PARADYNE®

ACCULINK
ACCESS CONTROLLER

Reference Guide for SSTE Applications

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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
    NEBS per Bellcore GR-63-CORE

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 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 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 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 Paradyne Corporation.

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Introduction

The ACCULINK Access Controller (AAC) allows access of the sophisticated network services available from long-distance companies, telephone companies, specialized carriers and PTTs. Using these new services increases the capabilities of your private network and simultaneously reduces cost.

The AAC takes the place of 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 AAC allows connection of a wide range of voice and data equipment over your network, including:

- LAN bridges and routers

- PBXs (analog or digital) and key systems

- Fax machines

- Terminals and computers

- Telephones

- Modems

- Video CODECs

How to Use this Guide

This guide is arranged to assist the technician in unpacking and assembling the AAC. The manual is arranged by Sections and Chapters.

Section 1, **Introduction**, contains the Preface.

Section 2, **System Information**, contains the System Slot Map, Installation, Basic Operations, System Operations and Redundant Operations chapters.

- The *System Slot Map* chapter is a description of the chassis and where to place the individual components. All of the "what goes where" questions can be answered in this section. Other sections give more detailed descriptions of the procedures involved.

- The *Installation* chapter elaborates upon the previous section and shows various installation techniques. This chapter discusses each of the power supplies, ringing options and methods of installing them in the system. This chapter also contains hardware settings of individual cards.

- The *Basic Operations* chapter is a system overview that allows the user to start and test the system and assign values to the alarm warnings.

- The *System Operations* chapter discusses how the user defines the timeslot map for the individual nodes.

- The *Redundant Operations* chapter deals with power, CPU and WAN card redundancy features.

Section 3, **CPU Card**, provides detailed information on the CPU card.

Section 4, **WAN Card**, provides detailed information on the WAN card.

Section 5, **Interface Card and External Alarm Card**, contains chapters on the Interface Card and External Alarm Card.

Section 6, **HSU Card**, provides detailed information on the HSU card.

Section 7, **Pinouts**, provides wiring specifications for all cards and panels.

Section 8, **Additional Information**, incorporates the Error Message and Glossary chapters.

Page Layout

This guide was designed to adhere to conventional documentation standards. The header on each page contains the Document and Chapter names. The footer of each page has the date, revision number and page number. The page number is comprised of the section number, chapter letter, and page number.

Power Supplies

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

Grounding Instructions for AC Power Only

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.

Service

If your equipment needs servicing, under the direction of the appropriate maintenance organization, you may need to contact Lucent Technologies Spares Exchange Services (SES) at 1-800-325-9890 for replacement equipment. For ease of reference, write your model number and serial number here:

Model Number: _____

Serial Number: _____

Ordering Information

To order documents from AT&T in the United States, call the AT&T Customer Information Center (CIC) at 1-800-432-6600 or FAX (317) 322-6484.

Written requests can be sent to AT&T Customer Support Center, Commercial Sales Representative, P.O. Box 19901, Indianapolis, IN 46219.

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.

FCC Part 68 Information

This equipment complies with Part 68 of the FCC rules. On the rear panel of the AAC 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.

The AAC 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 AAC 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"

Introduction

The system uses three basic types of cards: common cards (CPU and Interface cards), user cards (Data and Alarm cards) and WAN cards. Cards slide into slots in the front and back of the chassis. Rail guides in the top and bottom of the slots align the cards with the connectors for easy insertion.

The ACCULINK Access Controller (AAC) Unit 20114

Figure Slot-1 shows the front of the chassis (often called the Network side) with the slot numbers labeled. Figure Slot-2 shows the back of the chassis (often called the User side) with the slot numbers labeled. Cards inserted from the Network side have metal face plates with an ejection handle at the top of each card. The handle has the name and product number affixed thereon. Push the cards firmly into the chassis until the face plate touches the chassis. Cards have a screw at the top and bottom of the card to prevent cards from coming loose accidentally.

The chassis has an error-free card placement system. Individual cards are "keyed" to fit only in their own slots. User cards (e.g. HSU, Interface and Alarm), will not seat properly in the CPU Slots (C-1 and C-2). In addition to that safeguard, 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 dust and insects, 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.
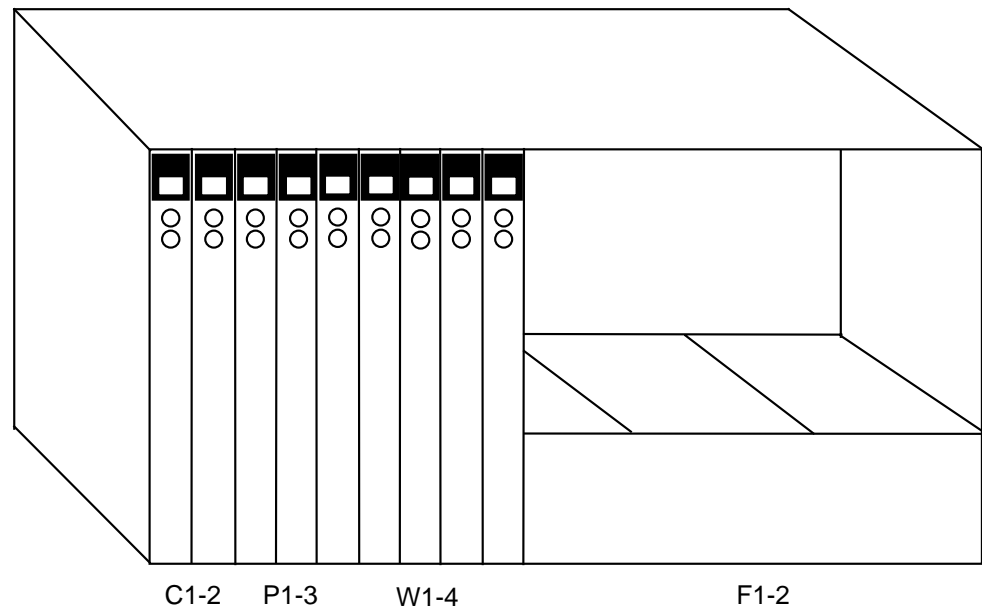
Figure Slot-1. Front of Chassis with Slot Numbers
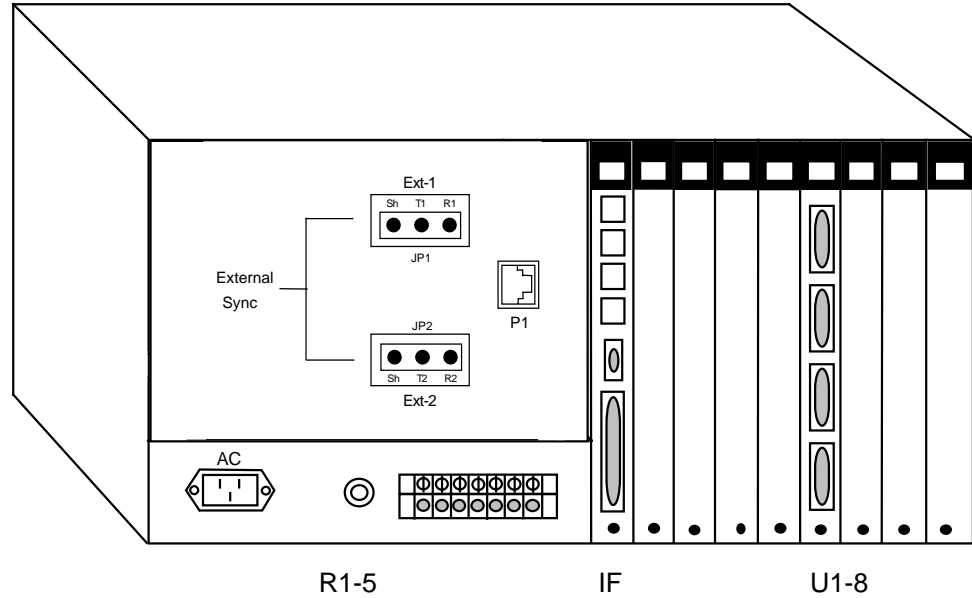
Figure Slot-2. Back of Chassis with Slot Numbers

Table Slot-1. Card Placement for the Chassis

Type of Card	# of Cards	Slots Used	Notes
CPU Cards	1-2	C1-C2	One required in either slot
WAN Cards	1-4	W1-W4	One required
Interface Card	1	IF	Required
Alarm Cards	0-1	U1-U8	Internal/External, any user slot
HSU Cards	0-8	U1-U8	High speed data, any user slot
Main Power (DC)	1-2	F1-F2	DC power Supplies

**Note: For SSTE Application, one (1) CPU is required in slot C1 and
two (2) power supplies are required in slots F1 and F2.**

Chassis Labeling

Two labels are provided with the installation kit that comes with the chassis. A copy of each is displayed below. These labels are to be affixed to the front and rear panels and used to identify the specific slots when inserting and removing cards.

Peel the back off of the label identified as SLOTMAP, FRONT and stick in the middle of the right side front panel. An example of the label is shown in Figure Slot-3..
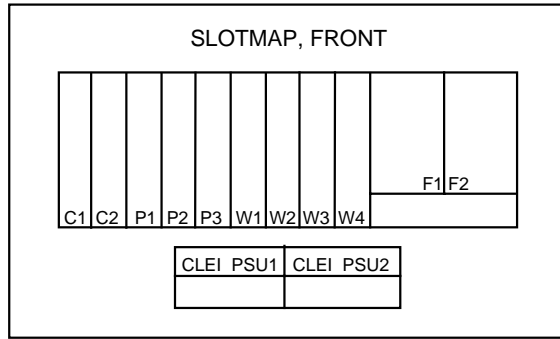
Figure Slot-3. Slotmap Label Front

Peel the back off of the label identified as SLOTMAP, REAR and stick in the middle slightly below the Ext openings of the left side rear panel. An example of the label is shown below.
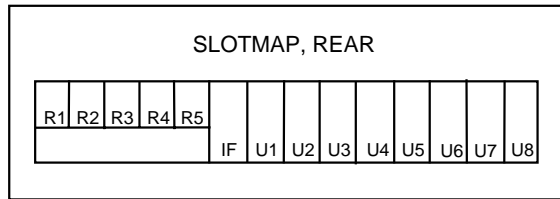
Figure Slot-4. Slotmap Label Rear
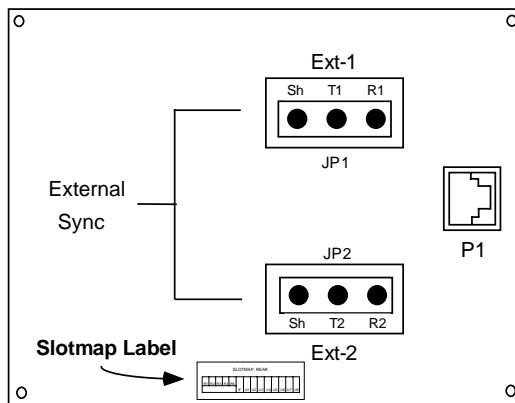
Figure Slot-5. Slotmap Label Panel

CLEI Labeling

Each card must be properly labeled with a Common Language Equipment Identifier (CLEI) code. These labels are provided with each card or component. An example of a label to be affixed to each card is shown in Figure Slot-6 below.

```
826020
826020
PEC 44444

SWE45GT645
SWE45GT645

SWE45GT645
SWE45GT645
```
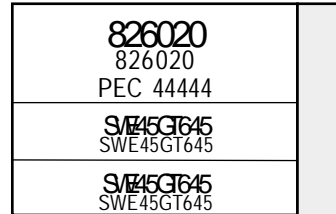
Figure Slot-6. CLEI Coded Label

The larger upper label identifies the label itself. The smaller lower labels are identical, and are designed to be peeled away and attached to the front panel of the card. Only one label is required per card; however, two labels have been provided to allow the labeling of enclosed cards (such as power supplies) on the card itself and on the exterior panel. This allows for automated inventory control without the need to remove exterior panels.

The small labels may be peeled away from their backing and positioned on their respective cards as indicated in Figure Slot-7. This is the recommended placement; however, labels may be placed anywhere on the front panel of the card.

Card Top

CLEI
Label

Front
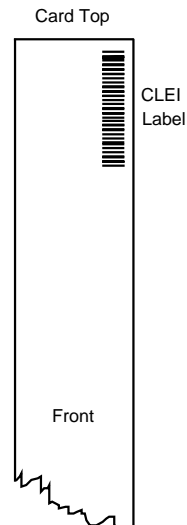
Figure Slot-7. Recommended CLEI Coded Label Placement

Introduction

The Installation chapter provides the user with information to unpack and assemble AAC systems. The checklist below 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.

Generic Installation Checklist

- Unpack and mount chassis

- Check US - European Jumper

- Remove power supply covers (as needed)

- Install DC power supply

- Install CPU Card

- Install WAN Card (see special instructions in this chapter)

- Install Interface Card

- Install all other Cards

- Verify voltage

- Verify DC fuse rating

- Connect to Datakit

- Replace power supply covers

- 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)

Choosing a Location

An AAC unit 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 AAC operates with the DC power supply. Table Install-1 lists the remaining electrical and environmental requirements. Table Install-2 lists the system specifications.

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.

Each customer must provide either space or climate control to assure that the outside temperature does not exceed 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.

Table Install-1. Electrical and Environmental Requirements

Parameter	Requirement
DC Power (-48VDC)	-39/-60VDC
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-2. Physical Specifications

Item (Paradyne Model)	LxW*	Depth*	LxW**	Depth**	Lbs	Kg	Power Cons. Watt	Heat Disap. BTU/hr
System Unit (20114)	9x17	15 3/8	22.5x42.5	38.4	11	5.0	--	--
48VDC Power Supply (15802)	5 5/8x3	8 1/8	14.1x7.5	20.3	1 3/4	0.8	--	--
CPU Card (10161)	8x15/16	7 1/2	20x2.3	18.8	3/4	0.3	1	3.41
WAN Card (15812)	8x15/16	7 1/2	20x2.3	18.8	3/4	0.3	1.5	5.12
DSX/CEPT Module (15887)	3 5/8x2 1/16	1/2	9.1x5.2	1.25	1/16	0.03	0.45	1.54
Ext Sync Module (20186)	3.3x2.85	0.53	8.4x7.3	1.3	0.1	0.04	--	--
Interface Card (10175)	8x15/16	7 1/2	20x2.3	18.8	1	0.5	0.6	2.05
Alarm Card (10116)	8x15/16	7 1/2	20x2.3	18.8	1/2	0.2	0.4	1.37
HSU Card (15895)	8x15/16	7 1/2	20x2.3	18.8	1/2	0.2	3.5	11.94

*Measured in inches   **Measured in centimeters

Checking the US - European Jumper

The US - European jumper (JP1) is located on the back-plane of the two-sided chassis.

Jumpers and callouts are intentionally oversized to reduce confusion!

JP1
US
EUR

C1-2   P1-3   W1-4   F1-2
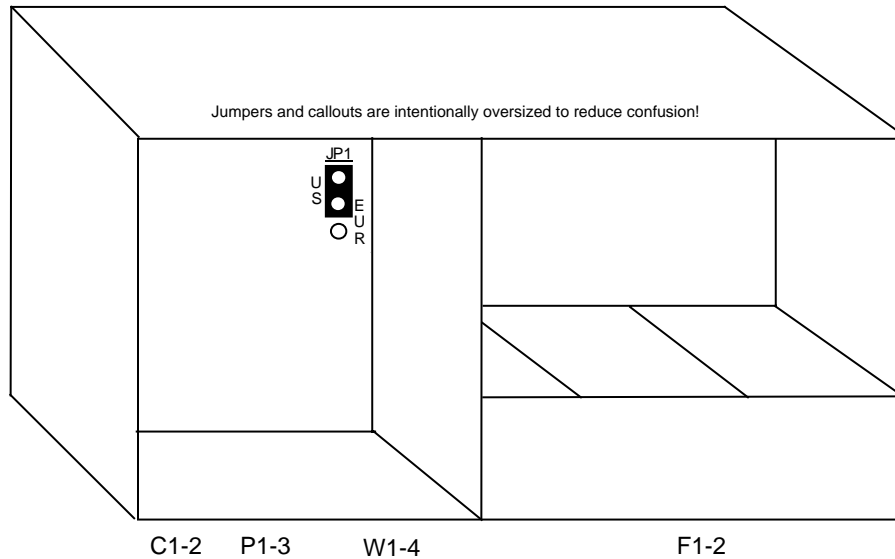
Figure Install-1. Jumper Location.

Directly behind and to the right of slot W-4 is a jumpered switch that sets the power orientation to either US or European standards. **Make sure this jumper is appropriately set before applying any voltage to the unit. All SSTE applications will set this jumper to "US," as shown above.**

Unpacking and Mounting the Chassis

When you receive the AAC, 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 AAC does not need access to the back side of the unit.

Table Install-3. Minimum Rack and Wall-Mount Clearances

Clearance	Front	Back	Top	Bottom
Inches	10	15	3/4	2
Centimeters	25	38	2	5

Mounting the Chassis

The two-sided chassis has twelve holes on each side of the chassis (see Figure Install-2). Eight of these holes (r) facilitate mounting the unit in any standard EIA 19- or 23-inch rack (7.5 or 9.1 cm). The two center holes on the bottom of the unit (t) can be used for mounting on a table or other flat surface. The other four holes (w) are used to attach the unit to the wall.

To attach the chassis to the rack (see Figure Install-2), you must attach metal brackets (provided) to the sides of the chassis with the four 10-32x1/4 screws (provided). Four 12-24x1/2 screws (provided) are needed to attach the bracketed chassis to the rack. The brackets are reversible to allow mounting in 19- or 23-inch racks (7.5 or 9.1 cm). You can attach the brackets either at the front of the chassis, back of the chassis or near the middle using holes (r). 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.
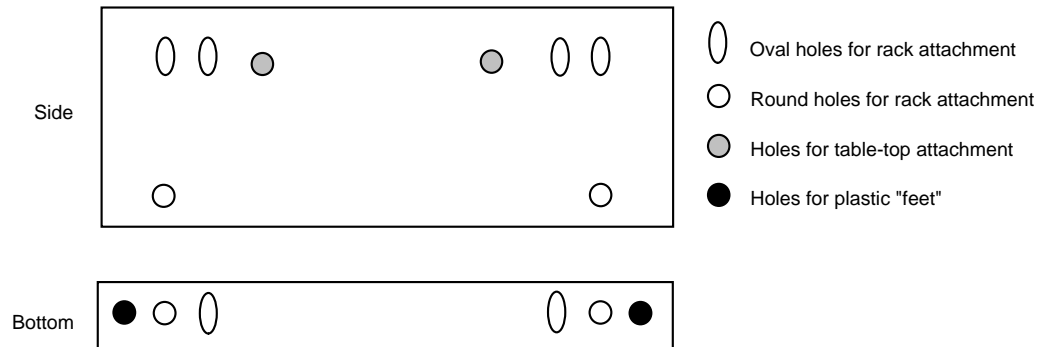
Figure Install-2. Mounting Holes in Bracket.
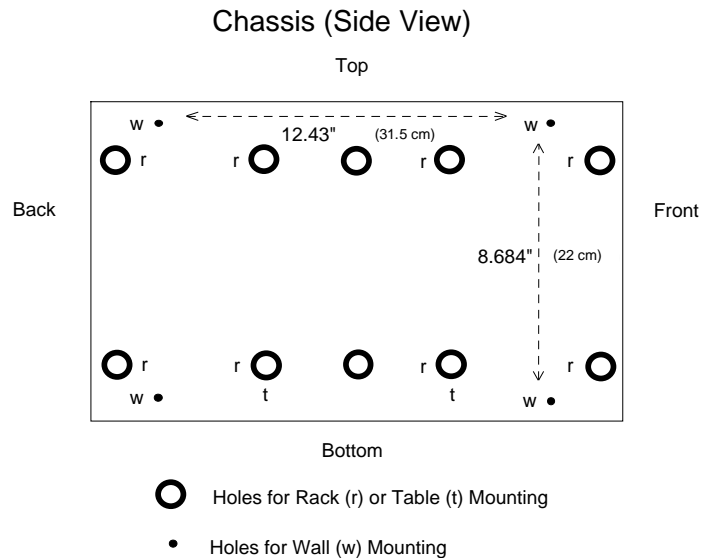
Figure Install-3. Mounting Holes on Chassis

To attach the unit to the wall, use the template of the hole pattern provided in the installation kit 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 do not mount the unit on the wall or in a rack, place it on a hard surface in a suitable environment. Make sure it is accessible from both the front and rear, and has at least 2 inches (5 cm) clearance above the chassis. The metal brackets should be used to provide the additional clearance needed for attaching cables to the user cards. Attach the brackets to the side of the chassis using the two center "r" holes (shown in Figure Install-3). Place the plastic abrasion-protective inserts ("feet") in the holes provided near the ends of the bottom of the bracket.

Power Supply

System Power

The system will always require a -48VDC (15802) power supply. 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.

Installing the DC Power Supply 15802

Table Install-4 lists the specifications for the 15802 (-48VDC) power supply.

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.

Table Install-4. DC Power Supply Specifications

Parameter	Rating
Output Power	50W continuous
Input Power	-39 to -60VDC
Source Input Current (Max)	3A
Approvals	UL, FCC, CSA

External Power Connector

A terminal block connector is attached to the chassis near the left rear and main power fuse. Figure Install-4 shows the connector.
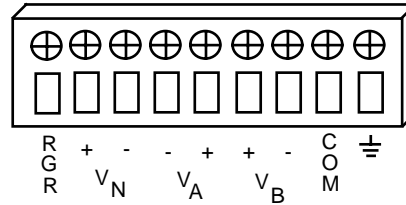
Figure Install-4. External Power Connector

Wires connected to the "V_A + and -" screws are used for a 48VDC power feed to the power supply in slot F1. Wires connected to the "V_B + and -" screws are used for a 48VDC power feed to the power supply in slot F2.

The screw showing the ground symbol is the chassis ground. The "COM" screw can be used as a zero voltage digital reference point. The "-RGR" screw is used for an external ringer. Wires connected to the "V_N + and -" screws provide output for an external ringing generator.

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.

External Timing Sync Connection 20186

The External Timing Sync Connection is used to provide external clocking source inputs (see Figure Install-5). It is located on the cover plate of the ringing supplies to the left of the Interface card.
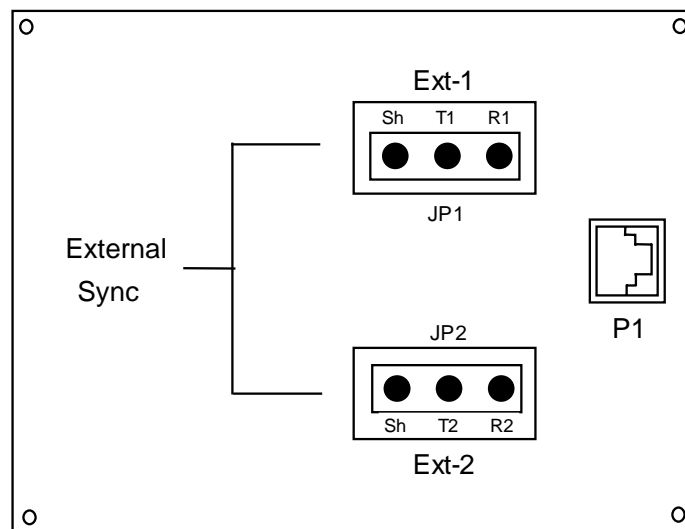
Figure Install-5. External Timing Sync Connection

The pins shown in JP1 are used to wrap the wires from an externally provided clocking source. A standard wire-wrap tool is used to make the connection. The pins shown in JP2 are used to wrap the wires from a second external clocking source.

The Ext-1 (JP1) pins are labeled "Sh" (Shield Ground), "T1" (Tip1) and "R1" (Ring1) and the Ext-2 (JP2) pins are labeled "Sh" (Shield Ground), "T2" (Tip2) and "R2" (Ring2).

The RJ48 connection labeled P1 is used to connect the external timing to the external sync port on the Interface Card with a short module plug to plug cable. (This cable is provided with the system.) External clock sources are shown on the Interface card as **ext1** and **ext2** under Primary Clock and Secondary Clock.

NOTE: Refer to Engineering specification for correct grounding procedures of external timing sources.

Configuring the DSX/CEPT Plug-in Module 15887

The 15887 DSX/CEPT plug-in module (see Figure Install-6) provides jumper settings for impedance compensation. The 15887 offers either T1 or E1 (75Ω or 120Ω operation). To configure the 15887, change the jumper positions on the pins according to Figures Install-6 through Install-8. The factory ships the product in T1 configuration.

To align the DSX module with the WAN card, JP2 is the TX side and JP1 is the RX side.
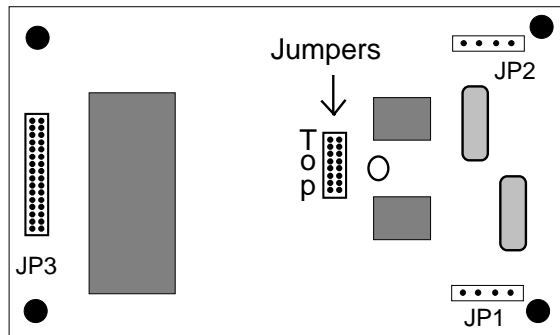
Figure Install-6. DSX/CEPT Module (Top View)
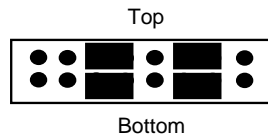
Figure Install-7. Jumper Settings for T1 Operation

Installing DSX/CEPT Module 15887

Plug-in modules used to activate WAN cards must be installed prior to insertion of the WAN card into the unit. Using Figure Install-8 as a guide, place the DSX module in the slot reserved for WAN1-1 (reference only; not shown this way on the actual card). Install plastic stand-off posts and 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. Place the second module in the slot reserved for WAN 1-2. Insert the TX pins into JP #15, while inserting the RX pins into JP #14 and the 24-pin end connector pins into JP #13.
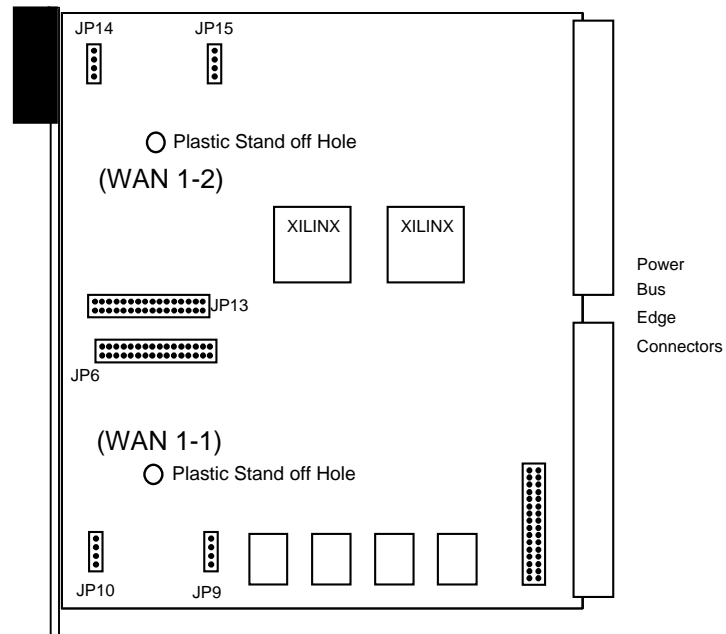
Figure Install-8. Inserting DSX/CEPT Modules

Amphenol Connectors

The Net - WAN Link Connector is located at the bottom of the 10175 Interface Card (see Figure Install-9). This is a 50-pin RJ27X Female connector. The specifications for this connector, including all pin assignments, are detailed in Pinouts (Chapter 7-A).
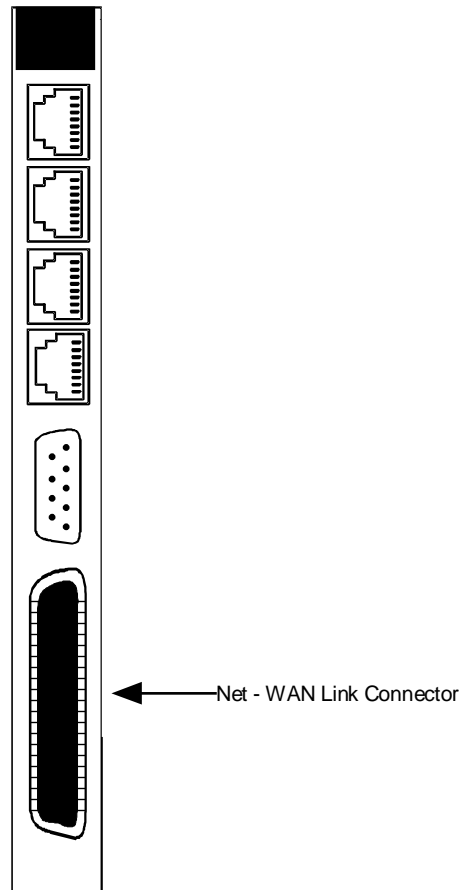
Figure Install-9. Net - WAN Link Connector on 10175 Interface Card

A 50-pin interface cable (amphenol connector) is used to connect the WAN card ports to incoming and outgoing T1 lines. Numerous versions of this standard cable can be used with the Net - WAN Link Connector. Traditional amphenol connectors, however, place the connector at a right angle to the cable itself (see Figure Install-10), thus preventing the screw at the bottom of the connector from being properly attached without removing the hood. **To ensure proper operation, the cable must be secured to the Interface Card at both the top and bottom of the amphenol connector.** For this reason, a Cable Tie Mounting Kit has been included with each Interface Card. This kit is used to secure the bottom of a traditional amphenol connector to the Net - WAN Link Connector.
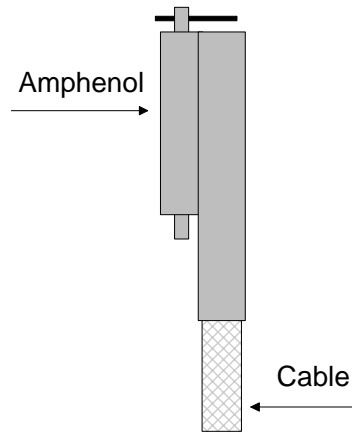
Figure Install-10. Traditional Amphenol Connector

Cable Tie Mounting Kit

The Cable Tie Mounting Kit consists of the following parts:

Two (2) cable tie mounts (pictured in Figure Install-11)
Two (2) cable ties (pictured in Figure Install-12)
Two (2) screws (not pictured)
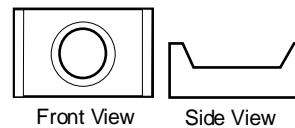
Figure Install-11. Cable Tie Mount

Figure Install-12. Cable Tie

Note: **The Cable Tie Mounting Kit contains two complete sets.** The extra set should
be retained as a backup in the event that the primary set is damaged or the amphenol
connector is replaced.

When to Use the Cable Tie Mounting Kit

**The Cable Tie Mounting Kit should be used only when traditional amphenol
connector cables are going to be used with the system.** If you are using a different type
of amphenol connector (one in which the screw at the bottom of the connector can be
correctly attached to the Interface Card), you cannot use the Cable Tie Mounting Kit
without disabling the ability for the connector to attach to the card. You should, however,
retain the kit in the event that you switch to a traditional amphenol connector.

Securing Traditional Amphenol Connectors

The amphenol connector is secured to the Net - WAN Link Connector by means of two screws in the amphenol connector, which normally are inserted directly into the upper and lower hex nuts (see Figure Install-13).
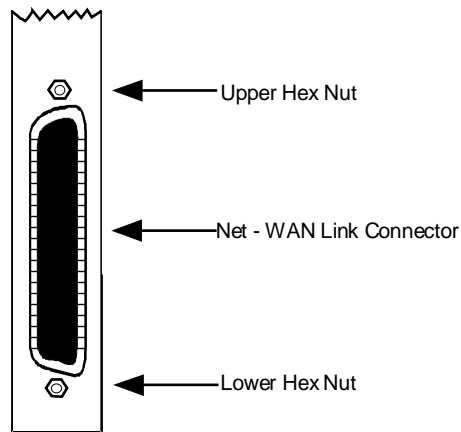
Figure Install-13. Hex Nut Identification on Net - WAN Link Connector

As noted above, traditional amphenol connectors do not allow the lower screw to be tightened into the lower hex nut. For this reason, if you are using a traditional amphenol connector, you must replace the lower hex nut with the cable tie mount.

Using pliers, remove the **lower** hex nut. Retain this hex nut in the event that you replace the traditional amphenol connector with one that allows the lower screw to be properly deployed. **DO NOT remove the upper hex nut.**

Fasten the cable tie mount in place of the lower hex nut (as shown in Figure Install-14) using one of the screws included in the Cable Tie Mounting Kit.
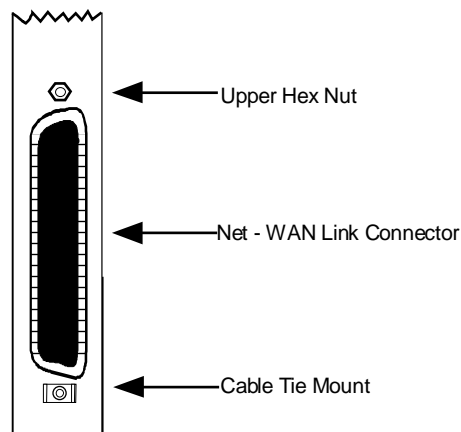
Figure Install-14. Cable Tie Mount Installation

Before attaching the amphenol connector to the Interface Card, thread the cable tie through the cable tie mount, with the raised portion of the cable tie head facing the Interface Card. Do not tighten the cable tie at this point.

Attach the amphenol connector to the Net - WAN Link Connector bus of the Interface Card, as shown in Figure Install-15. Make sure that the amphenol connector fits securely. Insert the screw at the top of the amphenol connector into the upper hex nut and tighten. At the bottom, take the loose ends of the cable tie and pull them around the back of the amphenol connector. Thread one end of the cable tie through the cable tie head and tighten to secure the amphenol connector.
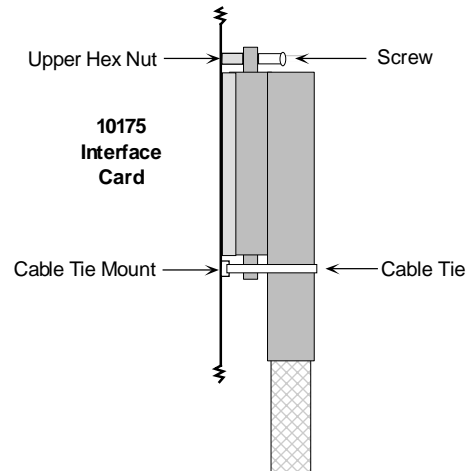
Figure Install-15. Cable Tie Usage - Traditional Amphenol Connector

The cable tie can only be fastened in one direction. If you have installed it "backwards," you can easily rethread the cable tie through the cable tie mount without detaching the amphenol connector.

Securing Other Types of Amphenol Connectors

If you are using a traditional amphenol connector with a metal cable bracket (see Figure Install-16), you can thread the cable tie through the metal bracket before tightening it, or you may be able to secure the cable tie around the back of the connector. In any event, the bottom of the amphenol connector should be secured tightly to the Interface Card.
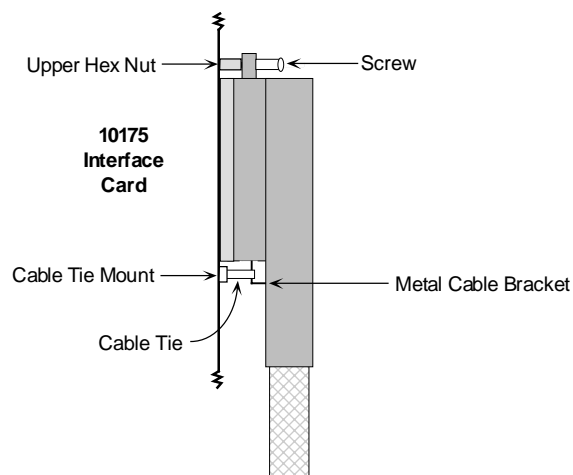
Figure Install-16. Cable Tie Usage - Amphenol Connector, Metal Cable Bracket

Another type of cable mounts the amphenol connector at a 180° angle to the cable and uses standard screws to attach the connector from both the top and the bottom (see Figure Install-17). If you have this type of connector, you cannot and do not need to use the Cable Tie Mounting Kit. Simply thread the attached screws into the existing hex nuts.
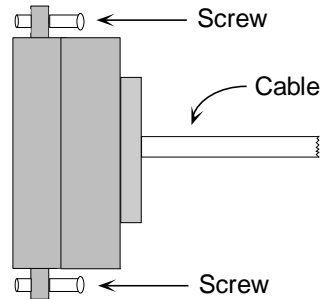
Figure Install-17. Amphenol Connector with Back Cable

Note: Per industry standards, torque on the connector screws should not exceed five inch-pounds. Higher levels of torque may cause the hex nuts to loosen or detach. If this occurs, the hex nuts should be reattached at a torque of five inch-pounds.

Other types of amphenol connector cables can also be used. Whether you need to install the cable tie mount depends on your ability to fasten the lower part of the amphenol connector securely to the Interface Card.

Registration

When the system is started for the first time, the registration screen shown below will appear. Answer the questions with the information shown below the screen and the system will automatically restart with the correct application parameters.

The vendor code for the system is: **280**

The registration procedure consists of three steps. First, the user must enter the vendor code. Second the user must select the type of chassis used (**for SSTE Application, select option 3**). Finally, confirmation of the proposed changes is required (Y=yes, N=no). Figure Basic-1 shows the completed Registration screen.

```
┌─────────────────────────────────────────────────────────────────┐
│ Fremont          │      Welcome to Registration      │ 12-31-99  14:33 │
│                                                                   │
│                                                                   │
│                                                                   │
│                          Vendor Code:   280                       │
│                                                                   │
│        1.  Front - Loading Only / Power Supplies on side          │
│                                                                   │
│        2.  Front - Loading Only / Power Supplies on top           │
│                                                                   │
│        3.  Front & Rear Loading / Power Supplies on side          │
│                                                                   │
│                          Select one:  3                           │
│                                                                   │
│                                                                   │
│                                                                   │
│                                                                   │
│ Is the information on this screen correct (Y/N)?                  │
│                                                                   │
│                                                                   │
└─────────────────────────────────────────────────────────────────┘
```

Figure Basic-1. Screen Layout

Introduction

After determining the configuration requirements, log on and set the cards to implement the network design. For each card, the system presents a screen showing the options and allows setting them.

All screens have the same general layout, as shown in Figure Basic-2.

```
┌─────────────────────────────────────────────────────────────────────────┐
│ Fremont     │ IF 10175   INTF-SYNC Com 407535053 Ser 01103 │ 12-31-99 14:33│
│                                                                           │
│                    1                                          OOS     U3  │
│ PRIMARY CLK        int                                                    │
│ EXT RATE           t1                                                     │
│ EXT FORMAT         esf                                                    │
│ EXT FRAME          n/a                                                    │
│                                                                           │
│ SECONDARY CLK      int                                                    │
│ EXT RATE           t1                                                     │
│ EXT FORMAT         esf                                                    │
│ EXT FRAME          n/a                                                    │
│                                                                           │
│ CURRENT CLK        int                                                    │
│                                                                           │
│                                                                           │
│                                                                           │
│                                                                           │
│                                                                           │
│ int      ext      serv      wan      user                                 │
│                                                                           │
│ Save │ Undo │ Refresh │ Time │ ACO │ proFiles │ taBs │ Ports │ Main       │
└─────────────────────────────────────────────────────────────────────────┘
```

Figure Basic-2. General Screen Layout

The dark line at the top of the card shows the Header Information Line. The node identity, card information, time and date are listed on this line. The area just below the node ID (Fremont) is the Parameter Settings section of the screen. Changes to new or existing cards are initiated in this section. The Status and Data Entry Change Line is located near the bottom of the card on the left hand side. Changing the options for each parameter is done on this line.

The dark line at the bottom of the screen is the Menu of Actions. Pressing the first capitalized letter of any of the items on this line will perform the function called for in the menu (although your input is case-insensitive).

The small dark area on the upper right hand side of the screen shows the area where alarm summary information is displayed. In this example, the alarm is an Out of Service card in slot U-3.

Logging On

You can log on to the system in one of two ways: either by running a line from a VT-100 (or similar) terminal to the Term port on the Interface card, or by connecting through one of the two Datakit ports (COM1 and COM2). Figure Basic-3 shows these ports on the Interface card.
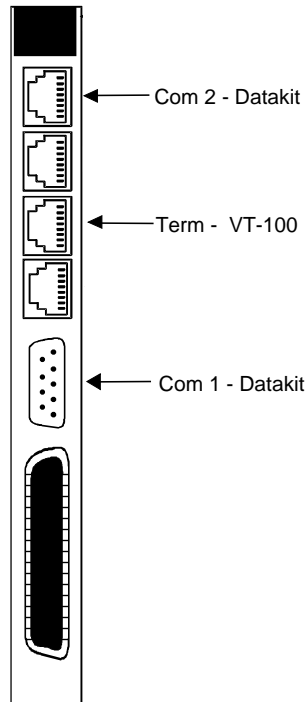
Figure Basic-3. Interface Card Connection Ports

The settings are 9.6Kbps, 8 data bits, no parity and 1 stop bit. The Login screen shown in Figure Basic-4 will appear. If the screen stays blank after 30 seconds, press the <Enter> key to display the screen. If the screen remains blank, check the terminal settings to make sure they match those of the system.

```
                         ACCULINK Access Controller
                     Copyright (C) AT&T Paradyne, 1993-1996


                          Password:  ██████████


                            Node:   Fremont






 Version:   4.0x
```
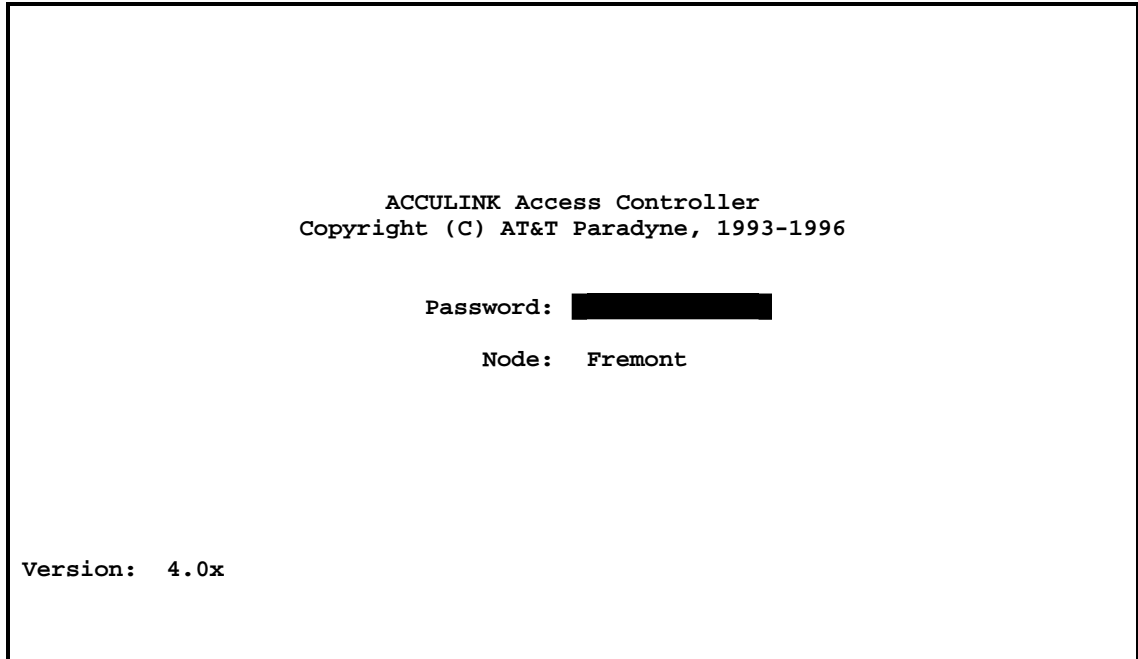
Figure Basic-4. The Login Screen

The Version number shown in the screen above is divided into two parts, the "4.0" which is the main software release identifier and the "x" which is the maintenance release identifier.

Logging Out

Logout is accomplished via the "**L**"(Logout) command from the Main menu or a **CTRL-C** (Control-C) from any menu.

The initial Login 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. 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 logging on to configure the system for the first time, log on at the Manager access level. If maintaining the system after its initial configuration, the password was probably changed from "Manager;" consult the network administrator for the current password. Type the password and press the <Enter> key to display the Main screen/status screen.

Status Screen

A quick way to check system activity of the ports of all system cards is using the Status screen. Toggling the "**s**" key will turn the status of the ports on or off. The default status for SSTE application is on.

Figure Basic-5 shows the Status screen and the information presented. The **lowercase letters** after the card entries signify the status of each of the ports on the cards. The possible values are "**s**" (Standby), "**a**" (Active), "**t**" (Test), "**l**" (Loopback) and "**r**" (Redundant).

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

Slot       Installed    Status      Slot       Installed    Status

C1         CPU XCON                 IF         INTF-Sync
C2                                  U1         HSU-530x4    ssss
P1                                  U2         HSU-530x4    ssss
P2                                  U3         HSU-530x4    ssss
P3                                  U4         HSU-530x4    ssss
W1         DSX+DSX      ss          U5         HSU-530x4    ssss
W2         DSX+DSX      ss          U6         HSU-530x4    ssss
W3                                  U7         HSU-530x4    ssss
W4                                  U8         HSU-530x4    ssss
F1         PS1                      RI
F2         PS2




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

Figure Basic-5. The Status Screen

If nothing is displayed in the Status column, pressing the "**s**" key will return the screen to its normal condition, with status settings. If the system is restarted by logoff/login activity or loss of power, the screen will also return to its normal condition. The status displayed is default (normal).

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 entering values, while others allow selecting 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 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 the 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 representing the action desired. Table Basic-2 shows the actions available from 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 unit 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.
Oos	Allows authorized operators to take cards out of service.
cpus**W**tch	Switches from the active to the redundant CPU card. See Redundant Operations chapter.

Configure each card to match the system settings previously determined. On the main screen, select each card in turn and change the options 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 NV-RAM on the Interface Card. Similar User, WAN and CPU cards may be replaced without having to reconfigure the new card. Replacing the card with a different type of card, the system will display a message to lose the current card settings. Pressing "**t**" will accept losing the card settings.

Alarms

Alarms warn of problems and alert of 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-6 shows the Alarm screen with one active alarm.

```
┌──────────────────────────────────────────────────────────────────────┐
│                                                                        │
│ Fremont              │                            │ 12-31-99  14:33    │
│                                                                        │
│ Active Alarms:      Page 1 of 1                                        │
│                                                                        │
│                                                                        │
│ 00023    W1-1    DSX-DSX    C  CGA_RED      12-31-99       12:41:21     │
│                                                                        │
│                                                                        │
│                                                                        │
│                                                                        │
│                                                                        │
│                                                                        │
│                                                                        │
│                                                                        │
│                                                                        │
│                                                                        │
│                                                                        │
│                                                                        │
│ Refresh  │  pgUp  │  pgDn  │  History  │  Filters  │  Main             │
│                                                                        │
└──────────────────────────────────────────────────────────────────────┘
```

Figure Basic-6. The Alarm Screen

The first column shows the Alarm Number (a sequential number from 00001 to 65535) used to identify the alarm for tracking and maintenance (in this case, 00023). The second column 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 DSX modules). The fourth column shows the alarm modifier (in this case, C [critical]). (See the Modifiers section further on in this chapter for more information about alarm modifiers.) The fifth column shows the type of alarm generated (in this case, CGA_RED). The sixth column shows the date of the alarm and the last column 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 the alarm reports occurrences in a number of different ways. Figure Basic-7 shows the Alarm Filters screen accessed by pressing "**F**" on the main Alarm screen.

```
┌─────────────────────────────────────────────────────────────────────────┐
│                                                                           │
│ Fremont                                              │ 12-31-99  14:33    │
│                                                                           │
│   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         log      minor    aco-off         │
│   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_LOS     DS3 PLCP Loss of Frame    ignore   minor    aco-off         │
│   PLC_YEL     DS3 PLCP Yellow Alarm     ignore   minor    aco-off         │
│                                                                           │
│                                                                           │
│                                                                           │
│  Save  │  Undo  │  Refresh  │  Main                                       │
│                                                                           │
└─────────────────────────────────────────────────────────────────────────┘
```

Figure Basic-7. The Alarm Filters Screen (Default values)

The first column shows the alarm abbreviation 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 in sections later in this chapter.

The filter in the third column will take precedence over its modifier. If 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 Sync	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		Not available for SSTE applications.
DCHAN		Not available for SSTE applications.
SWITCH		Not available for SSTE applications.
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 **latch** 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. Set ACO options to either **latch** or **cur** on the CPU card (see the ACO section on the next page).
SYNC	Clock Sync Alarm	The SYNC alarm is generated when either the primary or secondary external clock source is lost.
EER-3		Not available for SSTE applications.
PLC_OOF		Not available for SSTE applications.
PLC_LOF		Not available for SSTE applications.
PCL_YEL		Not available for SSTE applications.

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 if the ACO operation selected on the CPU card is **latch**. Current alarm conditions can be displayed if the **cur** option is selected on the CPU card. Used with the node port of the Interface card (see Interface card chapter), ACO can also trigger some external alarm devices, such as a bell or light, that must be manually cleared by the operator. *Latched ACO alarms must be cleared from the Interface card screen.*

Alarm Handling

The **report** alarm function sends alarm information to a remote printer, Network Management System or other logging device, in addition to logging the alarm in the Alarm History log.

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-8 shows the Alarm History Screen. While the History screen is displayed, update the list with any new alarms that occur by selecting "**r**" (Refresh) from the bottom menu of actions. Delete all entries in the log by selecting "**c**" (Clear) from the menu of actions on the History screen..

```
┌─────────────────────────────────────────────────────────────────────────┐
│ ┌─────────────────────────────────────────────────────────────────────┐ │
│ │ Fremont                │                       │ 12-31-99  14:33      │ │
│ │                                                                       │ │
│ │ History Alarms:     4  Page 1 of 1                        [ OOS  U3 ] │ │
│ │                                                                       │ │
│ │                                                                       │ │
│ │ 00012   W1-1    DSX+DSX    C  CGA_RED   12-31  12:22:00  12-31  12:23:00 │
│ │ 00011   W1-1    DSX+DSX    M  NOS       12-30  08:02:09  12-30  09:30:00 │
│ │ 00010   W1-1    DSX+DSX    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-8. The Alarm History Screen

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 the card in user slot three is out of service.

Re-Initializing the System

It is important to note the system is designed to perform as described throughout this chapter. Information about cards inserted, card settings, WAN connections, passwords and other data is stored on the nonvolatile RAM (NV-RAM) on the Interface Card.

When most card types are removed and replaced, the NV-RAM 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 a card is replaced with a different type of card, the system will offer the operator the option of deleting the old card, so the new parameters can be established (see Accept function in "Configuring the Cards," earlier in this chapter).

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-9.

```
                              Test and Debug










































 Zip  |  zAp  |  Debug  |  Reg  |  Backup  |  rEstore  |  Main
```
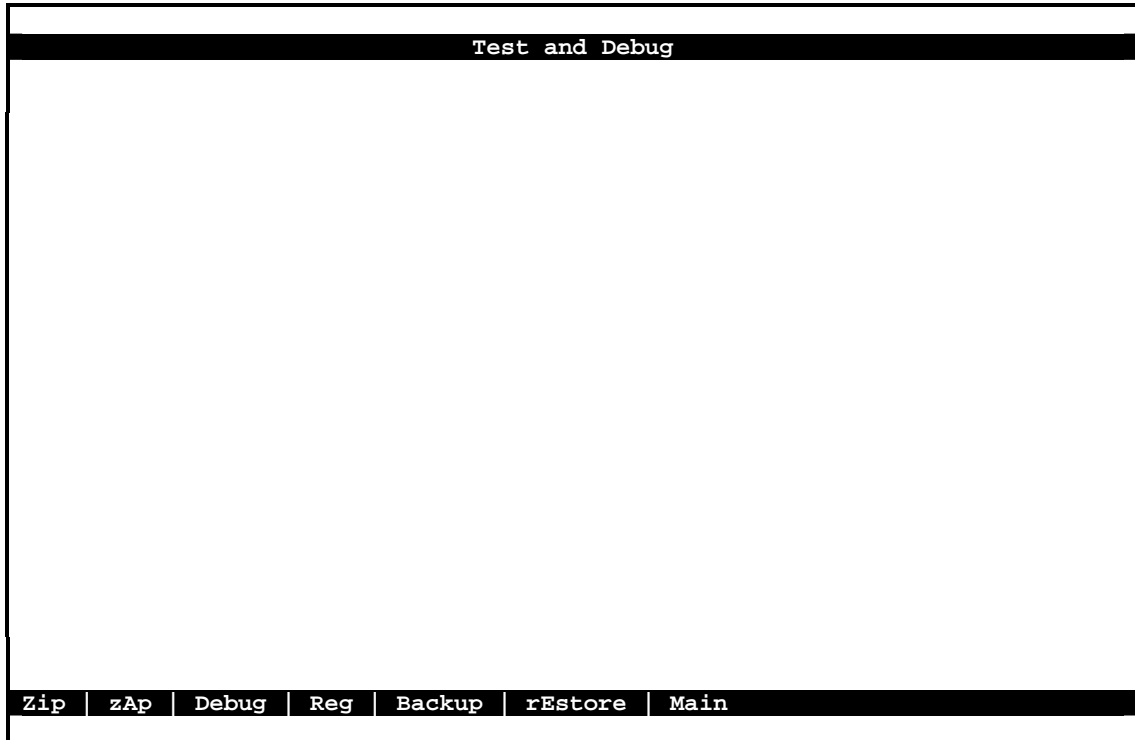
Figure Basic-9. Test and Debug Screen

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-10.

ZAP

Similar to the "Zip" command, the "zAp" command will also reboot the system unit and erase all card information, but all of the TCP/IP information for alarm reporting information will be retained.

```
┌──────────────────────────────────────────────────────────────┐
│ ██████████████████████████████████████████████████████████████ │
│ ██████████████████████ Test and Debug ████████████████████████ │
│                                                                │
│                                                                │
│                                                                │
│                                                                │
│                                                                │
│                                                                │
│                                                                │
│                                                                │
│                                                                │
│                                                                │
│                                                                │
│                                                                │
│                                                                │
│                                                                │
│                                                                │
│ Zip will reboot the system.  Ok to Zip (Y/N)?                  │
│ ██████████████████████████████████████████████████████████████ │
│ Zip │ zAp │ Debug │ Reg │ Backup │ rEstore │ Main              │
└──────────────────────────────────────────────────────────────┘
```
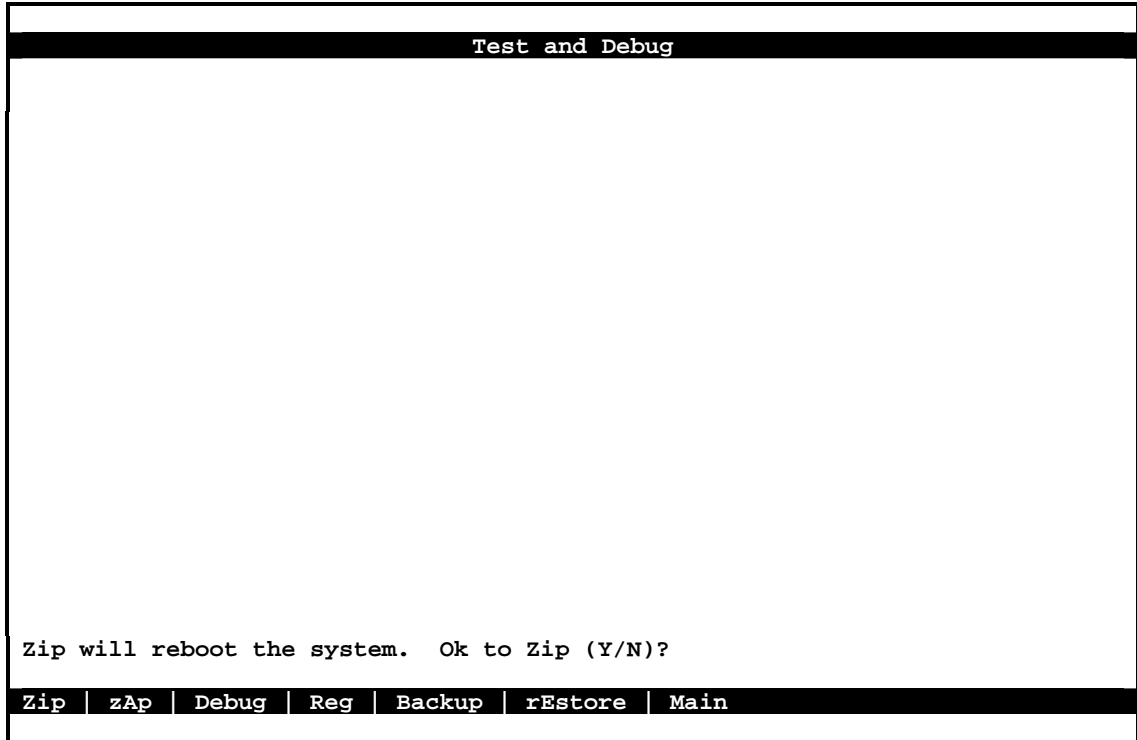
Figure Basic-10. Zip Screen

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 original registration is explained on the first page of this chapter. The user must have this information to properly reregister the system. **There should be no reason for this command to be used during normal operation of the system.**

The vendor code for the system is: **280**.

The registration procedure consists of three steps. First, the user must enter the vendor code. Second the user must 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). Finally, confirmation of the proposed changes is required (y=yes, n=no). Figure Basic-11 shows the completed Registration screen.

```
┌─────────────────────────────────────────────────────────────────────┐
│ Fremont            │        Welcome to Registration      │ 12-31-99  14:33 │
│                                                                       │
│                                                                       │
│                                                                       │
│                          Vendor Code:    280                          │
│                                                                       │
│          1.   Front - Loading Only / Power Supplies on side           │
│                                                                       │
│          2.   Front - Loading Only / Power Supplies on top            │
│                                                                       │
│          3.   Front & Rear Loading / Power Supplies on side           │
│                                                                       │
│                          Select one:  3                               │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
│ Is the information on this screen correct (Y/N)?                      │
│ Main                                                                  │
└─────────────────────────────────────────────────────────────────────┘
```

Figure Basic-11. Registration Screen

BACKUP

This feature is not available for SSTE operations.

RESTORE

This feature is not available for SSTE applications.

MAIN

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

Introduction

The primary purpose of the equipment is to maximize the use of incoming and outgoing T1 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 Timeslots from an HSU Card

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

Timeslot assignment will be as unique as each customer's needs. In order to illustrate the timeslot assignment process, a system using an HSU card in T1 operation is used. Figure System-1 shows a picture of one of those ways. In drop-and-insert mode, routes are defined on the timeslot map that assigns WAN port 1-1 timeslots TS#1-4 to port #1 on the HSU card, TS#5-8 to the second port on the HSU card, TS#9-12 to the third port and TS#13 to the fourth port on the HSU card. The remaining 11 timeslots can be cross-connected to the corresponding timeslots on WAN port 1-2. The HSU card illustrates the case where one port may be assigned to multiple WAN timeslots using a table (see Figure System-2). *All of the other cards available are assigned to timeslots in a similar manner and specific instructions are included in each card chapter.*
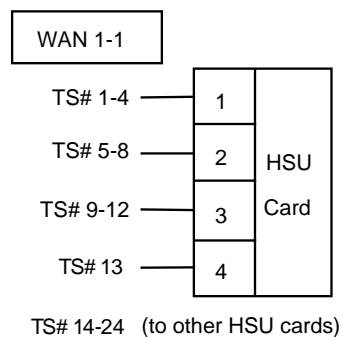
Figure System-1. A Drop-and-Insert Mode for T1 Operations

HSU Card

Figure System-2 shows the HSU card screen for the example in Figure System-1.

1. From the Main Screen, select the HSU card.

2. When the HSU card shows on the screen, choose the WAN timeslot ports.

3. Select the WAN port to assign the HSU port. This is a two-step process; first, select WAN from the WAN/SERVER and a sub-menu will allow selection of w1-1 - w4-2. In our example, this would be WAN w1-1. Second, 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 (using the arrow keys to move the cursor) and press the <Enter> key.** In the example, HSU port #1 is assigned to four timeslots.

4. Change the STATE for each port from **stdby** to **actv**.

5. Select **Save** (press "**s**") to save the changes.

```
┌──────────────────────────────────────────────────────────────────────────┐
│                                                                            │
│ Fremont     │ U1 15895 HSU-530X4  COM 407535061 Ser 01103 │ 12-31-99 14:33 │
│                                                                            │
│                      1             2             3             4           │
│          STATE       actv          actv          actv          actv       │
│          WAN/SERVER  w1-1          w1-1          w1-1          w1-1        │
│          TS          table         table         table         table      │
│          RATE        64K           64K           64K           64K         │
│          Tx CLOCK    int           int           int           int        │
│          CLOCK PLRTY norm          norm          norm          norm        │
│          DATA PLRTY  norm          norm          norm          norm        │
│          CTS         perm          perm          perm          perm        │
│          CTS DELAY   0             0             0             0           │
│          LOCAL LB    off           off           off           off         │
│          LB GEN MODE dds           dds           dds           dds         │
│          LB GEN      off           off           off           off         │
│          LB DET      w/to          w/to          w/to          w/to        │
│          ISDN CONN   no            no            no            no          │
│          ERR         off           off           off           off         │
│                                                                            │
│                                                                            │
│                     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                                                            │
│                                                                            │
│                                                                            │
│ Save │ Undo │ Refresh │ Copy │ Test │ Dial │ Perf │ Main                  │
│                                                                            │
└──────────────────────────────────────────────────────────────────────────┘
```

Figure System-2. HSU Card Screen with Timeslot Selection Displayed

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.

To see the results of the assignment selections check, 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-3).

3. Select <**m**> for Main to return to the WAN card screen.

4. Select <**m**> for Main again to return to the Main screen.

```
Fremont       | W1 15812  DSX+DSX  COM 407535046 Ser 00101  | 12-31-99  14:33

   TS    XCON   TS       CIRCUIT ID       TS     XCON   TS       CIRCUIT ID
 1  u2-1  D-01     user_circuit     13     u2-1  D-13    user_circuit
   2   u2-1  D-02     user_circuit     14     u2-1  D-14    user_circuit
   3   u2-1  D-03     user_circuit     15     u2-2  D 15    user_circuit
   4   u2-1  D-04     user_circuit     16     u2-1  D-16    user_circuit
   5   u2-2  D 05     user_circuit     17
   6   u2-2  D-06     user_circuit     18
   7   u2-2  D-07     user_circuit     19
   8   u2-2  D-08     user_circuit     20
   9   u2-2  D-09     user_circuit     21
  10   u2-3  D-10     user_circuit     22
  11   u2-3  D-11     user_circuit     23
  12   u2-3  D 12     user_circuit     24




Save | Undo | Refresh | Main
```

Figure System-3. Timeslot Screen in T1 Operations

Cross-Connecting WAN Timeslots

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

Cross-connecting WAN timeslots 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 the network. Figure System-4 shows the "Add" fields. Table System-2 lists the circuit parameters along with the possible and default values.

```
┌──────────────────────────────────────────────────────────────────────┐
│ Fremont      │ C1 10161 CPU XCON   COM 407535038 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      moos   n/a │
│                                                                        │
│                                                                        │
│ Save                                                                   │
└──────────────────────────────────────────────────────────────────────┘
```

Figure System-4. 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 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. In Figure System-5, 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, program each data DS0 cross-connect independently of the others. 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.

```
┌────────────────────────────────────────────────────────────────────────┐
│┌──────────────────────────────────────────────────────────────────────┐│
││ Fremont      │ C1 10161 CPU XCON   COM 407535038 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      moos   n/a ││
││                                                                        ││
││ SF01-NY01                                                              ││
││                                                                        ││
││                                                                        ││
││ Save                                                                   ││
│└──────────────────────────────────────────────────────────────────────┘│
└────────────────────────────────────────────────────────────────────────┘
```

Figure System-5. New Circuit Selection

W/U (WAN Unit)

The first WAN Unit column is the T1 link 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 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-6, shows the selection of w1-1.

TS/BW

The first Timeslot/Band Width column shows the different timeslots from w1-1 assigned
to this pass-through connection. Figure System-7 shows the selection of timeslots 8-12
from w1-1 assigned to the start of the connection. Any number of timeslots from **1-24**
would be acceptable for T1 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.

```
┌──────────────────────────────────────────────────────────────────────┐
│┌────────────────────────────────────────────────────────────────────┐│
││ Fremont        │ C1 10161 CPU XCON  COM 407535038 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     moos  n/a ││
││ w1-1  w1-2    w2-1   w2-2    w3-1   w3-2   w4-1    w4-2               ││
││                                                                      ││
││ Save                                                                 ││
│└────────────────────────────────────────────────────────────────────┘│
└──────────────────────────────────────────────────────────────────────┘
```

Figure System-6. The WAN Unit Options

```
┌──────────────────────────────────────────────────────────────────────┐
│┌────────────────────────────────────────────────────────────────────┐│
││ Fremont        │ C1 10161 CPU XCON COM 407535038 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     moos  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-7. The Timeslot/Band Width Options

Test

The first Test column allows the user to select the test pattern to be applied in the direction of the first WAN link specified. Figure System-8 shows the options 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 **lpbk** (loopback) option places the circuit in loopback in the direction of the first WAN link specified.

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

 page:    1  of  1

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




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

 off    all 0    all 1    m_oos    1:1    1:7    lpbk    300Hz    1KHz    3KHz

 Save
```

Figure System-8. The Test Options

W/U (WAN Unit)

The second WAN Unit column is the T1 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.

TS/BW

The second Timeslot/Band Width column shows the different timeslots from w3-2 assigned to this pass-through connection. Figure System-9 shows the selection of 5 timeslots from w3-2 assigned to the end of the connection. Any number of timeslots from **1-24** would be accepted for T1 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.*

```
┌─────────────────────────────────────────────────────────────────────────┐
│ Fremont        │ C1 10161 CPU XCON COM 407535038 Ser 00101 │ 12-31-99  14:33 │
│                                                                           │
│ page:    1  of  1                                                         │
│                                                                           │
│ CIRCUIT       W/U    TS/BW    TEST    W/U    TS/BW    TEST    TYPE   TC    CNV │
│ ID                                                                        │
│                                                                           │
│                                                                           │
│                                                                           │
│                                                                           │
│                                                                           │
│                                                                           │
│ SF01-NY01     w1-1   00x64    off    w3-2   00x64    off    d      moos   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-9. The Second Timeslot/Bandwidth Options

Test

The second Test column allows the user to select the test pattern to be applied in the direction of the second WAN link specified. Figure System-9 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), **1:7** ("one to seven" pattern where a zero is followed by a 1 and seven zeros), **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 **lpbk** (loopback) option places the circuit in loopback in the direction of the first WAN link specified. **Note**: TS/BW and Test are using same figure screen for this example.

Type

The Type column selects the mode of operation for the pass-through circuit. Figure System-10 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. The data option is the only one supported by SSTE.

```
┌──────────────────────────────────────────────────────────────────────┐
│ Fremont      │ C1 10161 CPU XCON COM 407535038 Ser 00101 │ 12-31-99  14:33 │
│                                                                        │
│ page:   1  of  1                                                       │
│                                                                        │
│ CIRCUIT      W/U    TS/BW   TEST    W/U    TS/BW   TEST   TYPE   TC    CNV │
│ ID                                                                     │
│                                                                        │
│                                                                        │
│                                                                        │
│                                                                        │
│                                                                        │
│                                                                        │
│ SF01-NY01    w1-1   05x64   off    w3-2   05x64   off    [ d   ]  moos  n/a │
│                                                                        │
│ v      v&s    [ d   ]                                                  │
│                                                                        │
│ Save                                                                   │
└──────────────────────────────────────────────────────────────────────┘
```

Figure System-10. 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 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 **moos**. An example of this is shown as Figure System-10.

CNV

The Conversion feature is not supported for SSTE applications.

```
┌─────────────────────────────────────────────────────────────────┐
│ Fremont      │ C1 10161 CPU XCON COM 407535038 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    d     moos  n/a │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│ Delete Selected Circuit (y/n)?                                     │
│ Add │ uPdate │ dElete │ pgUp │ pgDn │ View all │ Tads │ Main       │
└─────────────────────────────────────────────────────────────────┘
```

Figure System-11. The Delete Cross-Connect Screen

Menu of Actions

Table System-3 shows the Menu of Actions for the Cross-Connect Screen.

Table System-3. Menu of Actions Cross-Connect Screen

ACTION	FUNCTION
Add	Add allows programming additional pass-through criss-connects in the system.
u**P**date	Use to change information within fields. Use the "**s**" key to save changes.
d**E**lete	Use to delete existing pass-through connections. Press the "**y**" key to complete the transaction when prompted.
pg**U**p	Use this command to scroll up through the pages of TADS information.
pg**D**n	Use this command to scroll down through the pages of cross-connect information.
View all	This action is used to access the broadcast screen.
Tads	This is used to display test digroup information.
Main	Pressing "**m**" (Main) will return to the cross-connect screen.

Note: To perform an action, press the capitalized letter that corresponds to the action (for instance, "**a**" for "Add," "**p**" for "uPdate," "**u**" for "pgUp", etc.) User input is case-insensitive.

Test Access Digroups (TADS)

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

A test center can access the system unit and assign a non-intrusive testing circuit between the unit and the test center via another WAN link. Figure System-12 shows a 64Kbps data circuit between Fremont, CA and Tampa, FL and the cross-connect screen with the data circuits connected.

```
Fremont        | W1 15812 DSX+DSX  COM 407535046 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-12. The Updated WAN Card Screen

```
┌──────────────────────────────────────────────────────────────────┐
│ Fremont        │ 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  │
│ Tampa           w1-1  01*64   off     w1-2  01*64  off   d     moos  n/a  │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│                                                                    │
│ moNitor │ spLit │ Release │ Tla │ pgUp │ pgDn │ Main              │
└──────────────────────────────────────────────────────────────────┘
```

Figure System-13. The TADS Screen

In Figure System-13, the data circuit called "Tampa" is connected on a single time slot between w1-1 and w1-2.

Monitor Circuit

With the monitor circuit, the data test center (by remote access) creates a "hitless" monitor connection (i.e., created, maintained and dropped without affecting the information on the circuit being tested) between the data test center and the Fremont system unit.

Highlighting the desired circuit and pressing the "**N**" key, brings up the add monitor circuit screen shown in Figure System-14.

```
┌─────────────────────────────────────────────────────────────────────┐
│ Fremont      │ 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 │
│ Tampa          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-14. 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-15 shows the completed monitor circuit.

```
┌─────────────────────────────────────────────────────────────────────┐
│ Fremont      │ 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 │
│ Tampa          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 │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
│ moNitor │ spLit │ Release │ Tla │ pgUp │ pgDn │ Main                 │
└─────────────────────────────────────────────────────────────────────┘
```

Figure System-15. Completed Monitor Circuit

Figure System-16 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.
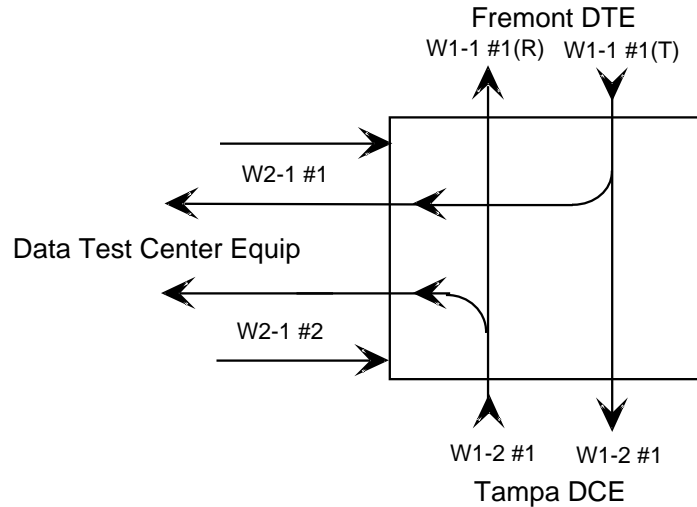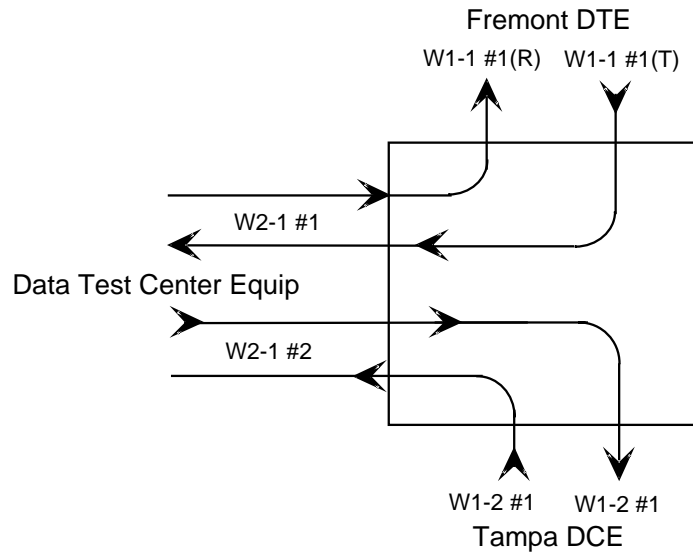

Figure System-16. Monitor Circuit Diagram

Split Circuit

Pressing the "**L**" command from the Menu of Actions allows splitting the circuit through the data test center equipment. New circuit information is added in the same manner as 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 intrusive and all transmit and receive data must pass through the equipment at the data test center.

Figure System-17 shows the TADS screen with a split circuit completed. It uses two 64Kbps timeslots (like the Monitor circuit). Figure System-17 shows a diagram of the split test circuit.

```
┌──────────────────────────────────────────────────────────────────────┐
│ Fremont      │ 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 │
│ Tampa          w1-1  01*64  spl   w1-2   01*64   off   d     moos  n/a  │
│ 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-17. TADS Screen with Split Circuits

Figure System-18. Split Circuit Diagram

Release

Pressing the "**R**" command from the Menu of Actions allows releasing 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 nonaccessed state.

Figure System-19 show the TADS screen with the restore question.

```
┌──────────────────────────────────────────────────────────────────────────┐
│ ┌────────────────────────────────────────────────────────────────────────┐│
│ │ Fremont      │ 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    ││
│ │ Tampa          w1-1  01*64  spl    w1-2  01*64   off   d     moos  n/a    ││
│ │ 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-19. 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-20 shows the TLA screen with the choice of **mon** (Monitor) or **uac** (Unassigned Channel Code) to be applied to the highlighted circuit. If TLA was applied to a Split circuit, the choices would be **spl** or **uac**.

```
┌─────────────────────────────────────────────────────────────────────────────┐
│                                                                               │
│ Fremont      │ 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     │
│ Tampa          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     │
│                                                                               │
│                                                                               │
│                                                                               │
│                                                                               │
│                                                                               │
│                                                                               │
│ Tampa          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-20. TLA Circuit State Screen

Menu of Actions

Table System-4 shows the Menu of Actions for the TADS screen.

Table System-4. Menu of Actions

ACTION	FUNCTION
mo**N**itor	The Monitor command allows the user to create a monitor circuit at the WAN interface.
sp**L**it	The Split command allows the user to create a split circuit at the WAN interface.
Release	The Release command allows the user to release and restore a split circuit or a monitor circuit.
Tla	The Terminate and Leave Access (TLA) command is the capability to terminate one or both directions of transmission on a circuit.
pg**U**p	The system can handle many different TADS circuits, which 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	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 to the cross-connect screen.

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.

DC Power Supply 15802

The 15802 DC power supply component is designed to switch to an alternative unit (if available) in the event the primary unit fails. The defective unit will create a system alarm upon failure to alert the operator of the condition so suitable diagnostic and repair work may be initiated.

Figure RDNT-1 shows the Main screen of a 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.

```
┌─────────────────────────────────────────────────────────────────────────┐
│ Fremont                                              │ 12-31-99  14:33    │
│                                                                           │
│ Slot    Installed   Status     Slot    Installed   Status    OOS      F1  │
│                                                                           │
│ C1      CPU XCON                IF      INTF-Sync                          │
│ C2                              U1      HSU-530x4   ssss                   │
│ P1                              U2      HSU-530x4   ssss                   │
│ P2                              U3      HSU-530x4   ssss                   │
│ P3                              U4      HSU-530x4   ssss                   │
│ W1      DSX+DSX     ss          U5      HSU-530x4   ssss                   │
│ W2      DSX+DSX     ss          U6      HSU-530x4   ssss                   │
│ W3      DSX+DSX     ss          U7      HSU-530x4   ssss                   │
│ W4      DSX+DSX     ss          U8      HSU-530x4   ssss                   │
│ F1      PS1         OOS         R1                                         │
│ F2      PS2                                                               │
│                                                                           │
│                                                                           │
│                                                                           │
│                                                                           │
│                                                                           │
│ Alarms │ Config │ Del │ accepT │ Xcon │ sYs│ Logout │ Oos │ cpuSwtch      │
└─────────────────────────────────────────────────────────────────────────┘
```

Figure RDNT-1. Redundant Power Systems

Introduction CPU Card 10161

The CPU Card controls all operations of the system. One CPU Card is required for all installations. Two Model 10161 CPUs can be used for CPU redundancy.

The 10161 CPU card supports complex applications requiring more than two WAN ports and the ability to cross-connect DS0s between WANs. The 10161 supports up to four WAN Cards for a total of eight T1 WAN ports and has a built-in cross-connect module. A system using a 10161 CPU card operates in "cross-connect" mode. Two Model 10161 CPUs can be installed in slots C1 and C2 to achieve CPU redundancy. The 10161 also supports 1xN WAN redundancy (see the Redundant Systems chapter).

Note: For SSTE Application, CPU and WAN redundancy are not supported.

CPU Card Settings

Figure CPU-1 shows the main CPU card screen and Table CPU-1 lists the settings accessible from this screen along with their possible and default values.

```
Fremont      │ C1 10161 CPU XCON  COM 407535038 Ser 01103 │ 12-31-99  14:33


NODE ID          Fremont
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 4.0x  Voice 4.0y












Save │ Undo │ Refresh │ Prt │ tcp/Ip │ Main
```
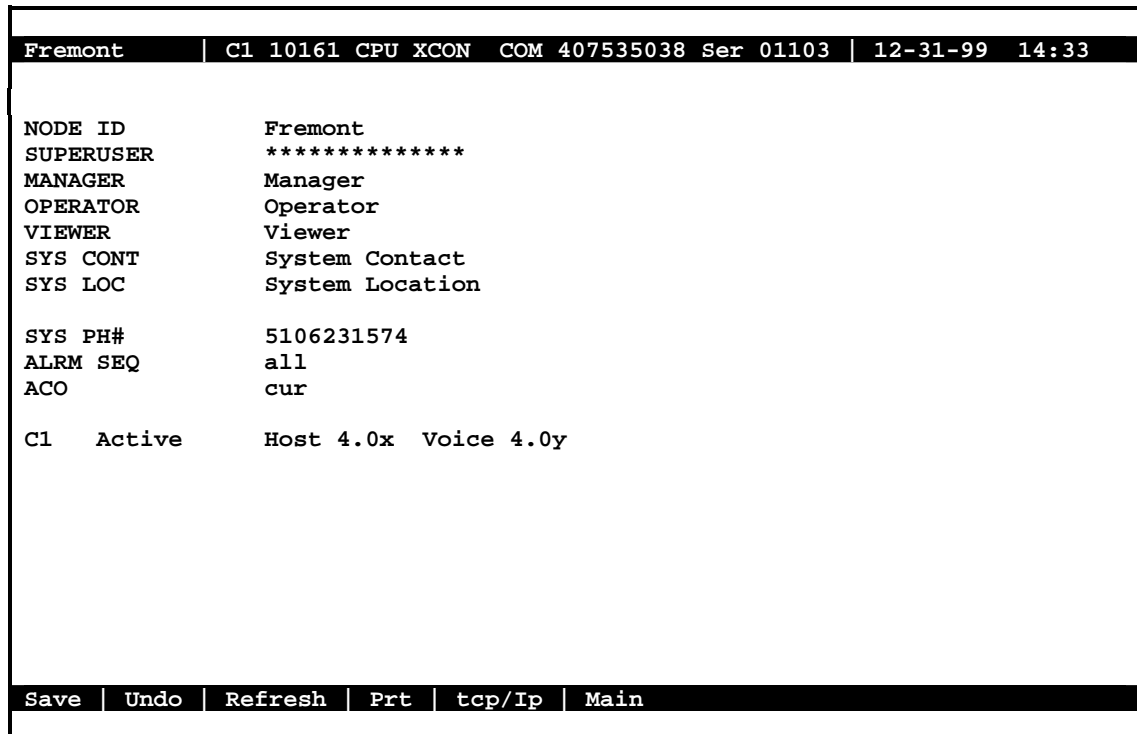
Figure CPU-1. CPU Card Screen

Note: The Host version may vary at **x** and **y** due to software maintenance builds.

The CPU card has nine settings: the Node ID, four passwords, System Contact, System Phone Number and Alarm Sequence number. The Node ID must be unique within your network for each unit. As described in the Basic Operations chapter, 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. You set 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: 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 field is blank (23 characters) used to describe the person or group responsible for maintenance of the system unit. The System Location (also 23 characters) is used for unit location information.

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

The Alarm Sequence setting will establish 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 ACO option allows the setting the alarm to a **latch** state (stay on) or only display the **cur** (current) state (active alarms).

The CPU screen will also display 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 the 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, some of the letters in the passwords may be capitalized to allow more combinations

In order to change the system passwords, the user must first log on to the system at the Manager access level and select the CPU card from the main screen. After highlighting the password to be changed, press the <Enter> key, type the new password over the old password and press the <Enter> key again. Make sure the password is correct (**passwords are case-sensitive**) and save your change.

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 not automatically updated (i.e. performance and test data).
Prt	Not a SSTE function.
tcp/**I**p	Not a SSTE function.
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 WAN Card 15812

WAN cards manage the flow of data through your network. They are also the point of T1 termination and generate or receive clocking. Both CSU and DSX modules are used to connect to T1 facilities operating at 1.544Mbps.

Additional information about WAN card functions is included in the Installation and System Operations chapters.

DSX/CEPT Plug-in Module 15887

The DSX/CEPT plug-in module supports either DSX or CEPT modes. It is mounted on the WAN Card. DSX is for T1 operation. Jumper settings on the module specify operation. See the Installation chapter for information about installing the module or changing jumper settings.

```
Fremont         | W1 15887 DSX+DSX   COM 407542737 Ser 00101 | 12-31-99 16:46

                  DSX                                    DSX
STATE             stdby             STATE                stdby
MODE              xcon              MODE                 xcon
FORMAT            esf               FORMAT               esf
LINE CODE         ami               LINE CODE            ami
PULSE             n/a               PULSE                n/a
LINE LEN          133               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           ansi
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-1. WAN Card Screen for DSX/DSX Operations

Table WAN-1. Parameter Options and Defaults for DSX Operations

Parameter	User Options	Notes	Default
STATE	stdby actv		stdby
MODE	xcon		xcon
FORMAT	d4 esf slc96 slcd4		esf
LINE CODE	ami b8zs		b8zs
PULSE	n/a		n/a
LINE LEN	0 133 266 399 533 655 csu.		0
SLIP LIM	126 138		126
AIS/ALM	none		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 off on		w/to
ESF/NMS RP	none at&t ansi c-fdl c-b7r efdl		at&t
EER THRHD	10e-4 thru 10e-9 none		10e-4
RDNT RULES	none OOS CGA	1	none
GROUP	none 1 2 3 4		none

NOTES

1. If there is no redundant WAN card in the appropriate slot, the only value is **n/a**.

STATE

In Standby state, the WAN port is electrically disconnected from the external network. Set State to **stdby** (standby) when setting up your WAN links, then change it to **actv** (active) when starting normal operations.

MODE

The Mode defaults to **xcon**.

FORMAT

The Format setting specifies the framing to be used on the WAN link so it matches the framing used by the T1 carrier. Set the Format parameter based on the type of framing your T1 carrier requires. If using an external Channel Service Unit (CSU), the framing format must match the CSU. The options are **d4** (normal superframe), **esf** (extended superframe), **slc96** (subscriber loop carrier) and **slcd4** (subscriber loop carrier - D4 format).

LINE CODE

The Line Code shows the transmission characteristics of the circuit. The options are **ami** (Alternate Mark Inversion) and **b8zs** (Bipolar 8-Zero Substitution, a coding scheme that maintains ones density).

PULSE

Pulse is not an SSTE function.

LINE LEN

Use the Line Length setting to adjust the T1 signal strength to the distance 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. There is an option **0** allowing the DSX module to talk to the network side of a co-located external CSU over a short-distance four-wire cable.

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

For SSTE Application, the AIS alarm is always framed. The only option is **none**.

LINE LB

The Line Loopback setting controls looping of the full T1 line back to the network, as shown in Figure WAN-2. When **on**, this setting allows end-to-end testing of the line.

LOCAL LB

The Local Loopback setting controls looping of the full T1 line back to the PCM bus, as shown in Figure WAN-2. The options are **off** and **on**. When **on**, this setting allows testing of local equipment.

CH LB

The Channel Loopback setting allows selecting 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-3) 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 looping part of a channel or multiple channels.

The loopback can be **off** or **clr** (clear). Clear means the entire 64Kbps channel will be looped back, but without the Robbed Bit Signaling (RBS), if any, embedded in this channel.
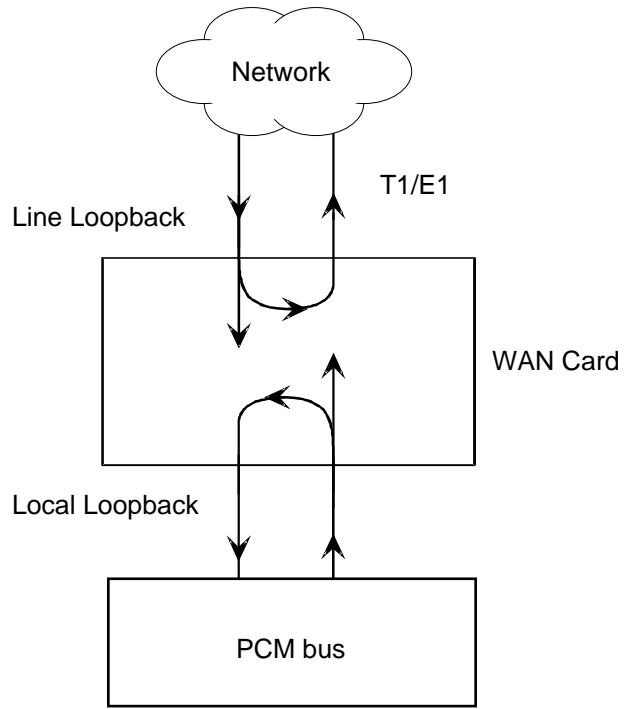
Figure WAN-2. WAN Card Line and Local Loopbacks
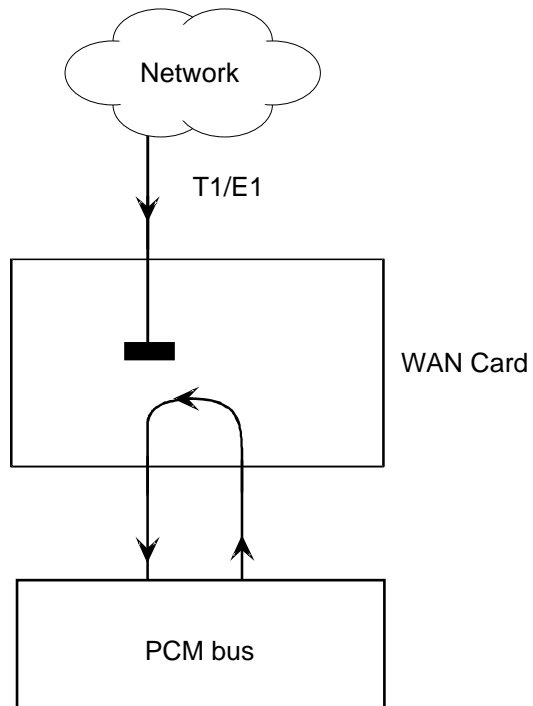
Figure WAN-3. WAN Card Channel Loopback

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 FDL diagnostic codes 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 **w/to** (with/time-out) is the same as **on** except if no loop down is detected after 10 minutes, the loopback will self-terminate.

The system will only respond to "in-band" loopback codes, thus the ANSI T1.403 loopbacks mentioned in the paragraph above will not be detected by this card.

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) and to the operator through the user interface. The options are **none**, **at&t**, **ansi**, **c-fdl**, **c-b7r** and **e-fdl.** The **at&t** option means the statistics are gathered in accordance with AT&T Publication 54016 whereas the **ansi** option means the ANSI T1.403 specification will be used to generate performance messages (PRM).

Note: No buffering of PRM data is performed. Therefore, the loss of a PRM would mean the loss of the collected data.

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 for NMS equipment. The **c-b7r** option sends and receives the same information over timeslot #24 on the WAN link highlighted. The **e-fdl** format option is a proprietary format and is only used with AT&T Paradyne 31xx equipment.

EER THRHD

The Excessive Error Rate Threshold selects the error rate at which an alarm message is declared. This setting interacts with the EER setting in the Alarm Filters of the 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 value displayed is **n/a**.

GROUP

The Group setting is not an SSTE function.

Menu of Actions

Table WAN-3 shows the Menu of Actions for the CSU/DSX main screen of the WAN Card.

Table WAN-3. 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 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 unit. See the Performance Monitoring section below.
Farstat	Brings up the performance monitoring screen for the far-end system unit. Since both Performance Monitoring and Farstat measure the same statistics, those statistics are only described in the Performance Monitoring section (see Far-End Statistics section below).
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.
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.

Performance Monitoring

Performance monitoring is supported on all WAN aggregates. The performance screen is accessed by typing the "**p**" (Perf) command from the WAN card main screen Menu of Actions. Statistics are accumulated for 15 minute increments that include the current period (CUR) and the previous 96 periods accessed by the "**pgUp**" and "**pgDn**" commands from the Menu of Actions. The screen will display Unit 1 or Unit 2 depending upon which WAN port has been selected.

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.

Periods when no seconds have accumulated or the registers have been cleared ("**c**") are represented by dashes in each of the columns (see Figure WAN-5, rows 11 and 12).

There are two modes of Performance Monitoring for T1 networks; ANSI and AT&T. Each performs in a slightly different manner. Whichever mode is selected, it **must** be the same at both ends of the network.

The user should also note that the performance statistics for both near- and far-end devices are mapped into the performance measurements of the AT&T publication 54016 (i.e., Errored Seconds, Burst Errored Seconds, Severely Errored Seconds, etc.).

ANSI Mode Performance Monitoring
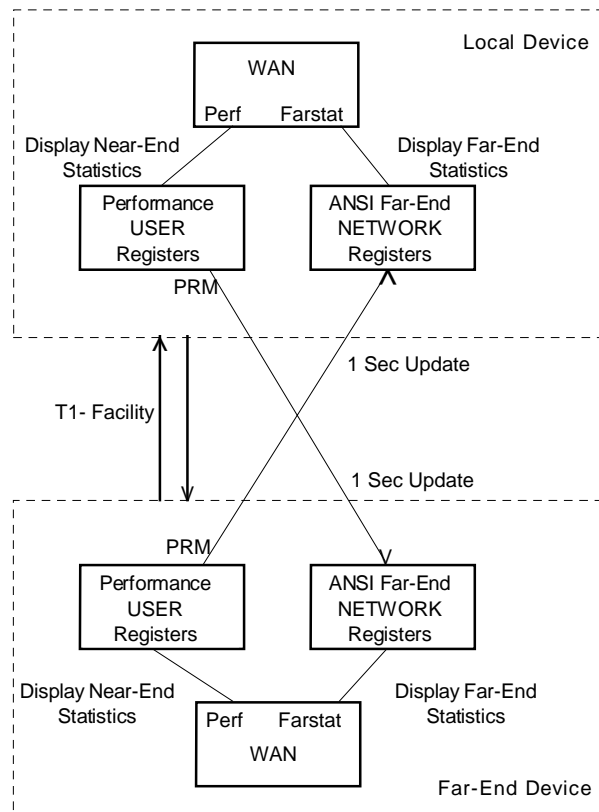
Figure WAN-4. ANSI Performance and Statistics Screens

Two sets of registers may be displayed in the ANSI mode: USER (near-end receive) and NETWORK (far-end receive data). The USER menu is accessed through the Perf command from the WAN card main menu, while the NETWORK menu is accessed through the Farstat command. The USER menu of ANSI mode displays the near-end performance registers accumulated on the incoming DS1, while the NETWORK menu of ANSI mode displays the far-end statistics accumulated from the PRMs of the remote device.

In the ANSI mode of operation, PRMs are not transmitted during the receipt of a facility alarm (such as Red or CGA-Red Alarm). Data of lost PRMs cannot be recovered by the receiving node. This may result in a difference in the register information between the ANSI far-end NETWORK menu display of the local AAC and the USER display menu of the far-end AAC for the same DS1. Alarm information stored in the alarm history log of the AAC should also be consulted when evaluating DS1 performance.

Figure WAN-5 below shows the ANSI Performance User Registers. Each of the registers displayed are defined later in this section.

```
Fremont          │ W1 15887 DSX+DSX  COM 407542737 Ser 00101 │ 12-31-99  16:46

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       . . . . . . .
01        0       0       0       0       0       0       0       . . . . . . .
02        0       0       0       0       0       0       0       . . . . . . .
03        0       0       0       0       0       0       0       . . . . . . .
04        0       0       0       0       0       0       0       . . . . . . .
05        0       0       0       0       0       0       0       . . . . . . .
06        0       0       0       0       0       0       0       . . . . . . .
07        0       0       0       0       0       0       0       . . . . . . .
08        0       0       0       0       0       0       0       . . . . . . .
09        0       0       0       0       0       0       0       . . . . . . .
10        0       0       0       0       0       0       0       . . . . . . .
11        ----    ----    ----    ----    ----    ----    ----    . . . . . . .
12        ----    ----    ----    ----    ----    ----    ----    . . . . . . .
TOTAL     0       0       0       0       0       0       0       . . . . . . .

STATUS:   Y=YEL   N=NOS   T=Test   L=LOS   O=OOS   B=BPV   E=ERR

 Refresh │ pgUp │ pgDn │ Clearregs │ Main
```

Figure WAN-5. ANSI Mode USER Performance Monitoring Screen

The USER registers in the ANSI Performance screen shown above may be cleared by selecting Clearregs from the Menu of Actions. Message displayed will be:

"**Ok to clear performance (y/n) ?**"

Pressing "**y**" (yes) will clear the statistics and a "**n**" (no) will halt the clear function.

ANSI Mode Far-End Statistics

The Far-End Statistics NETWORK (Farstat) screen is similar to the USER Performance
Monitoring screen. Figure WAN-6 displays the far-end network registers of the ANSI
mode.

When Farstat is selected, the far-end network statistics are displayed and updated at one-
second intervals. A refresh is required to display updates.

```
Fremont          | W1 15887 DSX+DSX  COM 407542737 Ser 00101 | 12-31-99  16:46

Unit 1 ANSI FAREND STATISTICS  NETWORK REGISTERS  Sec. 167 of 900

          ES      UAS     SES     BES     FE      SLIP
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

WAN1-1 ANSI-PRM receiving ...

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

Figure WAN-6. ANSI Mode Far-End Statistics

The message at the bottom of the screen indicates the status of the PRM packets received
from the far-end. The messages are: "**WAN1-1 ANSI-PRM receiving ...** " and
"**No WAN1-1 ANSI- PRM received ...** "

Pressing "**c**" (Clear) from the above Menu of Actions will clear the local display of the
far-end NETWORK statistics. Upon pressing "**c**", the following message will appear:

<div align="center">

"**Ok to clear performance (y/n)?**"

</div>

Pressing "**y**" (yes) will clear the statistics; pressing "**n**" (no) will halt the clear function.

The list of column headings defined below apply to both the ANSI USER and
NETWORK statistics screens.

ES

An Errored Second (ES) is a second with one or more CRC6 (ESF) errors, BPV errors,
one or more OOFs or one or more Controlled Slips.

UAS

An Unavailable Second (UAS) is any second 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) errors, BPV 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) errors or BPV errors.

LOFC

The Loss of Frame Count (LOFC) is the accumulation of the number of times a Loss Of Frame (LOF) is declared. LOF is declared after 2.5 seconds of continuous Loss Of Synchronization (LOS) or Out-Of-Frame (OOF) condition. An LOF is cleared after no more than fifteen consecutive seconds without an LOS or OOF condition. Not in Far-End screen.

FE

The Frame Sync Bit Errors detected in every frame is displayed in place of LOFC when displaying ANSI Network registers. Not in USER screen.

SLIP

A Slipped Second is any second containing one or more Controlled Slips. A Controlled Slip is the deletion or replication of a DS1 frame by the receiving equipment.

DM

A Degraded Minute (DM) is any minute during the reporting period containing more than 10^{-6} errors as described in CCITT G.821. The count for this field is 1-15 (min) rather than 1-900 (sec) for the other fields. Not in Far-End screen.

STATUS

If one of the described errors occurs during any of the fifteen minute intervals, the status column for that period would display the code for the error. The codes are displayed at the bottom of the screen. The 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). Not in Far-End screen.

Menu of Actions

Table WAN-4 shows the Menu of Actions for the ANSI Mode Performance Monitoring Screen.

Table WAN-4. Performance and Statistics Screens 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 information.
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.
Clearregs	*Only displays with user registers.* Clears the User Registers.
Clear	*Only displays with Farstat.* Clears the ANSI Far-End Network Registers.
Main	Returns to the main WAN card screen.

AT&T Performance Monitoring
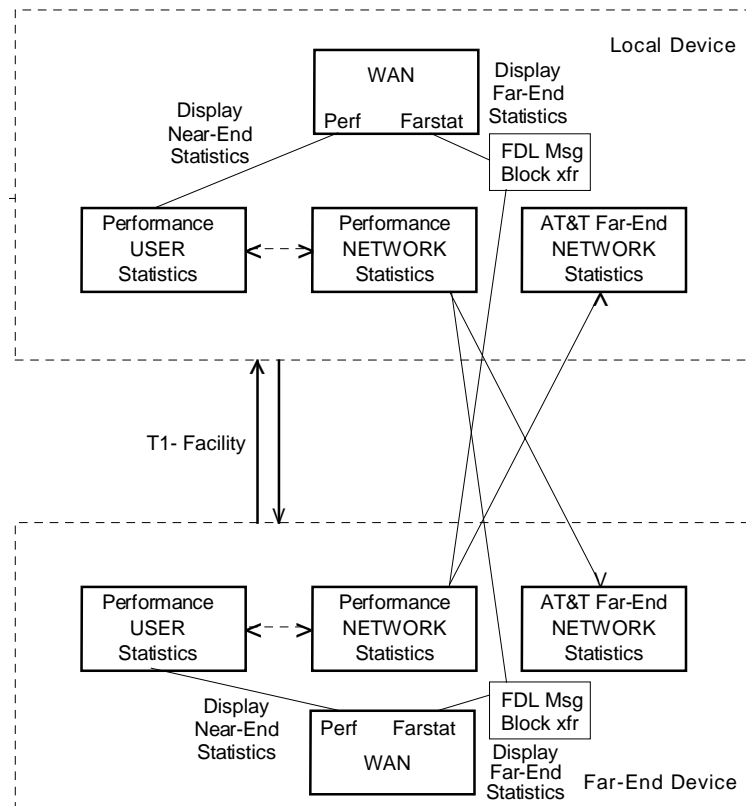
Figure WAN-7. AT&T Performance and Statistics Screens

Figure WAN-7 shows the AT&T Performance and Statistics screens from both ends of a T1 facility. The USER and NETWORK screens display data from the same source and the USER screens can be cleared using the Menu of Actions command for that screen. The Far-End statistics are displayed at the near-end when "Farstat" is selected. An FDL message is sent to the far-end and the statistics are returned as a block transfer and displayed locally.

The AT&T USER Performance Monitoring Screen is shown in Figure WAN-8. The statistics shown reflect the near-end receive performance.

From the AT&T USER screen, network registers can be displayed by pressing "**n**" (Networkregs). Figure WAN-9 shows an example of the NETWORK screen.

The USER and the NETWORK statistics screens will contain similar information until the USER registers are cleared using the "**c**" (Clearregs) action from the USER screen.

```
┌──────────────────────────────────────────────────────────────────────────┐
│ ▐ Fremont        │ W1  15887 DSX+DSX COM 407542737 Ser 00101 │ 12-31-99 16:46 ▌ │
│                                                                            │
│ 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      . . . . . . . .    │
│ 01      0      0      0      0      0      0      0      . . . . . . . .    │
│ 02      0      0      0      0      0      0      0      . . . . . . . .    │
│ 03      0      0      0      0      0      0      0      . . . . . . . .    │
│ 04      0      0      0      0      0      0      0      . . . . . . . .    │
│ 05      0      0      0      0      0      0      0      . . . . . . . .    │
│ 06      0      0      0      0      0      0      0      . . . . . . . .    │
│ 07      0      0      0      0      0      0      0      . . . . . . . .    │
│ 08      0      0      0      0      0      0      0      . . . . . . . .    │
│ 09      0      0      0      0      0      0      0      . . . . . . . .    │
│ 10      0      0      0      0      0      0      0      . . . . . . . .    │
│ 11      0      0      0      0      0      0      0      . . . . . . . .    │
│ 12      0      0      0      0      0      0      0      . . . . . . . .    │
│ TOTAL   0      0      0      0      0      0      0      . . . . . . . .    │
│                                                                            │
│ STATUS:  Y=YEL   N=NOS   T=Test   L=LOS   O=OOS   B=BPV   E=ERR            │
│                                                                            │
│ ▐ Refresh │  pgUp │  pgDn │  uSerregs │   Networkregs │ Clearregs │  Main  ▌│
└──────────────────────────────────────────────────────────────────────────┘
```

Figure WAN-8. AT&T Mode USER Performance Monitoring Screen

```
┌──────────────────────────────────────────────────────────────────────────┐
│ ▐ Fremont        │ W1  15887 DSX+DSX COM 407542737 Ser 00101 │ 12-31-99 16:46 ▌ │
│                                                                            │
│ Unit 1  PERFORMANCE   NETWORK REGISTERS   Sec. 167 of 900                  │
│                                                                            │
│         ES     UAS    SES    BES    LOFC   SLIP   DM     STATUS            │
│ CUR     0      0      0      0      0      0      0      . . . . . . . .    │
│ 01      0      0      0      0      0      0      0      . . . . . . . .    │
│ 02      0      0      0      0      0      0      0      . . . . . . . .    │
│ 03      0      0      0      0      0      0      0      . . . . . . . .    │
│ 04      0      0      0      0      0      0      0      . . . . . . . .    │
│ 05      0      0      0      0      0      0      0      . . . . . . . .    │
│ 06      0      0      0      0      0      0      0      . . . . . . . .    │
│ 07      0      0      0      0      0      0      0      . . . . . . . .    │
│ 08      0      0      0      0      0      0      0      . . . . . . . .    │
│ 09      0      0      0      0      0      0      0      . . . . . . . .    │
│ 10      0      0      0      0      0      0      0      . . . . . . . .    │
│ 11      0      0      0      0      0      0      0      . . . . . . . .    │
│ 12      0      0      0      0      0      0      0      . . . . . . . .    │
│ TOTAL   0      0      0      0      0      0      0      . . . . . . . .    │
│                                                                            │
│ STATUS:  Y=YEL   N=NOS   T=Test   L=LOS   O=OOS   B=BPV   E=ERR            │
│                                                                            │
│ ▐ Refresh │  pgUp │  pgDn │  uSerregs │ Networkregs │  Main               ▌│
└──────────────────────────────────────────────────────────────────────────┘
```

Figure WAN-9. AT&T Mode NETWORK Performance Monitoring Screen

From the AT&T NETWORK screen user registers can again be displayed by selecting "**s**" (uSerregs).

Pressing "**m**" (Main) from either menu of actions will return to the WAN screen.

AT&T Mode Far-End Statistics

The Far-End Statistics NETWORK (Farstat) screen is similar to the Performance Monitoring screen. The same statistics are collected in a slightly different manner. Figure WAN-10 displays the far-end NETWORK registers for the AT&T mode.

When Farstat is selected in the AT&T mode, an FDL message is generated to the far-end requesting the network statistics data, which is displayed on the local device. There will be a slight lag in the data display, caused by the data transfer interval.

```
Fremont        | W1 15887 DSX+DSX  COM 407542737 Ser 00101 | 12-31-99  16:46

Unit 1  AT&T FAREND STATISTICS   NETWORK REGISTERS  Sec. 167 of 900

        ES      UAS     SES     BES     LOFC    SLIP
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

Retrieving message.  Please wait ...

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

Figure WAN-10. AT&T Mode Far End Statistics

Pressing "**c**" (Clear) from the Menu of Actions will send an FDL message to the far-end device and clear the registers of the Far-End Statistics NETWORK display, as well as the registers of the PERFORMANCE NETWORK display of that far-end device. Upon pressing "**c**", the following message will appear:

"**Ok to clear performance (y/n) ?**"

Pressing "**y**" (yes) will clear the statistics, a "**n**" (no) selection will halt the clear function. To view the far-end information again, press "**r**" (restore) to send an FDL message and refresh the screen.

ES

An Errored Second (ES) is a second with one or more CRC6 (ESF) errors, BPV (D4) errors, one or more OOFs or one or more Controlled Slips.

UAS

An Unavailable Second (UAS) is any second 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) errors, BPV (D4) 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) errors or BPV (D4) errors.

LOFC

The Loss of Frame Count (LOFC) is the accumulation of the number of times a Loss Of Frame (LOF) is declared. LOF is declared after 2.5 seconds of continuous Loss Of Synchronization (LOS) or Out-Of-Frame (OOF) condition. An LOF is cleared after no more than fifteen consecutive seconds without an LOS or OOF condition.

SLIP

A Slipped Second is any second containing one or more Controlled Slips. A Controlled Slip is the deletion or replication of a DS1 frame by the receiving equipment.

DM

A Degraded Minute (DM) is any minute during the reporting period containing more than 10^{-6} errors as described in CCITT G.821. The count for this field is 1-15 (min) rather than 1-900 (sec) for the other fields. Not in Far-End screen.

STATUS

If one of the described errors occurs during any of the fifteen minute intervals, the status column for that period would display the code for the error. The codes are displayed at the bottom of the screen. The 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). Not in Far-End screen.

Menu of Actions

Table WAN-5 shows the Menu of Actions for the AT&T Mode Performance Monitoring
Screen.

Table WAN-5. 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 information.
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.
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 operation).
Clearregs	*Only displays for user registers.* Clears the User Registers. Network statistics remain the same.
Clear	*Only displays with Farstat.* Clears the Far-End Network Registers display.
Main	Returns to the main WAN card screen.

Test

Selection of "Test" from the Menu of Options will bring up the screen shown in Figure WAN-11. 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-6 lists the settings controlled on this screen along with their possible and default values.

```
Fremont       | W1 15887 DSX+DSX  Com 407542737 Ser 00101 | 12-31-99  16:46

                      DSX                DSX
BERT              n/a                n/a
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
```
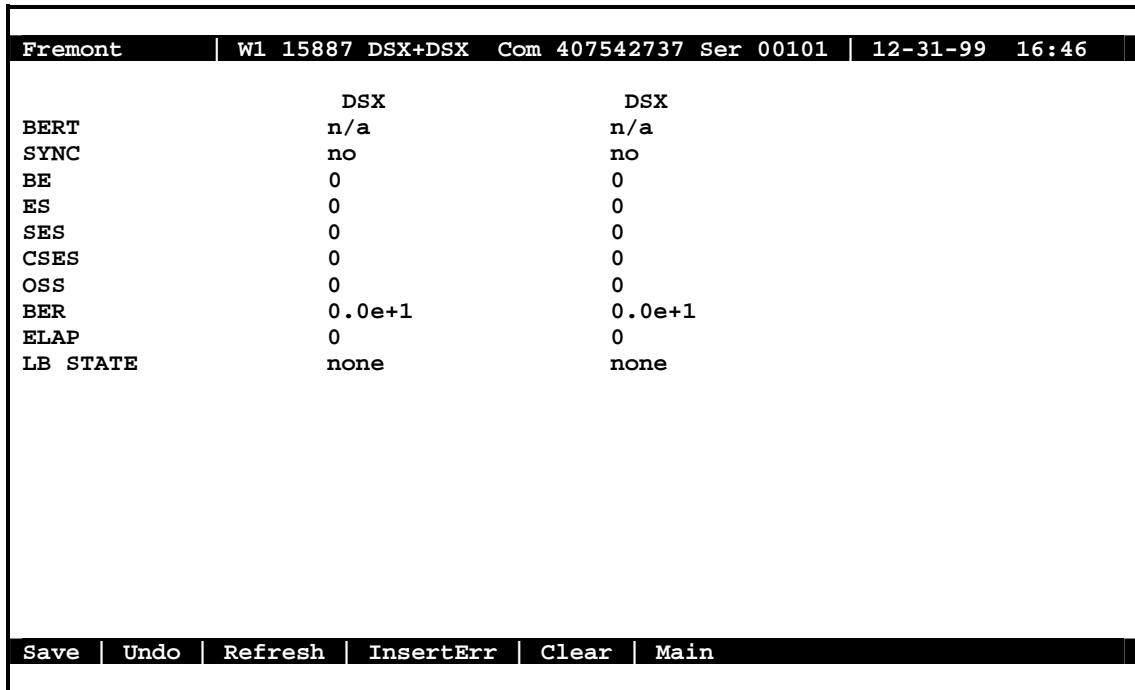
Figure WAN-11. The WAN Card Test Screen

Table WAN-6. Test Screen Options

Parameter	User Options	Notes	Default
BERT	off mark space 1:1 1:7 3:24 qrss lp-up lp-dn	1	off
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 STATE	information only - no user options		

NOTES

1. The **lp-up** (loop-up) and **lp-dn** (loop down) codes are not supported for CEPT WANs.

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**, **1:7**, **3:24**, **qrss** (quasi-random pseudo signal), **lp-up** (which sends an in-band T1 loop-up code to the remote end) and **lp-dn** (which sends an in-band loop-down code to the remote end). The last two options are not available for CEPT WANs.

SYNC

The Synchronization (SYNC) field displays 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 (BE) 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 (ES) 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 is an information-only field, there are no user-selectable parameters.

OSS

The Out of Synchronization Seconds (OSS) field shows the number of seconds the WAN 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.

LB STATE

The Loopback State setting changes when 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-7 shows the Menu of Actions for the Test Screen of the WAN Card.

Table WAN-7. 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 not automatically updated (i.e. performance and test data).
InsertErr	Allows the user to manually insert a single error into the clear data signal. This does not generate a CRC error.
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.

Introduction Interface Card 10175

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.

The 10175 Interface Card has all communications, control and network interface ports. It has a DB9 (male) serial port (COM1) for Datakit Control and four RJ48 jacks that provide for: external synchronization, a VT-100 local control terminal port, a node port for alarm notification and a second terminal port (COM2) for Datakit. The 10175 supports eight T1 WAN links.

Module 20176

The 20176 Module is placed on the 10175 Interface card to accept external timing from the External Timing Sync Connection panel. The module is usually placed on the Interface card prior to shipping. If it is removed, it is easily replaced by mating JP3 on the module with JP4 on the card, JP4 on the module to JP5 on the card, JP2 on the module to JP3 on the card and the thirty-pin connector, JP1 on the module to JP2 on the card. The settings for this module are presented at the end of this chapter.

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 WAN links, and holds the nonvolatile RAM. Table Interface-1 lists the interface ports and functions. Figure Interface-1 shows the component layout and labels the ports. See the Pinouts chapter for electrical specifications and pin assignments.
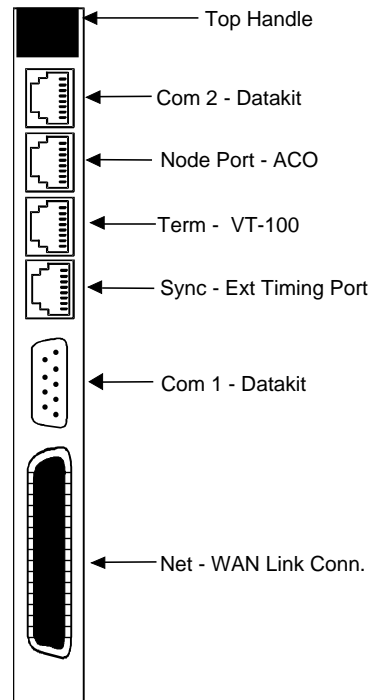
Figure Interface-1. 10175 Front Panel

Table Interface-1. Interface Ports and Functions

Interface Ports	Function
COM 2	Connects the system to a Datakit.
NODE	Provides contact closure to report ACO alarms.
TERM	Connects the system to a VT-100 compatible terminal.
SYNC	Connects the external timing P1 on the 20176 module to the Interface card.
COM1	Connects the system through the DB9(M) serial connector to Datakit.
NET	Connects the system to T1 lines.

Using the Node Port

The node port allows the system to report ACO alarms to an external system.

The node port uses an RJ48 connector. Pins 3, 4 and 5 form an RS485 compatible 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. Note: (pin 3 is normally closed, pin 4 is normally open)

Connecting the ACO alarm interface to an external alarm device (such as a buzzer or light) alerts for system problems. Figure Interface-2 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 discusses conditions and settings necessary to enable this feature.

The alarm contact (4) will close to (5) if power to the system is lost.

Designation	Pin #
+N	1
-N	2
ANO	3
ANC	4
ACOM	5
+F	6
-F	7
GND	8

Interface Card

Nodal Port

Amp
Amp
Common

External Alarm System

ANO = Open to ACOM on Alarm
(Alarm Normally Open)

ANC = Closed to ACOM on Alarm
(Alarm Normally Closed)
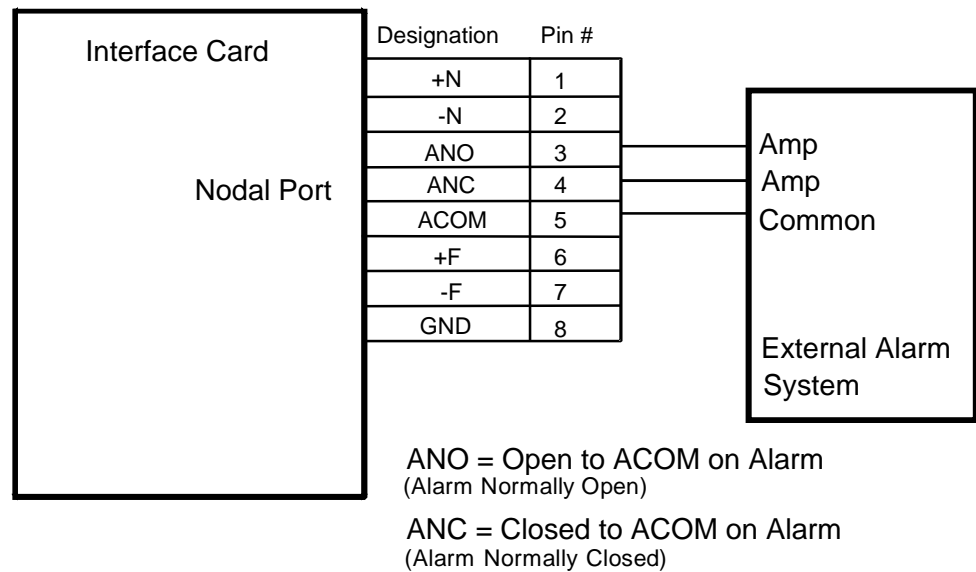
Figure Interface-2. Node Port ACO Alarm Interface

Interface Card Settings

Figure Interface-3 shows the interface card screen. Table Interface-2 lists the settings controlled on the screen along with their possible and default values.

```
Fremont   | IF 10175 INTF-Sync  COM 40755053  Ser 01103  | 12-31-99  14:33


                      1
PRIMARY CLOCK       int
EXT RATE            n/a
EXT FORMAT          n/a
EXT FRAME           n/a

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

CURRENT CLK         int









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

Figure Interface-3. Interface Card Main Screen

Table Interface-2. Main Screen Options and Defaults

Parameter	User Options	Default
PRIMARY CLOCK	int ext1 ext2 serv wan user	int
EXT RATE	t1	t1
EXT FORMAT	d4 esf	esf
EXT FRAME	n/a	n/a
SECONDARY CLOCK	int ext1 ext2 serv wan user	int
EXT RATE	t1	t1
EXT FORMAT	d4 esf	esf
EXT FRAME	n/a	n/a
CURRENT CLK	unchangeable	clock in use

PRIMARY CLOCK

The Primary Clock provides all internal timing for the system. Three clock sources are possible: the internal crystal oscillator, an external clock, or a network source.

The system can generate a clock from its own crystal. If **int** (internal) is selected, the crystal provides the clock source for this unit. The stability of this Stratum 4 clock is ± 25 parts per million (or $\pm 25 \times 10^{-6}$). 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 options **ext1** and **ext2** are used when the primary clock is derived from an external timing source. External timing sources are provided by the user and are connected through the wire-wrap terminals of the 20186 external timing sync connection panel (see Figure Interface-4). This panel allows for up to two external timing sources to be connected to the system. (For more detailed information on the external timing sync connection panel, refer to page 2-B-7 in the Installation chapter.)
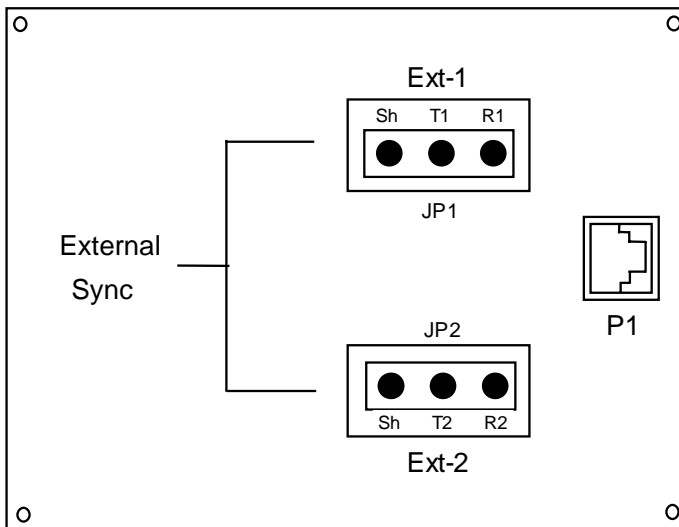
Figure Interface-4. External Timing Sync Connection Panel

The wire-wrap terminals are labeled Ext-1 and Ext-2. If the primary clocking source is connected to the Ext-1 terminal, select **ext1**. If the primary clocking source is connected to the Ext-2 terminal, select **ext2**. (See **EXT FORMAT** below for more information on external source clocking.)

To loop-time off an incoming DS1, 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 2.048Mbps depending on whether you are using a T1 or E1 line and must be accurate to ± 50 parts per million ($\pm 50 \times 10^{-6}$).

The options **serv** (server) and **user** (user) are not available at this time.

EXT RATE

The line rate describes the rate of the primary clocking source. The only option available is **t1**. This option is only used with an external timing source.

EXT FORMAT

The format setting describes the format of the primary clocking source. The options available are **d4** (normal superframe) and **esf** (extended superframe). This option is only used with an external timing source.

EXT FRAME

The only setting for the frame parameter is **n/a**.

SECONDARY CLOCK

Should the Primary Clock signal fail, the system automatically reverts to the defined Secondary Clock source. This source may be any of the choices listed in the primary clock setting shown above.

EXT RATE

The line rate describes the rate of the secondary clocking source. The only option available is **t1**. This option is only used with an external timing source.

EXT FORMAT

The format setting describes the format of the secondary clocking source. The options available are **d4** (normal superframe) and **esf** (extended superframe). This option is only used with an external timing source.

EXT FRAME

The only setting for the frame parameter is **n/a**.

CURRENT CLK

The current clock shows the clock source now in operation. This field is not accessible by the user.

Menu of Actions

Table Interface-3 shows the Menu of Actions for the Interface Card.

Table Interface-3. 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.
pro**F**iles	This is not an SSTE function.
ta**B**s	This is not an SSTE function.
Ports	Displays parameters for COM1, COM2, and TERM ports
Main	Returns to the Main screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

Figure Interface-4 shows the Ports screen for the Interface Card. This details the various options available for the Term port (VT) and the two COM ports (C1 and C2). The default values (shown below) should not need to be changed for normal operations.

```
Unknown      | IF INTF-Sync  8922 Rev AO 0  Ser 00000 | 12-31-99  14:33

              VT         C1         C2          oos      P2
PROTOCOL      ui         ui         ui
RATE          9.6        9.6        9.6
COM CFG       8,1,N      8,1,N      8,1,N
HANDSHAKE     none       dkit       dkit



```

Figure Interface-4. Ports Screen

Settings for External Sync Module 20176

Figure Interface-5 shows a drawing of the 20176 external sync timing module separated from the 10175 Interface card. Table Interface-4 shows the jumper settings of this module.
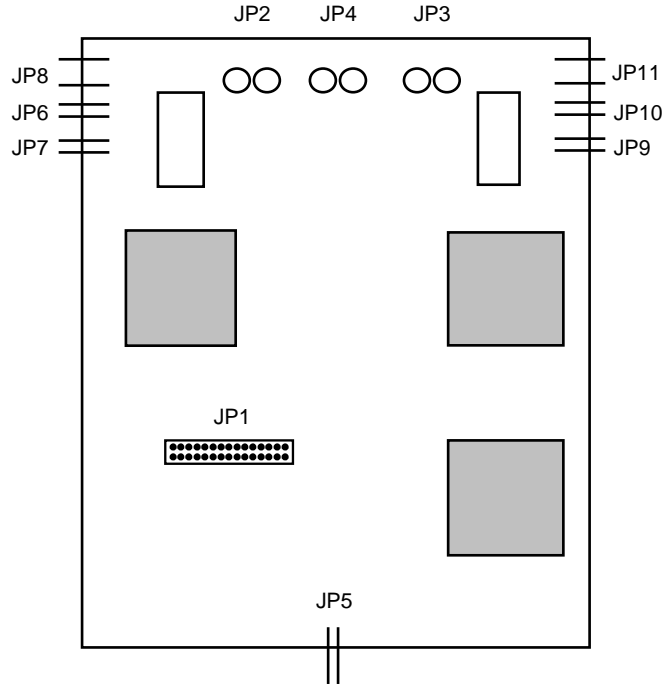
Figure Interface-5, Pin Arrangement for 20176 External Timing Module

Note: For T1 installations, ALL (JP5, JP6, JP7, JP8, JP9, JP10 and JP11) jumpers are open. (factory default)

Table Interface-4. Interface Card Jumper Settings on 20176 Module

Jumper #	Position	Results
JP5	Open	T1
JP5	Closed	E1
JP8	Open	Balanced
JP8	Closed	Unbalanced
JP6 and 7	Open	Ext1 (T1) 100Ω
JP9 and 10	Open	Ext2 (T1) 100Ω
JP6 and 7	Closed	Ext1 (E1) 75Ω
JP9 and 10	Closed	Ext2 (E1) 75Ω

Introduction External Alarm Card 10116

The External Alarm card has two alarm-notification modes. The "Switch/Act On" (outbound) function allows the user to report internal system alarms to external devices such as buzzers, bells or lights. The "Sensor/Trig On" (inbound) function allows external alarms to be reported to the system through sensors located on the card.

The external alarm card supports three (3) outbound switches and three (3) inbound sensors. This card is similar to the 25830 except the fourth alarm port can only be used as an **outbound** alarm showing the system power has failed.

External Alarm Card Settings

Figure Alarm-1 shows the External Alarm Card screen. Table Alarm-1 shows the settings and options.

```
┌─────────────────────────────────────────────────────────────────────────┐
│ Fremont       │ U1 10116  ALR    COM 407542729  Ser 00101 │ 12-31-99  14:33 │
│                                                                            │
│                   1        2        3                                      │
│ SWITCH          stdby    stdby    stdby                                    │
│ ACT ON          major    major    major                                   │
│ SENSOR          stdby    stdby    stdby                                    │
│ TRIG ON         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 **actv** (on) or **stdby** (off).

ACT ON

The Act On parameter defines the type of system alarm causing the switch to trigger. 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 to define an alarm as major or minor.

SENSOR

The Sensor setting indicates if the inbound alarm sensor is **actv** (on) or **stdby** (off).

TRIG ON

The Trig On parameter defines if the sensor should report an external alarm upon sensing the **open** (opening) or the **close** (closure) of the Form-C contact.

Major=

The Major= accumulation register shows the current number of reported alarms designated either Major or Critical.

Minor=

The Minor= accumulation register shows the current number of reported alarms 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 not automatically updated (major/minor registers).
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.

Setting Jumpers on the 10116

Figure Alarm-2 shows the side view with jumper settings of the External Alarm Card.
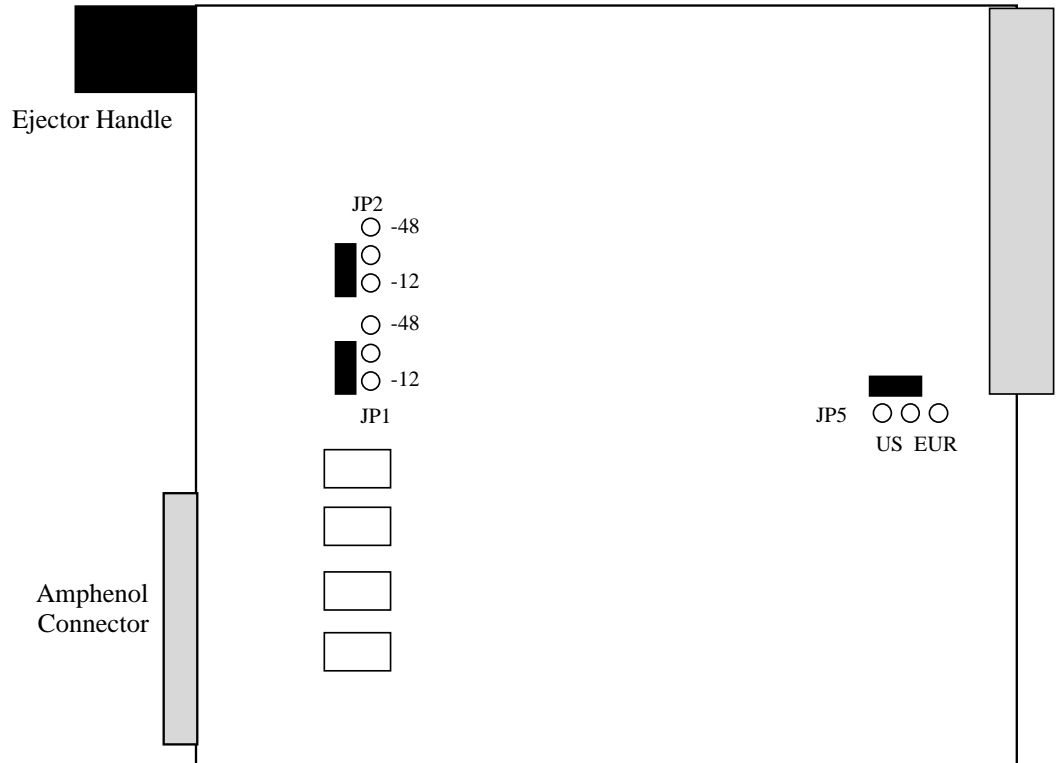
Figure Alarm-2. Jumper Settings on the 10116 Alarm Card

Jumper settings "JP1" and "JP2" changes the input sensor voltage from -12VDC to -48VDC. The jumpers are factory set for -12VDC using the bottom and middle pins. To change the settings to -48VDC, move the jumper to the middle and the top pin.

Jumpers at "JP5" sets the card to U.S. or European safety requirements. The factory setting is U.S. and the jumper is placed over the left and middle pins. To change the settings to European compliance, move the jumper to the middle and right pins.

Introduction HSU Card 15895

High-Speed Data Unit (HSU) cards allows the connection of high-speed data terminal equipment (DTE) and data communications equipment (DCE) to WAN links, resource cards or another HSU card.

The 15895 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 Figure HSU-12 on page 6-A-14). Use the RS530 setting if RS449 is desired (requires correct cable).

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 HSU card screen. Table HSU-1 lists the settings controlled on this screen along with their possible and default values.

```
┌──────────────────────────────────────────────────────────────────────────┐
│ Fremont      │ U1 15895 HSU-530X4 COM 407593193 Ser 01103 │ 12-31-99  14:33│
│                                                                            │
│                     1         2         3         4                        │
│ STATE              stdby     stdby     stdby     stdby                      │
│ WAN/SERVER         w1-1      w1-1      w1-1      w1-1                        │
│ TS                 table     table     table     table                      │
│ RATE               64K       64K       64K       64K                        │
│ Tx CLOCK           int       int       int       int                        │
│ CLOCK PLRTY        norm      norm      norm      norm                        │
│ DATA PLRTY         norm      norm      norm      norm                        │
│ CTS                perm      perm      perm      perm                        │
│ CTS DELAY          0         0         0         0                          │
│ LOCAL LB           off       off       off       off                        │
│ LB GEN MODE        dds       dds       dds       dds                         │
│ LB GEN             off       off       off       off                        │
│ LB DET             w/to      w/to      w/to      w/to                        │
│ ISDN CONN          no        no        no        no                         │
│                                                                            │
│                                                                            │
│                                                                            │
│                                                                            │
│                                                                            │
│ Save │ Undo │ Refresh │ Copy │ Test │ Dial │ Perf │ Main                    │
└──────────────────────────────────────────────────────────────────────────┘
```

Figure HSU-1. HSU Card Screen

Table HSU-1. HSU Card Setting Options and Defaults

Parameter	User Options	Notes	Default
STATE	stdby act		stdby
WAN/SERVER	wan serv user	1	wan
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 csu-1 csu-2 ds0-1 ds0-2	3	off
LB DET	w/to on off		off
ISDN CONN	no isdn	4	no

NOTES

1. The WAN/SERVER parameter has three choices: **wan**, **serv** and **user**. If **wan** is chosen, the options are **w1-1** - **w4-2**. If **serv** (a Resource card) is chosen, the options are **P1**, **P2**, and **P3**. If **user** is chosen, the options are **U1**-**U8** and port **1-2** or **1-4**.

2. If the WAN selected above has a CSU or DSX module connected, the values will range from **1-24**.

3. These options are only valid if the Loopback Generation Mode selected is **dds**. If the Loopback Generation Mode is **v.54**, **ft1**, or **perf**, then the LB GEN options are **off** and **on**.

4. This is not an SSTE function.

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 State to **stdby** (standby) for ports not using or have not yet configured. Set to **actv** (active) 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/SERVER

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** - **w4-2**). If **serv** is chosen, the data will be directed to a port on a Resource card (the options are **P1**, **P2**, and **P3**).

If **user** is chosen, the data will be routed to another HSU card. The first step of this process is to highlight the selected user slot (U1-U8). If there is a compatible HSU card in that slot, the system will ask which port number to connect (1-2 or 1-4). Type in the number of the port desired. If a number higher than the possible number of available ports is chosen (i.e., 9), the system will automatically select port #1.

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 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. Figure HSU-2 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.

```
Fremont     | U1 15895 HSU-530X4  COM 407593193 Ser 01103 | 12-31-99  14:33

                      1            2            3            4
       STATE          stdby        stdby        stdby        stdby
       WAN/SERVER     w1-1         w1-1         w1-1         w1-1
       TS             table        table        table        table
       RATE           64K          64K          64K          64K
       Tx CLOCK       int          int          int          int
       CLOCK PLRTY    norm         norm         norm         norm
       DATA PLRTY     norm         norm         norm         norm
       CTS            perm         perm         perm         perm
       CTS DELAY      0            0            0            0
       LOCAL LB       off          off          off          off
       LB GEN MODE    dds          dds          dds          dds
       LB GEN         off          off          off          off
       LB DET         w/to         w/to         w/to         w/to
       ISDN CONN      no           no           no           no


                      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-2. HSU Table Option

RATE

The Rate setting allows selection of 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, defines the port speed.

Tx CLOCK

The Transmit Clock setting identifies the clock source for the transmit data (SD) stream. The option **int** (internal) requires the DTE to synchronize its transmitted data with the clock on the SCT leads. The option **ext** (external) 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, the HSU automatically generates a clock internally. If this clock is not synchronized with the data, 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 the **inv** (inverted) mode, the relationship between clock and data is altered to compensate for the long cable distance that the signals must travel. The other option, **norm** (normal), means that the relationship between clock and data is left unchanged. If **inv** (inverted) Clock Polarity is selected, set Tx CLOCK to **int**.

DATA PLRTY

The Data Polarity option allows you to invert all bits in the transmitted data stream. The default, **norm** (normal), means that the data is left untouched while **inv** (inverted) 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 the zeros, the likelihood is reduced 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 to **perm** (permanent) to make the CTS signal always **High** or on. The **rlocal** (remote-local) option allows RTS to control both the CTS of the local equipment and RLSD of the remote DTE equipment.

Set CTS to **ignor** (ignore) to make the CTS signal always Low or off. The CTS signal is always enabled (High) when the port is in standby state, regardless of the CTS setting. Set CTS to **locl** (local) to make the CTS signal follow the RTS signal from the local DTE.

CTS DELAY

The Clear To Send Delay changes in the CTS signal in the local mode. Enter the value in milliseconds. The options are **0**, **30**, **60** and **100** ms. Start with **0** ms and increase the value if you experience problems. CTS 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-3).
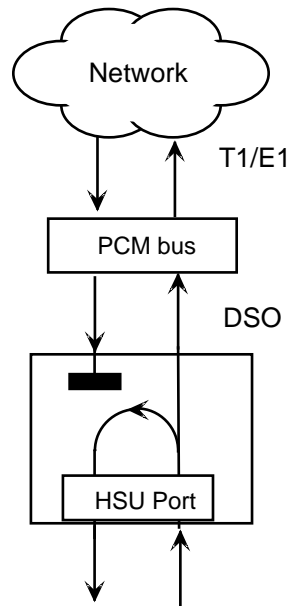
Figure HSU-3. Data Card DTE Loopback

The **net** (network) 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-4). This option also drops the DSR control signal output on the HSU port.
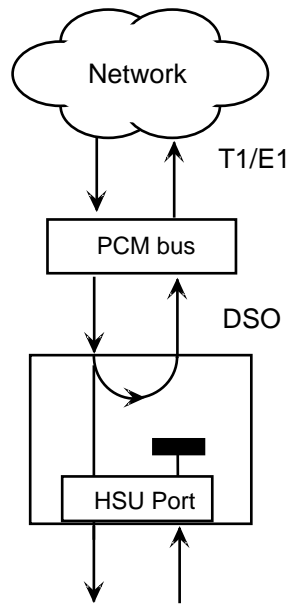
Figure HSU-4. Data Card Network Loopback

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 **v.54** or **ft1** was selected in the previous setting, the Loopback Generation setting allows sending a loop-up command (**on**) or a loop-down command (**off**). If you selected **dds** as the Loopback Generation Mode, this setting allows you to define the type of DDS loopback to generate.

The four latching options are **ocu** (Office Channel Unit), **dsu** (Data Service Unit), **csu** (Channel Service Unit) and **ds0** (a full 64Kbps loopback). Figures HSU-5, -6 and -7 illustrate where the loopbacks will take place. You can also turn all DDS remote loopbacks **off**.
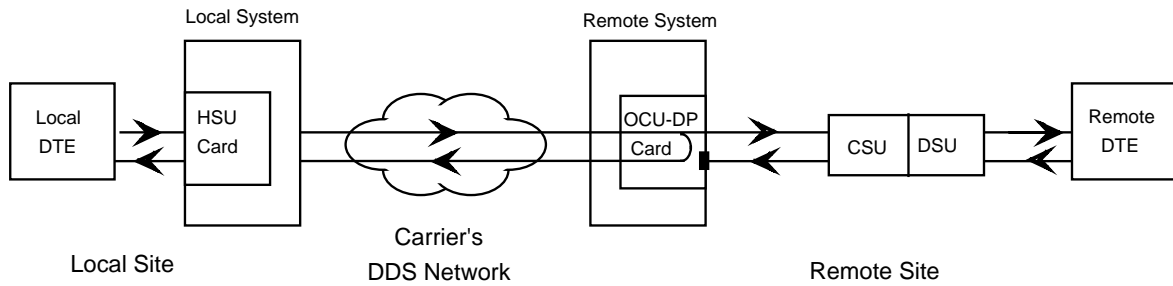
Figure HSU-5. A Remote OCU Loopback Commanded by the System
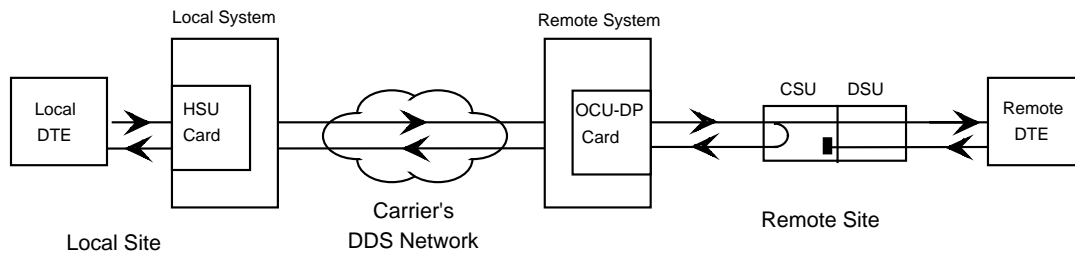
Figure HSU-6. A Remote CSU Loopback Commanded by the System
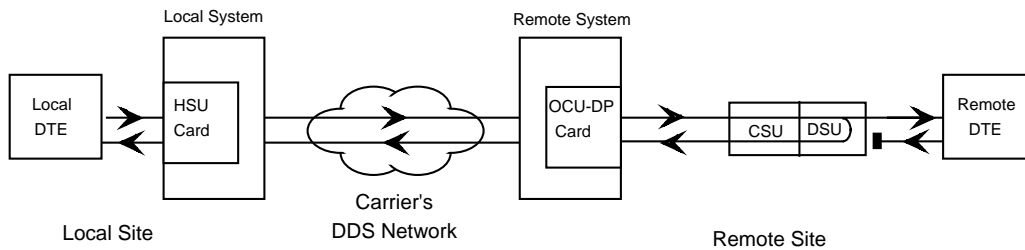
Figure HSU-7. A Remote DSU Loopback Commanded by the System
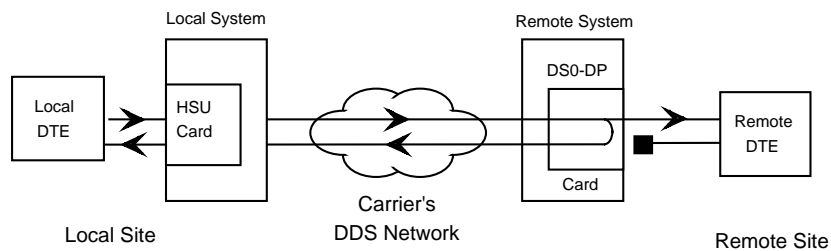
Figure HSU-8. A Remote DS0 Loopback Commanded by the System

Four additional loopback codes are supplied to test the circuit when repeaters are used between the remote system and the Remote DTE. The additional loopbacks are **csu-1** and **csu-2** to loop-up a CSU circuit when there is other equipment (e.g. repeaters) between the remote central office and the far-end CSU/DSU equipment and **dso-1** and **ds0-2**. Figure HSU-8 shows the location of each of the CSU loopbacks.

The **csu** loopback will cause the first piece of equipment it finds to loopback data on the transmit side to the receive side of the circuit. This is the first piece of CSU/DSU equipment it finds, however, there might be repeaters between the far end central office. In Figure HSU-6, the **csu** loopback is placed at the far end station at the CSU/DSU there.

Figure HSU-9 shows the position of the loopback when repeaters are added to the circuit. The diagram shows how additional **csu** loopbacks are used to send a loop-up command to the remote unit from the near end equipment. To create a loopback at the first repeater, the user would chose a normal **csu** loopback. To create a loopback at the second repeater, the user would chose a **csu-1** loopback. And to duplicate the loopback shown in Figure HSU-6 (with the two repeaters in the circuit) the near end equipment would use a **csu-2** loopback.
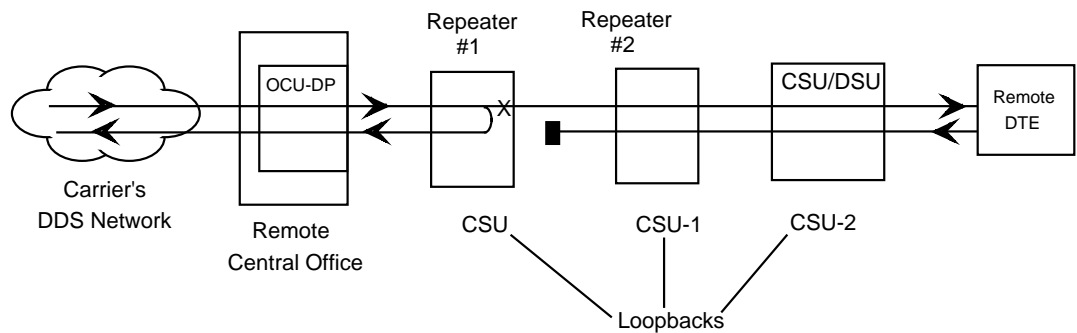
Figure HSU-9. Remote CSU Loopbacks

Figure HSU-10 shows the position of the **ds0**, **ds0-1** and **ds0-2** loopbacks when passing through DS0-DP cards are added to the circuit. The diagram shows how additional **ds0** loopbacks are used to send a loop-up commands to the remote unit from the near end equipment. To create a loopback at the first DS0 card, the user would chose a normal **ds0** loopback (Shown as Figure HSU-10). To create a loopback at the second card, the user would chose a **ds0-1** loopback. And to create the loopback at the third card, the user would chose a **ds0-2** loopback.
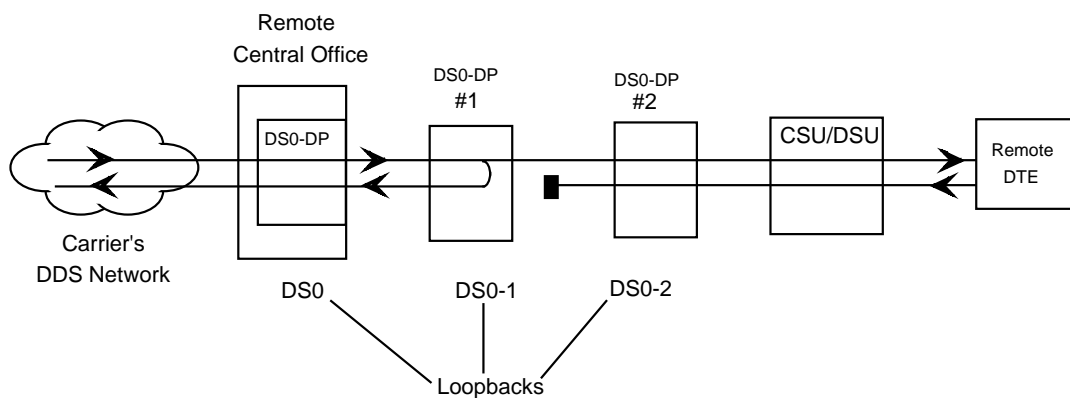
Figure HSU-10. Remote DS0 Loopbacks

LB DET

Depending on the selection 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 **w/to** (with time-out) option is the same as the **on** option, except after ten minutes the system automatically releases loopbacks initiated by the remote equipment.

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.

ISDN CONN

The ISDN Connection parameter is not an SSTE application.

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	Not an SSTE function.
Perf	Not an SSTE function.
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-11. 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.

```
┌─────────────────────────────────────────────────────────────────────────────┐
│ Fremont    │ U1 15895 HSU-530X4 COM 407593193 Ser 01103 │ 12-31-99  14:33   │
│                                                                               │
│                   1              2              3              4              │
│          BERT     n/a            n/a            n/a            n/a            │
│          CTS      norm           norm           norm           norm           │
│          RLSD     norm           norm           norm           norm           │
│          DSR      norm           norm           norm           norm           │
│          SYNC     no             no             no             no             │
│          BE       *****          *****          *****          *****          │
│          ES       *****          *****          *****          *****          │
│          CSES     *****          *****          *****          *****          │
│          OSS      *****          *****          *****          *****          │
│          BER      *****          *****          *****          *****          │
│          ELAP     *****          *****          *****          *****          │
│          RTS      *****          *****          *****          *****          │
│          DTR      *****          *****          *****          *****          │
│          LB ST    *****          *****          *****          *****          │
│                                                                               │
│ Save  │ Undo  │ Refresh │ InsertErr │ Clear │ Main                            │
└─────────────────────────────────────────────────────────────────────────────┘
```

Figure HSU-11. 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	
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**, **511** (511 test pattern), **qrss** (quasi-random pseudo signal) and **2047** (2047 test pattern).

On the model 15895 HSU only, selection of BERT pattern **ds0** will display another set of BERT patterns. Additional patterns are **ff**, **7e**, **32**, **40**, **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. The alternating patterns are non-latching. Refer to Figures HSU-5 through HSU-10 for loopback locations.

CTS

The Clear To Send (CTS) option defines whether the CTS control lead should be held **on** (high) or **off** (low). Selecting either **on** or **off** will override the selection made in the HSU Card screen. The third option is **norm** (normal) which means that CTS will operate in the mode selected in the HSU Card screen.

RLSD

The Receive Level Signal Detect (RLSD) option defines whether the RLSD control lead is held **on** (high) or **off** (low). The third option is **norm** (normal) which means that RLSD will behave as described in Table HSU-2.

DSR

The Data Set Ready (DSR) option defines whether the DSR control lead should be held **on** (high) or **off** (low). The third option is **norm** (normal) which means that DSR will behave as described in Table HSU-2.

SYNC

The Synchronization (SYNC) field displays 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 (BE) 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 (ES) 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}). 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 is an information-only field; there are no user-selectable parameters.

OSS

The Out of Synchronization Seconds (OSS) 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 (ELAP) 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.

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.

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.

LB ST

The Loopback State (LB-ST) 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 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.

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).
InsertErr	Allows the user to manually insert a single error into the clear data signal. This does not generate a CRC error.
Clear	Clears the testing screen and resets all counters to zero.
Main	Returns to the HSU card main screen. If changes are made to settings and not saved, you will be prompted to save or lose changes.

HSU Card 15895 Settings

Setting or resetting switches is necessary for conversion of the operation of all four ports on the 15895 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-12. (Note: Down Setting is V.35)

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.
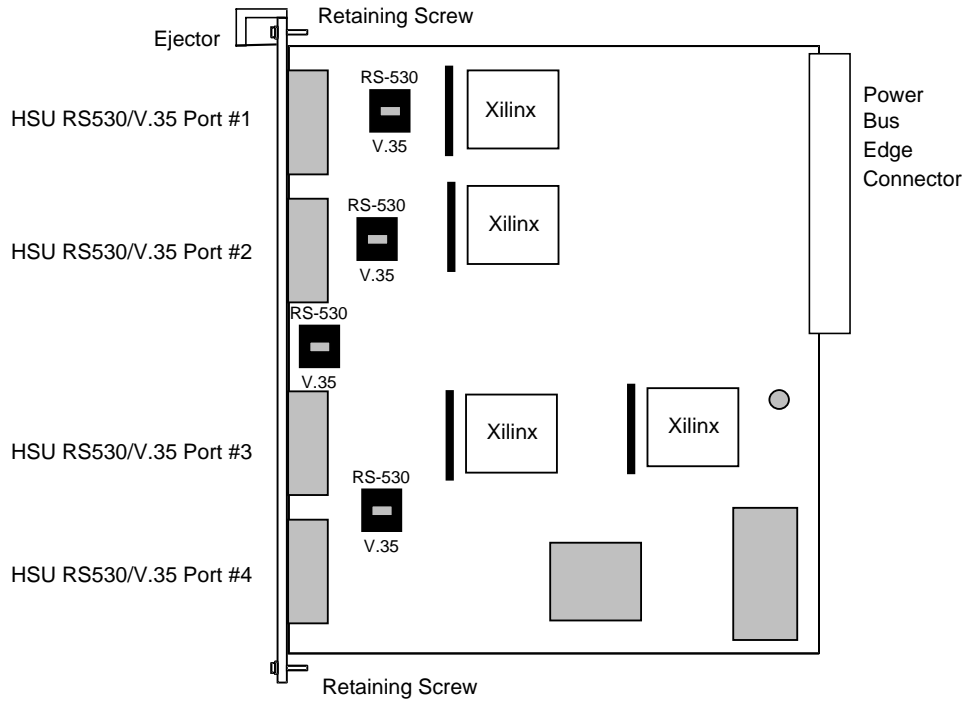
Figure HSU-12. Switches for Conversion from RS530 to V.35

Introduction

This chapter describes the pinouts of the card connectors used to attach circuits and devices to the network. The unit was designed so all cabling would be done at the back of the chassis shown in Figure Pinouts-1. The number and type of connectors needed will vary with the cards installed. Each card requiring cabling is shown in this chapter, the connector is described and pinouts labeled.

Chassis 20114
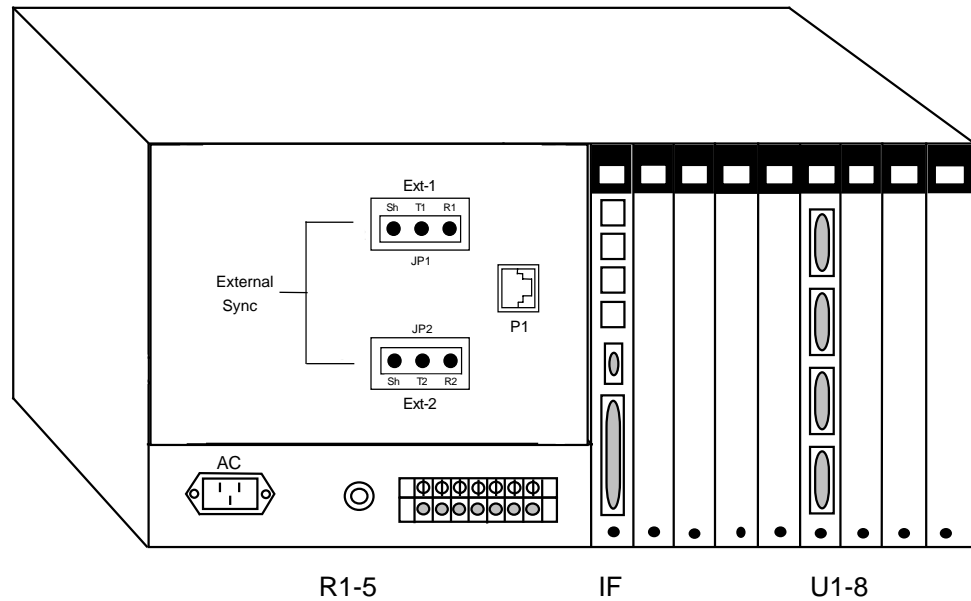
Figure Pinouts-1. Two-Sided Chassis, Back View

The pin connections for the sync panel shown below are in the Installation section.
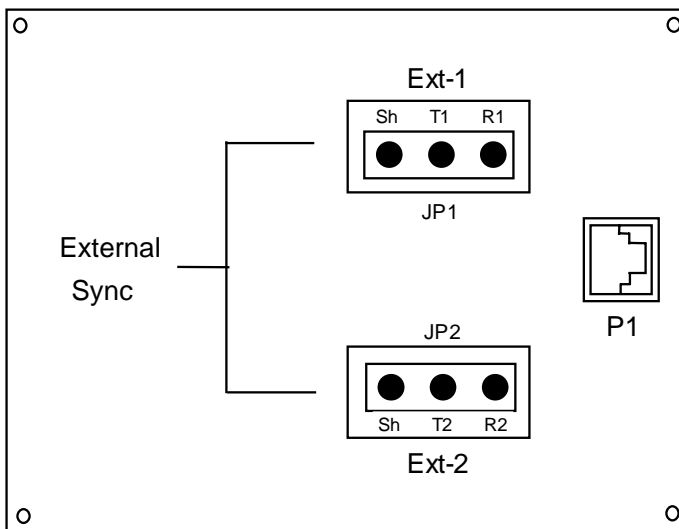
Figure Pinouts-2. External Sync Panel

Interface Card 10175

The 10175 Interface Card must be installed in the IF slot on all units. The interface card connectors are arranged as shown in Figure Pinouts-3.
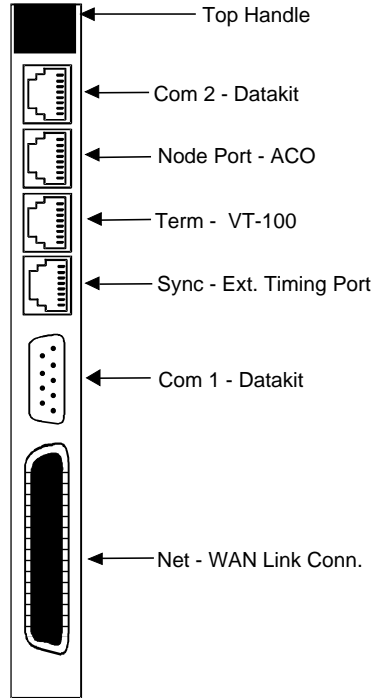
Figure Pinouts-3. Interface Card Connectors

This section describes the interface card connectors.

Net - WAN Link Connector

The Net - WAN link connector allows connection to the WAN card ports to incoming and outgoing T1 lines. It has the following characteristics:

Connector: 50-pin RJ27X
Gender: Female

Figure Pinouts-4 shows the pinouts for this connector, Table Pinouts-1 lists the pin assignments. Electrical signals comply with T1 specifications.
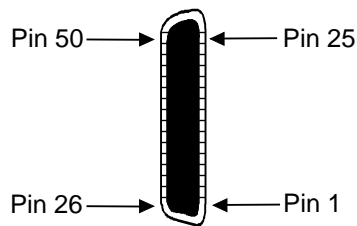
Figure Pinouts-4. Net - WAN Link Connector

Table Pinouts-1. Net - 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.			

Note: Per industry standards, torque on the amphenol connector screws should not exceed five inch-pounds. Higher levels of torque may cause the hex nuts to loosen or detach. If this occurs, the hex nuts should be reattached at a torque of five inch-pounds.

Com 1 (Datakit)

The RS232 port is used for configuration control.

Connector: 9-pin D-connector
Gender: Male
Standard: EIA 574
Electrical: RS232 DTE

Figure Pinouts-5 shows the pinouts for the computer port connector, while Table Pinouts-2 lists the pin assignments. In the table, "Input" means data is flowing from the Datakit to the system.
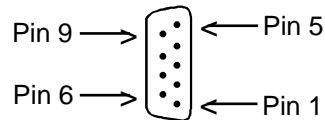
Figure Pinouts-5. Com 1 for Datakit

Table Pinouts-2. Com 1 Pin Assignments

	DB-9		DTE
Designation	**Pin #**	**Function**	**Direction**
RLSD	1	Receive Line Signal Detect	Input
RxD	2	Receive Data	Input
TxD	3	Transmit Data	Output
DTR	4	Data Terminal Ready	Output
S GND	5	Signal Ground	N/A
DSR	6	Data Set Ready	Input
RTS	7	Request to Send	Output
CTS	8	Clear to Send	Input
RI	9	Ring Indicator	Input

Note: Per industry standards, torque on the Datakit connector screws should not exceed five inch-pounds. Higher levels of torque may cause the hex nuts to loosen or detach. If this occurs, the hex nuts should be reattached at a torque of five inch-pounds.

Term (Local VT-100 Port)

The Term (RS232 control terminal interface) port allows connection of the system to a compatible terminal (VT100) used to send commands to the system. The term port has the following characteristics:

Connector: RJ48 receptacle
Gender: Female
Standard: EIA 561
Electrical: RS232 DCE

Figure Pinouts-6 shows the pinouts for the term port, while Table Pinouts-3 lists the pin assignments.
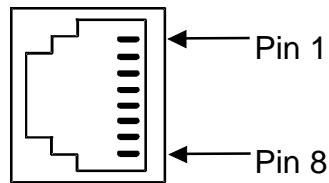
RJ-48

Figure Pinouts-6. Term Port

Table Pinouts-3. Term Port Pin Assignments

Pin #	Function	Direction
4	Signal Ground	N/A
5	Receive Data	Output
6	Transmit Data	Input
All other pins are unconnected.		

Com 2 (Datakit)

The RS232 computer port is used for configuration control.

Connector:	RJ48 receptacle
Gender:	Female
Standard:	EIA 561
Electrical:	RS232 DCE
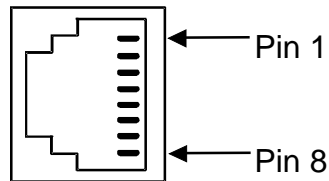
RJ-48

Figure Pinouts-7. COM2 (Datakit)

Figure Pinouts-7 shows the pinouts for the COM2 port connector, while Table Pinouts-4 lists the pin assignments. "Input" means data is flowing from the Datakit.

Table Pinouts-4. COM2 Interface Pin Assignments

Pin #	Function	Direction
1	Ring Indicator	Output
2	RLSD	Output
3	DTE Ready	Input
4	Signal Common	GND
5	Received Data	Output
6	Transmitted Data	Input
7	CTS	Output
8	RTS	Input

Node Port

The RS485 node port allows the activation of external alarms alerting the operator of critical situations. Using the ACO function (see Basic Operations chapter), will keep the alarm active until manually cleared from the terminal. The Node port has the following characteristics:

Connector: RJ48 receptacle
Gender: Female
Electrical: RS485

Figure Pinouts-8 shows the pinouts for the Node port, while Table Pinouts-5 lists the pin assignments.

RJ-48
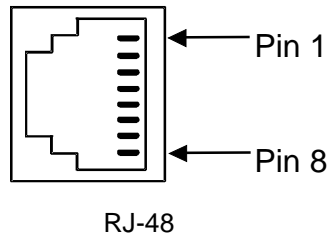
Figure Pinouts-8. Node Port

Table Pinouts-5. Node Port Pin Assignments

Pin #	Designation	Function
1	+n	Not used for SSTE Applications
2	-n	Not used for SSTE Applications
3	NC - ANO	Alarm Open Condition
4	NO - ANC	Alarm Closed Condition
5	ACOM	Alarm Common Lead (Source)
6	+F	Not used for SSTE Applications
7	-f	Not used for SSTE Applications
8	GND	Not used for SSTE Applications

External Sync Port

The External Sync Port allows connection of up to two external clocking sources from the external timing sync connection panel to each system unit. The external sync port has the following characteristics:

Connector: RJ48 receptacle
Gender: Female
Electrical: RS485

Figure Pinouts-9 shows the pinouts for the external sync port, while Table Pinouts-6 lists the pin assignments.

RJ-48
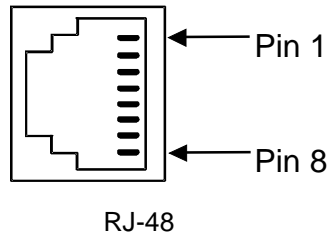
Figure Pinouts-9. External Sync Port

Table Pinouts-6. External Sync Port Pin Assignments

Pin Number	Designation	Description
1	R1	RX from Clock Source (Ext 1)
2	T1	RX from Clock Source (Ext 1)
7	R2	RX from Clock Source (Ext 2)
8	T2	RX from Clock Source (Ext 2)

External Alarm Card 10116

The External Alarm card can be installed in any user card slot, U1-U-8 on the chassis. This cards enable the system to respond to three external alarms and three internal alarms to outside alarm indicators (for example, a critical alarm lights a red light or rings a bell).

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 U7-3).

Each outbound "floating" relay (normally open contacts and normally closed contacts) respond 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 three 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-10 shows the pinouts for the connector and Table Pinouts-7 shows the pin assignments for both inbound sensor alarms and outbound internal alarm indicators.

Pin 50 →   ← Pin 25

Pin 26 →   ← Pin 1
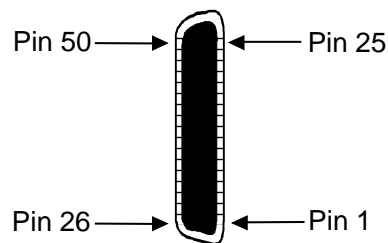
Figure Pinouts-10. External Alarm Card Connector Pinouts

Table Pinouts-7. External Alarm Card Pin Assignments

Inward Alarms			Outward Alarms			
Sensor	**Designation**	**Pin**	**Relay**	**Source**	**Norm Close**	**Norm Open**
1	R1	1	R1(A)	7	6	8
	T1	26	R1(B)	32	31	33
2	R2	2	R2(A)	11	10	12
	T2	27	R2(B)	36	35	37
3	R3	3	R3(A)	15	14	16
	T3	28	R3(B)	40	39	41
4	R4	4	R4(A)	19	18	20
	T4	29	R4(B)	44	43	45

Note: Per industry standards, torque on the amphenol connector screws should not exceed five inch-pounds. Higher levels of torque may cause the hex nuts to loosen or detach. If this occurs, the hex nuts should be reattached at a torque of five inch-pounds.

HSU Card RS530/V.35 15895

The HSU card can be inserted in any user card slot (U1-U8) on the chassis. Each card has four DB26 connectors. Figure Pinouts-11 shows the card.
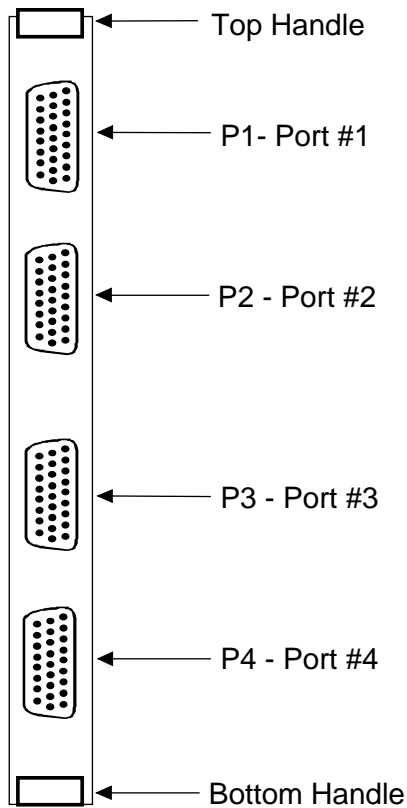
Figure Pinouts-11. HSU Card Connectors

RS530/V.35 Channel Connectors

The RS530/V.35 connectors on the HSU card allow the connection of the system to external data devices. The connectors have the following characteristics:

Connector:	26-pin D-connectors
Gender:	Female
Standards:	15895—Proprietary pinout
Electrical:	15895—RS530 or V.35 (switch selectable)

Figure Pinouts-12 shows the connector Pinouts and Table Pinouts-8 lists the pin assignments.

Pin 26 →   ← Pin 9

Pin 19 →   ← Pin 1

DB-26
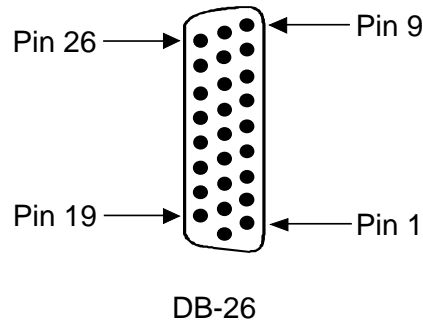
Figure Pinouts-12. HSU Card Connector Pinouts

Table Pinouts-8. HSU Card Connector 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.		

Note: Per industry standards, torque on the HSU connector screws should not exceed five inch-pounds. Higher levels of torque may cause the hex nuts to loosen or detach. If this occurs, the hex nuts should be reattached at a torque of five inch-pounds.

Error Messages

ADPCM card is not installed.

The user has assigned compression option from voice card without ADPCM card.

ADPCM wan/ts should not be equal to wan/ts.

This message is received when the user is trying to send compressed voice on the same WAN timeslot from which it was received.

Alarm Card can't be active with dialing.

The External Alarm card cannot be used when HSU cards are programmed for ISDN dialing.

All available PVCs are already taken.

The number of PVCs available on Main FRAD screen has been exceeded by the number of PVCs assigned on the PVC screen.

All blank prt report.

The "empty" option has been selected for all four elements of the Print Alarm field on the Interface Card. This configuration cannot be saved.

ASYNC/ 5 databits must have 2 stop or parity.

The user is trying to assign an SRU port to an asynchronous circuit with 5 data bits, one stop bit and no parity.

B-channels must be allocated.

The user is trying to make an ISDN-PRI D channel active that has no assigned B channels.

Bad routing format.

The telephone numbers used for the ISDN-PRI routing table are not formatted correctly.

Bad Service number format.

ISDN-PRI Service numbers must be a two-digit number (01-99).

BCH is not supported in XCON.

Error correction format 'bch' on the OCU-DP card cannot be used on systems using the cross-connect WAN card.

Both ports must be on a same WAN for d-i mode.

A WAN card with one module cannot be set to drop and insert mode.

Both WAN's cannot be in test mode.

The user is trying to use the test option for both sides of a cross-connect circuit from the XCON main screen.

Broadcast cannot be looped back.

A Broadcast cross-connect circuit cannot be placed in loopback mode.

Bus cannot allocate slots.

The user is trying to assign a multirate HSU circuit to more than 30 timeslots.

Call manufacturer for availability.

The user is trying to assign more D Channels to the ISDN-PRI card than it is capable. That card must be upgraded or another card must be purchased.

Cannot be STDBY while BERT test is running.

The user is trying to change the State of a port to "stdby" while the Bit Error Rate Tester is running. Bert must be turned off before an "active" port can be changed to "stdby".

Cannot define any more xcon. circuits.

The maximum number of cross-connect circuits is 99.

Cannot do it in Viewer mode.

User with Viewer access level and authorization is trying make changes to system.

Cannot have REMOTE and LOCAL loopbacks.

Cards with loopback capability cannot be placed in both local and remote loopback at the same time.

Cannot switch non-compatible WANs.

The current WAN configuration will not support redundant switchover.

Cannot switch to a non-operational WAN.

The current WAN configuration will not support redundant switchover.

Cannot use the same TS on diff WAN.

Ports on the SRU card cannot be assigned to the same timeslot on different WAN ports.

Card already installed.

The user is trying to use the Configuration option on an occupied slot.

Card is in ACE mode.

The External Alarm card will not work when dial triggers are in use by the HSU card. ACE stands for Automatic Calling Equipment.

Card is not available.

The user is trying to place a card in test mode while it is in an Out of Service condition.

Channel test is available from WAN XCON screen.

The user is trying to test a voice cross-connect from the cross-connect screen instead of the WAN screen for that particular port.

Circuit ID must be unique.

A cross-connect circuit must be assigned a unique name.

Circuit is already used, no subaddress allowed.

The user is trying to assign the same circuit number to different user ports on the FRAD User Port screen.

Circuit name must be entered.

The Circuit name for cross-connect circuits must be assigned some designation.

Combined ADPCM rate must equal 64K.

User has tried to assign a 40Kbps and a 32Kbps to an ADPCM 64Kbps engine.

Config. changes must be made from primary WAN.

The user is trying to make changes to the redundant WAN port.

Cumulative bandwidth exceeds 115.2K.

User has assigned more bandwidth than allowed for an SRU card.

D-channel is active.

The user is trying to change WAN port parameters without deactivating the ISDN D channel associated with it.

D-channel is not active.

The user is trying to place an ISDN call from the HSU card on an inactive D channel.

Dialing is not available with Alarm Card.

If an External Alarm card is present in the system, dial triggers for the HSU card cannot be used.

ds0-n available only with 64K rate.

The user is trying to generate a "ds0-n" loopback on an OCU-DP port with a data rate of less than 64Kbps.

Duplicate prt report element.

The user has requested the Print Alarms option to print the same element twice.

Each WAN can have only one d-chan.

User is trying to assign two D channels to the same WAN port.

Empty field is not allowed.

The user is trying to assign a blank password on the CPU screen.

Empty slot.

The user is trying to access a card in an empty slot.

Engine pair must have same ADPCM WAN and TS.

Each pair of ADPCM engines (1-2, 3-4, 5-6, etc.) must be assigned to the same ADPCM timeslot.

ERR COR bch_ts must be larger than TS.

Error correction BCH requires a separate WAN timeslot that is numerically higher than the WAN timeslot carrying the data signal.

Error correction is not supported.

1. Error correction is not supported on the five-port or ten-port OCU-DP card.

2. Maj-v error correction is not supported for data rates higher than 9.6Kbps.

FR circuit is not defined.

The user is trying to assign a User circuit for an undefined Frame Relay PVC.

FR port and DLCI must be unique.

The Frame Relay port and DLCI form a unique address for each PVC.

FR port is not active.

The user is trying to activate a PVC on an inactive Frame Relay port.

HSU has broadcast links.

The HSU card cannot be placed in standby when it has active broadcast lines.

Intf.ID must be uniquely identified.

ISDN-PRI card must have a different two-digit number for each WAN port used for B channels.

Invalid character in Node Id.

The only valid characters for a Node ID are alpha and numeric characters and the underscore.

Invalid date/time format.

The user places an invalid date into the system (i.e., February 31).

Invalid parameters for ADPCM.

The user is trying to use ADPCM on voice cards using A-Law coding.

Invalid password for this command.

The user is trying to use the debug command from the SYS screen without proper password authorization.

Invalid secondary clock format.

The user is trying to assign an external clock source as the secondary system clock.

Invalid SR TS.

The user is trying to assign a sub-rate port to a WAN timeslot that does not have enough room on the sub-rate timeslot for that much bandwidth (e.g. Having a port with b-5 framing occupying four of the available sub-rate timeslots and trying to assign another port whose bandwidth exceeds 9.6Kbps to the remaining sub-rate timeslot #5).

Invalid sub address.

The user is trying to assign the same sub-address number to two different user ports on the FRAD User screen.

Invalid TimeSlot.

The user is trying to assign an unavailable WAN timeslot.

Invalid WAN.

The user is trying to assign services to an unavailable WAN card port.

ISDN connected circuit.

An HSU port with an active ISDN call cannot be placed in standby status.

ISDN,FRAD,ADPCM do not support WAN switch.

WAN redundancy is not available if any of those cards are resident in the system.

Mode cannot be changed when any ts are allocated.

The user is trying to change the mode from "d-i" to "term" (or vice-versa) when timeslots are occupied.

Module is not installed.

The user is trying to use the Configuration option for a WAN port that doesn't have a CSU or DSX.

Must be in terminal mode.

The user is trying to use the Configuration e option for a WAN card in "drop and insert" mode.

Must have clean WAN.

The user is trying to use the Configuration option for a WAN card when timeslots are occupied.

Must have OOS status.

User is trying to delete a card that has not been removed from the system.

Must have WAN card installed.

The user is trying to use the Configuration option for a uninstalled WAN card.

N392 must be less than or equal to N393.

N392 determines the amount of errors that will be tolerated during the amount of events assigned in N393. FRAD rules specify that N392 be less than or equal to N393.

No changes for selected switch.

When connected to an ISDN office switch, the user cannot change the status of a b channel.

No changes while BERT is running.

Bit Error Rate Testing is active for this port. Bert must be turned off before changes to that port are accepted.

No d-i mode for this slot.

The user in an RCON system is trying to assign the "d-i" mode to the WAN in slot W-3.

No historical alarms.

The user has selected the "History" command from the Menu of Actions of the Alarm screen after the Alarm History has been cleared and no new alarms have been generated.

No more profiles allowed.

The user has tried to assign more than 16 call profiles to the Interface Card.

No more than 1 ts allowed.

The user is trying to assign more than one WAN timeslot to the FRAD circuit.

No more than 2 ts allowed.

The Frame Relay PVC circuit cannot exceed 128Kbps (2x64Kbps timeslots).

No more than two WANs in BERT test are allowed.

Only two WAN ports can be placed in BERT test at the same time.

No NFAS for selected switch.

The ISDN office switch is not set up to accept NFS b channel assignments.

No timeslot(s) specified.

The user is trying to make a user card active with no WAN timeslot(s) assigned.

Not enough available U-slots.

The user is trying to use the Configuration Option with less than three available User Slots for T1.

Not implemented yet.

The user is trying to use a feature or function that is not released yet. This will normally happen on beta test versions of software.

Number of TS from must be equal to TS to.

The user is trying to assign a cross-connect with an unequal number of "from" and "to" timeslots.

Only B-chan can be controlled.

The user is trying to change the status of a timeslot user by something other than a b channel from the ISDN BMap Status screen.

Only broadcast/data type can be controlled.

The user is trying to update or delete a regular cross-connect circuit from the XCON Broadcast screen.

Only network or data type can be broadcasted.

The user is trying to broadcast a Broadcast circuit from the XCON Broadcast screen.

Only U-slots can be configured.

The user is trying to use the Configuration option for P slots, C slots or the I slot.

Only w1-1 or w1-2 are supported.

The Configuration option is only valid for WAN w1-1 and w1-2.

Parameters are not saved.

The user has selected the Main command from the Menu of Actions without saving the changes made to the card.

Parameters have been saved.

The user has made changes to the card and invoked the Save command from the Menu of Actions.

Phone number must be uniquely identified.

The primary phone number on an HSU card must be unique.

Port has PVC(s) allocated. No changes allowed.

The user is trying to deactivate a Frame Relay port with active PVC(s).

Port is in use.

The user is trying to make changes to an active port.

Port is not active.

The user is trying to use the Hangup option on an HSU port in the standby state.

Primary WAN is not operational.

The user is trying to switch back from a redundant WAN to the primary WAN while it is still not operational.

Profile has to be loaded first.

The user is trying to use the Dial command from the HSU card Menu of Actions without having a call profile loaded.

Profile Id was not found.

Using the "Load" command from the Menu of Actions on the HSU card, the user is requesting a nonexistent call profile from the Interface card.

PVC has user circuits active. No changes allowed.

The user is trying to deactivate a Frame Relay PVC with active user circuit(s).

Redundancy requires WAN Model 8014 in Slot W4.

The user is trying to use the WAN redundancy feature without the proper equipment.

Redundancy switchover is complete.

The user has requested the system to switch to the redundant WAN and the switchover is complete.

Redundant CPU.

The user is trying to access the redundant CPU.

Redundant wan is taken already.

The user is trying to switch to the redundant WAN in slot WAN-4 that is already in use from another WAN switch.

Restricted field.

The user is trying to access the Superuser password field on the CPU card.

Service table is currently used by profile.

The user is trying to change the service table on the ISDN configuration screen.

SR TS overlapping.

The sub-rate circuit assigned does not allow enough space for a previously assigned circuit on the same sub-rate timeslot (e.g. Having a 19.2Kbps on sub-rate timeslot #1 in b-5 framing and trying to assign another 19.2Kbps circuit to sub-rate timeslot #2 rather than sub-rate timeslot #3 or #4 since the circuit on #1 actually occupies #1 and #2).

Switchover must be made from the primary WAN.

The user is trying to switch to the redundant WAN port from the redundant port rather than the primary port.

Test in progress. No changes from this screen.

No changes in card parameters are allowed while the card test is in progress.

Timeslot has different framing.

The user is trying to assign different sub-rate framing to the same WAN timeslot (e.g. Having a port with b-5 framing on one WAN timeslot and trying to assign a different port with b-10 framing to the same WAN timeslot).

Timeslot is taken already.

The user is trying to assign a user port to an occupied WAN timeslot.

TS Connection must be specified.

The user has not specified a timeslot connection for a cross-connect circuit.

Voice CPU is not responding.

The voice CPU is not working. The system power must be reset.

WAN must be active (no loopback) to run BERT test.

All WAN loopbacks must be turned off prior starting a BERT test on a WAN port.

Xconnect table can be accessed from primary WAN.

The user is trying to access the WAN cross-connect information from the redundant WAN port.

Glossary

ACAMI	Alternate Channel AMI - transmitting data on every other DS0 in a DS1 to ensure ones-density
ACO	Alarm Cut Off
ADPCM	Adaptive Differential Pulse Code Modulation
aggregate	A single bitstream combining many bitstreams
AIS	Alarm Indication Signal
a-law	E1 companding standard used in the conversion between analog and digital signals in PCM systems
AMI	Alternate Mark Inversion, a line coding for T1 lines
ANSI	American National Standards Institute
ASCII	American Standard Code of Information Interchange
AWG	American Wire Gauge (the size of electrical wires)
B8ZS	Bipolar 8-Zero Substitution, a coding scheme that maintains ones density
B Channel	In ISDN, a full duplex, 64 Kbps channel used for user data
BER	Bit Error Rate, the number of errored bits divided by the total number of bits
BERT	Bit Error Rate Tester
bit	Contraction of the words "binary" and "digit."
bps	Bits per second
BRI	Basic Rate Interface (2b+d) in ISDN
CAS	Channel Associated Signaling
CAS-CC	Channel Associated Signaling - Common Channel
CAS-BR	Channel Associated Signaling - Bit-robbing mode
CCITT	Consultative Committee for International Telegraph and Telephone (also known as ITU [International Telecommunications Union])
CCS	Common Channel Signaling
CEPT	Conference on European Posts and Telecommunications, a European standards organization
CGA	Carrier Group Alarm

CLE	Customer Located Equipment
clear channel	A channel without format restrictions
CO	Central Office
channel bank	A device to place multiple channels on a digital or analog carrier
CPE	Customer Provided Equipment
CODEC	COder/DECoder (a device to encode and decode signals)
companding	Non-linear reduction of a signal, usually compressing the larger signal values
CRC	Cyclic Redundancy Check
CRC4	CRC using four check bits
CRC6	CRC using six check bits
CSA	Carrier Serving Area
CSC	Common Signaling Channel
CSU	Channel Service Unit, the interface to the T1 line that terminates the local loop
CTE	Channel Terminating Equipment (Network)
CTS	Clear To Send, a lead on an interface indicating that the DCE is ready to receive data
DACS	Digital Access and Cross-Connect System (an electronic digital patching system)
DCC	Data Communication Channel
DCE	Data Communications Equipment
DDS	Digital Data Service
d/i	Drop and Insert, one of the modes of operation for the WAN card
DID	Direct Inward Dialing
DLC	Digital Loop Carrier
DMA	Direct Memory Access
DPO	Dial Pulse Originate
DPT	Dial Pulse Terminate
DS0	Digital Signal Zero, the standard bandwidth for digitized voice channels
DS0-A	Strategy for mapping a single low-speed data circuit to a single DS0

DS0-B	Strategy for mapping multiple low-speed data circuits to a single DS0 (e.g. 5x9.6Kbps, 10x4.8Kbps or 20x2.4Kbps)
DSR	Data Set Ready
DSX	Digital signal cross-connect
DTE	Data Terminal Equipment
DTR	Data Terminal Ready
DX	Duplex Signaling
E1	The DS1 line. The signaling rate of an E1 line is 2.048Mbps.
ESF	Extended Superframe (24-frame multiframe, PCM24)
ESS	Electronic Switching System
E&M	Earth and Magnetic. The signaling leads on inter-switch voice connections.
F4	Four frame multiframe structure (PCM24)
FAS	Frame Alignment Signal
FCC	Federal Communications Commission
FDL	Facility Data Link bits
FOTS	Fiber Optics Transmission Systems
frame	A delineated assembly of information
FRAD	Frame Relay Assembler/Disassembler
FS	Frame Signaling bits
FT	Frame Terminal bits
FX	Foreign Exchange, not the nearest Central Office (CO). An FX line goes from a CO or PBX to beyond the PBX or CO's normal service area.
FXO	Foreign Exchange Office, encodes analog to digital and digital to analog transmission
FXS	Foreign Exchange Subscriber or Station, an interface at the end of an FX line connected to a telephone or PBX, decodes digital to analog and analog to digital transmission
ground	A physical connection to the earth or other reference point
GS	Ground Start

HDB3	High Density Bipolar three zero maximum coding. Provides fourth zero violation for data bytes.
HDLC	High Level Data Link Control Procedure (a bit-oriented protocol)
hlink	A proprietary format for sub-rate data when using the ADPCM card
HSU Card	High Speed Unit Card (one of the data cards for this system)
ICMP	Internet Control Message Protocol
IEC	InterExchange Carrier (sometimes referred to as **IXC**)
IMUX	Inverse Multiplexer
IP	Internet Protocol
ISDN-BRI	Integrated Services Digital Network - Basic Rate Interface. 2B+D ISDN configuration.
ISDN-PRI	Integrated Services Digital Network - Primary Rate Interface. 23B+D ISDN configuration for T1 and 30B+1D for E1.
ITU	International Telecommunications Union (also known as CCITT [Consultative Committee for International Telegraph and Telephone])
IXC	IntereXchange Carrier (sometimes referred to as **IEC**)
loopback	Returning back the sending signal for testing
modem	Contraction of the words modulate and demodulate
mrd	Manual Ring-Down
mu-law	T1 companding standard used in the conversion between analog and digital signals in PCM systems
Network Card	A CPU card or WAN card
NMS	Network management system, a computer used to control network operations from a single location
NOS	No Signal Alarm
NRZ	Non Return to Zero signal
NTU	Network Termination Unit - used to connect BRI station equipment to the AAC unit. (Any standard 2B1Q (U interface) device that supports "nailed- up" (1 or 2 B channels) connections with no D channel signaling.)
OOF	Out Of Frame, an indication that the MUX is searching for the framing bit pattern
OOS	Out of Service

PAM	Pulse Amplitude Modulation
PBX	Private Branch Exchange, a small phone switch inside a company location
PCM	Pulse Code Modulation
ping	A program used to test IP-level connectivity from one IP address to another
PLR	Pulse Link Repeater
POP	Point of Presence, a telephone carrier's office
POTS	Plain Old Telephone Service
protocol	Procedure or set of rules
PTT	Postal, Telephone, and Telegraph authority
QAM	Quadrature Amplitude Modulation
RAI	Remote Alarm Indication
red alarm	Local alarm on a T1 line. A major failure has occurred at this location.
robbed bit	A type of analog signaling that will occasionally steal information bits to use for circuit signaling coding
RZ	Return to Zero signal
SLIP	Serial Line Internet Protocol
SMDS	Switched Multimegabit Data Service
SNMP	Simple Network Management Protocol
system	Often used as a synonym for the AAC equipment
T1	The North American DS1 line. The signaling rate of a T1 line is 1.544Mbps.
TDM	Time Division Multiplexing
TELNET	An application protocol offering virtual terminal service in the Internet suite of protocols
time slot map	Specification of the connections between all incoming and outgoing lines connected to the system. A cross-connect map allows you to split the bandwidth of T1 and E1 lines into amounts more suitable for normal voice and data communications
TS	Time Slot
UDP	User Datagram Protocol
UI	Unit Interval

User card	A Voice card, Data card or Alarm card
WAN Card	Wide Area Network Card (one of the cards for this system)
wideband	Bandwidth equal to many individual channels
X.50	CCITT (ITU) standard data transmission protocol
yellow alarm	Remote alarm on a T1 line. A major failure has occurred at a remote location.
ZCS	Zero Code Suppression