to define whether the RLSD control lead should be held high (**on**) or low (**off**). The third option is normal (**norm**) which means that RLSD will behave as described in Table SRU-2.

SYNC

The Synchronization (SYNC) field tells you if the integrated BERT has achieved synchronization either with itself via a remote loopback or with the remote test equipment. Since this is an information-only field, there are no user-selectable parameters.

BE

The Bit Error field shows the total number of bit errors logged. Since this is an information-only field, there are no user-selectable parameters.

ES

The Errored Seconds field shows the total number of seconds in which any errors were detected. Since this is an information-only field, there are no user-selectable parameters.

SES

The Severely Errored Seconds (SES) field shows the total number of seconds in which the bit error rate exceeded one bit per thousand (1 x 10^{-3}). Since this is an information-only field, there are no user-selectable parameters.

CSES

The Consecutive Severely Errored Seconds (CSES) field is triggered by the occurrence of ten consecutive Severely Errored Seconds. Once triggered, the CSES field will increment (by one) for each elapsed second until the system logs ten consecutive non-Severely Errored Seconds. Since this it an information-only field there are no user-selectable parameters.

OSS

The Out of Synchronization Seconds field shows the number of seconds that the SRU BERT has been out of synchronization. Since this is an information-only field, there are no user-selectable parameters.

BER

The Bit Error Rate (BER) field shows the rate at which errors are being logged. The system calculates BER by dividing the number of bit errors (BE) by the total number of bits transmitted during the test. Since this is an information-only field, there are no user-selectable parameters.

ELAP

The Elapsed time setting shows the running tally of the total number of seconds during the test. Since this is an information-only field, there are no user-selectable parameters for this option.

RTS

The Request To Send (RTS) field shows the current status of the RTS control lead. The two values that can be displayed are "**on**" and "**off**." Since this is an information-only field, there are no user-selectable parameters for this option.

SR OSS

The Subrate Out of Synchronization Seconds (SR OSS) field shows how many seconds in which there was a Subrate framing loss. Since this is an information-only field, there are no user-selectable parameters for this option.

LB ST

The Loopback State (LB ST) field indicates whether there are any remotely-initiated loopbacks currently active on the SRU port. This field will display both latching and non-latching loopbacks that are initiated from a remote device via in-band loop-up codes. In addition to "**none**," the six possible messages that can be displayed in that field are "**l-ocu**," "**l-dsu**" and "**l-csu**" for latching loopbacks, and "**ocu**," "**dsu**" and "**csu**" for non-latching loopbacks. Since this is an information-only field, there are no user-selectable parameters for this option.

EER

The Excessive Error field will display the computed the DS0 error rate for each port where that option was selected. The Majority Error Rate will be computed based on the integration period for the selected threshold. For example, if the 10e-4 threshold was selected, the integration would be ten seconds.

Menu of Actions

Table SRU-6 shows the Menu of Actions for the Test Screen of the SRU Card.

Table SRU-6. Test Screen Menu of Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e. performance and test data).
Insert**E**rr	Allows the user to manually insert a single error into the clear data signal.
Clear	Clears the testing screen and resets all counters to zero.
Main	Returns to the SRU card main screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Introduction

The OCU-DP (Office Channel Unit–Data Port) is used to interface directly to Data Service Units (DSUs)/Channel Service Units (CSUs) supporting data traffic up to and including 64kbps. A four-wire circuit can connect the OCU-DP card to a DSU/CSU that can be located up to four miles away. In Switched 56kbps mode, users access the network on an as-needed basis by dial-up commands. The system must be equipped to provide -48VDC power to fully support the functionality of the OCU-DP card.

8249 OCU-DP Card

The 8249 OCU-DP card supports two ports, each of which may be connected to a DSU/CSU operating at 64kbps, 56kbps, Switched 56kbps, 19.2kbps, 9.6kbps, 4.8kbps or 2.4kbps. Secondary channel operation is supported from 2.4 to 56kbps.

8247 OCU-DP Card

The 8247 OCU-DP card supports ten ports, five of which require installation of the 845 child card to become operational. The 8247 supports all the features and functions of the 8249 two-port OCU-DP card with the following exceptions:

- BCH Error correction is not supported
- Performance monitoring is not supported
- Operation in CSU mode is not supported

845 OCU-DP Child Card

The 845 OCU-DP Child Card is a piggy-back addition to the 8247 OCU-DP card that activates the additional five data ports on the 8247.

8248 OCU-DP Card

The 8248 OCU-DP card is an older version of the 8247 OCU-DP that supports five ports with the installation of the 845 child card.

OCU-DP Card Settings

Figure OCU-1 shows the OCU-DP screen. Table OCU-1 lists the settings controlled on this screen along with their possible and default values.

```
Node_1       | U1  OCU-DPx2   8249  Rev AC-0   Ser 00101   | 12-31-99
14:33


                      1                2
STATE                stdby            stdby
WAN/SRV              w1-1             P1-C3
TS                   01               n/a
FRAME                a                a
RATE                 2.4              64k
SR TS                01               01
MODE                 ocu              ocu
ERR COR              off              n/a
SECOND               off              n/a
USER LB              d                d
LB                   off              off
LB GEN               off              off
LB DET               w/to             w/to





Save | Undo | Refresh | Perf | Test | Main
```

Figure OCU-1. The Main Card Screen

Table OCU-1. Setting Options and Defaults

Parameter	User Options	Notes	Default
STATE	stdby act		stdby
WAN	w1-1 w1-2 w2-1 w2-2 w3-1 w3-2 w4-1 w4-2		w1-1
TS	01-24 01-31		01
FRAME	a b-5 b-10 b-20		a
RATE	2.4 4.8 9.6 19.2 56k 64k sw56k		2.4
SR TS	01 01-05 01-10 01-20		01
MODE	ocu csu		ocu
ERR COR	off maj-v bch	1	off
SECOND	off on		off
USER LB	d o		d
LB	off dte net-d net-a		off
LB GEN	off ocu-n cha-n cha-u		off
LB DET	w/to on off		w/to

NOTES

1. The **maj-v** option is supported on all cards if the Rate is **2.4**, **4.8** or **9.6**. The **bch** option is supported only if the Rate is **19.2** , **56k** or **64k** in systems using the 8800 and 8804 CPU Cards or the Rate is **19.2** with systems using the 8801 CPU Card. Error Correction is not supported if the Rate is **sw56k**. BCH Error Correction is not supported on the 5-port and 10-port OCU-DP card.

STATE

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

WAN

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

TS

The TS setting identifies the time slot on the WAN link to which this port is connected. Values range from **01 to 24** for T1 links and **01 to 31** (excluding TS 16 in **cas** or **ccs** mode) for E1 links. For a display of the available time slots, refer to your cross-connect map for the WAN link; see the Operations chapter for information about viewing cross-connect maps.

FRAME

The Frame setting allows you to set up the framing of the DS0 to which the OCU-DP port is connected. The choices, as diagrammed in Figure OCU-2, are DSO-A (**a**), DSO-B with a limit of five ports (**b-5**), DSO-B with a limit of ten ports (**b-10**), DSO-B with a limit of twenty ports (**b-20**).

RATE

The Rate setting identifies the highest data transmission rate for the OCU-DP port. Values are **2.4**, **4.8**, **9.6**, **19.2**, **56k**, **64k** and **sw56k** (switched 56kbps). See Figure OCU-2.

SR TS

The Sub-Rate Time Slot (SR TS) indicates the sub-rate position within the DS0 time slot that the port will occupy (see Figure OCU-2). If **a** framing is selected, only one sub-rate time slot is supported and the SR TS setting will default to **1**. If **b-5** framing is selected, then the sub-rate time slots available are **1-5**. If **b-10** framing is selected, then the sub-rate time slots available are **1-10**. If **b-20** framing is selected, then the sub-rate time slots available are **1-20**.

In **b-5** framing, if circuits with speeds greater than 9.6kbps are assigned to the sub-rate time slot, adjacent sub-rate time slots must be available to accommodate their size. A 19.2kbps circuit would occupy two contiguous sub-rate time slots (leaving space for up to three 9.6kbps circuits from other OCU-DP cards and ports).

The SR TS number selected will be the first segment occupied by this circuit. If a 19.2kbps circuit occupies two segments of the **b-5** frame, selecting SR TS #1 will assign it to segments 1 and 2. Segments 3, 4 and 5 may be assigned either independently to 9.6kbps (or less) circuits from other OCU-DP cards.

If a circuit is assigned that exceeds the slots necessary to accommodate it, such as a 19.2kbps circuit to SR TS #5 in **b-5** framing, the message, "Invalid SR TS," will be displayed. If a circuit requires more space than the SR TS has available, such as a having a 19.2kbps circuit assigned to SR TS #1, a 19.2kbps circuit assigned to SR TS #3 and then attempting to assign a 19.2kbps circuit to SR TS #4, the message "SR TS overlapping," will be displayed.

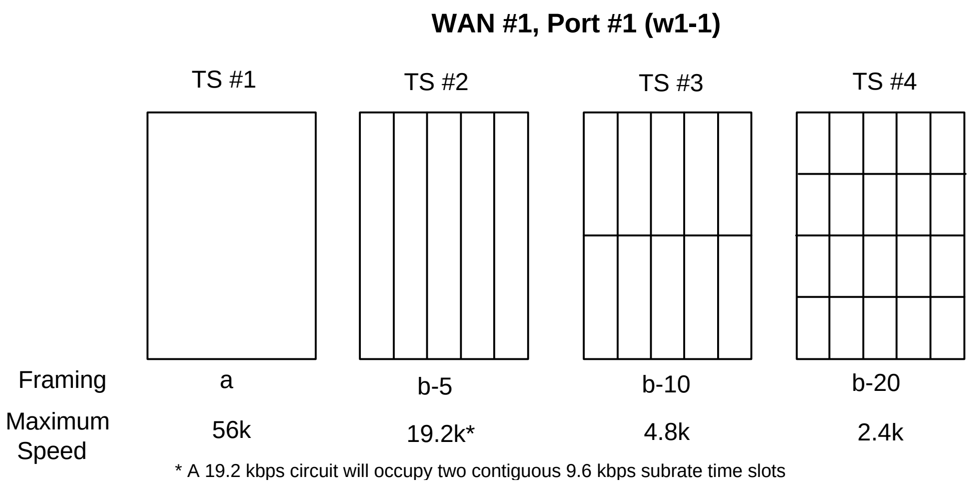


Figure OCU-2. Frames, Rates and Time Slots

MODE

The Mode setting options are **ocu** and **csu**. You should select **ocu** (which is by far the more common) whenever the OCU-DP port is attached to a CSU/DSU over a 4-wire circuit. In that mode, the OCU-DP port will generate the necessary sealing current and the CSU/DSU will terminate it. The **csu** mode should not be used unless you have two back-to-back OCU-DP ports. In that case, to achieve proper orientation and sealing current, one of two OCU-DP ports should be configured for **ocu** mode and the other for **csu** mode. The **csu** mode is not supported on the 5-port and 10-port OCU-DP card.

ERR COR

The Error Correction setting provides for different methods of error correction depending upon the Rate selected. The default ERR COR setting is **off**. When sub-rate speeds of **9.6k** or less are chosen in the Rate setting, the Error Correction setting of **maj-v** (majority vote) is available. Using the majority vote option allows the system to do error-polling and decision-making based upon the repeated bit pattern.

The **bch** error correction is available for rates of **19.2**, **56k** and **64k** on the 8800 and 8804 CPU Cards or a **19.2** rate on the 8801 CPU Card. Using **bch** with either **56k** or **64k** requires an additional WAN timeslot to carry the error correction information. The WAN timeslot selected must be larger than the one chosen in the TS option (e.g., if timeslot #17 is chosen for TS, the timeslot used for error correction must be #18-24 for T1 systems and #18-31 for E1 systems).

Error Correction is not supported on the 5-port and 10-port OCU-DP card.

SECOND

Secondary channel allows the CSU/DSU to establish a separate lower speed data circuit with the OCU-DP port. When synchronized, this special circuit can be used for testing and maintenance of the main circuit or for the transmission of other low-speed data. The settings are **on** and **off**.

The secondary channel is transported in the 8th bit position of the DS0 to which the OCU-DP is assigned. The following chart shows the secondary channel rate associated with the various primary port rates supported on the OCU-DP card. *For a further description of the secondary channel function refer to Pub 62310 and TA TSY 000077 and TA TSY 000083.*

Primary Port Rate	Secondary Port Rate
56kbps	2666 bps
19.2kbps	1,066 bps
9.6kbps	533 bps
4.8kbps	266 bps
2.4kbps	133 bps

USER LB

The User Loopback (USER LB) is a specialized code conversion function that is only relevant in Taiwan and some other countries in the Far East. The two options are **d** and **o**, neither of which has any effect in North America.

LB

The OCU-DP card supports three Loopback options that act on the card itself. The **dte** option loops the 4-wire analog interface of the OCU-DP port towards the attached CSU/DSU. It is used to test the local cabling and the analog drivers in the OCU-DP card (see Figure OCU-3).

The network A (**net-a**) option loops the 4-wire OCU-DP interface towards the network. It is used to test all of the OCU-DP card circuitry, the system common equipment, the WAN link card, the remote equipment, and the WAN line between the two sites (see Figure OCU-4).

The network D (**net-d**) option puts a loopback towards the network at the point where the OCU-DP card interfaces with the system bus. It serves to separate the OCU-DP card circuitry from the system common equipment, the WAN link card, the remote equipment, and the WAN line between the two sites (see Figure OCU-5).

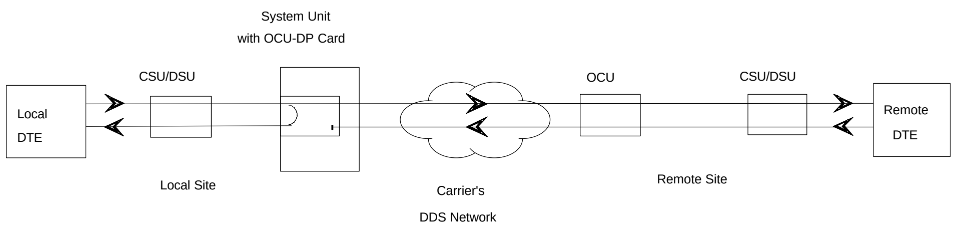


Figure OCU-3. OCU Local Loopback (dte option)

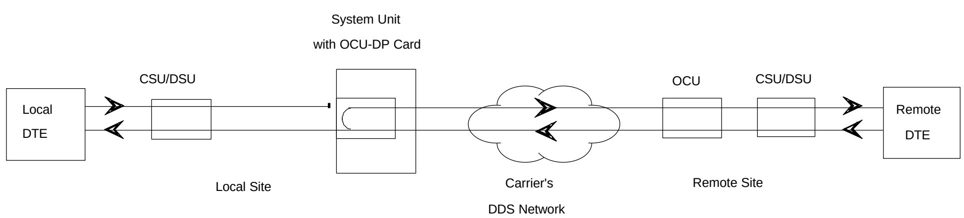


Figure OCU-4. OCU Local Loopback (net-a option)

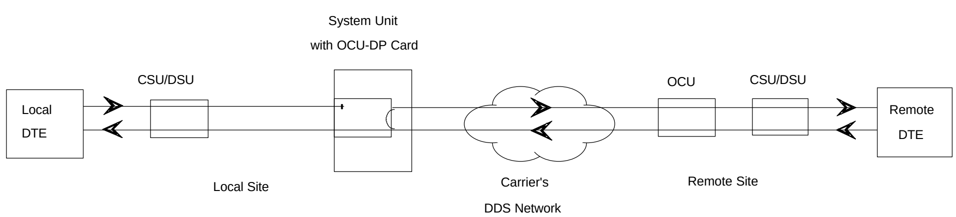


Figure OCU-5. OCU Local Loopback (net-d option)

LB GEN

The Loopback Generate settings initiate various in-band diagnostic codes sent to the remote equipment. These codes are compatible with DDS networks and allow you to command a latching loopback at remote DDS equipment. The **ds0-n** loopback loops the analog interface of the remote OCU-DP device back towards the network for circuits using the 64k Rate. The **ocu-n** loopback loops the analog interface of the remote OCU-DP device back towards the network for circuits using the 56k or less Rates. The **csu-n** loopback loops the 4-wire interface of the remote CSU/DSU device back towards the network. **A 48V converter is required for this loopback.**

The **csu-u** loopback loops the 4-wire interface of the local CSU/DSU device towards the network. Figures OCU-6, -7, and -8 show the loopback locations. You can also turn all remote loopbacks **off**.

Loop-up or loop-down commands cannot be implemented for two ports on the same card simultaneously. The user must finish all loopback operations on one port before attempting to perform any loopback operations on another port.

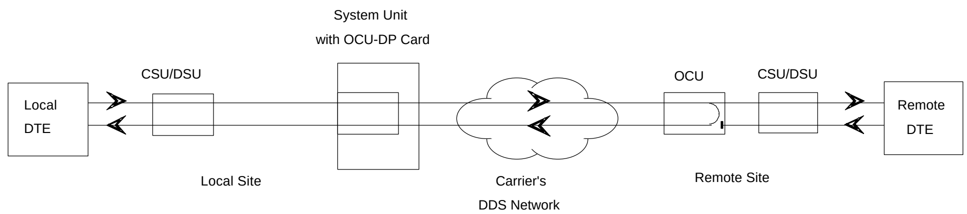


Figure OCU-6. OCU Remote Loopback (ds0-n and ocu-n options)

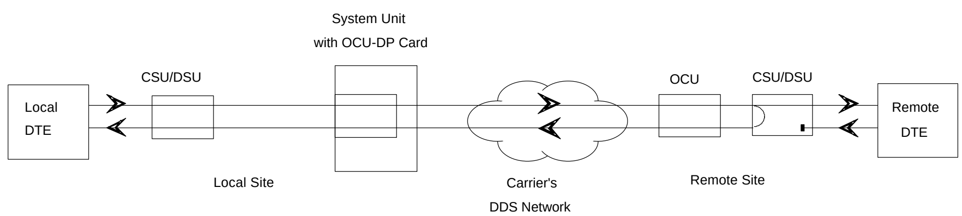


Figure OCU-7. OCU Remote Loopback (csu-n option)

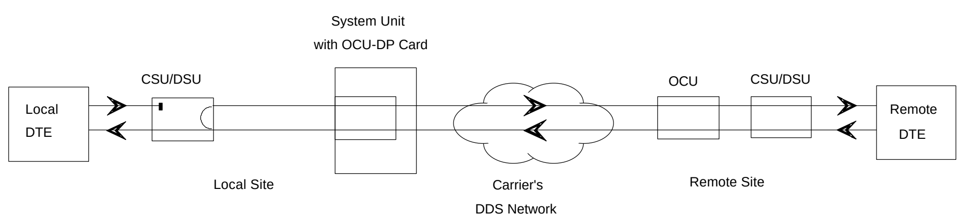


Figure OCU-8. OCU Remote Loopback (csu-u option)

LB DET

The Loopback Detection setting determines how the system responds to latching and non-latching loopback commands from remote equipment. The OCU-DP reacts only to the in-band DDS format loopback commands for Channel Loop, OCU Loop, and DSU Loop. The Loopback Detection setting does not affect local loopback commands from the local control terminal. The settings are **off**, **on** and **w/to** (on with time out).

The **off** option causes the system to ignore all remote loopback commands. The **on** option causes the system to monitor for DDS format loopback commands from the remote equipment. If the system detects a loopback command, it loops the data back until the remote equipment sends a stop loopback command. The with time-out (**w/to**) option is the same as the **on** option, except that after ten minutes the system automatically releases loopbacks commanded by the remote equipment.

When using the OCU-DP port for a clear-channel, 64kbps circuit in DS0A mode, you should set the loopback detection to **off** to prevent unintentional loopback activation.

Menu of Actions

Table OCU-2 shows the Menu of Actions for the OCU-DP Card.

Table OCU-2. The OCU-DP Card Screen Menu of Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e. performance and test data).
Perf	Brings up the performance monitoring screen. See below.
Test	Initiates and monitors testing of all OCU-DP card ports. Refer to Test section below.
Main	Returns to the main terminal screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Test

Selection of "Test" from the Menu of Options will bring up the screen shown in Figure OCU-9. From this screen, users are allowed to create test situations between OCU-DP cards or between a single OCU-DP card and data test equipment at a remote site. Table OCU-3 lists the settings controlled on this screen along with their possible and default values.

```
Node_1      | U1  OCU-DPx2   8249  Rev AC-0   Ser 00101   | 12-31-99
14:33


                   1                 2
BERT              n/a               n/a
DIR               net               net
DATA              pri               pri
SYNC              no                no
BE                *****             *****
ES                *****             *****
SES               *****             *****
CSES              *****             *****
OSS               *****             *****
BER               *****             *****
ELAP              *****             *****
LB ST             *****             *****
4W DDS            *****             *****





Save | Undo | Refresh | insertErr | Clear | Main
```

Figure OCU-9. The OCU-DP Test Card Screen

Table OCU-3. Setting Options and Defaults

Parameter	User Options	Notes	Default
BERT	off mark space 1:1 1:7 511 2047 qrss		off
DIR	net user		net
DATA	pri sec		pri
SYNC	information only—no user options		
BE	information only—no user options		
ES	information only—no user options		
SES	information only—no user options		
CSES	information only—no user options		
OSS	information only—no user options		
BER	information only—no user options		
ELAP	information only—no user options		
LB ST	information only—no user options		
4W DDS	information only—no user options		

BERT

Bit Error Rate Tester (BERT) sends a data pattern and measures the bit error rate (BER) on the selected OCU-DP port. The patterns that can be selected are **off**, **mark** (all ones), **space** (all zeros), **1:1** (1010), **1:7** (0100-0000), **511** (511 test pattern), 2047 (2047 test pattern) and **qrss** (quasi-random pseudo signal).

DIR

The Direction (DIR) setting allows you to specify where the BERT test signal should be directed. The first option is **net** (network) which means that the test signal will be transmitted through the system toward the Wide Area Network (WAN). The **user** option means that the signal will be directed toward the attached CSU/DSU device over the 4-wire interface.

DATA

The DATA setting specifies whether the BERT test signal should be connected to the Primary (**pri**) or the Secondary (**sec**) channel of the OCU-DP port. If there is no Secondary channel associated with the OCU-DP port, then the only option available is **pri**.

SYNC

The Synchronization (SYNC) field tells you if the integrated BERT has achieved synchronization either with itself via a remote loopback or with the remote test equipment. Since this is an information-only field, there are no user-selectable parameters.

BE

The Bit Error field shows the total number of bit errors logged. Since this is an information-only field, there are no user-selectable parameters.

ES

The Errored Seconds field shows the total number of seconds in which any errors were detected. Since this is an information-only field, there are no user-selectable parameters.

SES

The Severely Errored Seconds (SES) field shows the total number of seconds in which the bit error rate exceeded one bit per thousand (1×10^{-3}). Since this is an information-only field, there are no user-selectable parameters.

CSES

The Consecutive Severely Errored Seconds (CSES) field is triggered by the occurrence of ten consecutive Severely Errored Seconds. Once triggered, the CSES field will increment (by one) for each elapsed second until the system logs ten consecutive non-Severely Errored Seconds. Since this it an information-only field there ore no user-selectable parameters.

OSS

The Out of Synchronization Seconds field shows the number of seconds that the OCU-DP BERT has been out of synchronization. Since this is an information-only field, there are no user-selectable parameters.

BER

The Bit Error Rate (BER) field shows the rate at which errors are being logged. The system calculates BER by dividing the number of bit errors (BE) by the total number of bits transmitted during the test. Since this is an information-only field, there are no user-selectable parameters.

ELAP

The Elapsed time setting shows the running tally of the total number of seconds during the test. Since this is an information-only field, there are no user-selectable parameters for this option.

4W DDS

The 4-wire DDS setting shows if the 4-wire interface is both present and operational. The field will show **norm** if the interface is connected or **nos** for No Signal.

Menu of Actions

Table OCU-4 shows the Menu of Actions for the Test Screen of the OCU Card.

Table OCU-4. Test Screen Menu of Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Since the informational fields on this screen are not updated in “real time,” the Refresh command is used to obtain the latest statistics.
Insert**E**rr	Allows you to manually insert a single error into a clear data signal.
Test	Clears the test screen.
Main	Returns to the OCU-DP card main screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

OCU-DP Error Correction and Performance Monitoring

If "majority vote" or "BCH" error correction is enabled on the two-port OCU-DP card, then the system will support performance monitoring of the data traffic. The performance monitoring screen is accessed by selecting one of the two ports from the OCU-DP card main screen and typing "p." Error correction and performance monitoring are not supported on the 5-port and 10-port OCU-DP card.

If the BCH method of error correction is selected, then the OCU-DP card will monitor the data traffic coming in from the T1 network and use the BCH polynomial values that accompany the data to log the number of errors and to attempt to correct such errors. Any data errors that are observed are considered "input" data errors and contribute to the input error statistics such as Input Errored Seconds (IES), Input Severely Errored Seconds (ISES) and Input Consecutive Severely Errored Seconds (ICSES). Depending upon the severity of the input errors, the BCH algorithm may be able to correct the data prior to transmitting it over the four-wire DDS circuit. If an error is so severe that it cannot be corrected, then it will also be logged as an "output" data error and will increment the Output Errored Seconds (OES), Output Severely Errored Seconds (OSES) and Output Consecutive Severely Errored Seconds (OCSES) counters.

If the majority vote method of error correction is selected, then the OCU-DP card will monitor the data traffic coming in from the T1 network and use the majority vote algorithm to determine if any data errors have occurred. Any data errors that are observed are considered "input" data errors and contribute to the input error statistics such as Input Errored Seconds (IES), Input Severely Errored Seconds (ISES) and Input Consecutive Severely Errored Seconds (ICSES). Since the majority vote algorithm assumes that it can correct any data input errors, the "output" data error category has no meaning in this context. Consequently, the Output Errored Seconds (OES), Output Severely Errored Seconds (OSES) and Output Consecutive Severely Errored Seconds (OCSES) fields do not apply to the majority vote mode.

Figure OCU-10 shows the OCU-DP performance monitoring screen. Performance statistics covering the previous twenty-four hours are available and are totaled-up at the bottom of the screen.

```
Node_1       | U1  OCU-DPx2   8249  Rev AC-0   Ser 00101   | 12-31-99
14:33

UNIT 1 PERFORMANCE

             IES     ISES    ICSES   OES    OSES    OCSES
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

Refresh | Clear | pgUp | pgDn | Main
```

Figure OCU-10. Performance Monitoring Screen

IES

The Input Errored Seconds (IES) field shows the total number of seconds in which any input errors were detected. Since this is an information-only field, there are no user-selectable parameters.

ISES

The Input Severely Errored Seconds (ISES) field shows the total number of seconds in which the input bit error rate exceeded one bit per thousand (1 x 10^{-3}). Since this is an information-only field, there are no user-selectable parameters.

ICSES

The Input Consecutive Severely Errored Seconds (ICSES) field is triggered by the occurrence of ten consecutive Input Severely Errored Seconds. Once triggered, the ICSES field will increment by one for each elapsed second until the system logs ten consecutive seconds that are not severely errored. Since this is an information-only field, there are no user-selectable parameters.

OES

The Output Errored Seconds (OES) field shows the total number of seconds in which any output errors were detected. This field only applies if the error correction method selected is BCH. Since this is an information-only field, there are no user-selectable parameters.

OSES

The Output Severely Errored Seconds (OSES) field shows the total number of seconds in which the output bit error rate exceeded one bit per thousand (1 x 10^{-3}). This field only applies if the error correction method selected is BCH. Since this is an information-only field, there are no user-selectable parameters.

OCSES

The Output Consecutive Severely Errored Seconds (OCSES) field is triggered by the occurrence of ten consecutive Output Severely Errored Seconds. Once triggered, the OCSES field will increment by one for each elapsed second until the system logs ten consecutive that are not severely errored. This field only applies if the error correction method selected is BCH. Since this is an information-only field, there are no user-selectable parameters.

Menu of Actions

Table OCU-5 shows the Menu of Actions for the Performance Monitoring Screen of the OCU Card.

Table OCU-5. Performance Monitoring Screen Menu of Actions

Action	Function
Refresh	Updates certain time-related information fields that are not automatically updated (i.e. performance and test data).
Clear	Clears the test screen.
pg**U**p	Scrolls through data screens from the oldest to the newest.
pg**D**n	Scrolls through data screens from the newest to the oldest.
Main	Returns to the OCU-DP card main screen.

Introduction

8231 FRAD Card

The 8231 FRAD (Frame Relay Assembler Disassembler) card is a plug-in user card for the system. It provides users access to the Frame Relay network of carriers through the use of ten on-board RS232 ports on the front panel of the card. Additionally, DS0-B traffic can be routed through the FRAD card across the backplane via WAN cross-connect and low speed data cards.

8231 FRAD Card Main Screen

Figure FRAD-1 shows the 8231 FRAD main screen. Table FRAD-1 lists the settings controlled on this screen along with their possible and default values.

```
Node_1          | U1  FRAD2-10  8231  Rev A2-0  Ser 01103  | 12-31-99  14:33
Version #:2.0
               1     2     3     4     5     6     7     8     9     10
STATE         actv  stdby actv  actv  actv  stdby stdby stdby stdby stdby
PRT TYP       frad  frad  frad  frad  frad  frad  frad  frad  frad  frad
SRC           none  none  rs232 rs232 rs232 none  none  none  none  none
TS            02    n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a
RATE          64k   n/a   19.2  9.6   14.4  n/a   n/a   n/a   n/a   n/a
DLCI          n/a   16    16    16    16    16    16    16    16    16
SUB AD        no    no    no    no    no    no    no    no    no    no
LMI           none  n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a
DTE PRM       n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a
DES PRT       1     1     1     1     1     1     1     1     1     1
FORMAT        hdlc  hdlc  hdlc  hdlc  hdlc  hdlc  hdlc  hdlc  hdlc  hdlc
COM CTF       n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a
FLW CTL       n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a
CTS           n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a
TX CLK        int   int   int   int   int   int   int   int   int   int
LB            off   off   off   off   off   off   off   off   off   off
FRM LEN       n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a



Save | Undo | Refresh | Perf | Test | Main
```

Figure FRAD-1. 8231 FRAD Card Main Screen

Table FRAD-1. 8231 Main Screen Options and Defaults

Parameter	User Options	Default
STATE	stdby actv	stdby
PRT TYP	frad conc	
SRC	wan serv rs232 wan: none w1-1 through w4-2 serv: P1 P2 P3 rs232: 2.4 4.8 9.6 14.4 19.2 28.8 38.4	w1-1
TS	n/a table table: 1-24 (T1)	table
RATE	56k 64k	56k
DLCI	Enter number <1 - 1024>	1-1024
SUB ADR	n/a	n/a
LMI	n/a	n/a
DTE PRM	n/a	n/a
DES PRT	1 - 10	1-10
FORMAT	hdlc	hdlc
COM CF	n/a	n/a
CTS	n/a	n/a
TX CLK	int ext	int
LB	off dte net	off
FRM LEN	32 64 128 256 n/a	n/a

STATE

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

PRT TYPE

The Port Type identifies the type of interface expected for this port. The selections are frad and conc. If frad is selected, the rs232 or serv is the usual input source. If conc is selected then wan is the usual input source.

SRC

The Source parameter allows the user to select the type and source of data input to that port. The options are wan, serv and rs232 . If rs232 is selected, the card will expect direct transmission of data through the corresponding RS232 input port (i.e. the eight numbers at the top of the screen are also associated with the eight user ports on the back of the card).

The User card is set up as four groups of two ports each (1-2, 3-4, 5-6, 7-8 and 9-10). These ports are considered pairs so that if rs232 is selected for port #1, port #2 will also require RS232 input.

TS

The Timeslot (TS) setting identifies the time slot on the WAN link to which the Frame Relay port is connected. Highlight the table option and press the "Enter" key. At the bottom of the screen, the system will display the time slots that can be assigned to the WAN link selected in the previous selection (i.e. if w1-1 is chosen and the SRC option is either CSU or DSX, 24 timeslots will show available for assignment, if w1-1 is CEPT, 30 timeslots will show available for assignment). Only one timeslot can be selected for each Frame Relay port.

RATE

The Rate parameter is user selectable depending upon the SRC and the Format settings. If frad and rs232 is selected, the options (in Kbps) are 2.4 to 38.4. Since these ports are considered pairs, if rs232 is selected above for port #3, port #4 will also have choices for 2.4 to 38.4Kbps rates.

If conc is selected the rate parameter selection options will be 56k and 64k

DLCI

The Data Link Connection Identifier (DLCI) identifies the frame's logical connection within the Frame Relay port. This number is assigned by the carrier. The options are 16 through 991.

SUB AD

n/a - not available - no user input

LMI

The Local Management Interface options are n/a when the Port Type is set to frad and none when Port Type is conc.

DTE PRM

n/a - not available - no user input

DES PRT

The Destination Port options are n/a if frad port type is selected and 1-10 if conc (concentrator) is selected.

FORMAT

The Format parameter is currently set to hdlc.

COM CTF

n/a - not available - no user input.

CTS

n/a - not available - no user input

TX CLK

The Transmit Clock (TX CLK) setting is only available to users who selected rs232 in the SRC setting. The options are int (internal) and ext (external). If any other SRC setting was selected, this setting will show as n/a. (A special cable, available from your vendor, is necessary to enable the external clock.)

LB

The Loopback (LB) setting allows you to activate a number of different loopback options for RS232 (Figure FRAD-2). The off option is the default setting. The dte (DTE) loops data from the local DTE back to itself through the local FRAD card. The net (network) option loops data back toward the distant DTE through the local FRAD card.

FRM LEN

The Frame Length is the amount of data being transmitted over the data lines.

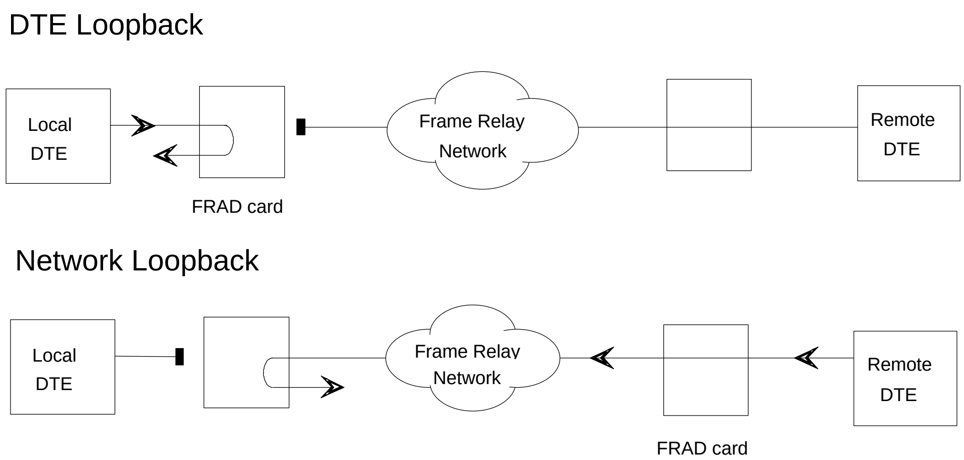


Figure FRAD-2. FRAD Loopback Options

Menu of Actions

Table FRAD-2 shows the Menu of Actions for the 8231 main screen.

Table FRAD-2. 8231 Card Main Screen Menu of Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e. performance and test data).
Perf	Allows the user to access the screen that contains performance statistics of the Frame Relay port. Refer to Performance section below.
Test	Allows the user to access the screen that initiates and measures testing statistics for highlighted user. Then refer to test section below.
Main	Returns to the main screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

8231 FRAD Card Performance Screen

The 8231 Frame Relay card records performance statistics for the Frame Relay port. Measurements taken during the current hour and each of the previous 24 hours are displayed. A second counter at the top of the screen shows elapsed time from the last expired hour or in the current hour. Performance statistics are not updated in real time. Use the "R" (Refresh) command from the Menu of Actions at the bottom of the screen to update columns. The total for the entire 24 hour period (not including the current hour figure) is shown at the bottom of the column. Figure FRAD-3 shows the performance monitoring screen for the main Frame Relay card screen.

```
Node_1          | U1  FRAD2-10  8231  Rev A2-0  Ser 01103  | 12-31-99
14:33

Port 01  PERFORMANCE  SEC.  00000 of 900

             FRAME Rx   FRAME Tx  OCTETS Rx OCTETS Tx DRPRx  DRPTx   STATUS
CUR          0          0         0         0         0       0      .LS
01           0          0         0         0         0       0      .LS
02           0          0         0         0         0       0      .LS
03           0          0         0         0         0       0      .LS
04           0          0         0         0         0       0      .LS
05           0          0         0         0         0       0      .LS
06           0          0         0         0         0       0      .LS
07           0          0         0         0         0       0      .LS
08           0          0         0         0         0       0      .LS
09           0          0         0         0         0       0      .LS
10           0          0         0         0         0       0      .LS
11           0          0         0         0         0       0      .LS
12           0          0         0         0         0       0      .LS
TOTAL        0          0         0         0         0       0      .LS

STATUS:    T=DTE Down  L=LOOPBACK  S=STANDBY




pgUp | pgDn | Refresh | Main
```

Figure FRAD-3. The 8231 Port Performance Monitoring Screen

BLOCK Rx

The Block Receive column shows a total of Blocks received during that particular one hour period.

BLOCK Tx

The Block Transmit column shows a total of Blocks transmitted during that particular one hour period.

OCTETS Rx

The Octets Receive column shows a total of bytes received during that particular one hour period.

OCTETS Tx

The Octets Transmit column shows a total of bytes received during that particular one hour period.

DRPRX

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

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 an alphabetic character to describe the condition that caused the error in the last two columns. Conditions displayed are T (DTE port down), L (Loopback) and S (Standby).

Menu of Actions

Table FRAD-3 shows the Menu of Actions for the Main Performance Monitoring screen.

Table FRAD-3. Main Performance Monitoring Screen Menu of Actions

Action	Function
pg**U**p	View the first 12 hour period (current + 1-12).
pg**D**n	View the second 12 hour period (current + 13-24).
Refresh	Update performance and test data that are not automatically updated
Main	Return to the user port configuration screen.

Introduction

The 8254 DS0 Data Port/G.703 Contradirectional/Codirectional Data Unit (DS0-DP/G.703) is a plug-in user card for the system. The DS0-DP/G.703 provides a 64kbps interface to a DS0 of a T1/E1 network. Since the byte alignment of the 64kbps data stream to the DS0 is essential, the interface provides a 64kbps bit clock and a 8KHz byte clock in the DS0-DP mode, and a composite clock/data signal in the G.703 mode.

DS0-DP Card Settings

Figure DS0-1 shows the DS0-DP screen. Table DS0-1 lists the settings controlled on this screen along with their possible and default values.

```
Node_1          | U1  DS0DPx4   8254  Rev A01-0  Ser 01103  | 12-31-99
14:33


                  1        2        3        4
STATE          stdby    stdby    stdby    stdby
WAN            w1-1     w1-1     w1-1     w1-1
TS             01       01       01       01
MODE           ds0dp    ds0dp    ds0dp    ds0dp
CLK            int      int      int      int
LB             off      off      off      off
LBGEN          off      off      off      off
LB DET         off      off      off      off













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

Figure DS0-1. The DS0-DP Card Screen

UL Statement

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

Table DS0-1. DS0-DP Card Setting Options and Defaults

Parameter	User Options	Default
STATE	stdby 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	01
MODE	ds0dp contr codir	ds0dp
CLK	int ext	int
LB	off dte net	off
LB GEN	off ocu csu dsu ds0	off
LB DET	off enab w/to	off

STATE

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

WAN

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

TS

The TS setting identifies the time slot on the WAN link to which this port is assigned. Values range from **1-24** for T1 links and **1-31** (excluding time slot 16 in **cas** or **ccs** mode) for E1 links. For a display of the available time slots, refer to your cross-connect map for the WAN link; see the Operations chapter for information about viewing cross-connect maps.

MODE

This option displays the selection of modes. In **ds0dp** mode, the port will provide a common bit and byte clock to be used by the attached DTE device for both receive and transmit. When one port is set to **ds0dp** all other ports will default to the DS0-DP mode as well. Similarly, when one port is changed to one of the G.703 modes (Codirectional or Contradirectional), any port set for the DS0-DP mode will default to the Contradirectional mode. The **contr** selection configures the port for the Contradirectional mode. In this mode, the card supplies both the transmit and receive clocks to the DTE. The **codir** selection configures the port for the Codirectional mode. In this mode, the clocks and data make up a composite signal. The clocks must be derived from the data.

CLK

This option allows the selection of the desired clocking mode when in the DS0-DP mode. When set to **int**, the card generates the bit and byte clocks to the DTE. When set to **ext**, the card receives the bit and byte clocks from the attached device. All ports must have the same clock setting, therefore, when one port is changed, all ports are changed. When a G.703 mode is selected, this option defaults to **n/a**.

LB

This option allows the user to set local loopbacks. The **off** option is for no loopbacks. The **dte** selection loops data towards the DTE. The **net** option loops data towards the network.

LB GEN

This option allows the user to set local loopbacks. The **off** option is for no loopbacks. The other options (**ocu**, **dsu**, **csu**, **ds0**) force the card to send the appropriate DDS latching loopback code towards the remote end. This option will only function in the DS0-DP mode.

LB DET

This option allows the card to detect DDS latching loopbacks. When set to **off**, no loopbacks can be detected. When set to **enab**, loopbacks will be detected. When a loopback is detected, it will be maintained until a loop down is detected. **w/to** is the same as **enab** except that if no loop down is detected after 10 minutes, the loopback will self-terminate. This option only functions in the DS0-DP mode.

Menu of Actions

Table DS0-2 shows the Menu of Actions for the DS0-DP Card.

Table DS0-2. The DS0-DP Card Screen Menu of Actions

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

Introduction

The B7R Data card enables the system to accept network management information from each of eight separate DS0s and multiplex them into a single 38.4kbps asynchronous bitstream running the Serial Line Interface Protocol (SLIP). (See the Network Management section of the CPU card chapter.)

8228 Bit-7-Redundant (B7R) Card

The 8228 B7R Card will multiplex up to eight B7R formatted data channels from eight different DS0s. This card has a separate maintenance and testing channel (port #9) and a single aggregate channel (port #10) to redirect information from the DS0s to the single RS232 connector on the back of the card.

Figure B7R-1 shows the part the B7R card plays in the Network Management System. SNMP alarm traps and TELNET configuration run over this path. Both formats can use the 4kbps FDL (Facility Data Link) on a T1 link using ESF format, a full DS0 on a T1 link or the computer port of the Interface card using SLIP protocol.

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 to a full DS0. (On point-to-point circuits, a DACSII™ is not needed.) A B7R card is used at the NMS site to multiplex the contents of eight DS0 circuits into a single 38.4kbps asynchronous circuit using SLIP protocol for use by a communication server or terminal server for routing to a Local Area Network.

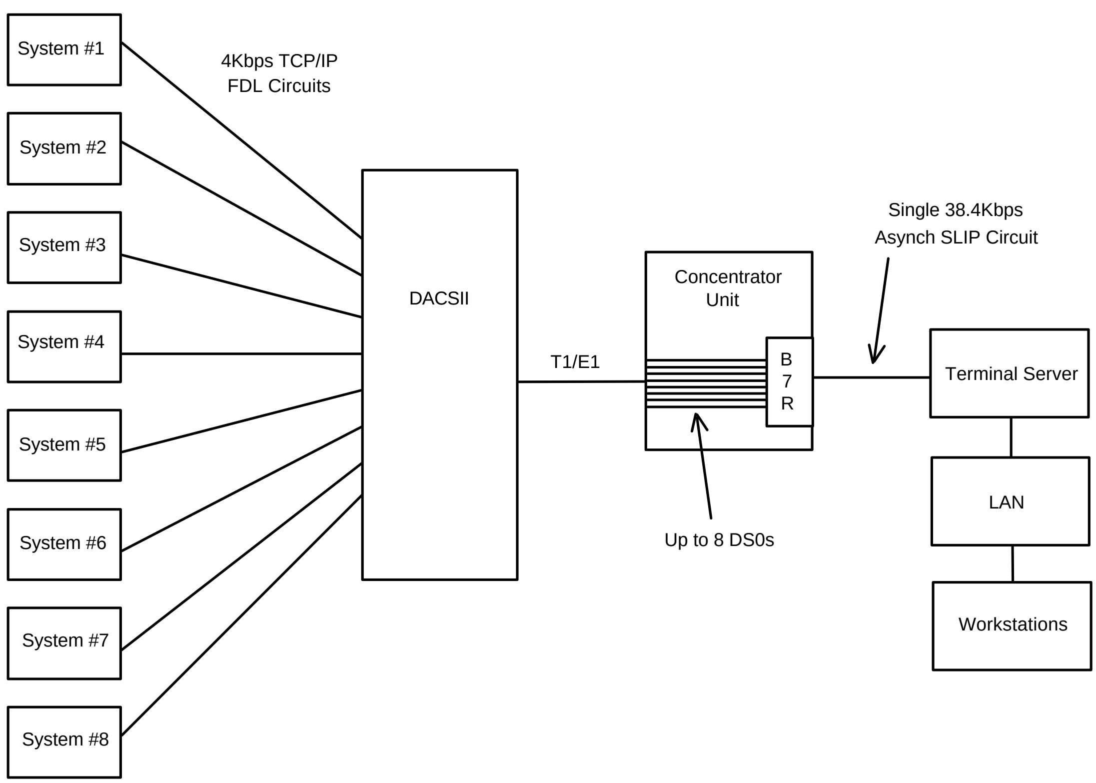


Figure B7R-1. A Typical NMS Application

B7R Card Settings

Figure B7R-2 shows the B7R card screen. Table B7R-1 lists the settings controlled on this screen along with their possible and default values.

```
Node_1         | U1  B7R-8    8228  Rev A0-0  Ser 00101   | 12-31-99  14:33


                 1     2     3     4     5     6     7     8     9     10
STATE          stdby stdby 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  w1-1  w1-1
TS             01    01    01    01    01    01    01    01    01    01
RATE           fdl   fdl   fdl   fdl   fdl   fdl   fdl   fdl   fdl   fdl
COM CF         n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a
CTS            n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a   n/a
ADDR           Ip    Ip    Ip    Ip    Ip    Ip    Ip    Ip    Ip    Ip
NETMSK         Ip    Ip    Ip    Ip    Ip    Ip    Ip    Ip    Ip    Ip







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

Figure B7R-2. SRU Card Default Screen

Table B7R-1. B7R Card Setting Options and Defaults

Parameter	User Options	Notes	Default
STATE	stdby actv		stdby
WAN	w1-1 w1-2 w2-1 w2-2 w3-1 w3-2 w4-1 w4-2		w1-1
TS	01-24 01-31		01
FORMAT	b7r b4r 9.6 19.2 28.2 38.4	1	b7r
COM CF	8 7 6 5	2	8
	1 2		1
	none odd even space mark		none
CTS	off on		off
ADDR	ip	3	0.0.0.0
NETMSK	ip	4	0.0.0.0

NOTES

1. Rate settings are only available for port #10.
2. Com CF is a three step process that is only available for port #9 and #10.

3. The IP address of ports #1-8 must match the IP address assigned to the remote system on that DS0. Port #9 does not require an IP address because it is a debug port.
4. Ports #1-8 share the same subnetwork mask, and the subnet address for ports #1-8 must be different from the one used for port #10.

STATE

The State setting determines whether the port is active or inactive. Set the State setting to standby (**stdby**) for ports you are not using or have not yet configured. Set it to active (**actv**) for ports that are ready for use. Port #9 is used for debug purposes and is normally in the **stdby** position.

WAN

The WAN setting identifies the WAN link that carries the data for this B7R port (either from the DACS or directly from the WAN link). The choices for this setting are **w1-1** through **w4-2.** Ports #9 and #10 do not require input from WAN links, therefore this field shows **n/a** for these ports.

TS

The TS (timeslot) setting identifies the timeslot on the WAN link carrying data for the B7R port (either from the DACS or directly from the WAN link). Acceptable values for this field are **01-24** for a T1 link or **01-15** and **17-31** for an E1 link.

Generally, timeslots are assigned sequentially. For example, card #1 would be assigned to ports 1-8, card #2 to ports 9-16 and card #3 would be assigned to ports 17-24, but this is not required.

RATE

The Rate setting allows you to select the rate in thousands of bits per second (kbps) for transmission of data. The rate of ports #1-8 are preset to 4kbps. The rate of port #9 is preset to 9.6kbps. The options for port #10 are **9.6**, **19.2**, **28.8** and **38.4**. Since the combined output of ports #1-8 are 32kbps, port #10 should be set to **38.4** to accommodate a full system.

COM CF

The Communication Configuration setting is not applicable for ports #1-8 and the **n/a** value cannot be changed. Ports #9-10 can be changed in a three step procedure that selects the data bits, parity and stop bits. The default values are **8**, **N**, **1**.

CTS

The Clear To Send setting selects an option that will allow hardware handshaking with the terminal server and the B7R card when enabled for port #10. Since it is not applicable for ports #1-8, the **n/a** value cannot be changed. Ports #9-10 can be changed. The values for this setting are **off** and **on**.

All cabling must be terminated before activating the CTS feature.

ADDR

The Address setting defines the IP address for each Integrated Access Controller associated with the first eight ports and port #10. Port #9 does not require an IP address and cannot be changed from the **n/a** setting. This address must be the same as the address used in the **PORT IP ADDR** field on the Interface card of the system with which it is associated for ports #1-8. The IP address for port #10 is a unique address for each B7R card and must be on a different network than ports #1-8. This allows the user to "ping" each B7R card itself for system diagnostics.

NETMSK

The Network Mask setting defines the single subnet mask address for each system associated with the first eight ports and a different subnet mask for port #10. A change of subnet mask for any of the first eight ports will change all of the ports. Port #9 does not require a subnet mask and cannot be changed from the **n/a** setting. This address must be the same as the address used in the **NETMASK** field on the Interface card of the system with which it is associated for ports #1-8.

Menu of Actions

Table B7R-2 shows the Menu of Actions for the B7R card.

Table B7R-2. The B7R Card Screen Menu of Actions

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

Introduction

The Basic Rate Interface (BRI) user card offers non-switched connectivity to sites located up to 18,000 feet from the system location. Factors such as wire gauge, bridge tap and loading patterns are described in ANSI T1.601-1992 specifications. The 8260 and 8261 BRI cards are equipped with eight (8) "U" interfaces, each of which can carry one BRI, 2B+D channel, providing either two 64Kbps or one 128Kbps bearer channels per interface.

The 8262 four-wire BRI card supports the "S" and "T" interfaces. The connection distances for this card are largely dependent on the number of devices connected to the card.

8260 BRI Card

The 8260 BRI Card has software selectable mode operations of LT and NT. The 8260 supports up to eight leased or BRI terminal extension (brite) applications. The 8260 does *not* support sealing current and does not provide any DC termination.

8261 BRI Card

The 8261 BRI Card has all of the functionality of the 8260. Switching between the LT and NT modes requires both making a menu selection and changing jumper connections on the card (see Figure BRI-14). The 8261 supports sealing current of 7.5mA or 15.0mA for a number of different times and duration.

To activate sealing current, set the jumpers on the card to the desired position (see Figure BRI-15 for jumper locations) also set SEAL CURR to **on** (see Figure BRI-2). The Sealing Current screen (see Figure BRI-3) provides for setting the start time, duration, and repeat interval.

This card is shipped with jumpers attached that make the automatic default for the card **LT** and **15mA** sealing current. (Sealing current is not applicable in NT mode.)

The 8260 and 8261 are very similar in operation and will be discussed together at the start of the chapter. The 8262 BRI Card is sufficiently different that its screen and operation information is included separately.

8262 BRI Card

The 8262 BRI Card is designed to support "S/T" 4-wire interface applications. It also supports both internal and external phantom power arrangements. Jumpers are available to select termination's on the receive and transmit sides individually.

UL Statement

OPERATION OF THIS INTERFACE IS LIMITED TO INTER-BUILDING CONNECTIONS LESS THAN 1,000 METERS

BRI Circuit Applications

Figure BRI-1 shows the difference between the two circuit types, Leased line (**lease**) and BRI Terminal Extension (**brite**). The leased circuit can be any standard 2B1Q (U interface) NTU device that supports "nailed-up" (1 or 2 B channels) connections with no D channel signaling. The brite mode supports switched connectivity to ISDN capable switches and D channel signaling on either a full DS0 or multiplexed 4:1 on a single DS0.

For both examples, B channels carrying voice traffic on the BRI card can be compressed through the ADPCM card to extend the user's resources (see Conversion section). The only limitation on BRI traffic is that NTUs or NT1s must be located less than 18,000 feet from the system unit.

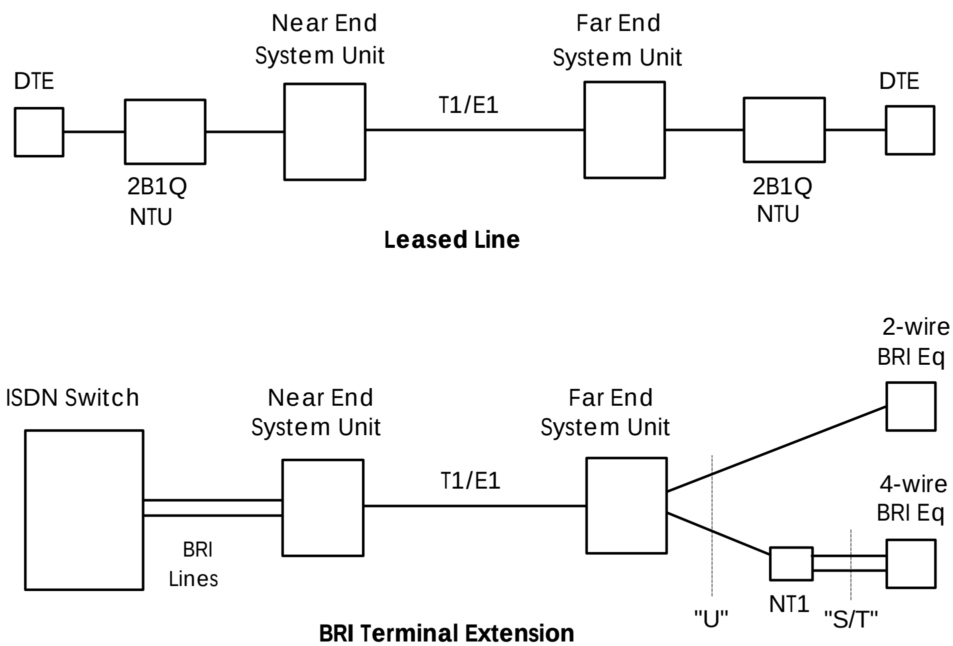


Figure BRI-1. Typical BRI System Application

8260 and 8261 BRI Card Settings

Figure BRI-2 shows the BRI main screen and Table BRI-1 lists the settings controlled on the screen along with their possible and default values.

```
Node_1         | U1 BRI Ux8sc   8261  Rev D2-0  Ser 01103  | 12-31-99
14:33

Version: #1.5
                  1      2      3      4      5      6      7      8
STATE           stdby  stdby  stdby  stdby  stdby  stdby  stdby  stdby
TERMINAL        lt     lt     lt     lt     lt     lt     lt     lt
TYPE            lease  lease  lease  lease  lease  lease  lease  lease
B MODE          none   none   none   none   none   none   none   none
B1 WAN/SRV      w1-1   w1-1   w1-1   w1-1   w1-1   w1-1   w1-1   w1-1
B1 TS           n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a
B2 WAN/SRV      w1-1   w1-1   w1-1   w1-1   w1-1   w1-1   w1-1   w1-1
B2TS            n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a
D WAN           w1-1   w1-1   w1-1   w1-1   w1-1   w1-1   w1-1   w1-1
D TS            n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a
D SUBCHAN       off    off    off    off    off    off    off    off
LOCAL LB        off    off    off    off    off    off    off    off
LB CHAN         B1     B1     B1     B1     B1     B1     B1     B1
LBGEN MD        ddsT   ddsT   ddsT   ddsT   ddsT   ddsT   ddsT   ddsT
LB GEN          off    off    off    off    off    off    off    off
SEAL CURR       off    off    off    off    off    off    off    off
TR COND         off    off    off    off    off    off    off    off



Save | Undo | Refresh | Copy | conVert | Eoc | Ntu | Test | Perf | Main
```

Figure BRI-2. The BRI Main Screen

Table BRI-1. BRI Card Parameter Options and Defaults (8260/8261)

Parameter	User Options	Notes	Default
STATE	stdby actv		stdby
TERMINAL	lt nt		lt
TYPE	lease brite		lease
B MODE	none B1 B2 B1+B2 128K		none
B1 WAN/SERV	w1-1 w1-2 w2-1 w2-2 w3-1 w3-2 w4-1 w4-2	3	w1-1
B1 TS	n/a 01-24 01-31		01
B2 WAN/SERV	w1-1 w1-2 w2-1 w2-2 w3-1 w3-2 w4-1 w4-2	3	w1-1
B2 TS	n/a 01-24 01-31		01
D WAN	w1-1 w1-2 w2-1 w2-2 w3-1 w3-2 w4-1 w4-2	1	w1-1
D TS	n/a 01-24 01-31	1	01
D SUBCHAN	off 1 2 3 4	1	off
LOCAL LB	off ta net		off
LB CHAN	B1 B2 B1+B2		B1
LBGEN MD	ddsT ddsN v54T v54N ft1T ft1N eoc		ddsT
LB GEN	off B1ocu B1csu B1ds0 B1dsu B2ocu B2csu B2ds0 B2dsu	2	off
SEAL CURR	n/a off on		n/a
TR COND	off on		off

NOTES

1. D Channels will only show if **brite** is selected for Type.
2. These choices are only available for LBGEN Modes of ddsT and ddsN. See LB GEN paragraph below.
3. SRV functions will be activated in a future release.

STATE

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

TERMINATION

The 8260 and 8261 Terminal setting shows if the port is acting as a line termination (**lt**) or a network termination (**nt**). Generally, the line termination resides at the local central office, while the network termination is located at the customer location.

Changing the termination from **nt** (the default) to **lt** on the 8261 BRI card requires changing jumper settings on the card itself. Instructions for this conversion are included at the end of this chapter.

TYPE

The Type setting determines the type of BRI connection for this port. The options available are **lease** (a permanent circuit), **brite** (BRI Terminal Emulation), **iw** (interworking) and **ntu_l** (Network Terminating Unit - Lease, 8260 and 8261 only).

If **ntu_l** is selected, the user is required to select either **64** (which corresponds to the Adtran NTU) or **2560** (which corresponds to the 2560/2561 NTUs). If the wrong type of NTU is selected, the user will not be able to perform remote configuration of the NTU.

B MODE

The B Channel Mode option determines the B channel usage for this port. Setting the port to **none** tells the system that the equipment associated with this port does not require a B channel and access to both B WANs is disabled. Setting the highlighted port to **B1** tells the system that only one B channel is required for the BRI equipment. Selecting **B1** enables the B1 WAN and B1 TS and disables the B2 WAN and B2 TS. Setting the port to **B2** tells the system that only one B channel is required for the BRI equipment. Selecting **B2** enables the B2 WAN and B2 TS and disables the B1 WAN and B1 TS.

Setting the port to **B1+B2** tells the system that two B channels are required for the BRI equipment. Selecting **B1+B2** enables both the B1/B2 WANs and TSs. Any WAN and any timeslot can be assigned to either B channel.

Setting the port to **128K** tells the system that a 128Kbps "pipe" is required for the DTE equipment. Selecting **128K** enables both the B1/B2 WANs and TSs. Both B channels must be assigned to the same WAN.

B1 WAN/SERV

The WAN setting identifies the WAN link for the first B channel assigned to this port. It is not necessary for all 8 ports on the same card to be assigned to the same WAN link, or to contiguous time slots on a WAN link. The **serv** port is set from conVert screen.

B1 TS

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

B2 WAN/SERV

The WAN setting identifies the WAN link for the second B channel assigned to this port. If **128K** is selected for the B Mode, the second B channel must be assigned to the same WAN link as the first B channel.

B2 TS

The TS setting identifies the time slot on the WAN link for the second B channel assigned to this port. Values range from **1-24** for T1 links and **1-31** for E1 links. Time slot 16 is not available on E1 links that are programmed for **cas** or **ccs** signaling.

D WAN

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

D TS

The TS setting identifies the time slot on the WAN link for the D channel assigned to this port for **brite** circuits. Values range from **1-24** for T1 links and **1-31** for E1 links. Time slot 16 is not available on E1 links that are programmed for **cas** or **ccs** signaling.

D SUBCHAN

The D Subchannel option allows the user to use a full DS0 for the D channel or split the DS0 into four 16Kbps sections to allow D channels to be combined into a single 64Kbps DS0. D subchannels must be used on the same BRI card only.

LOCAL LB

The Local Loopback setting controls the direction of the local loopback. The settings are **off** (for no loopback), **ta** (for a loopback toward the terminal adapter) and **net** (for a loopback toward the network).

LB CHAN

The Loopback Channel setting places the local loopback on either the first B channel (**B1**), the second B channel (**B2**) or both B channels (**B1+B2**).

LBGEN MD

The Loopback Generation Mode specifies the type of loopback to be placed on the circuit. The BRI card only generates loopback codes, it does not detect loopback codes. The options are **ddsT** (a DDS loopback on the terminal side of the line), **ddsN** (a DDS loopback on the network side of the line), **v54T** (V.54 loopback toward the terminal), **v54N** (V.54 loopback toward network), **ft1T** (a fractional T1 loopback toward the terminal), **ft1N** (fractional T1 loopback toward the network) and **eoc** (Embedded Operations Channel loopback towards the U interface).

LB GEN

The Loopback Generation option specifies different loopback codes depending on the selection of loopback generation mode above. The options for **ddsT** and **ddsN** are **off** (no loopback), **B1ocu** (an OCU loopback on the first B channel), **B1csu** (a CSU loopback on the first B channel), **B1ds0** (a full DS0 loopback on the first B channel), **B1dsu** (a DSU loopback on the first B channel), **B2ocu** (an OCU loopback on the second B channel), **B2csu** (a CSU loopback on the second B channel), **B2ds0** (a full DS0 loopback on the second B channel) and **B2dsu** (a DSU loopback on the second B channel).

The options for **v.54T**, **v,54N**, **ft1T** and **ft1N** are **off** (no loopback), **B1** (v.54 or Ft1 loopback on the first B channel), **B2** (v.54 or Ft1 loopback on the second B channel) and **B1+B2** (v.54 or Ft1 loopback on both B channels).

The options for **eoc** are **off** (no loopback), **B1** (eoc loopback on the first B channel), **B2** (eoc loopback on the second B channel), **B1+B2** (eoc loopback on the both B channels) and **2B+D** (eoc loopback on the both B channels and the D channel).

If the loopback is directed toward the terminal, the loopback pattern selected will not start until the U-ST parameter on the test screen shows the status of "**actv**." (See the test section below for further information about the U-ST parameter.)

SEAL CURR

Sealing current (on the 8261 card only) is used to inhibit corrosion on wire splices in outside plant. The Sealing Current option on the BRI card allows the user to select sealing current on a port-by-port basis.

Jumpers on the card allow the user to choose between a 15mA (the default) or 7.5mA current (provided by the -48VDC power converter). The jumper settings are shown at the end of this chapter.

The setting for this parameter is **n/a** for the 8260 card. The settings are **no** and **yes** for the 8261 card. Choosing yes for this setting will automatically bring up the screen of Figure BRI-3. Table BRI-3 shows the parameter settings and defaults for this screen.

RCVE

The settings are **noTst** (no code violation test) and **cdVol** (code violation test). If cdVol is set and a code violation is detected, the card sends an interrupt toward the network line.

TR COND

The Trunk condition (TR COND) setting allows the BRI card to pass trunk conditions from the network to the U/ST interface when set to **on**. Setting the TR COND state to **off** prevents the condition to be passed through the card.

Menu of Actions

Table BRI-2. BRI Card Main Screen Menu of Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e. performance and test data).
Copy	Copies the contents of the current column (except timeslot) to the next column. Useful if a user changes a lot of entries in one column and wants to repeat those changes in subsequent columns.
con**V**ert	The Conversion feature allows the B channels to be used with ADPCM compression features. See the Conversion section.
Eoc	Embedded Operations Channel (not yet supported)
Ntu	Network Terminating Unit programming. (not applicable to 8262).
Test	Initiates and monitors testing of all BRI card ports. See Test section.
Perf	Shows the performance statistics for the port highlighted. See the Performance Monitoring section. Not implemented in S/T card.
Main	Returns to the main terminal screen. If changes are made to settings and not saved, users will be prompted to save or lose changes.

The Sealing Current Screen

This screen applies to the 8261 only, and only in LT mode. Move the cursor to the SEAL CURR selection for the desired channel and press <Enter> to bring up the screen of Figure BRI-3.

```
Node_1       | U1  BRI Ux8sc   8261  Rev D2-0  Ser 01103  | 12-31-99
14:33


                  1
START    (h)     0
DURATION (m)     0
REPEAT           0
REP.EVRY (h)     0










Save | Undo | Refresh | Main
```

Figure BRI-3. The Sealing Current Screen

Table BRI-3. Sealing Current Options

Parameter	User Options	Default
START (H)	0-24	0
DURATION (M)	1-60	1
REPEAT	no yes	no
REP EVRY (H)	0 1-24	0

START (h)

The Start parameter allows the user to set the time (in hours) that the sealing current is to be applied to the selected port. The values are **0** (zero) through **24**. Selection of zero will start the sealing current as soon as the changes are saved. Selection of any other number between 1 and 24 turns on the sealing current on that many hours from now.(e.g. selection of six [6] turns on the current six hours from now).

DURATION (m)

The Duration parameter allows the user to set the duration of time (in minutes) the sealing current is to be applied to the port selected. The values are **1-60**.

REPEAT

The Repeat parameter allows the user to repeat the application of sealing current to the line of the port selected. The values are **yes** and **no**.

REP. EVRY (h)

The Repeat Every parameter allows the user to set the time (in hours) that the sealing current is to be repeated on the port selected. The values are **1-24**. Selection of any number between 1 and 24 repeats the sealing current on that interval (e.g. selection of one [1] repeats the current every hour).

Menu of Actions

Table BRI-4 shows the Menu of Actions for the Sealing Current Screen.

Table BRI-4. Sealing Current Screen Menu of Actions

Action	Function
Save	Save changes to settings.
Undo	Return all settings to the last saved state.
Refresh	Update time-related information fields that are not automatically updated
Main	Return to the main terminal screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Conversion

The conversion feature allows the user to compress B channel voice traffic to be used with the ADPCM card. Figure BRI-4 shows the Conversion screen and Table BRI-5 shows the options and default settings.

It is not necessary to assign both B channels of a B1+B2 circuit to ADPCM engines. Furthermore, B channels can share an ADPCM timeslot with any other type of service.

```
Node_1        | U1  BRI Ux8sc  8261  Rev D2-0  Ser 01103  | 12-31-99
14:33

Version: #1.8
                  1      2      3      4      5      6      7      8
B1 CNV          off    off    off    off    off    off    off    off
B1 RATE         n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a
B1 ADPCM        n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a
B2 CNV          off    off    off    off    off    off    off    off
B2 RATE         n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a
B2 ADPCM        n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a

Save | Undo | Refresh | Main
```

Figure BRI-4. Conversion Screen

Table BRI-5. Conversion Screen Options and Defaults

Parameter	User Options	Default
B1 CNV	off ad-u ad-A	off
B1 RATE	n/a 24K,1 32K,1 40K,1 24K,2 32K,2 40K,2	n/a
B1 ADPCM	n/a P1 P2 P3	n/a
B2 CNV	off ad-u ad-A	off
B2 RATE	n/a 24K,1 32K,1 40K,1 24K,2 32K,2 40K,2	n/a
B2 ADPCM	n/a P1 P2 P3	n/a

B1 CNV

The B Channel #1 Conversion parameter allows the user to choose Pulse Code Modulation (PCM) coding for B channel #1 voice traffic. The values are **off**, **ad-u** and **ad-A**. Use **ad-u** when converting from T1 carriers and use **ad-A** for E1 carriers (this signal is A-inv not A-law).

B1 RATE

The B Channel #1 Rate parameter allows the user to choose both the speed of the B Channel traffic and the position on the ADPCM time slot.

There must be two ADPCM engines assigned to each WAN timeslot and the rate combination of both engines must equal 64Kbps.

The values are **n/a**, **24K,1** (64Kbps to 24Kbps on the first ADPCM engine), **32K,1** (64Kbps to 32Kbps on the first ADPCM engine), **40K,1** (64Kbps to 40Kbps on the first ADPCM engine), **24K,2** (64Kbps to 24Kbps on the second ADPCM engine), **32K,2** (64Kbps to 32Kbps on the second ADPCM engine), **40K,2** (64Kbps to 40Kbps on the second ADPCM engine).

B1 ADPCM

The B Channel #1 ADPCM parameter allows you to choose the ADPCM card to which you would like to assign this B channel. The options are **n/a**, **P1** (the ADPCM card in slot P1), **P2** (the ADPCM card in slot P2) and **P3** (the ADPCM card in slot P3).

B2 CNV

The B Channel #2 Conversion parameter allows the user to choose Pulse Code Modulation (PCM) coding for B channel #2 voice traffic. The values are **off**, **ad-u** and **ad-A**. Use **ad-u** when converting from T1 carriers and use **ad-A** for E1 carriers (this signal is A-inv not A-law).

B2 RATE

The B Channel #2 Rate parameter allows the user to choose both the speed of the B Channel traffic and the position on the ADPCM time slot.

There are two ADPCM engines assigned to each WAN timeslot and the rate combination of both engines must equal 64Kbps.

The values are **n/a**, **24K,1** (64Kbps to 24Kbps on the first ADPCM engine), **32K,1** (64Kbps to 32Kbps on the first ADPCM engine), **40K,1** (64Kbps to 40Kbps on the first ADPCM engine), **24K,2** (64Kbps to 24Kbps on the second ADPCM engine), **32K,2** (64Kbps to 32Kbps on the second ADPCM engine), **40K,2** (64Kbps to 40Kbps on the second ADPCM engine).

B2 ADPCM

The B Channel #2 ADPCM parameter allows you to choose the ADPCM card to which you would like to assign this B channel. The options are **n/a**, **P1** (the ADPCM card in slot P1), **P2** (the ADPCM card in slot P2) and **P3** (the ADPCM card in slot P3).

Menu of Actions

Table BRI-6 shows the Menu of Actions for the BRI Conversion Screen.

Table BRI-6. Menu of 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 BRI card main screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Embedded Operations Channel

Not currently supported

Remote NTU Configuration

The **Ntu** option on the BRI Main screen allows the user to configure up to 8 remote NTUs per card. This option is currently available only for 8260/8261 BRI cards with 1.8 firmware). Typing **n** (Ntu) on the 8260/8261 Main Screen brings up the NTU screen of Figure BRI-5.

```
DEV TYPE: NTU560  |  SW VER: 5.2                        | 12-31-99  14:33

                        1
DTE INTF TYPE        v.36
DTE SYNC/ASYN        sync
DTE DATA RATE        64k
CLOCK MODE           int
DCD OPTIONS          on
DCD OFF DELAY        n/a
DSR OPTIONS          on
CTS OPTIONS          on
CTS ON DELAY         n/a
ASYN BAUDRATE        offset
RI INDICATION        off
RL LINE              ena
LL LINE              ena
NTU CONSOLE          ena




Save | Undo | Refresh | Load | Write | Test | stAtus | Main
```

Figure BRI-5. Remote NTU Configuration Screen

NTU Configuration Parameters and Options

Use the arrow keys to scroll through the options of Figure BRI-5. Table BRI-7 shows the parameters and options available. Defaults are identified in parameter lists by **bold** type.

Table BRI-7. Remote NTU Configuration Screen Options and Defaults

Parameter	User Options	Default
DTE INTF TYPE	Display only. v.36; for the 2561, it is v.24.	display only
DTE SYNC/ASYN	sync asy8 asy9 asy10 asy11	sync
DTE DATA RATE	sync: 1.2k 2.4k 4.8k 9.6k 14.4k 19.2k 28.8k 32k 38.4k 48k 56k 64k 72k 128k asyx: <1.2k 1.2k 2.4k 4.8k 9.6k 14.4k 19.2k 28.8k 38.4k	
CLOCK MODE	Display only.	display only
DCD OPTIONS	off on r_rts	on
DCD OFF DELAY	n/a 5-80 bits	n/a
DSR OPTIONS	off on	on
CTS OPTIONS	off on l_rts	on
CTS ON DELAY	n/a 0-60 bits 10-250 msec	n/a
ASYN BAUDRATE	offset exact	offset
RI INDICATION	off on	off
RL LINE	dis	dis
LL LINE	dis ena	ena
NTU CONSOLE	dis ena	ena

DTE INTF TYPE

Display only. The DTE Interface Type identifies the interface on the rear panel of the NTU. This parameter is detected automatically. For the 2560, it is **v.36**; for the 2561, it is **v.24**.

DTE SYNC/ASYN

Selects Synchronous **(sync)** or asynchronous **(asy)** transmission mode (Sync is the default). Asynchronous transmission has options for four character lengths: **asy8** (8-bit), **asy9** (9-bit), **asy10** (10-bit), or **asy11** (11-bit).

DTE DATA RATE

sync: 1.2k 2.4k 4.8k 9.6k 14.4k 19.2k 28.8k 32k 38.4k 48k 56k 64k 72k 128k

asyx: <1.2k 1.2k 2.4k 4.8k 9.6k 14.4k 19.2k 28.8k 38.4k

CLOCK MODE

Display only. CLOCK MODE is detected based on the Primary Clock setting on the Interface Card.

DCD OPTIONS

The Data Carrier Detect option can be **off**, **on** (default), or **r_rts** (Remote Ready To Send). **r_rts** option requires setting of the DCD OFF DELAY option.

DCD OFF DELAY

n/a if the DCD OPTIONS selection is **on** or **off**.
If **r_rts** is selected, the options are **5**, **10**, **15**, **20**, **25**, **30**, **35**, **40**, **45**, **50**, **55**, **60**, **65**, **70**, **75**, or **80** bits.

DSR OPTIONS

off or on.

CTS OPTIONS

The Clear To Send option can be **off**, **on** (default), or **l_rts** (Local Ready To Send). **l_rts** option requires setting of the CTS ON DELAY option.

CTS ON DELAY

n/a if the CTS OPTIONS selection is **on** or **off**.
If **l_rts** is selected, the CTS ON DELAY is measured either in bits or milliseconds. The options are **0**, **10**, **20**, **30**, **40**, **50**, or **60** bits, or **10**, **20**, **30**, **40**, **50**, **100**, or **250** msecs.

ASYN BAUDRATE

The asynchronous baud rate can either be set as **offset** (default) or **exact**.

RI INDICATION

The ring indicator setting may be turned **on** or **off** (default)

RL LINE

The remote (network) loop line indicator is always disabled. This is the loop between the BRI card and the NTU (see Figure BRI-6). **May be overridden locally by means of a switch on the front panel of the NTU.**

LL LINE

Sets up loopback testing permission between the NTU and the Data Terminal Equipment (DTE) (see Figure BRI-6). The setting may be **ena** (enable) (default) or **dis** (disable). **This parameter can be overridden locally by means of a switch on the front panel of the NTU.**

NTU CONSOLE

When this option is enabled (ena) (default), the NTU may be programmed locally by a line from the rear connector port to a DTE. When disabled, the NTU must be programmed remotely (e.g., through the BRI card).

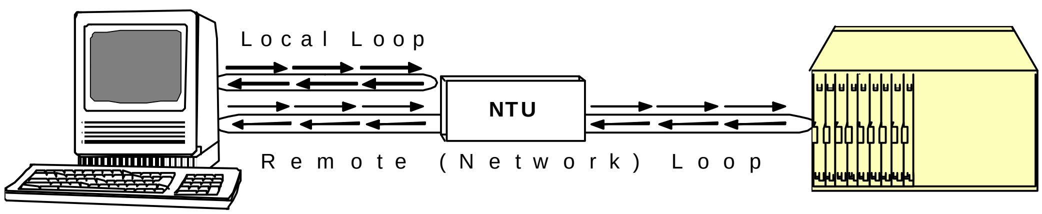


Figure BRI-6. Local and Remote NTU Loopback Testing.

Menu of Actions

Table BRI-8. Remote NTU Configuration Screen Menu of Actions.

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Data is not automatically updated on screen. Pressing the "R" key will show updated statistics.
Load	Loads currently saved parameters from the NTU.
Write	Saves configuration information to the NTU.
Test	Brings up the Test Screen (see below).
st**A**tus	Brings up the Status Screen (see below).
Main	Returns to the BRI card main screen. If changes are made to settings and not saved, users will be prompted to save or lose changes.

NTU Test

Figure BRI-7 shows the NTU Test screen, while Table BRI-9 shows the parameter options.

```
DEV TYPE: NTU560  |  SW VER: 5.2                            | 12-31-99  14:33

                           1
TEST                      off
TIMER                     on
STATUS                    off
ERROR                     n/a
TOTAL                     n/a

Save | Undo | Refresh | Main
```

Figure BRI-7. NTU Test Screen

Table BRI-9. NTU Test Screen Options and Defaults

Parameter	User Options	Notes	Default
TEST	off net		off
TIMER	off on		on
STATUS	off loc net loc_net	1	off
ERROR	n/a	2	n/a
TOTAL	n/a	2	n/a

NOTES

1 The **loc** and **loc_net** options are included to support manual loopback override at the NTU site.

2 These parameters are not supported in this release.

TEST

Choosing **net** allows the user to start a loopback test in the network loop (between the BRI card and NTU). The default is **off**.

TIMER

This indicates whether the loopback test is set to time out, or whether it is ongoing. The options are **off** and **on** (default). This is a read-only parameter; it is not user-selectable.

STATUS

This parameter indicates the direction of the loopback testing. The options are **off** (default), **loc** (local loop), **net** (network loop), and **loc_net** (local and network loops). The **loc** and **loc_net** parameters are included in the event that the local loopback testing is activated manually by selecting a switch on the front panel of the NTU. This is a read-only parameter; it is not user-selectable.

ERROR

This parameter is not supported in this release.

TOTAL

This parameter is not supported in this release.

Menu of Actions

Table BRI-10. NTU Test Screen Menu of Actions.

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Test data is not automatically updated on screen. Pressing the "R" key will show updated statistics.
Main	Returns to the remote NTU configuration screen. If changes are made to settings and not saved, users will be prompted to save or lose changes.

NTU Status

Figure BRI-8 shows the NTU Status screen, while Table BRI-11 identifies the status displays.

```
DEV TYPE: NTU560  |  SW VER: 5.2                             | 12-31-99  14:33

                      1
ALARM                none
CTS                  on
DSR                  on
DCD                  on
RTS                  off
DTR                  off
RX FIFO ERR          no
TX FIFO ERR          no

HW CODE              1
LINE TR              st5411
ASIC REV             3
EPLD REV             2

Refresh | Main
```

Figure BRI-8. NTU Status Screen

Table BRI-11. NTU Status Screen Displays

Parameter	Display
ALARM	none U L R M Displays active alarms, including: none, U (U interface is down), L (NTU has lost sync and is not yet configured), R (NTU has been reset and is not yet configured), and M (NTU is in the Master mode).
CTS	CTS Status: off on
DSR	DSR Status: off on
DCD	DCD Status: off on
RTS	RTS Status: off on
DTR	DTR Status: off on
RX FIFO ERR	Indicates a FIFO buffering error on the receive end; reports yes or no.
TX FIFO ERR	Indicates a FIFO buffering error on the transmit end; reports yes or no.
HW CODE	0-255
LINE TR	Line transceiver type: tp3410 or st5411
ASIC REV	0-255
EPLD REV	0-255

Menu of Actions

Table BRI-12. NTU Status Screen Menu of Actions.

Action	Function
Refresh	Data is not automatically updated on screen. Pressing the "R" key will show updated statistics.
Main	Returns to the remote NTU configuration screen. If changes are made to settings and not saved, users will be prompted to save or lose changes.

BRI (8260/8261) Test

Selection of "Test" from the Menu of Options will bring up the screen shown in Figure BRI-9. From this screen, users are allowed to create test situations between BRI Cards or between a single BRI Card and data test equipment at a remote site. Table BRI-15 lists the settings controlled on this screen along with their possible and default values.

```
Node_1         | U1  BRI Ux8sc  8260  Rev B1-0  Ser 01103  | 12-31-99
14:33


                1      2      3      4      5      6      7      8
BERT           n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a
DIR            ta     ta     ta     ta     ta     ta     ta     ta
CHAN           B1     B1     B1     B1     B1     B1     B1     B1
SYNC           no     no     no     no     no     no     no     no
BE             *****  *****  *****  *****  *****  *****  *****  *****
ES             *****  *****  *****  *****  *****  *****  *****  *****
SES            *****  *****  *****  *****  *****  *****  *****  *****
CSES           *****  *****  *****  *****  *****  *****  *****  *****
OSS            *****  *****  *****  *****  *****  *****  *****  *****
BER            *****  *****  *****  *****  *****  *****  *****  *****
ELAP           *****  *****  *****  *****  *****  *****  *****  *****
U-ST           *****  *****  *****  *****  *****  *****  *****  *****
LB ST          *****  *****  *****  *****  *****  *****  *****  *****
SEAL           *****  *****  *****  *****  *****  *****  *****  *****






Save | Undo | Refresh | InsertErr | Clear | Main
```

Figure BRI-9. BRI Card Test Screen (8260 and 8261)

Table BRI-15. 8260/8261 Test Screen Options and Defaults

Parameter	User Options	Default
BERT	off mark space 1:1 1:7 p_1 p_0 p_1:1 p_1:7	off
DIR	ta net	ta
CHAN	B1 B2 128K D	B1
SYNC	see description below	no
BE	see description below	
ES	see description below	
SES	see description below	
CSES	see description below	
OSS	see description below	
BER	see description below	
ELAP	see description below	
U-ST	stdby, init , actv, fail, deact, nos, los, b1eoc, b2eoc, 2beoc, bdeoc.	actv
LB ST	off, ta, or net.	off
SEAL	Indicates if the sealing current is selected or not (8261 BRI Card only).	

BERT

Bit Error Rate Tester (BERT) sends a data pattern and measures the bit error rate (BER) on the selected BRI port. Depending upon whether the test is on B channels or D channels, the patterns can be sent as either raw data or as HDLC packets containing the patterns. BERT can only be sent on one port at a time.

For a B channel test, the patterns that can be selected are **off**, **mark** (1111), **space** (0000), **1:1** (1010), **1:7** (0100-0000), **p_1** (packet, 1111), **p_0** (packet, 0000), **p_1:1** (packet, 1010) and **p_1:7** (packet, 0100-0000).

If the D channel is selected, the patterns that can be selected are **off**, **p_1** (packet, 1111), **p_0** (packet, 0000), **p_1:1** (packet, 1010) and **p_1:7** (packet, 0100-0000).

DIR

Selects the direction of the test. The options are **ta**, toward the Terminal Adapter (customer site) or **net**, toward the Network (carrier).

CHAN

Selects the side of the line on which the BER pattern will be sent. The options are **B1** (BERT on B channel #1), **B2** (BER is on B channel #2), **128K** (BERT is on the 128K pipe) and **D** (BERT is on the D channel).

SYNC

Synchronization (SYNC) displays **yes** if the integrated BERT has achieved synchronization either with itself via a remote loopback or with the remote test equipment, **no** if it has not.

BE

Bit Error (BE) displays the total number of bit errors logged.

ES

Errored Seconds (ES) displays the total number of seconds in which errors were detected.

SES

Severely Errored Seconds (SES) shows the total number of seconds in which the bit error rate exceeded one bit per thousand (1×10^{-3}).

CSES

Consecutive Severely Errored Seconds (CSES) is triggered by the occurrence of ten consecutive Severely Errored Seconds. Once triggered, the CSES field will increment (by one) for each elapsed second until the system logs ten consecutive non-Severely Errored Seconds.

OSS

Out of Synchronization Seconds (OSS) shows the number of seconds that the BRI BERT has been out of synchronization.

BER

Bit Error Rate (BER) shows the rate at which errors are being logged. BER equals the number of bit errors (BE) divided by the total number of bits transmitted during the test.

ELAP

Elapsed time (ELAP) is the total number of seconds elapsed during the test.

U-ST

Displays the status of the U interface ports. Possible U interface states include **stdby**, **init** (initializing), **actv**, **fail** (failed to activate), **deact** (deactivated), **nos** (no signal), **los** (loss of signal), **b1eoc** (eoc loopback on B1), **b2eoc** (eoc loopback on B2), **2beoc** (eoc loopback on both B channels), **bdeoc** (eoc loopback on both B and D channels).

If the LB GEN option (on the previous screen) is set to **ta**, the U-ST field must show "**actv**" before any loopbacks selected become operational.

LB ST

Loopback State (LB STATE) indicates the local loopback selected on the main screen for this port. Possible states are: **off**, **ta**, or **net**.

SEAL

Indicates if the sealing current is selected or not (8261 BRI Card only).

Menu of Actions

Table BRI-16 shows the Menu of Actions for the BRI test screen.

Table BRI-16. Test Screen Menu of Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Test data is not automatically updated in "real time." Pressing the "R" key will show updated statistics.
Insert**E**rr	Allows the user to manually insert a single error into the clear data signal.
Clear	Clears the testing screen and resets all counters to zero.
Main	Returns to the BRI card main screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Performance Monitoring (8260/8261)

The 8260 and 8261 BRI cards support proprietary performance monitoring, which continuously measures operation performance of the connection from the Integrated Access Controller to the NTU. Each one hour segment is divided into 3600 seconds and statistics are kept for the current hour and the past 24 one hour periods.

To get statistics for a particular port, highlight the port on the BRI card main screen and press the **P** (Performance Monitoring) key. The screen shown as Figure BRI-10 appears. Table BRI-17 defines the parameters displayed.

While viewing the performance monitoring screen, the user must press the **R** (refresh) command from the menu of actions to obtain updated statistics.

```
Node_1          | U1  BRI Ux8sc  8260  Rev D2-0  Ser 01103  | 12-31-99
14:33

Unit 1 PERFORMANCE

           ES     UAS    NOS    LOS    DM     NEBE    FEBE    STATUS
CUR        0      0      0      0      0      0       0       . . . . . . .
010        0      0      0      0      0      0       0       . . . . . . .
020        0      0      0      0      0      0       0       . . . . . . .
030        0      0      0      0      0      0       0       . . . . . . .
040        0      0      0      0      0      0       0       . . . . . . .
050        0      0      0      0      0      0       0       . . . . . . .
060        0      0      0      0      0      0       0       . . . . . . .
070        0      0      0      0      0      0       0       . . . . . . .
080        0      0      0      0      0      0       0       . . . . . . .
090        0      0      0      0      0      0       0       . . . . . . .
100        0      0      0      0      0      0       0       . . . . . . .
110        0      0      0      0      0      0       0       . . . . . . .
120        0      0      0      0      0      0       0       . . . . . . .
TOTAL      0      0      0      0      0      0       0       . . . . . . .

STATUS:   T=Test; L=LOS; N=NOS; P=PS1; p=PS2; t=NTM; S=STDBY/SWITCH



Save | Undo | Refresh | insertErr | Clear | Main
```

Figure BRI-10. BRI Card Performance Monitoring Screen

Table BRI-17. Performance Monitoring Displays

Parameter	User Options	Default
ES	see description below	display only
UAS	see description below	display only
NOS	see description below	display only
LOS	see description below	display only
DM	see description below	display only
NEBE	see description below	display only
FEBE	see description below	display only
STATUS	L (loss of synchronization), N (no signal), S (standby), T (test), P (power failure of primary source for NT), p (power failure of secondary source for NT) and t (network terminal test mode).	see status options

ES

Errored Seconds registers the number of seconds for which the BRI card detected a Near End Block Error (NEBE) or a Far End Block Error (FEBE) greater than zero (0)

UAS

Unavailable Seconds shows the number of seconds for which the U-Interface is not available (not active).

NOS

No Signal Seconds column shows the number of seconds for which the BRI card detected a NOS line condition (applicable for LT Terminal Type only). For NT Terminal Type, no signal seconds are reported in the Unavailable Seconds column.

LOS

Loss of Synchronization Seconds shows the number of seconds for which the BRI card detected a LOS line condition (applicable for LT Terminal Type only). For NT Terminal Type, the loss of synchronization seconds are included in the Unavailable Seconds column.

DM

The Degraded Minutes register shows the number of minutes for which the BRI card detected ES, UAS, NOS or LOS greater than zero (0).

NEBE

Near End Block Error shows transmission errors detected by the near end equipment.

FEBE

Far End Block Error shows transmission errors detected by the far end equipment.

STATUS

Status displays error codes for line conditions that occur during the one hour intervals. Identifying codes are displayed at the bottom of the screen. The values are **L** (loss of synchronization), **N** (no signal), **S** (standby), **T** (test), **P** (power failure of primary source for NT), **p** (power failure of secondary source for NT) and **t** (network terminal test mode).

The last three codes (**P**, **p** and **t**) are not available for network terminal applications.

Menu of Actions

Table BRI-18 shows the Menu of Actions for the BRI Performance Monitoring screen.

Table BRI-18. Performance Monitoring Screen Menu of Actions

Action	Function
Refresh	Since the BRI card does not show accumulated performance statistics in "real time" (i.e. second by second), the Refresh command must be used to show changes from the last recorded number.
Clear	Clears the testing screen and resets all counters to zero.
pg**U**p	Allows the user to see the first 12 hour period (current + 1-12).
pg**D**n	Allows the user to see the second 12 hour period (current + 13-24).
Main	Returns to the main screen.

8262 BRI Card Settings

Figure BRI-11 shows the 8262 BRI main screen.

```
Node_1          | U1 BRI-STx8   8262  Rev E2-0  Ser 00047  | 12-31-99  14:33
Version: #1.8
                  1      2      3      4      5      6      7      8
STATE           stdby  stdby  stdby  stdby  stdby  stdby  stdby  stdby
TERMINAL        nt-pp  nt-pp  nt-pp  nt-pp  nt-pp  nt-pp  nt-pp  nt-pp
TYPE            lease  lease  lease  lease  lease  lease  lease  lease
B MODE          none   none   none   none   none   none   none   none
B1 WAN/SRV      none   none   none   none   none   none   none   none
B1 TS           n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a
B2 WAN/SRV      none   none   none   none   none   none   none   none
B2 TS           n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a
D WAN           none   none   none   none   none   none   none   none
D TS            n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a
D SUBCHAN       n/a    n/a    n/a    n/a    n/a    n/a    n/a    n/a
LOCAL LB        off    off    off    off    off    off    off    off
LB CHAN         B1     B1     B1     B1     B1     B1     B1     B1
LBGEN MD        ddsT   ddsT   ddsT   ddsT   ddsT   ddsT   ddsT   ddsT
LB GEN          off    off    off    off    off    off    off    off
RCVE            noTst  noTst  noTst  noTst  noTst  noTst  noTst  noTst
TR COND         off    off    off    off    off    off    off    off




Save | Undo | Refresh | Copy | conVert | Eoc | Ntu | Test | Perf | Main
```

Figure BRI-11. BRI Main Screen (8262)

8262 BRI Card Main Screen Parameter Options

Table BRI-19 lists the parameters controlled on the screen along with their possible settings. Default values in the option lists are identified in **bold** type.

Table BRI-19. 8262 BRI Card Parameter Options and Defaults

Parameter	User Options	Default
STATE	stdby actv	stdby
TERMINAL	nt-pp nt-sb nt-eb te	nt-pp
TYPE	lease brite iw	lease
B MODE	none B1 B2 B1+B2 128K	none
B1 WAN/SRV	none w1-1 w1-2 w2-1 w2-2 w3-1 w3-2 w4-1 w4-2 P1 P2 P3	none
B1 TS	n/a 01-24 01-31	n/a
B2 WAN/SRV	none w1-1 w1-2 w2-1 w2-2 w3-1 w3-2 w4-1 w4-2 P1 P2 P3	none
B2 TS	n/a 01-24 01-31	n/a
D WAN	none w1-1 w1-2 w2-1 w2-2 w3-1 w3-2 w4-1 w4-2 P1 P2 P3	none
D TS	n/a 01-24 01-31	n/a
D SUBCHAN	n/a off 1 2 3 4	n/a
LOCAL LB	off ta net	off
LB CHAN	B1 B2 B1+B2	B1
LBGEN MD	ddsT ddsN v54T v54N ft1T ft1N	ddsT
LB GEN	off B1ocu B1csu B1ds0 B1dsu B2ocu B2csu B2ds0 B2dsu	off
RCVE	noTst cdVol	noTst
TR COND	n/a off on	off

NOTES

1. SRV functions (P1, P2 and P3) may be activated from the conVert screen when an ADPCM server is installed.
2. D-Channels will only show if **brite** is selected for Type.
3. These choices are only available for LB GEN Modes of ddsT and ddsN. See LB GEN paragraph below.

STATE

Set the State option to **stdby** (standby) for ports that are not in use or not yet configured; set it to **actv** (active) for ports that are ready for use. The default is **stdby**.

TERMINAL

The 8262 Terminal setting allows the port to be set as an **nt-pp** (network termination point-to-point), **nt-sb** (network termination short-bus), **nt-eb** (network termination extended-bus) or **te** (terminal equipment) device. The default for the 8262 is **nt-pp**.

TYPE

The Type setting determines the type of BRI connection for this port. The options available are **lease** (a permanent circuit), **brite** (BRI Terminal Emulation), **iw** (interworking) and **ntu_l** (Network Terminating Unit **-** Lease, 8260 and 8261 only).

B MODE

Determines the B channel usage for this port. **none** disables access to both B WANs. Setting the highlighted port to **B1** assigns only one B channel. Selecting **B1** enables the B1 WAN and B1 TS and disables the B2 WAN and B2 TS. Setting the port to **B2** enables the B2 WAN and B2 TS and disables the B1 WAN and B1 TS.

Selecting **B1+B2** enables both the B1/B2 WANs and TSs. Any WAN and any timeslot can be assigned to either B channel.

Setting the port to **128K** tells the system that a 128kbps "pipe" is required for the DTE equipment. Selecting **128K** enables both the B1/B2 WANs and TSs. Both B channels must be assigned to the same WAN.

B1 WAN/SRV

The WAN setting identifies the WAN link for the first B channel assigned to this port. It is not necessary for all 8 ports on the same card to be assigned to the same WAN link, or to contiguous time slots on a WAN link. The **serv** port is set from conVert screen.

B1 TS

The TS setting identifies the time slot on the WAN link for the first B channel assigned to this port. Values range from **1-24** for T1 links and **1-31** for E1 links. Time slot 16 is not available on E1 links that are programmed for **cas** or **ccs** signaling. **Use the up and down arrow keys to scroll through the time slots.** For a display of the available time slots, refer to the cross-connect map for the WAN link. See the Operations chapter for information about viewing cross-connect maps. There is no assignment to a server.

B2 WAN/SRV

The WAN setting identifies the WAN link for the second B channel assigned to this port. If **128K** is selected for the B Mode, the second B channel must be assigned to the same WAN link as the first B channel. The **serv** port is set from conVert screen.

B2 TS

The TS setting identifies the time slot on the WAN link for the second B channel assigned to this port. Values range from **1-24** for T1 links and **1-31** for E1 links. Time slot 16 is not available on E1 links that are programmed for **cas** or **ccs** signaling. **The up and down arrow keys are used to scroll through the time slots.** There is no assignment to a server.

D WAN

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

D TS

The TS setting identifies the time slot on the WAN link for the D channel assigned to this port for **brite** circuits. Values range from **1-24** for T1 links and **1-31** for E1 links. Time slot 16 is not available on E1 links that are programmed for **cas** or **ccs** signaling.

D SUBCHAN

The D Subchannel option allows users to employ a full DS0 for the D channel or split the DS0 into four 16kbps sections to allow D channels to be combined into a single 64kbps DS0. D subchannels must be used on the same BRI card only.

LOCAL LB

The Local Loopback setting controls the direction of the local loopback. The settings are **off** (no loopback), **ta** (loopback toward the terminal adapter) and **net** (loopback toward the network).

LB CHAN

The Loopback Channel setting places the local loopback on either **B1** (the first B channel), **B2** (the second B channel) or **B1+B2** (both B channels).

LBGEN MD

The Loopback Generation Mode specifies the type of loopback to be placed on the circuit. The BRI card only generates loopback codes, it does not detect loopback codes. The options are **ddsT** (DDS loopback on the terminal side of the line), **ddsN** (a DDS loopback on the network side of the line), **v54T** (V.54 loopback toward the terminal), **v54N** (V.54 loopback toward network), **ft1T** (fractional T1 loopback toward the terminal), **ft1N** (fractional T1 loopback toward the network).

LB GEN

The Loopback Generation option specifies different loopback codes depending on the selection of loopback generation mode above. The options for **ddsT** and **ddsN** are **off** (no loopback), **B1ocu** (an OCU loopback on the first B channel), **B1csu** (a CSU loopback on the first B channel), **B1ds0** (a full DS0 loopback on the first B channel), **B1dsu** (a DSU loopback on the first B channel), **B2ocu** (an OCU loopback on the second B channel), **B2csu** (a CSU loopback on the second B channel), **B2ds0** (a full DS0 loopback on the second B channel) and **B2dsu** (a DSU loopback on the second B channel).

The options for **v.54T**, **v.54N**, **ft1T** and **ft1N** are **off** (no loopback), **B1** (v.54 or Ft1 loopback on the first B channel), **B2** (v.54 or Ft1 loopback on the second B channel) and **B1+B2** (v.54 or Ft1 loopback on the both B channels).

If the loopback is directed toward the terminal, the loopback pattern selected will not start until the U-ST parameter on the test screen shows the status of **actv**. (See the Test section for further information about the U-ST parameter).

RCVE

The settings are **noTst** (no code violation test) and **cdVol** (code violation test). If cdVol is set and a code violation is detected, the card sends an interrupt toward the network line.

TR COND

The Trunk condition (TR COND) setting allows the BRI card to pass trunk conditions from the network to the U/ST interface when set to **on**. Setting the TR COND state to **off** prevents passing the condition through the card.

Menu of Actions

Table BRI-20. BRI Card Main Screen Menu of Actions

Action	Function
Save	Saves changes to settings.
Undo	Returns all settings to the last saved state.
Refresh	Updates certain time-related information fields that are not automatically updated (i.e. performance and test data).
Copy	Copies the contents of the current column (except timeslot) to the next column. Useful if a user changes a lot of entries in one column and wants to repeat those changes in subsequent columns.
con**V**ert	The Conversion feature allows the B channels to be used with ADPCM compression features. See the Conversion section.
Eoc	Embedded Operations Channel (not yet supported)
Ntu	Network Terminating Unit programming. (not applicable to 8262).
Test	Initiates and monitors testing of all BRI card ports. See Test section.
Perf	Shows the performance statistics for the port highlighted. See the Performance Monitoring section. Not implemented in S/T card.
Main	Returns to the main terminal screen. If changes are made to settings and not saved, users will be prompted to save or lose changes.

Conversion

The conversion feature (conVert) for the 8262 is the same as for the 8260/8261 and will not be repeated here.

Test

Selecting **Test** from the Main Screen Menu of Actions for the 8262 brings up the screen shown in Figure BRI-12. The test screen lets users create test situations between BRI Cards or between a single BRI Card and data test equipment at a remote site. Table 8G-21 lists the options and displayed values on this screen. Values of parameters to be entered (if any) are listed at the top of the User option cell for the field, with the default shown in **bold** type.

```
Node_1         | U1  BRI-STx8  8262  Rev E2-0  Ser 00047  | 12-31-99  14:33

Version: #1.5
               1      2      3      4      5      6      7      8
BERT          off    off    off    off    off    off    off    off
DIR           ta     ta     ta     ta     ta     ta     ta     ta
CHAN          B1     B1     B1     B1     B1     B1     B1     B1
SYNC          no     no     no     no     no     no     no     no
BE            0      *****  *****  *****  *****  *****  *****  *****
ES            0      *****  *****  *****  *****  *****  *****  *****
SES           0      *****  *****  *****  *****  *****  *****  *****
CSES          0      *****  *****  *****  *****  *****  *****  *****
OSS           0      *****  *****  *****  *****  *****  *****  *****
BER           0e-0   *****  *****  *****  *****  *****  *****  *****
ELAP          0      *****  *****  *****  *****  *****  *****  *****
L1-ST         actv   *****  *****  *****  *****  *****  *****  *****
LB ST         off    *****  *****  *****  *****  *****  *****  *****

Save | Undo | Refresh | InsertErr | Clear | Main
```

Figure BRI-12. BRI 8262 Test Screen

Table BRI-21. 8262 Test Screen Options and Defaults

Parameter	User Options	Default
BERT	off mark space 1:1 1:7 p_1 p_0 p_1:1 p_1:7	off
DIR	ta net	ta
CHAN	B1 B2 128K D	B1
SYNC	yes no	no
BE	see description below	
ES	see description below	
CSES	see description below	
OSS	see description below	
BER	see description below	
ELAP	see description below	
L1-ST	actv, fail, or init	actv
LB ST	off, ta, or net	off

BERT

Bit Error Rate Tester (BERT) sends a data pattern and measures the bit error rate (BER) on the selected BRI port. Depending upon whether the test is on B channels or D channels, the patterns can be sent as either raw data or as HDLC packets containing the patterns. BERT can only be sent on one port at a time.

For a B channel test, the patterns that can be selected are **off**, **mark** (1111), **space** (0000), **1:1** (1010), **1:7** (0100-0000), **p_1** (packet, 1111), **p_0** (packet, 0000), **p_1:1** (packet, 1010) and **p_1:7** (packet, 0100-0000).

If the D channel is selected, the patterns that can be selected are **off**, **p_1** (packet, 1111), **p_0** (packet, 0000), **p_1:1** (packet, 1010) and **p_1:7** (packet, 0100-0000).

DIR

Selects the direction of the test. The options are **ta**, toward the Terminal Adapter (customer site) or **net**, toward the Network (carrier).

CHAN

Selects the side of the line on which the BER pattern will be sent. The options are **B1** (BERT on B channel #1), **B2** (BER is on B channel #2), **128K** (BERT is on the 128K pipe) and **D** (BERT is on the D channel).

SYNC

Synchronization (SYNC) displays **yes** if the integrated BERT has achieved synchronization either with itself via a remote loopback or with the remote test equipment, **no** if it has not.

BE

Bit Error (BE) displays the total number of bit errors logged.

ES

Errored Seconds (ES) displays the total number of seconds in which errors were detected.

SES

Severely Errored Seconds (SES) shows the total number of seconds in which the bit error rate exceeded one bit per thousand (1 x 10^{-3}).

CSES

Consecutive Severely Errored Seconds (CSES) is triggered by the occurrence of ten consecutive Severely Errored Seconds. Once triggered, the CSES field will increment (by one) for each elapsed second until the system logs ten consecutive non-Severely Errored Seconds.

OSS

Out of Synchronization Seconds (OSS) shows the number of seconds that the BRI BERT has been out of synchronization.

BER

Bit Error Rate (BER) shows the rate at which errors are being logged. BER equals the number of bit errors (BE) divided by the total number of bits transmitted during the test.

ELAP

Elapsed time (ELAP) is the total number of seconds elapsed during the test.

L1-ST

L1-ST (L1-STATE) displays the condition for the selected port. Possible states are: **actv**, **fail**, or **init.**

LB ST

Loopback State (LB STATE) indicates the local loopback selected on the main screen for this port. Possible states are: **off**, **ta**, or **net**.

Setting Terminal Type Jumpers on the 8261

Setting or resetting jumpers is necessary for conversion of individual ports on the 8261 from Network Terminal (**nt**) to Line Terminal (**lt**). Cards are shipped with Network Terminal as the default (jumpers closed). To make the conversion, remove the BRI card from its slot and remove shorting jumpers across the jumpers labeled **J101-J801** (the first digit [e.g. 101] is the port number indicator) on both sets of pins next to the front edge of the card as shown in Figure BRI-13.

Ports can be set individually for the **lt** feature, but once set, remain in the **lt** mode until the jumpers are reattached.

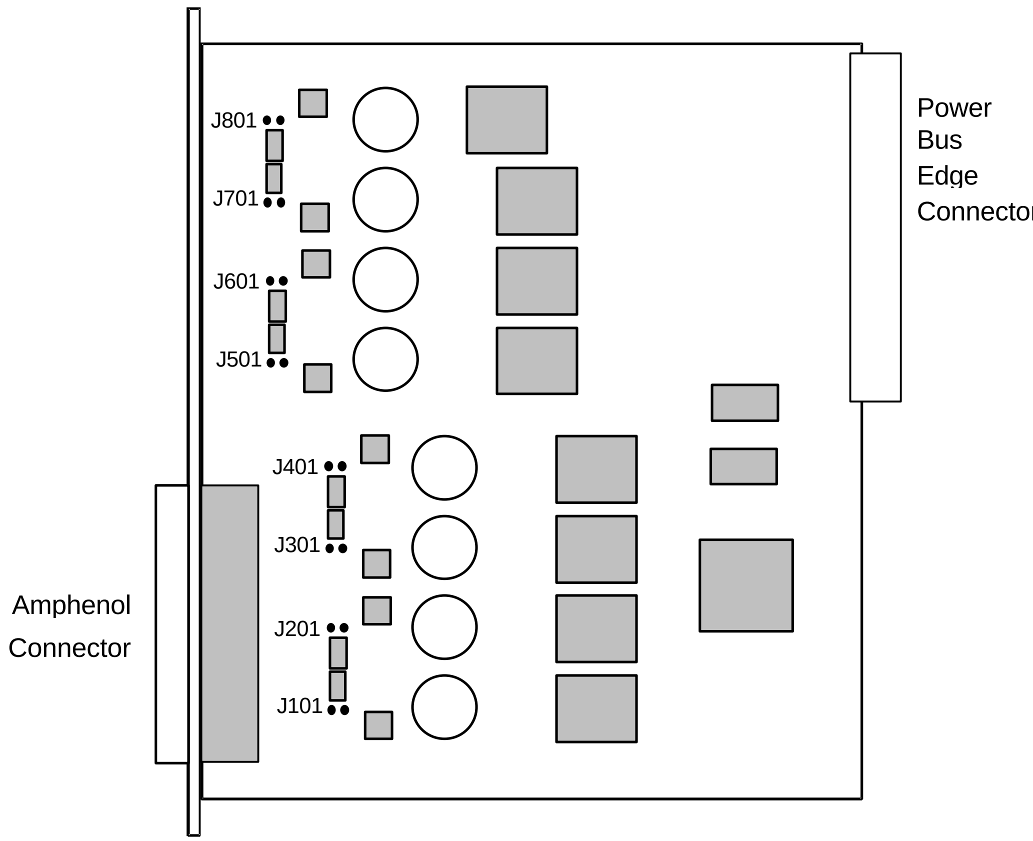


Figure BRI-13. LT-NT Jumper Locations on the 8261 BRI Card

Setting Sealing Current Jumpers on the 8261

Setting or resetting jumpers is necessary for conversion of individual ports on the 8261 from 15mA to 7.5mA of sealing current. Cards are shipped with 15mA as the default (jumpers closed). To make the conversion, remove the BRI card from its slot and remove shorting jumpers across the pins labeled **J102-J802** (the first digit [e.g. 102] is the port number indicator) on both sets of pins next to the front edge of the card as shown in Figure BRI-14.

Ports can be set individually for 7.5mA but, once set, remain in that setting until the jumpers are reattached.

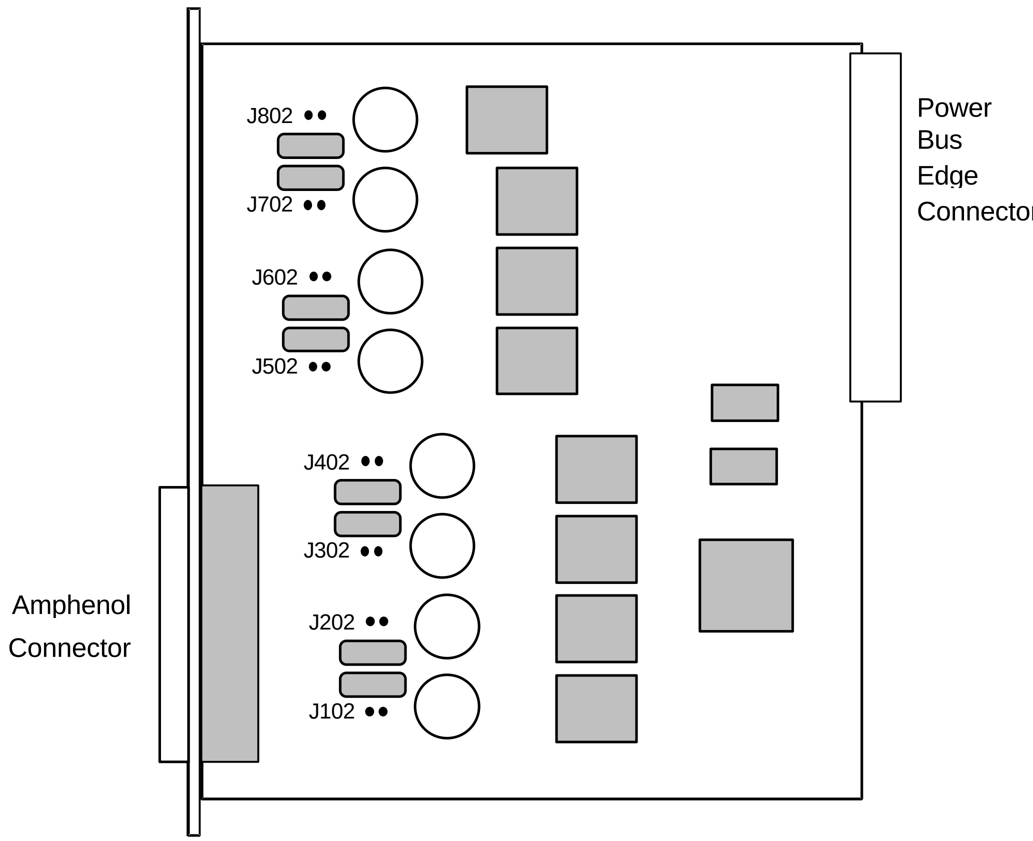


Figure BRI-14. Sealing Current Jumper Locations on the 8261 BRI Card

Setting Jumpers on the 8262

As shown in Figure BRI-15, there are 4 jumper options, JPx01, JPx02, JPx03 and JPx04, for each of the eight (8) BRI ports. (The "x" indicates the numbers 1 through 8.)

Jumpers JPx02, when installed, applies the XMT 100 Ohm termination. Jumpers JPx03, are installed as the default to apply the RCV 100 Ohm termination. The actual network design determines the setting of these termination's.

Jumpers JPx01 and JPx04 are installed (ON) to provide either internal (INT) or external (EXT) -48v power to the phantom leads based upon the setting of JP5 and JP6 (see markings on the 8262 board). When the JPx01 and JPx04 jumpers are ON, they provide power out on the cable pair. When OFF, there is no power out on the cable pair.

The jumper defaults are as follows:

Phantom Power - ON/OFF (Jx01 and Jx04) are default = ON
Phantom Power Source - Int/Ext (JP5 & JP6) are default = External
100 Ohm Term - Xmt OUT, Rcv IN

If external power is used, jumpers JP5 and JP6 ***must*** *be set to* **EXTERNAL** *mode. Failure to do so could damage or destroy the card or system.*

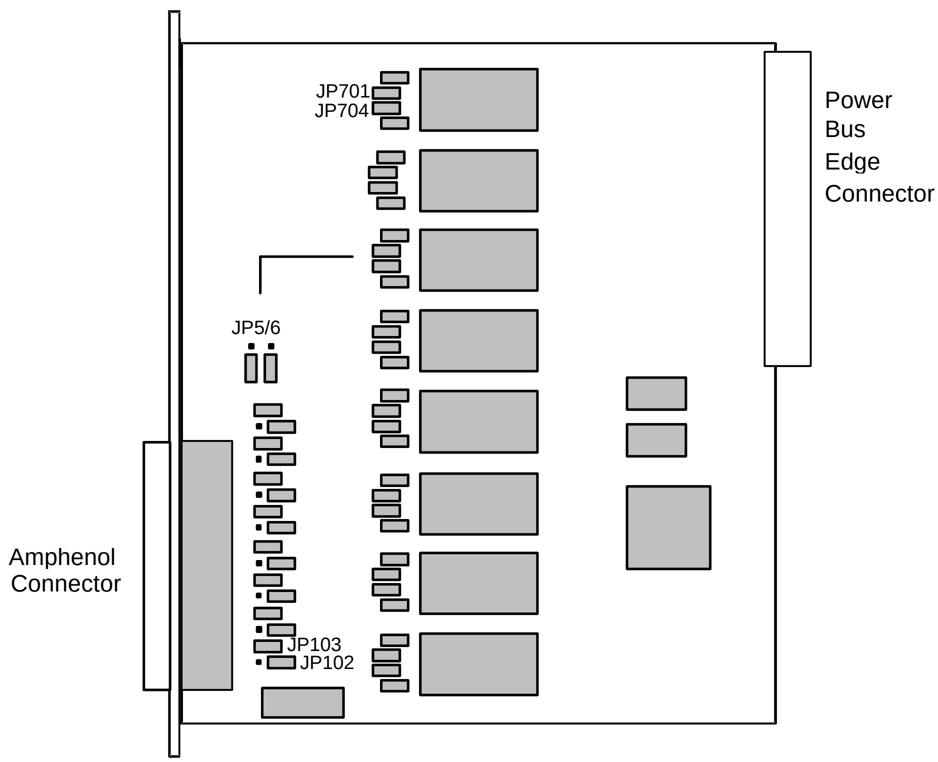


Figure BRI-15. Jumper Locations on the 8262 BRI Card

Introduction

This chapter describes the pinouts of the card connectors used to attach circuits and devices to the integrated access system complex. The front view of the two-sided chassis is shown in Figure Pinouts-1. The two-sided unit was designed so that all cabling would be done at the back of the chassis shown in Figure Pinouts-2. All front-loading chassis were designed so that all cabling would be done at the front of the chassis, as seen in Figure Pinouts-3 through Figure Pinouts-5. The number and type of connectors needed will vary with the card installed. Each card that requires cabling is shown in this chapter, the connector is described, and the pinouts labeled.

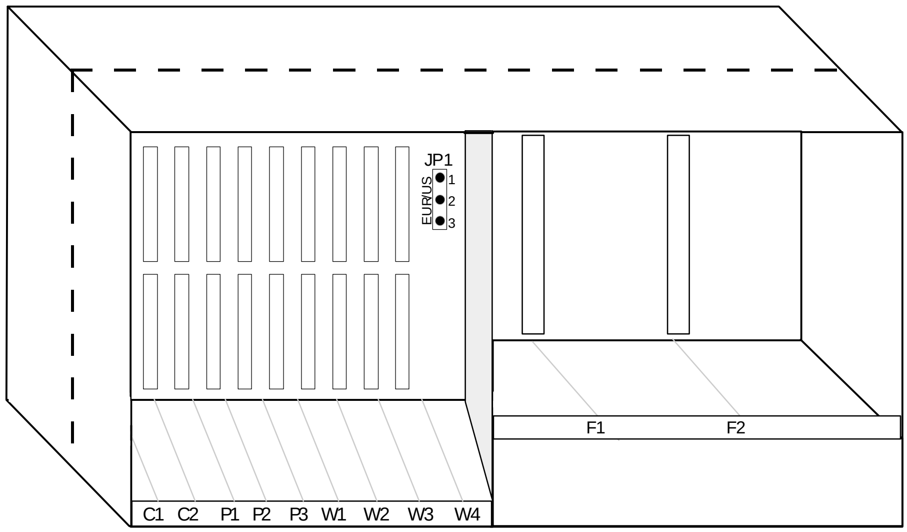


Figure Pinouts-1. 891822/891823 Two-Side Chassis, Front View

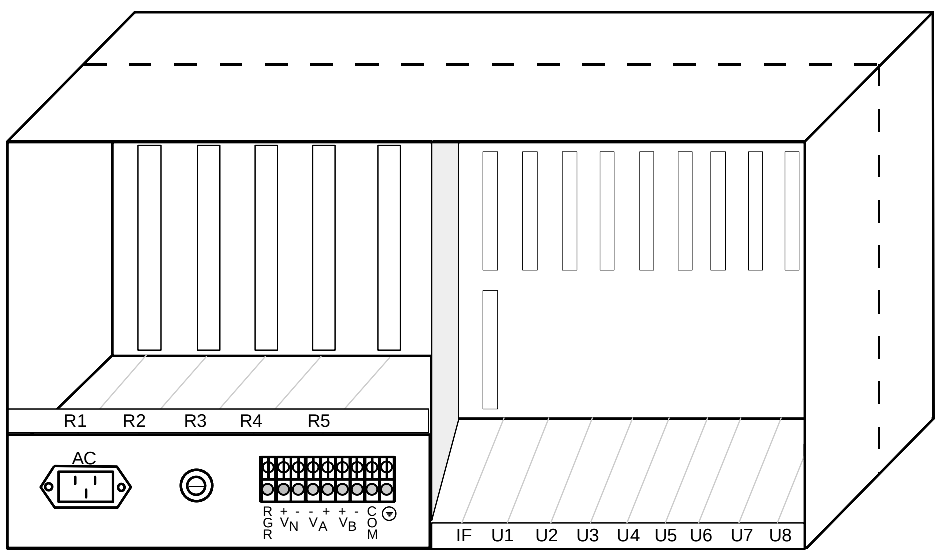


Figure Pinouts-2. 891822/891823 Two-Sided Chassis, Back View

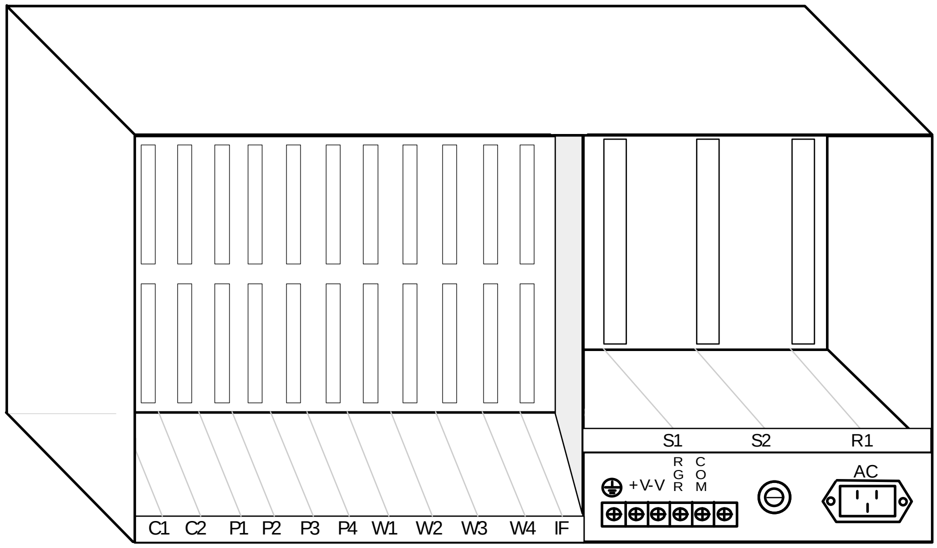


Figure Pinouts-3. 8916 Front-Loading Chassis.

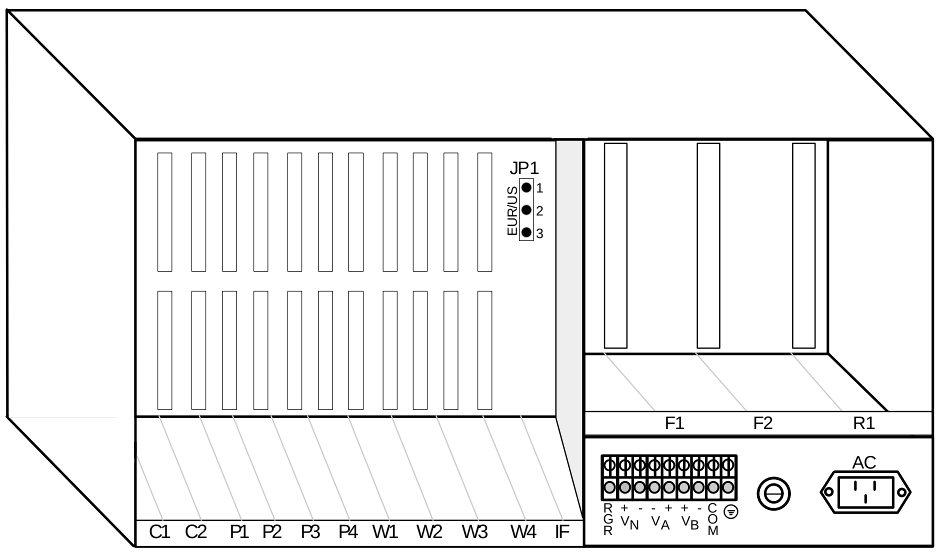


Figure Pinouts-4. 891620 Front-Loading Chassis.

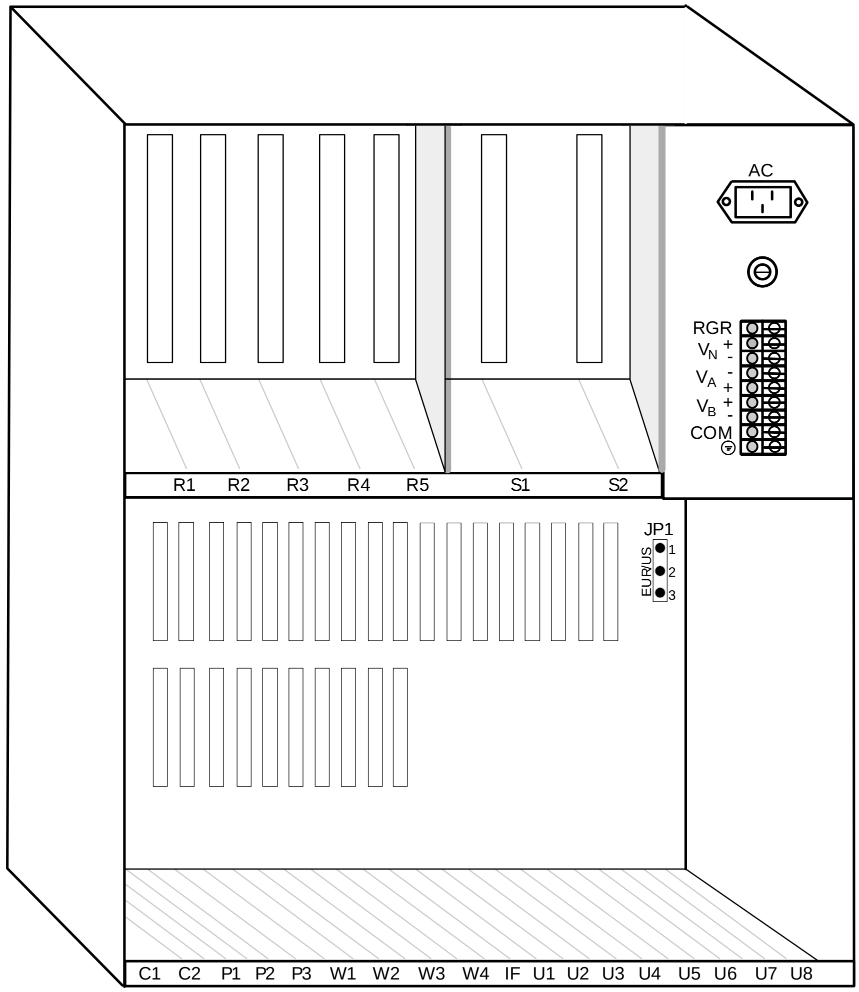


Figure Pinouts-5. 891920 Front-Loading Chassis.

Interface Cards (8920 and 8921)

The 8920 and 8921 Interface Cards must be installed in slot IF on all units. The interface card connectors are arranged as shown in Figure Pinouts-6. The 8920 has a DB9 (DTE Male) serial port. The 8921 is similar to the 8920 in all aspects except there is not modem jack.

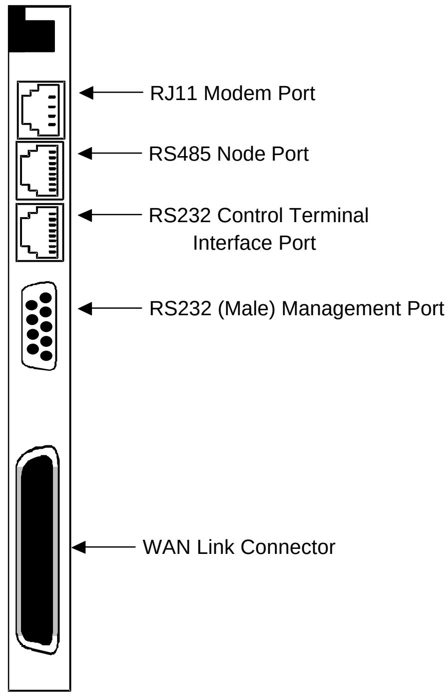


Figure Pinouts-6. Interface Card Connectors (8920 and 8921)

This section describes the interface card connectors from the bottom to the top of the card.

WAN Link Connector

The WAN link connector allows you to connect the WAN card ports to incoming and outgoing T1/E1 lines. It has the following characteristics:

Connector:	50-pin RJ27X
Gender:	Female

Figure Pinouts-7 shows the pinouts for this connector, while Table Pinouts-1 lists the pin assignments. Electrical signals comply with T1/E1 specifications.

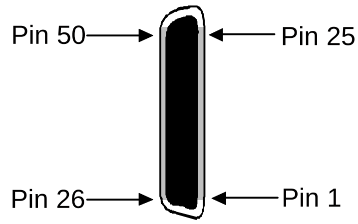


Figure Pinouts-7. WAN Link Connector

Table Pinouts-1. WAN Link Pin Assignments

WAN Link	Designation	Pin #	Function
WAN 1-1	TI	47	Rx from Network
WAN 1-1	RI	22	Rx from Network
WAN 1-1	T	48	Tx to Network
WAN 1-1	R	23	Tx to Network
WAN 1-2	TI	44	Rx from Network
WAN 1-2	RI	19	Rx from Network
WAN 1-2	T	45	Tx to Network
WAN 1-2	R	20	Tx to Network
WAN 2-1	TI	41	Rx from Network
WAN 2-1	RI	16	Rx from Network
WAN 2-1	T	42	Tx to Network
WAN 2-1	R	17	Tx to Network
WAN 2-2	TI	38	Rx from Network
WAN 2-2	RI	13	Rx from Network
WAN 2-2	T	39	Tx to Network
WAN 2-2	R	14	Tx to Network
WAN 3-1	TI	35	Rx from Network
WAN 3-1	RI	10	Rx from Network
WAN 3-1	T	36	Tx to Network
WAN 3-1	R	11	Tx to Network
WAN 3-2	TI	32	Rx from Network
WAN 3-2	RI	7	Rx from Network
WAN 3-2	T	33	Tx to Network
WAN 3-2	R	8	Tx to Network
WAN 4-1	TI	29	Rx from Network
WAN 4-1	RI	4	Rx from Network
WAN 4-1	T	30	Tx to Network
WAN 4-1	R	5	Tx to Network
WAN 4-2	TI	26	Rx from Network
WAN 4-2	RI	1	Rx from Network
WAN 4-2	T	27	Tx to Network
WAN 4-2	R	2	Tx to Network
All other pins are unconnected.			

1183 Adapter (600 Chassis)

The 1183 Adapter may be used to provide convenient coaxial cable connections for 8 E1 lines. The 1183 Adapter interfaces with the WAN Link Connector. It is shown in Figure Pinouts-8. Jumpers should be set for balanced or unbalanced operation prior to installation. For a discussion of balanced/unbalanced jumper settings please see the WAN section of this manual.

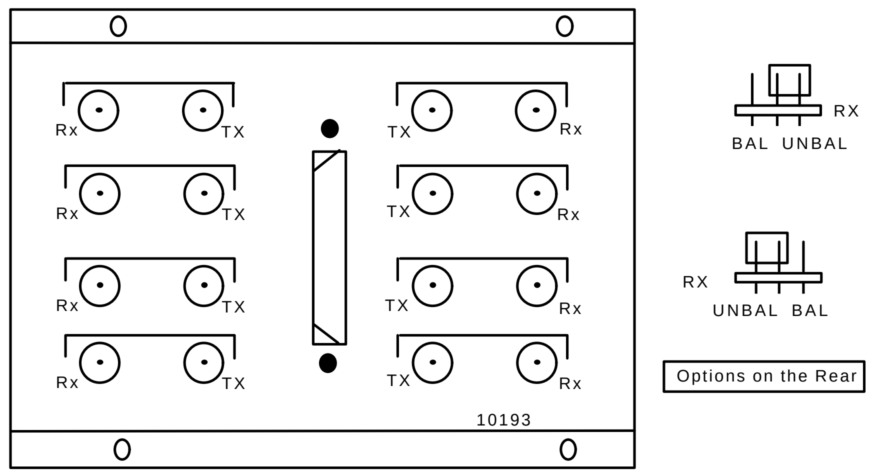


Figure Pinouts-8. 1183 E1 Interface Adapter

1184 Adapter (800 Chassis)

The 1184 Adapter may be used to provide convenient coaxial cable connections for 8 E1 lines. The 1184 Adapter interfaces with the WAN Link Connector. It is shown in Figure Pinouts-9. Jumpers should be set for balanced or unbalanced operation prior to installation. For a discussion of balanced/unbalanced jumper settings please see the WAN section of this manual.

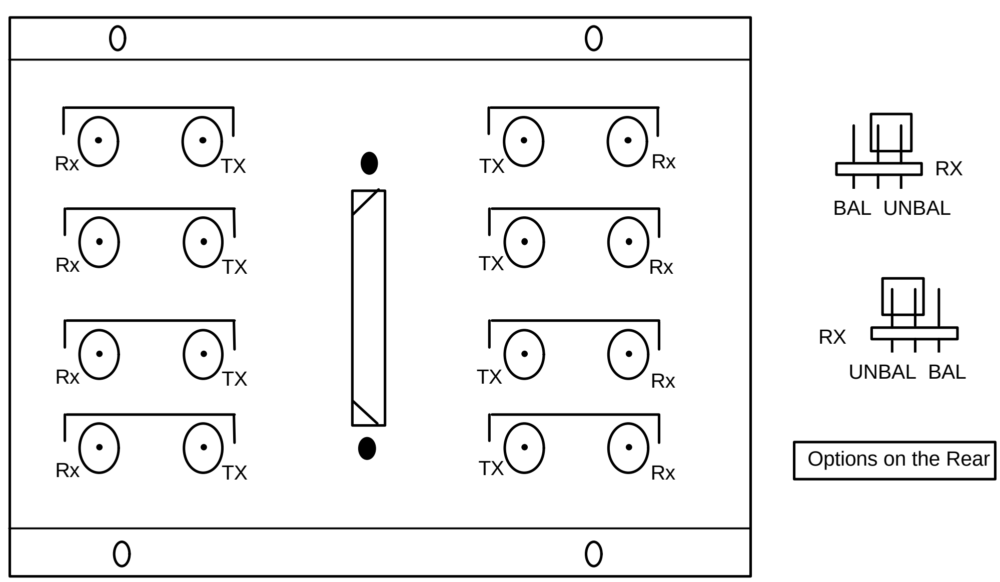


Figure Pinouts-9. 1184 E1 Interface Adapter

RS232 Management Port

The RS232 computer port is used for direct reporting of alarms to an outside device and connecting to the network management system has the characteristics shown in Table Pinouts-2

Table Pinouts-2. RS232 Management Port Characteristics

Connector:	9-pin D-connector	9-pin D-connector
Gender:	male	Male
Standard:	EIA 574	EIA 574
Electrical:	RS232 DTE	RS232 DTE
Card	**8920**	**8921**

The pinouts for the computer port connector are shown at right, while Table Pinouts-3 lists the pin assignments. In the table, “Input” means that data is flowing from the computer to the system.

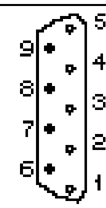


Table Pinouts-3. Management Port Pin Assignments (DB-9)

Pin #	Pin Name	Pin Function	DTE Direction
1	RLSD	Receive Line Signal Detect	IN
2	RxD	Receive Data	IN
3	TxD	Transmit Data	OUT
4	DTR	Data Terminal Ready	OUT
5	S Gnd	Signal Ground	N/A
6	DSR	Data Set Ready	IN
7	RTS	Request to Send	OUT
8	CTS	Clear to Send	IN
9	RI	Ring Indicator	IN

RJ11C Modem Port

The modem port is used to connect the Interface card's internal dial modem to a standard telephone line. This port may be used either to log into the unit from a remote VT100 terminal or to send system alarms to a remote device. The modem port presents an RJ11C female connector. Table Pinouts-5 lists the pin assignments. The modem port has the following characteristics:

Connector: RJ11C receptacle
Gender: Female
Standard: RJ11C
Electrical: 600 ohm, 2-wire

Table Pinouts-5. Modem Port Pin Assignments

Pin #	Function
3	Tip
4	Ring
Pins 1, 2, 5, and 6 are unconnected.	

RS485 Node Port

The RS485 node port has the following characteristics:

Connector: RJ48 receptacle
Gender: Female
Electrical: RS485

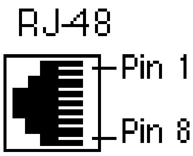


Table Pinouts-6 lists the pin assignments.

Table Pinouts-6. Node Port Pin Assignments

Pin #	Designation	Function
1	+n	Internodal Communications
2	-n	Internodal Communications
3	ANO	Alarm on Open Condition
4	ANC	Alarm on Closed Condition
5	ACOM	Alarm Common Lead (Source)
6	+F	Frame Synchronization
7	-f	Frame Synchronization
8	GND	Chassis Ground

RS232 Control Terminal Interface Port

The RS232 control terminal interface port allows you to connect the system to a VT100 compatible terminal, with which you can send commands to the system. The control terminal interface port characteristics are shown below:

Connector:	RJ48 receptacle
Gender:	Female
Standard:	EIA 561
Electrical:	RS232 DCE

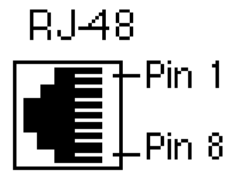


Table Pinouts-7 lists the pin assignments.

Table Pinouts-7. Control Terminal Interface Port Pin Assignment

Pin #	Function	Direction
4	Signal Ground	N/A
5	Receive Data	Output
6	Transmit Data	Input
All other pins are unconnected.		

Interface Card (8925)

The 8925 Interface Card uses RJ48 jacks to terminate two T1 and four Bantam jacks to monitor WAN links and an RS232 control terminal interface port. The computer port, modem port and node port are not available on this interface card. Like the 8920, this card must be installed in slot IF on all units. The interface card connectors are arranged as shown in Figure Pinouts-10. The pinouts for the RJ48 connectors for T1 links are shown in Table Pinouts-8.

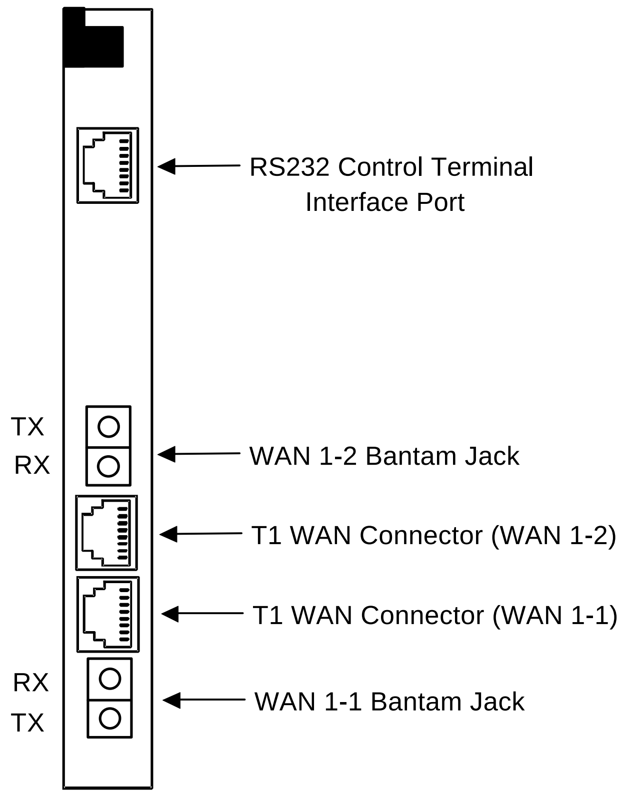


Figure Pinouts-10. 8925 Interface Card Ports

RS232 Control Terminal Interface Port

The RS232 control terminal interface port allows you to connect the system to a VT100 compatible terminal, which you can use to send commands to the system. The port uses a standard RJ48 jack as described for the 8920.

WAN Link Connectors

The WAN connectors allows you to connect the system to two WAN links The terminals are standard RJ48 or Bantam jacks. Table Pinouts-8 lists the pin assignments for each RJ48 and Bantam jack with which it is associated.

Table Pinouts-8. WAN Link and Monitoring Pin Assignments

WAN Link	Designation	Function	RJ-48 Pin	Bantam Pin
WAN 1-1	TI	Rx from Network	2	RX 1
WAN 1-1	RI	Rx from Network	1	RX 2
WAN 1-1	T	Tx to Network	5	TX 1
WAN 1-1	R	Tx to Network	4	TX 2
WAN 1-2	TI	Rx from Network	2	RX 1
WAN 1-2	RI	Rx from Network	1	RX 2
WAN 1-2	T	Tx to Network	5	TX 1
WAN 1-2	R	Tx to Network	4	TX 2
All other pins are unconnected.				

Interface Card (8926)

The 8926 Interface card is similar to the 8925 Interface card with the addition of the computer port, node port and modem port. Like the 8920, this card must be installed in slot IF on all units. The interface card connectors are arranged as shown in Figure Pinouts-11. The pinouts for the RJ48 connectors for T1 links are the same as those shown for the 8925 Interface card (see Table Pinouts-9). The pinouts for the DB9, RJ48 and RJ11 connectors are the same as those shown for the 8920 Interface card.

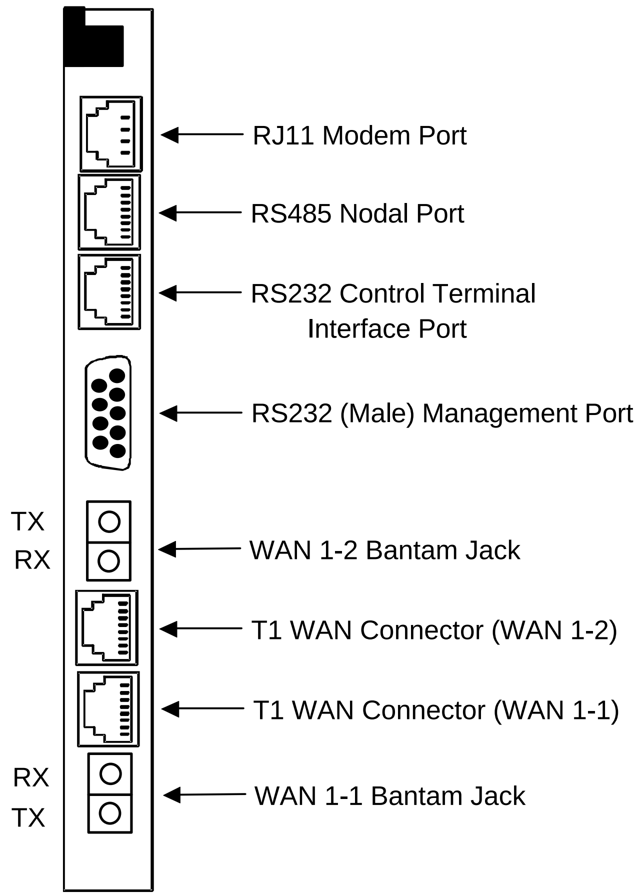


Figure Pinouts-11. 8926 Interface Card Port

Interface Card (8927)

The 8927 Interface Card uses BNC connectors to terminate two E1 WAN links, a DB9 management port, an RJ48 control terminal interface port and an RJ48 node port. Like the 8920 and 8925, it must be installed in slot IF on all units. The interface card connectors are arranged as shown in Figure Pinouts-12. The pinouts for the DB9 and RJ48 connectors are the same as those shown for the 8920 Interface card.

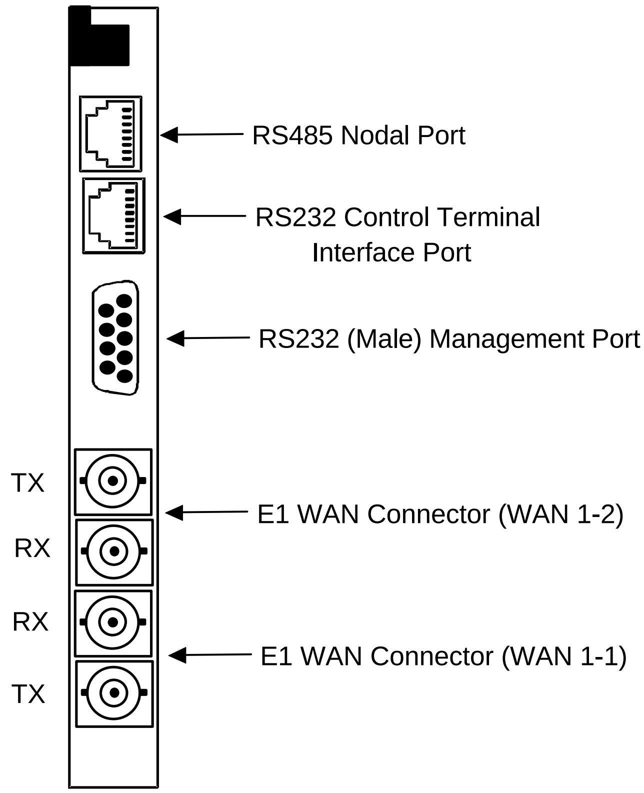


Figure Pinouts-12. 8927 Interface Card Port

External Alarm Card (8401 and 8402)

External Alarm cards can be installed in any user card slot, U1-U-8 on the 8918 two-sided chassis or 8919 front-loading chassis, and P1-P4 or W1-W4 on the 8916 front-loading chassis. These cards enable the integrated access system to respond to four external alarms (three alarms for the 8402) for control of environmental and security conditions, and four internal alarms (three alarms for the 8402) to outside alarm indicators (for example, a critical alarm lights a red light).

Each inbound alarm sensor has the capability of responding to one external condition. The alarms appear on the screen in the alarm section, showing the alarm as a SENSOR alarm and includes the slot number and sensor number of the condition (i.e., SENSOR U7-4).

The inbound alarm sensors may be optioned to accept either 12 or 48v. Both JP1 and JP2 jumpers should be set to the proper inbound voltage. The inbound sensors are isolated from ground.

Each outbound "floating" relay (normally open contacts and normally closed contacts) responds to system alarm categories (major [major and critical] and minor [minor and informational]) and activates an external device. There are two relays for each of the four Alarm Card ports. The relays are dual-pole, double-throw.

The External Alarm Card has an RJ27X (female) 50-pin Amphenol connector located on the faceplate of the card. Figure Pinouts-13 shows the pinouts for the connector and Table Pinouts-9 shows the pin assignments for both inbound sensor alarms and outbound internal alarm indicators.

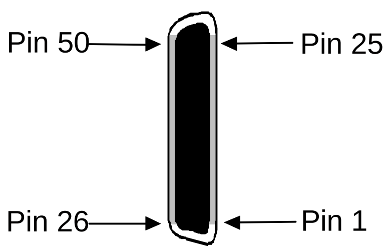


Figure Pinouts-13. External Alarm Card Connector Pinouts

Table Pinouts-9. External Alarm Card Pin Assignments

Inward Alarms		
Sensor	**Designation**	**Pin**
1	R1	1
	T1	26
2	R2	2
	T2	27
3	R3	3
	T3	28
4	R4	4
	T4	29

Outward Alarms			
Relay	**Source**	**Norm Close**	**Norm Open**
R1(A)	7	6	8
R1(B)	32	31	33
R2(A)	11	10	12
R2(B)	36	35	37
R3(A)	15	14	16
R3(B)	40	39	41
R4(A)	19	18	20
R4(B)	44	43	45

External Alarm Card (8403)

The 8403 External Alarm Card has two Amphenol connectors, J3 (lower) and J4 (upper), located on the card front to interface the sensors and switches (see Figure Pinouts-14). The pin positions are displayed in Figure Pinouts-15. Pin assignments for sensors are documented in Table Pinouts-10, while the pin assignments for switches are displayed in Table Pinouts-11.

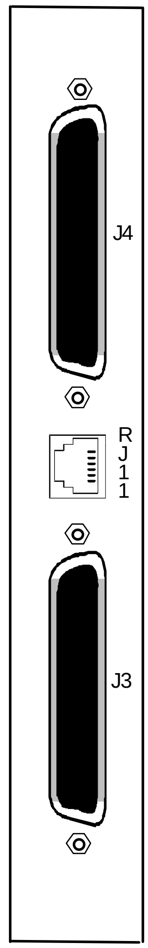


Figure Pinouts-14. External Alarm Card (8403) Connectors.

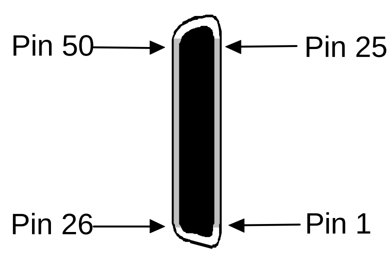


Figure Pinouts-15. External Alarm Card (8403) J3/J4 Pinouts

Table Pinouts-10. External Alarm Card (8403) Sensor Pin Assignments

Sensor	Desig.	J3 Connector Pin #
1	sense -	12
	sense +	37
2	sense -	13
	sense +	38
3	sense -	14
	sense +	39
4	sense -	15
	sense +	40
5	sense -	16
	sense +	41
6	sense -	17
	sense +	42
7	sense -	18
	sense +	43
8	sense -	19
	sense +	44
9	sense -	20
	sense +	45
10	sense -	21
	sense +	46
11	sense -	22
	sense +	47
12	sense -	23
	sense +	48
13	sense -	24
	sense +	49
14	sense -	25
	sense +	50

Sensor	Desig.	J4 Connector Pin #
15	sense -	12
	sense +	37
16	sense -	13
	sense +	38
17	sense -	14
	sense +	39
18	sense -	15
	sense +	40
19	sense -	16
	sense +	41
20	sense -	17
	sense +	42
21	sense -	18
	sense +	43
22	sense -	19
	sense +	44
23	sense -	20
	sense +	45
24	sense -	21
	sense +	46
25	sense -	22
	sense +	47
26	sense -	23
	sense +	48
27	sense -	24
	sense +	49
28	sense -	25
	sense +	50

Table Pinouts-11. External Alarm Card (8403) Switch Pin Assignments

Switch #	Contact Type Form	Desig.	J3 Connector Pin #	Switch #	Contact Type Form	Desig.	J4 Connector Pin #
1	**C**	Open	2	8	**C**	Open	27
		Close	1			Close	26
		Comm	3			Comm	28
2	**C**	Open	27	9	**C**	Open	2
		Close	26			Close	1
		Comm	28			Comm	3
3	**A**	Open	---	10	**B**	Open	4
		Close	4			Close	---
		Comm	29			Comm	29
4	**C**	Open	6	11	**C**	Open	6
		Close	5			Close	5
		Comm	7			Comm	7
5	**C**	Open	31	12	**C**	Open	31
		Close	30			Close	30
		Comm	32			Comm	32
6	**C**	Open	9	13	**C**	Open	9
		Close	8			Close	8
		Comm	10			Comm	10
7	**C**	Open	34	14	**C**	Open	34
		Close	33			Close	33
		Comm	35			Comm	35

The jumper pairs that correspond to each sensor are numbered accordingly. For example, the jumper pairs for sensor #12 are those in row SI12 of the lower jumper group (columns JP1 and JP2). The jumper pairs that correspond to sensor #25 are those in row SI25 of the upper jumper group (columns JP3 and JP4).

The outside pin of each jumper pair carries voltage, while the inside pins are passive, as shown in Figure Pinouts-15. The outside (left) pins for the jumper pairs in columns JP1 and JP3 carry positive (+) voltage, while the outside (right) pins for the jumper pairs in columns JP2 and JP4 carry negative (-) voltage.

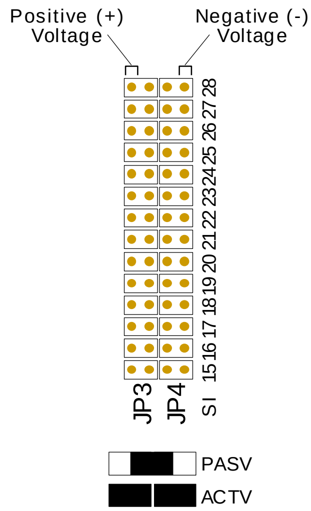


Figure Pinouts-16. Jumper Pair Assignments.

Between the Amphenol connectors is a standard RJ11 connector to interface the voice port. The pin positions for this connector are shown in Figure Pinouts-17, while its pin assignments are shown in Table Pinouts-12. The RJ11 port, which may be used to send system alarms to a remote device, has the following characteristics:

Connector:	RJ11 receptacle
Gender:	Female
Standard:	RJ11
Electrical:	600Ω 2-wire

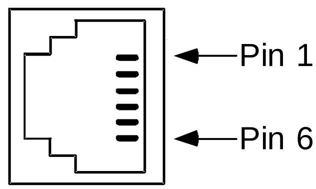


Figure Pinouts-17. RJ11 Port

Table Pinouts-12. RJ11 Port Pin Assignments

Pin #	Function
3	Ring
4	Tip
All other pins are unconnected.	

E&M Card (8108)

The 2-wire, eight-port 8108 E&M Card can be installed in any user card slot, U1-U-8 on the 8918 two-sided chassis or 8919 front-loading chassis, and P1-P4 or W1-W4 on the 8916 front-loading chassis. This card allows you to connect the integrated access system to 2-wire analog voice equipment with E&M signaling.

The 8108 E&M Card has an RJ27X (female) 50-pin Amphenol connector located on the faceplate of the card. Figure Pinouts-18 shows the pinouts for this connector, while Table Pinouts-13 lists the pin assignments.

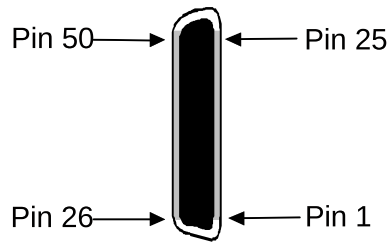


Figure Pinouts-18. 8108 E&M Card Connector

Table Pinouts-13. 8108 E&M Card Connector Pin Assignments

Port #	Designation	Pin #
1	T	26
1	R	1
1	E	28
1	M	3
2	T	29
2	R	4
2	E	31
2	M	6
3	T	32
3	R	7
3	E	34
3	M	9
4	T	35
4	R	10
4	E	37
4	M	12
5	T	38
5	R	13
5	E	40
5	M	15
6	T	41
6	R	16
6	E	43
6	M	18
7	T	44
7	R	19
7	E	46
7	M	21
8	T	47
8	R	22
8	E	49
8	M	24
All channels	SG	25
All channels	SB	50
All other pins are unconnected.		

E&M Card (8115)

The 4-wire, four-port 8115 E&M Card can be installed in any user card slot, U1-U-8 on the 8918 two-sided chassis or 8919 front-loading chassis, and P1-P4 or W1-W4 on the 8916 front-loading chassis. This card allows you to connect the integrated access system to 4-wire analog voice equipment with E&M signaling.

The 8115 E&M Card has an RJ27X (female) 50-pin Amphenol connector located on the faceplate of the card. Figure Pinouts-19 shows the pinouts for this connector, while Table Pinouts-14 lists the pin assignments.

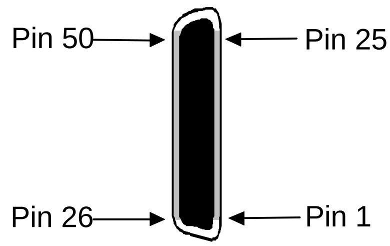


Figure Pinouts-19. 8115 E&M Card Connector

Table Pinouts-14. 8115 E&M Card Connector Pin Assignments

Port #	Designation	Pin #
1	T	26
1	R	1
1	T1	27
1	R1	2
1	E	28
1	M	3
2	T	29
2	R	4
2	T1	30
2	R1	5
2	E	31
2	M	6
3	T	32
3	R	7
3	T1	33
3	R1	8
3	E	34
3	M	9
4	T	35
4	R	10
4	T1	36
4	R1	11
4	E	37
4	M	12
All channels	SG	25
All channels	SB	50
All other pins are unconnected.		

E&M Card (8118)

The 4-wire, eight-port 8118 E&M card can be installed in any user card slot, U1-U-8 on the 8918 two-sided chassis or 8918 front-loading chassis, and P1-P4 or W1-W4 on the 8916 front-loading chassis. This card allows you to connect the system to four-wire analog voice equipment with E&M signaling.

The 8118 E&M card has an RJ27X (female) 50-pin Amphenol connector located on the faceplate of the card. Figure Pinouts-20 shows the pinouts for this connector, while Table Pinouts-15 lists the pin assignments.

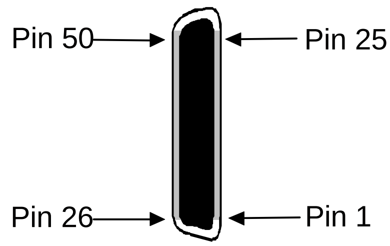


Figure Pinouts-20. 8118 Card Connector

Table Pinouts-15. 8118 Pin Assignments

Port #	Designation	Pin #
1	T	26
1	R	1
1	T1	27
1	R1	2
1	E	28
1	M	3
2	T	29
2	R	4
2	T1	30
2	R1	5
2	E	31
2	M	6
3	T	32
3	R	7
3	T1	33
3	R1	8
3	E	34
3	M	9
4	T	35
4	R	10
4	T1	36
4	R1	11
4	E	37
4	M	12

Table Pinouts-15. 8118 Pin Assignments (cont.)

5	T	38
5	R	13
5	T1	39
5	R1	14
5	E	40
5	M	15
6	T	41
6	R	16
6	T1	42
6	R1	17
6	E	43
6	M	18
7	T	44
7	R	19
7	T1	45
7	R1	20
7	E	46
7	M	21
8	T	47
8	R	22
8	T1	48
8	R1	23
8	E	49
8	M	24
All channels	SG	25
All channels	SB	50

E&M Card (8119)

The 4-wire, eight-port 8119 E&M card can be installed in any user card slot, U1-U-8 on the 8918 two-sided chassis or 8919 front-loading chassis, and P1-P4 or W1-W4 on the 8916 front-loading chassis. This card allows you to connect the system to four-wire analog voice equipment with E&M signaling.

The 8119 E&M card has an RJ27X (female) 50-pin Amphenol connector located on the faceplate of the card. Figure Pinouts-21 shows the pinouts for this connector, while Table Pinouts-16 lists the pin assignments.

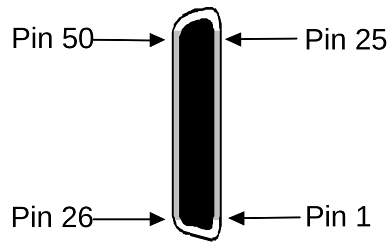


Figure Pinouts-21. 8119 E&M Card Connector

Table Pinouts-16. 8119 Pin Assignments

Port #	Designation	Pin #
1	T	26
1	R	1
1	T1	27
1	R1	2
1	E	28
1	M	3
2	T	29
2	R	4
2	T1	30
2	R1	5
2	E	31
2	M	6
3	T	32
3	R	7
3	T1	33
3	R1	8
3	E	34
3	M	9
4	T	35
4	R	10
4	T1	36
4	R1	11
4	E	37
4	M	12

Table Pinouts-16. 8119 Pin Assignments (cont.)

5	T	38
5	R	13
5	T1	39
5	R1	14
5	E	40
5	M	15
6	T	41
6	R	16
6	T1	42
6	R1	17
6	E	43
6	M	18
7	T	44
7	R	19
7	T1	45
7	R1	20
7	E	46
7	M	21
8	T	47
8	R	22
8	T1	48
8	R1	23
8	E	49
8	M	24
All channels	SG	25
All channels	SB	50

FXS Card (8124 and 8125)

The 2-wire, four-port 8124 and 8125 FXS cards can be installed in any user card slot, U1-U-8 on the 8918 two-sided chassis or 8919 front-loading chassis, and P1-P4 or W1-W4 on the 8916 front-loading chassis. These cards allow you to connect the integrated access system to 2-wire analog voice equipment.

The 8124 and 8125 FXS cards have an RJ27X (female) 50-pin Amphenol connector located on the faceplate of the card. Figure Pinouts-22 shows the pinouts for this connector, while Table Pinouts-17 lists the pin assignments.

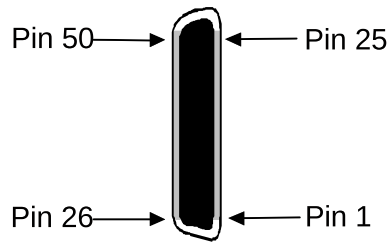


Figure Pinouts-22. 8124 and 8125 FXS Card Connector

Table Pinouts-17. 8124 and 8125 FXS Card Pin Assignments

Port #	Designation	Pin #
1	T1	26
1	R1	1
2	T2	29
2	R2	4
3	T3	32
3	R3	7
4	T4	35
4	R4	10
All other pins are unconnected.		

FXS Card (8128 and 8129)

The 2-wire, eight-port 8128 and 8129 FXS cards can be installed in any user card slot, U1-U-8 on the 8918 two-sided chassis or 8919 front-loading chassis, and P1-P4 or W1-W4 on the 8916 front-loading chassis. These cards allow you to connect the integrated access system to 2-wire analog voice equipment.

The 8128 and 8129 FXS cards have an RJ27X (female) 50-pin Amphenol connector located on the faceplate of the card. Figure Pinouts-23 shows the pinouts for this connector, while Table Pinouts-18 lists the pin assignments.

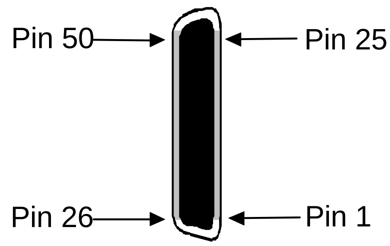


Figure Pinouts-23. 8128 and 8129 FXS Card Connector

Table Pinouts-18. 8128 and 8129 FXS Card Pin Assignments

Port #	Designation	Pin #
1	T1	26
1	R1	1
2	T2	29
2	R2	4
3	T3	32
3	R3	7
4	T4	35
4	R4	10
5	T5	38
5	R5	13
6	T6	41
6	R6	16
7	T7	44
7	R7	19
8	T8	47
8	R8	22
All other pins are unconnected.		

FXO Card (8134 and 8135)

The 2-wire, four-port 8134 and 8135 FXO cards can be installed in any user card slot, U1-U-8 on the 8918 two-sided chassis or 8919 front-loading chassis, and P1-P4 or W1-W4 on the 8916 front-loading chassis. These cards allow you to connect the integrated access system to 2-wire analog voice equipment.

The 8134 and 8135 FXO cards have an RJ27X (female) 50-pin Amphenol connector located on the faceplate of the card. Figure Pinouts-24 shows the pinouts for this connector, while Table Pinouts-19 lists the pin assignments.

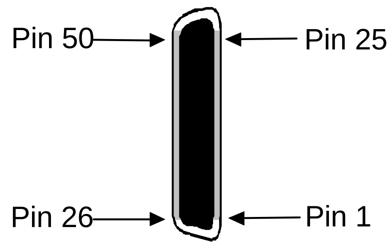


Figure Pinouts-24. 8134 and 8135 FXO Card Connectors

Table Pinouts-19. 8134 and 8135 FXO Card Pin Assignments

Port #	Designation	Pin #
1	T1	26
1	R1	1
2	T2	29
2	R2	4
3	T3	32
3	R3	7
4	T4	35
4	R4	10
All other pins are unconnected.		

FXO Card (8138 and 8139)

The 2-wire, eight-port 8138 and 8139 FXO cards can be installed in any user card slot, U1-U-8 on the 8918 two-sided chassis or 8919 front-loading chassis, and P1-P4 or W1-W4 on the 8916 front-loading chassis. These cards allow you to connect the integrated access system to 2-wire analog voice equipment.

The 8138 and 8139 FXO cards have an RJ27X (female) 50-pin Amphenol connector located on the faceplate of the card. Figure Pinouts-25 shows the pinouts for this connector, while Table Pinouts-20 lists the pin assignments.

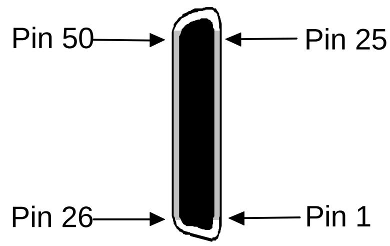


Figure Pinouts-25. 8138 and 8139 FXO Card Connector

Table Pinouts-20. 8138 and 8139 FXO Card Pin Assignments

Port #	Designation	Pin #
1	T1	26
1	R1	1
2	T2	29
2	R2	4
3	T3	32
3	R3	7
4	T4	35
4	R4	10
5	T5	38
5	R5	13
6	T6	41
6	R6	16
7	T7	44
7	R7	19
8	T8	47
8	R8	22
All other pins are unconnected.		

FXS Coin Card (8149)

The FXS Coin Card has a 50-pin Amphenol jack located on its faceplate. Figure Pinouts-26 shows this jack, and Table Pinout-21 list the signal pinouts.

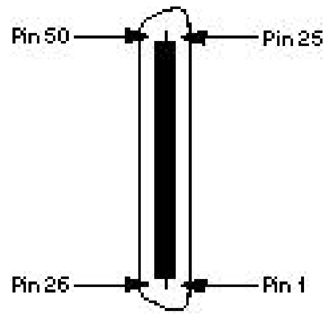


Figure Pinouts-26. FXS Coin Card Jack

Table Pinouts-21. FXS Coin Card Jack Pinouts

Port	Designation	Pin
1	T1	26
1	R1	1
2	T2	29
2	R2	4
3	T3	32
3	R3	7
4	T4	35
4	R4	10
5	R5	13
5	T5	38
6	R6	16
6	T6	41
All other pins are unconnected.		

FXO Coin Card (8159)

The FXO Coin Card has a 50-pin Amphenol jack on its faceplate. Figure Pinouts-27 shows this jack, and Table Pinouts-22 lists the signal pinouts.

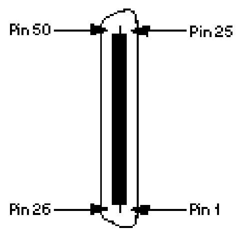


Figure Pinouts-27. FXO Coin Card Jack

Table Pinouts-22. FXO Coin Card Jack Pinouts

Port #	Designation	Pin #
1	T1	26
1	R1	1
2	T2	29
2	R2	4
3	T3	32
3	R3	7
4	T4	35
4	R4	10
5	T5	38
5	R5	13
6	T6	41
6	R6	16
7	T7	44
7	R7	19
8	T8	47
8	R8	22
All other pins are unconnected.		

HSU Card (8202) RS530

The 8202 HSU Card may be installed in any user card slot, U1-U-8 on the 8918 two-sided chassis or 8919 front-loading chassis, and P1-P4 or W1-W4 on the 8916 front-loading chassis. Each card has two DB-25 connectors. Figure Pinouts-28 shows the card.

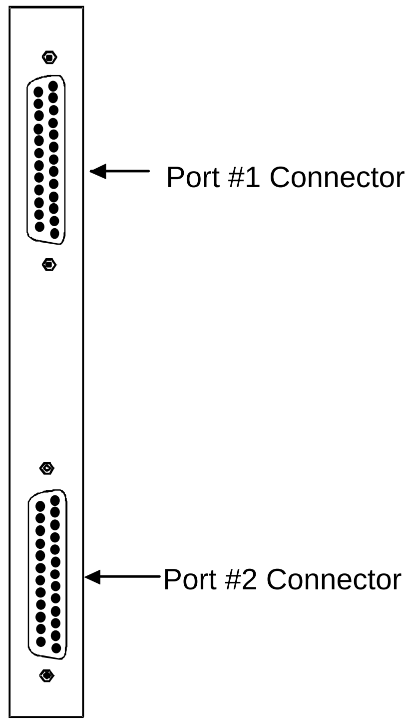


Figure Pinouts-28. 8202 HSU Card Connectors

RS530 Channel Connectors

The RS530 connectors on the 8202 HSU card allow you to connect the system to external data devices. The connectors have the following characteristics:

Connector:	25-pin D-connectors
Gender:	Female
Standards:	8202—Proprietary pinout
Electrical:	8202—RS530

Figure Pinouts-29 shows the connector Pinouts and Table Pinouts-23 lists the pin assignments.

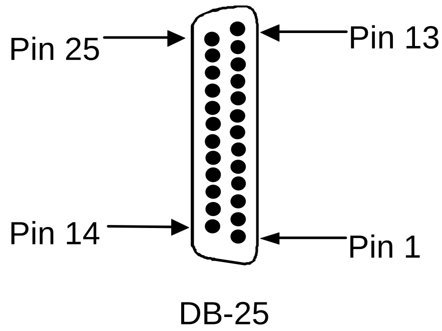


Figure Pinouts-29. Channels 1 and 2 Connectors on 8202 HSU Card

Table Pinouts-23. 8202 HSU Card Channel Connectors Pin Assignments

Pin #	Function	Direction
1	Cable Shield	--
2	Send Data A	Input
3	Receive Data A	Output
4	RTS A	Input
5	CTS A	Output
6	DCE Ready	Output
7	Signal Common	--
8	RR/RLSD A	Output
9	Receive Timing B	Output
10	RR/RLSD B	Output
11	Terminal Timing B	Input
12	Send Timing B	Output
13	CTS B	Output
14	Send Data B	Input
15	Send Timing A	Output
16	Receive Data B	Output
17	Receive Timing A	Output
18	Local Loopback	Input
19	RTS B	Input
20	DTE Ready	Input
21	Remote Loopback	Input
22	Incoming Call	Output
23	Receive Common	--
24	Terminal Timing A	Input
25	Test Mode	Output
All other pins are unconnected.		

HSU Card (8203)

The 8203 High-Speed data Unit (HSU) card allows users to connect high-speed data terminal equipment (DTE) and data communications equipment (DCE) to WAN links or other HSU cards.

The 8203 HSU Card has two ports supporting ANSI/EIA/TIA-530 or two X.21 data ports (see Figure Pinouts-30). Each of the two ports can be configured to operate as a DCE port or a DTE port, with data speeds ranging from 56/64 Kb/s to 1.544/2.048 Mb/s.

The card may be installed in any user card slot, U1-U-8 on the 8918 two-sided chassis or 8919 front-loading chassis, and P1-P4 or W1-W4 on the 8916 front-loading chassis.

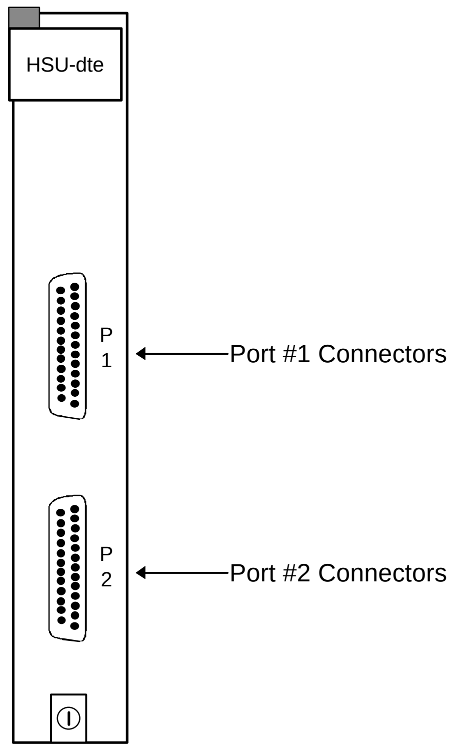


Figure Pinouts-30. 8203 HSU Card Connectors

DB-25 Channel Connectors

The DB-25 connectors on the 8203 HSU card allow you to connect the system to external data devices. The connectors have the following characteristics:

Connector:	25-pin D-connectors
Gender:	Female
Standards:	8203—Proprietary pinout
Electrical:	8203—X.21

Figure Pinouts-31 shows the connector Pinouts and Table Pinouts-24 lists the pin assignments.

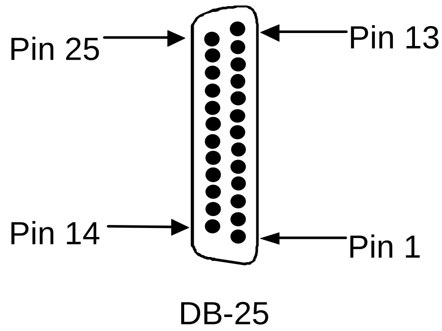


Figure Pinouts-31. Connectors on an 8203 HSU Card

Table Pinouts-24. 8203 HSU Card Pin Assignments

Pin #	Function	Direction
1	Cable Shield	--
2	RD A	Output
3	TD A	Input
4	RTS A	Output
7	Signal Common (Ground)	--
8	Control RLSD A	Output
10	Control RLSD B	Output
11	Timing Clock B	Input
14	RD B	Output
16	TD B	Input
19	RTS B	Input
24	Timing Clock A	Input
All unlisted pins are unconnected.		

HSU Card (8212) V.35

The 8212 HSU Card may be installed in any user card slot, U1-U-8 on the 8918 two-sided chassis or 8919 front-loading chassis, and P1-P4 or W1-W4 on the 8916 front-loading chassis. Each card has two DB-25 connectors. Figure Pinouts-32 shows the card.

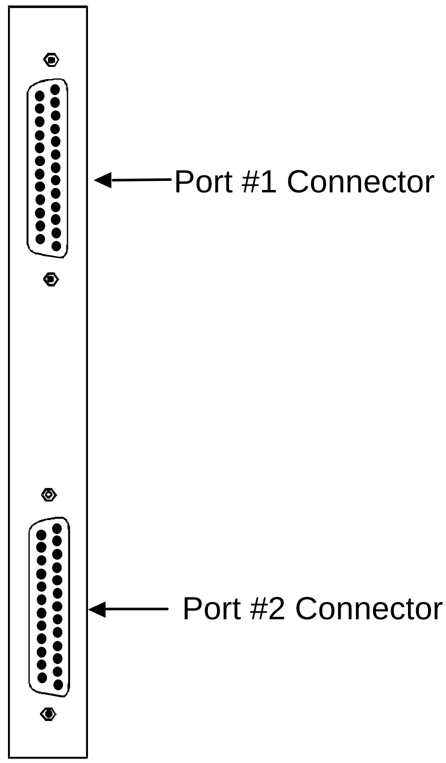


Figure Pinouts-32. 8212 HSU Card Connectors

V.35 Channel Connectors

The V.35 connectors on the 8212 HSU Card allow you to connect the system to external data devices. The connectors have the following characteristics:

Connector:	25-pin D-connectors
Gender:	Female
Standards:	8212—Proprietary pinout
Electrical:	8212—V.35 DCE

Figure Pinouts-33 shows the connector pinouts and Table Pinouts-25 lists the pin assignments.

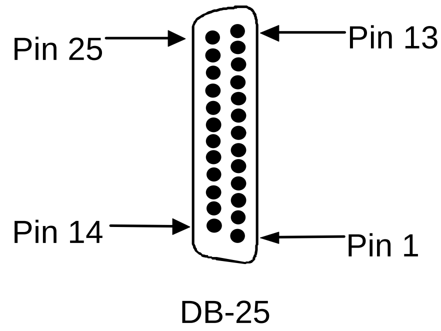


Figure Pinouts-33. Connectors on an 8212 HSU Card

Table Pinouts-25. 8212 HSU Card Pin Assignments

Pin #	Function	Direction
1	Cable Shield	---
4	RTS	Input
5	CTS	Output
6	DSR	Output
7	Signal Ground	---
8	RLSD	Output
9	SD B	Input
10	SD A	Input
11	SCTE B	Input
12	SCTE A	Input
13	RD B	Output
14	RD A	Output
17	SCR B	Output
18	SCR A	Output
24	SCT B	Output
25	SCT A	Output
All other pins are unconnected.		

HSU Card (8214) V.35

The 8214 High-Speed data Unit (HSU) card allows users to connect high-speed data terminal equipment (DTE) and data communications equipment (DCE) to WAN links or other HSU cards.

The 8214 HSU Card supports two V.35 data ports. Each of the two ports can be configured to operate as a DCE port or a DTE port, with data speeds ranging from 56/64 Kb/s to 1.544/2.048 Mb/s.

The card may be installed in any user card slot, U1-U-8 on the 8918 two-sided chassis or 8919 front-loading chassis, and P1-P4 or W1-W4 on the 8916 front-loading chassis. Figure Pinouts-34 shows the card.

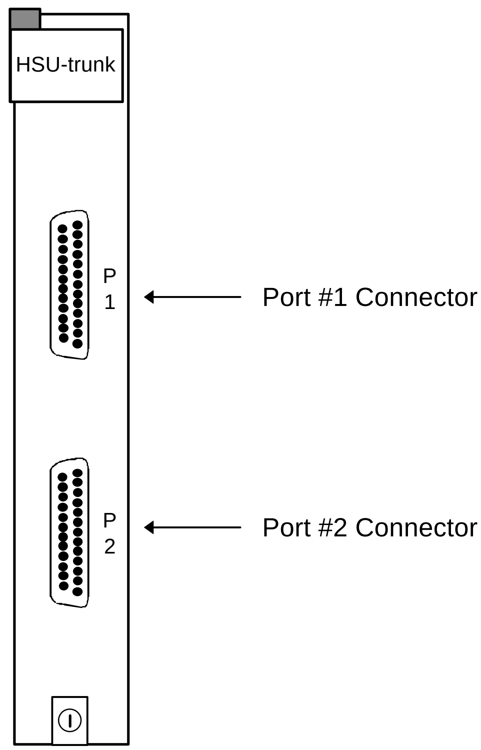


Figure Pinouts-34. 8214 HSU Card Connectors

Homologation Notification

The equipment was tested against NET2 for connection to V.35 interfaces to Digital Data Networks. Testing was carried out using a Premisys 1260M cable for DTE connections.

If any other cable is used, its capacitance must not exceed 2060 picofarads (pF).

DB-25/V.35 Channel Connectors

The DB-25/V.35 connectors on the 8214 HSU card allow you to connect the system to external data devices or trunks. The connectors have the following characteristics:

Connector:	25-pin D-connectors
Gender:	Female
Standards:	8214—Proprietary pinout
Electrical:	8214—V.35

Figure Pinouts-35 shows the connector Pinouts and Table Pinouts-26 lists the pin assignments.

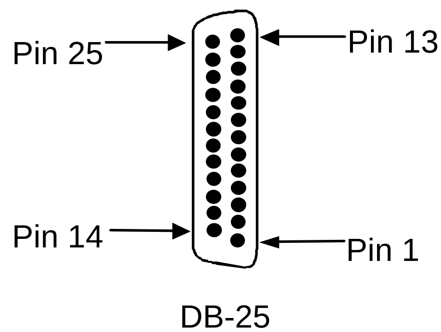


Figure Pinouts-35. Connectors on an 8214 HSU Card

Table Pinouts-26 8214 HSU Card Pin Assignments

Pin #	Function	Direction
1	Cable Shield	---
4	RTS	Input
5	CTS	Output
6	DSR	Output
7	Signal Ground	---
8	RLSD	Output
9	TD B	Input
10	TD A	Input
11	TT B	Input
12	TT A	Input
13	RD B	Output
14	RD A	Output
15	RC A	Input
16	RC B	Input
17	RT B	Output
18	RT A	Output
19	TM	Output
20	DTR	Output
21	RLB	Input
22	LLB	Input
24	ST B	Output
25	ST A	Output
All other pins are unconnected.		

HSU Card (8215) RS530 / V.35

The 8215 HSU card may be installed in any user card slot, U1-U-8 on the 8918 two-sided chassis or 8919 front-loading chassis, and P1-P4 or W1-W4 on the 8916 front-loading chassis. Each card has four DB-26 connectors. Figure Pinouts-36 shows the card.

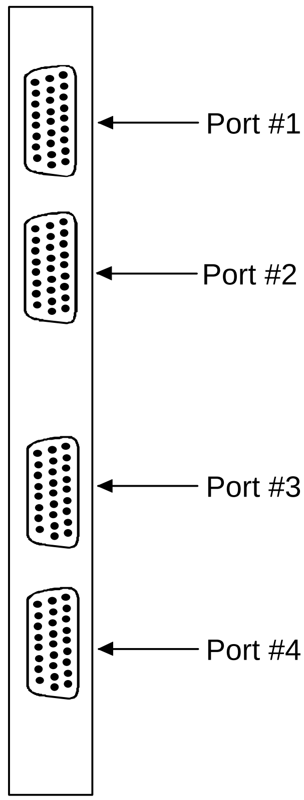


Figure Pinouts-36. 8215 HSU Card Connectors

RS530/V.35 Channel Connectors

The RS530/V.35 connectors on the 8215 HSU card allow you to connect the system to external data devices. The connectors have the following characteristics:

Connector:	26-pin D-connectors
Gender:	Female
Standards:	8215—Proprietary pinout
Electrical:	8215—RS530 or V.35 (switch selectable)

Figure Pinouts-37 shows the connector Pinouts and Table Pinouts-27 lists the pin assignments.

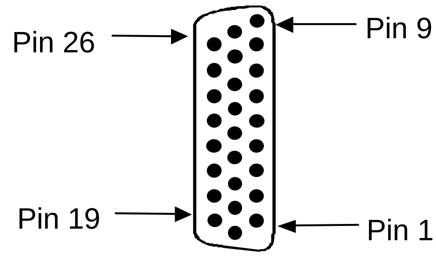


Figure Pinouts-37. Connectors on 8215 HSU Card

Table Pinouts-27. 8215 HSU Card Pin Assignments

Pin #	Function	Direction
1	Cable Shield	--
2	Send Data A	Input
3	Receive Data A	Output
4	RTS A	Input
5	CTS A	Output
6	DCE Ready	Output
7	Signal Common	--
8	RR/RLSD A	Output
9	Receive Timing B	Output
10	RR/RLSD B	Output
11	Terminal Timing B	Input
12	Send Timing B	Output
13	CTS B	Output
14	Send Data B	Input
15	Send Timing A	Output
16	Receive Data B	Output
17	Receive Timing A	Output
18	Local Loopback	Input
19	RTS B	Input
20	DTE Ready	Input
21	Remote Loopback	Input
22	Incoming Call	Output
23	Ext Rcv Clock	Input
24	Terminal Timing A	Input
25	Test Mode	Output
26	Ext Rcv Clock	Input
All other pins are unconnected.		

SRU Card (8220)

The SRU card may be installed in any user card slot, U1-U-8 on the 8918 two-sided chassis or 8919 front-loading chassis, and P1-P4 or W1-W4 on the 8916 front-loading chassis. Each card has ten standard RJ48C connectors that correspond with the ten sub-rate time slots assignable from each card. Figure Pinouts-38 shows the card and Table Pinouts-28 shows the pinouts for the RJ48C connections on the SRU Card.

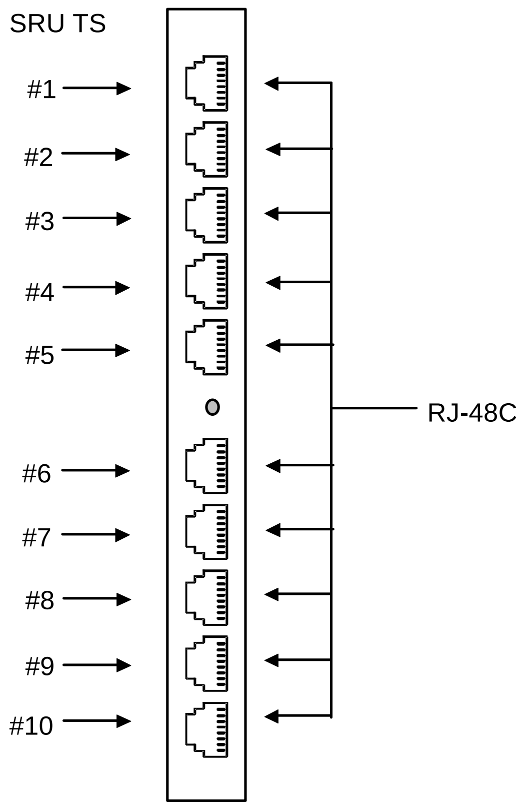


Figure Pinouts-38. SRU Card Connectors

Table Pinouts-28. SRU Connector Pin Assignments

Male RJ-48 Pin #	Signal Name	Direction
1	RCLK	output
2	RLSD	output
3	TCLK	output
4	GND	-
5	RD	output
6	TD	input
7	CTS	output
8	RTS	input

OCU-DP Card (8247)

The 8247 OCU-DP card may be installed in any user card slot, U1-U-8 on the 8918 two-sided chassis or 8919 front-loading chassis, and P1-P4 or W1-W4 on the 8916 front-loading chassis. The card has ten standard RJ48C connectors, five of which are assignable from the card. The other five connectors on the 8247 OCU-DP card are activated with the 845 Child Card. Figure Pinouts-39 shows the card and Table Pinouts-29 shows the pin assignments for the RJ48C connections on the OCU-DP Card.

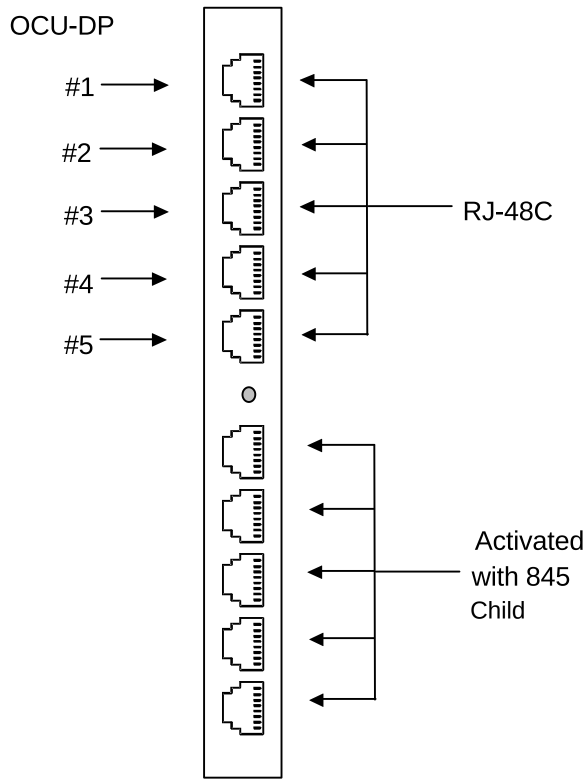


Figure Pinouts-39. 8247 OCU-DP Card Connectors

Table Pinouts-29. 8247 OCU-DP Card Pin Assignments

Male RJ-48 Pin #	Signal Name	Direction
1	R1	input
2	T1	input
3	--	--
4	--	--
5	--	--
6	--	--
7	T	output
8	R	output

OCU-DP Card (8248)

The 8248 OCU-DP card may be installed in any user card slot, U1-U-8 on the 8918 two-sided chassis or 8919 front-loading chassis, and P1-P4 or W1-W4 on the 8916 front-loading chassis. The card has ten standard RJ48C connectors, five of which are assignable from the card. The other five connectors on the 8248 OCU-DP card are activated with the 845 Child Card. Figure Pinouts-40 shows the card and Table Pinouts-30 shows the pin assignments for the RJ48C connections on the OCU-DP Card.

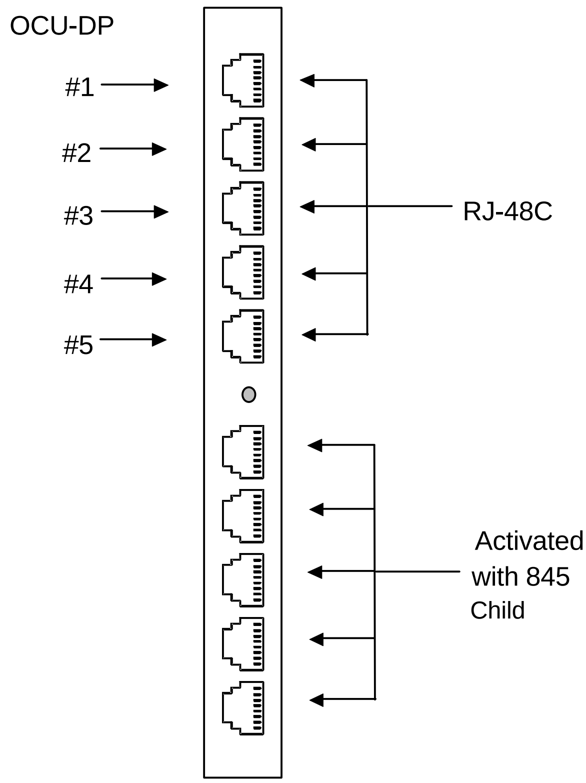


Figure Pinouts-40. 8248 OCU-DP Card Connectors

Table Pinouts-30. 8248 OCU-DP Card Pin Assignments

Male RJ-48 Pin #	Signal Name	Direction
1	R1	input
2	T1	input
3	--	--
4	--	--
5	--	--
6	--	--
7	T	output
8	R	output

OCU-DP Card (8249)

The OCU-DP card may be installed in any user card slot, U1-U-8 on the 8918 two-sided chassis or 8919 front-loading chassis, and P1-P4 or W1-W4 on the 8916 front-loading chassis. Each card has two standard RJ48C connectors that correspond with the two OCU-DP Ports assignable from each card. Figure Pinouts-41 shows the card and Table Pinouts-31 shows the pin assignments for the RJ48C connections on the OCU-DP Card.

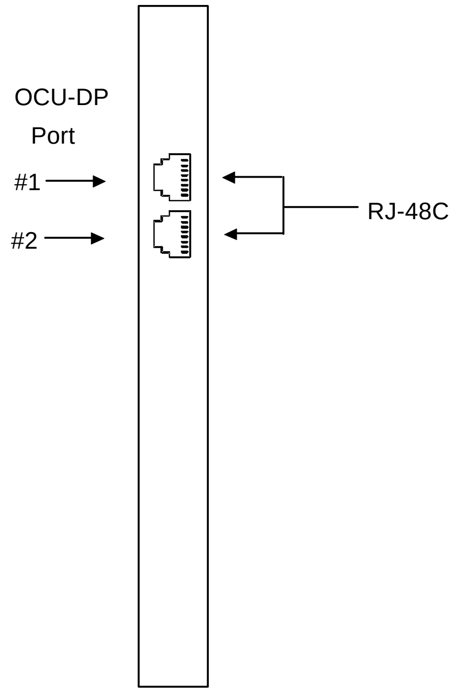


Figure Pinouts-41. 8249 OCU-DP Card Connectors

Table Pinouts-31. 8249 OCU-DP Card Pin Assignments

Male RJ-48 Pin #	Signal Name	Direction
1	R1	input
2	T1	input
3	--	--
4	--	--
5	--	--
6	--	--
7	T	output
8	R	output

DS0-DP Card (8254)

The DS0-DP card may be installed in any user card slot, U1-U-8 on the 8918 two-sided chassis or 8919 front-loading chassis, and P1-P4 or W1-W4 on the 8916 front-loading chassis. Each card has four standard (female) DB-15 connectors that are labeled to correspond with the four DS0-DP Ports assignable from each card. Figure Pinouts-42 shows the card and Table Pinouts-32 shows the pin assignments for the DB-15(F) connections on the DS0-DP Card.

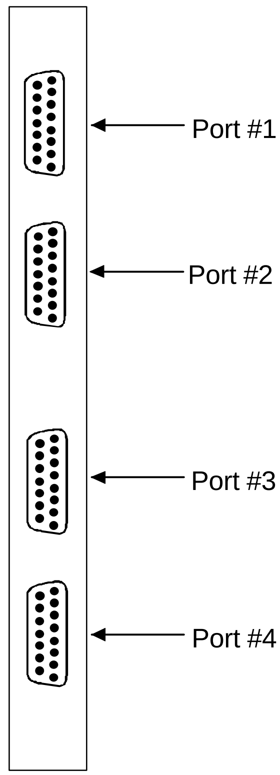


Figure Pinouts-42. DS0-DP Card Connectors

Table Pinouts-32. DS0-DP Card Pin Assignments

DB-15(F) Pin	Signal Name	Direction	Modes Used In
1	GND	---	all
2	N/A	---	n/a
3	CR CK A	output	contra-directional
4	CX CK A	output	contra-directional
5	DTAR A	output	all
6	DTAX A	input	all
7	BYTECLK A	both	DS0-DP
8	BITCLK A	both	DS0-DP
9	N/A	---	n/a
10	CR CK A	output	contra-directional
11	CX CK A	output	contra-directional
12	DTAR A	output	all
13	DTAX A	input	all
14	BYTECLK A	both	DS0-DP
15	BITCLK A	both	DS0-DP

FRAD Card (8231)

The 8231 FRAD card may be installed in any user card slot, U1-U-8 on the 8918 two-sided chassis or 8919 front-loading chassis, and P1-P4 or W1-W4 on the 8916 front-loading chassis. Each card has ten standard RJ48C connectors that correspond with the ten user ports assignable from each card. Figure Pinouts-43 shows the card and Table Pinouts-33 shows the pin assignments for the RJ48C connections on the 8231 FRAD Card.

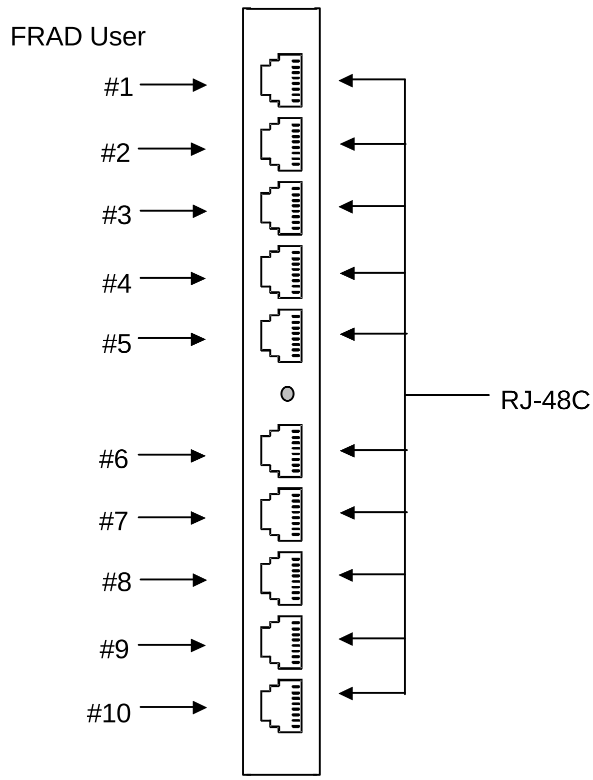


Figure Pinouts-43. FRAD Card Connectors

Table Pinouts-33. FRAD Card Pin Assignments

Male RJ-48 Pin	Signal Name	Direction
1	RCLK	output
2	RLSD	output
3	TCLK	output
4	GND	-
5	RD	output
6	TD	input
7	CTS	output
8	RTS	input

B7R Card (8228)

The B7R card may be installed in any user card slot, U1-U-8 on the 8918 two-sided chassis or 8919 front-loading chassis, and P1-P4 or W1-W4 on the 8916 front-loading chassis. Each card has ten standard RJ48C connectors (8 of which are unused). The two usable port connectors are for the Aggregate Port and the Debug Port. Figure Pinouts-44 shows the card and Table Pinouts-34 shows the pin assignments for the RJ48C connections on the B7R Card.

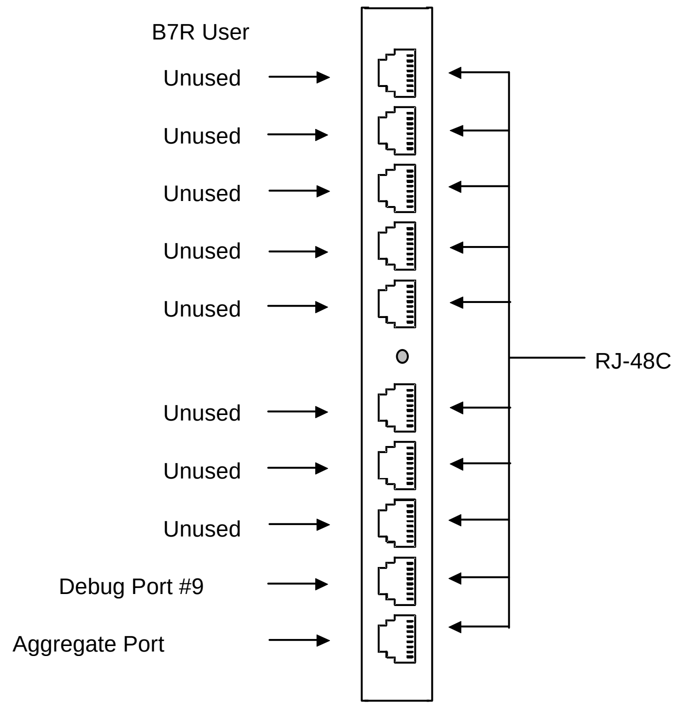


Figure Pinouts-44. B7R Card Connectors

Table Pinouts-34. B7R Card Pin Assignments

Male RJ-48 Pin #	Signal Name	Direction
1	* RCLK	output
2	RLSD	output
3	* TCLK	output
4	GND	-
5	RD	output
6	TD	input
7	CTS	output
8	RTS	input
* Clocking unnecessary for Asynch Transmission		

BRI Card (8260, 8261, and 8262)

The eight-port BRI cards may be installed in any user card slot, U1-U-8 on the 8918 two-sided chassis or 8919 front-loading chassis, and P1-P4 or W1-W4 on the 8916 front-loading chassis. These cards allow you to connect the integrated access system to leased BRI services from service providers.

The BRI card has an RJ27X (female) 50-pin Amphenol connector located on the faceplate of the card. Figure Pinouts-45 shows the pinouts for this connector. Table Pinouts-35 lists the pin assignments for the 8260 and 8261, while Table Pinouts-36 lists the pin assignments for the 8262.

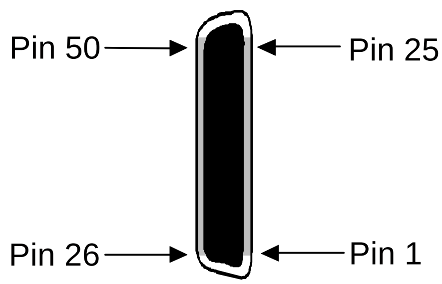


Figure Pinouts-45. BRI Card Connector

Table Pinouts-35. BRI Card Pin Assignments (8260 / 8261)

Port #	Designation	Pin #
1	T1	26
1	R1	1
2	T2	29
2	R2	4
3	T3	32
3	R3	7
4	T4	35
4	R4	10
5	T5	38
5	R5	13
6	T6	41
6	R6	16
7	T7	44
7	R7	19
8	T8	47
8	R8	22
All other pins are unconnected.		

Table Pinouts-36 BRI Card Pin Assignments (8262)

Port	Designation	Pin #
1	Xmt–T0	26
1	Xmt–R0	1
1	Rcv–T0	27
1	Rcv–R0	2
2	Xmt–T1	29
2	Xmt–R1	4
2	Rcv–T1	30
2	Rcv–R1	5
3	Xmt–T2	32
3	Xmt–R2	7
3	Rcv–T2	33
3	Rcv–R2	8
4	Xmt–T3	35
4	Xmt–R3	10
4	Rcv–T3	36
4	Rcv–R3	11
5	Xmt–T4	38
5	Xmt–R4	13
5	Rcv–T4	39
5	Rcv–R4	14
6	Xmt–T5	41
6	Xmt–R5	16
6	Rcv–T5	42
6	Rcv–R5	17
7	Xmt–T6	44
7	Xmt–R6	19
7	Rcv–T6	45
7	Rcv–R6	20
8	Xmt–T7	47
8	Xmt–R7	22
8	Rcv–T7	48
8	Rcv–R7	23
External Power	+48v	50
External Power	-48v	25

If external power is used, jumpers JP5 and JP6 ***must*** *be set to* **EXTERNAL** *mode. Failure to do so could damage or destroy the card or integrated access system.*