Xedge™ 6000

Hardware Installation

Xedge 6000 Chassis Systems
Xedge V6.2X and V7.X Slot Controllers
Xedge Switch Fabric
Line Interface Modules
Node Timing Modules
System Management Modules
Cables & Peripherals

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Documentation

Revision History of GDC P/N 032R440-000

Issue	Date	Description of Change
1	June 2009	Consolidates and updates hardware setup and installation instructions for all Xedge modules supported under V6.2 or V7.x switch code. (Formerly in Software, Hardware, and Chassis manuals: 032R401-V7x, 032R440-V620, 032R410-000)
2	August 2009	Minor updates/corrections.
3	September 2010	Added LIMs; general updates and corrections.
4	October 2010	Added LIMs; general updates and corrections.
5	June 2011	Added ASIO LIM, new LPMs.
6	July 2011	Minor updates/corrections.
7	October 2011	Clarifications and corrections.
8	February 2012	Added pinout information for LIM cable 027H703-008 (T1/E1 LIMs)

Related Publications

Description	Part Number
Xedge / ProSphere Deployment Guide (for all Xedge systems)	032R297-000
Xedge / ProSphere Security Administration Guide (for all Xedge systems)	032R298-000
Xedge / ProSphere Quick Reference (for all Xedge systems)	032R299-000
Xedge 6000 Hardware Setup Guide (for all Xedge systems)	032R440-000
Xedge 6000 Version 6.2.x Software Configuration Guide Xedge 6000 Version 6.2.x Diagnostics Guide Xedge 6000 Version 6.2.x Release Notes and Cumulative Patch Notes	032R400-V62X 032R500-V62X 032R901-V62X
Xedge MSPx Version 7.3.x Software Configuration Guide Xedge MSPx Version 7.3.x Release Notes and Cumulative Patch Notes	032R401-V73X 032R901-V73X
ProSphere NMS Version 6.0.X User Guide ProSphere NMS Version 6.0.X Installation and Release Notes (CORE, AEM, GFM, SPM, RTM)	032R610-V60X 032R906-V60X

-### is the hardware revision (**-000**, **-001**, etc.)
-V### is the Xedge or ProSphere software version (**-V440**, **V53x**, **V620**, **V73x**, etc**.**)
In addition to the publications listed above, always read Patch and Release Notes for your products.
Browse to http://www.gdc.com and follow the Library link for the latest Xedge/ProSphere documentation.

Preface

Chapter 1: Xedge Hardware Overview

Chapter 2: Xedge Chassis Systems

Preface

Scope of this Manual

This manual provides a detailed description of the front panel features, hardware setup and installation procedures for the Xedge hardware modules supported under Xedge Software Versions 6.2, Version 7.2 and later. All information in this document applies to these components, except where noted. This document consolidates and updates hardware information previously issued in GDC P/N 032R401-V7.X, 032R410-000 and GDC P/N 032R440-V620.

- Refer to the latest Xedge 6000 System Version 6.2.x Configuration & Diagnotics Guide (032R400) to configure switch fabric, controllers and LIMs under Version 6.2.x.

- Refer to the latest Xedge MSPx System Version 7.x Configuration & Diagnotics Guide (032R401) to configure controllers and LIMs under Version 7.x.

- Always read the latest software release and patch notes supporting your Xedge modules for a list of new features, bug fixes, known issues, installation requirements, etc.

- *Related Publications* are listed on the inside front cover of this document.

This information is intended for qualified network operators and administrators who are experienced in setting up and managing MPLS and ATM traffic and signaling in Xedge networks. Wiring must comply with the local electrical codes in your area that govern the installation of electronic equipment. A background knowledge of voice and data telecommunications, network architecture and terminology is assumed.

The information contained in this manual has been carefully checked and is believed to be entirely reliable. As General DataComm continually improves the reliability, function and design of its products, it is possible that some information may not be current. Contact General DataComm, your sales representative or point your browser to `http:\\www.gdc.com` for the latest information.

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Manual Organization

This manual is divided into chapters that describe installation instructions, front panel indicators and connectors, and jumper and switch settings of the various Xedge modules. When using the digital version of this manual, click on any link (shown in blue text) to jump to that section.

Chapter 1, Xedge Hardware Overview

Chapter 2, Xedge Chassis Systems

Chapter 3, Switch Fabric and V6.2 Controllers

Chapter 4, V7.x Packet Controllers

Chapter 5, Line Interface Modules

Chapter 6, Network Timing Modules

Chapter 7, System Management Modules

Chapter 8, Cables & Peripherals

Safety Information

This manual should be read in its entirety and all procedures completely understood before installing or operating the unit, including all notes, cautions and warnings (examples below). The CAUTION, WARNING, and DANGER statements that appear throughout this manual are intended to provide critical information for the safety of both the service engineer and operator. These statements also enhance equipment reliability. The following definitions and symbols for CAUTION, WARNING, and DANGER as they are used comply with ANSI Z535.2, American National Standard for Environmental and Facility Safety Signs, and ANSI Z535.4, Product Safety Signs and Labels, issued by the American National Standards Institute. .

Note   *Indicates a note. It is something you should be particularly aware of; something not readily apparent. A note is typically used as a suggestion.*

Note   *IMPORTANT! Indicates an emphasized note. It is something you should be particularly aware of, something not readily apparent. An Important Note is typically used to prevent equipment damage.*

CAUTION *indicates conditions or practices that can cause damage to equipment or loss of data.*

WARNING *indicates an imminently hazardous situation which, if not avoided, may result in minor to moderate injury. It may also be used to alert against unsafe practices.*

DANGER *indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.*

Safety Guidelines

- Always use caution and common sense, especially when unsafe conditions or potentially hazardous voltages are present.
- Repairs must be performed by qualified service personnel only.
- To reduce the risk of electrical shock, do not operate equipment with the cover removed.
- Never install telephone jacks in a wet location unless the jack is designed for that location.
- Never touch uninsulated telephone wires or terminals unless the telephone line is disconnected at the network interface.
- Never install telephone wiring during an electrical storm.

Antistatic Precautions

This product may contain static-sensitive devices that are easily damaged by ESD (electrostatic discharge). ESD occurs when a person whose body has built up static electricity touches a computer component. ESD can cause computer components to fail. Take proper handling, grounding and precautionary ESD measures when installing parts or cards. Keep parts and cards in antistatic packaging when not in use or during transport. If possible, use antistatic pads on floor and workbench. When handling components, always use an antistatic wrist strap connected to a grounded equipment frame or chassis. *If a wrist strap is not available, periodically touch an unpainted metal surface on the equipment.* Never use a conductive tool, like a screwdriver or a paper clip, to set switches.

Compliance

FCC Part 68

Connection of data communications equipment to the public telephone network is regulated by FCC Rules and Regulations. This equipment complies with Part 68 of these regulations which require all of the following.

For single or multi-line equipment that connects to the telephone network via a plug and jack, the plug and jack must comply with the FCC Part 68 rules. This device is designed to be connected to the telephone or premises wiring, using a compatible modular jack which is Part 68 compliant. See installation chapter for details.

If the unit causes harm to the telephone network, the telephone company may discontinue your service temporarily and if possible, you will be notified in advance. If advance notice is not practical, you will be notified as soon as possible and will be advised of your right to file a complaint with the FCC. The telephone company may change its communication facilities, equipment, operations and procedures where reasonably required for operation. If so, the telephone company will notify you in writing. Any other repair or modification by a user voids the FCC registration and the warranty.

- The APEX DDS1 has a DSX-1 interface. To use the public telephone network, it must be connected to a registered CSU.

- To connect the APEX DDS1 to the public telephone network the customer is required to provide the following information:

FCC Registration Number: AG6USA-23156-XD-N
Telephone Company jack type: Provided by the registered CSU.
Facility Interface Codes: T1 Interface - 04DU9-BN, 04DU9-DN, 04DU9-1KN, 04DU9-1ZN
Service Order Code: T1 Interface - 6.0N

Industry Canada Notification

The Industry Canada label identifies certified equipment. This certification means that the equipment meets telecommunications network protective, operation and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirements document(s). The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

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

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

Notice: The Ringer Equivalence Number (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the devices does not exceed 5.

Electromagnetic Compatibility

This Class A digital apparatus complies with Canadian ICES-003.

Avis D'industrie Canada

L'étiquette d'Industrie Canada identifie le matériel homologué. Cette étiquette certifie que le matériel est conforme aux normes de protection, d'exploitation et de sécurité des réseaux de télécommunications, comme le prescrivent les documents concernant les exigences techniques relatives au matériel terminal. Le Ministère n'assure toutefois pas que le matériel fonctionnera à la satisfaction de l'utilisateur.

Avant d'installer ce matériel, l'utilisateur doit s'assurer qu'il est permis de le raccorder aux installations de l'entreprise locale de télécommunication. Le matériel doit également être installé en suivant une méthode acceptée de raccordement. L'abonné ne doit pas oublier qu'il est possible que la comformité aux conditions énoncées ci-dessus n'empêche pas la dégradation du service dans certaines situations.

Les réparations de matériel homologué doivent être coordonnées par un représentant désigné par le fournisseur. L'entreprise de télécommunications peut demander à l'utilisateur de débrancher un appareil à la suite de réparations ou de modifications effectuées par l'utilisateur ou à cause de mauvais fonctionnement.

Pour sa propre protection, l'utilisateur doit s'assurer que tous les fils de mise à la terre de la source d'énergie électrique, des lignes téléphoniques et des canalisations d'eau métalliques, s'il y en a, sont raccordés ensemble. Cette précaution est particulièrement importante dans les régions rurales.

Avertissement: L'utilisateur ne doit pas tenter de faire ces raccordements lui-même; il doit avoir recours à un service d'inspection des installations électriques, ou à un électricien, selon le cas.

Avis: L'indice d'équivalence de la sonnerie (IES) assigné à chaque dispositif terminal indique le nombre maximal de terminaux qui peuvent être raccordés à une interface. La terminaison d'une interface téléphonique peut consister en une combinaison de quelques dispositifs, à la seule condition que la somme d'indices d'équivalence de la sonnerie de tous les dispositifs n'excède pas 5.

La Compatibilité d' Eléctro-magnetique

Cet appareil numerique de la classe A est conforme a la norme NMB-003 du Canada.

Deutschland

Installations Anweisungen: Installieren Sie die Telefonleitungen nicht während eines Gewitters. Installieren Sie die Telefonleitungen nicht in einem feuchten Raum, auβer die Dose entspricht den Vorschriften für Feuchträume. Berühren Sie unisolierte Telefonleitungen oder Einrichtungen nicht, auβer diese sind vom Telefonnetz getrennt. Vorsicht bei der Installierung oder Änderung von Telefonleitungen. *Achtung:* Es gibt keine durch den Benutzer zu wartende Teile im Gerät. Wartung darf nur durch qualifiziertes Personal erfolgen.

Before You Begin

Inspect all shipping cartons and their contents for visible damage. If any damage is found, inform your supplier immediately.

Note   *IMPORTANT! An Electrostatic Discharge (ESD) wrist strap can be plugged into the wrist strap connectors on the front and rear of the chassis, or can be clamped to any open ground connection on the chassis to prevent equipment damage.*

Site Requirements

Inspect the site, particularly the equipment room, before unloading or unpacking the equipment to ensure the following requirements are met. Refer to your Xedge chassis manual for guidelines.

- Ensure that grounding provisions are adequate.

- Ensure that front and rear access space to the equipment is adequate.

- Ensure that heating, ventilation and air conditioning systems are operating properly.

- Ensure adequate air flow and sufficient lighting.

- Check the power resources to ensure that the current ratings of the branch current feeds meet the requirements of the chassis to be installed. Ensure that redundant power feeds are on separate circuit breakers.

Installation & Connectivity

- Refer to the tables in *Chapter 1, Xedge Hardware Overview* for a complete understanding of controller/LIM/chassis compatibility.

- Refer to *Chapter 2, Xedge Chassis Systems* for specific information on installing devices in your particular Xedge chassis and making connections to the network.

- Refer to the remaining chapters that pertain to the specific modules in your switch to ensure that all switches, jumpers and connectors are set up according to your network requirements.

Accessing the Xedge Switch

The Xedge switch supports multi-level, password-protected access via a Telnet or craft connection to the switch, or via the ProSphere Network Management System (NMS).

- Refer to the Xedge Configuration Guide that supports your slot-0 controller for procedures on configuring the switch for management access (032R400-V62x or 032R401-V7x). *Table 1-2* provides a list of controllers and their associated software versions.

- Refer to the ProSphere NMS User Guide for information on accessing the Xedge switch via an Ethernet connection (032R610-V5x).

Support Services and Training

General DataComm provides comprehensive support for GDC hardware and software products, including open source components. Two GDC customer support organizations are dedicated to pre- and post-sale support services and training for GDC products. *Corporate Client Services* and *Factory-Direct Support & Repair* assist customers throughout the world in the installation, management, maintenance and repair of GDC equipment. Located at GDC's corporate facility in Naugatuck, Connecticut USA, these customer support organizations work to ensure that customers get maximum return on their investment through cost-effective and timely product support.

Corporate Client Services

Corporate Client Services is a technical support and services group that is available to GDC customers throughout the world for network service and support of their GDC products. Customers get the reliable support and training required for installation, management and maintenance of GDC equipment in their global data communication networks. Training courses are available at GDC corporate headquarters in Naugatuck, Connecticut, as well as at customer sites.

Factory Direct Support & Repair

GDC provides regular and warranty repair services through *Factory Direct Support & Repair* at its U.S. headquarters in Naugatuck, Connecticut. This customer support organization repairs and refurbishes GDC products, backed by the same engineering, documentation and support staff used to build and test the original product. Every product received for repair at Factory Direct Support & Repair is processed using the test fixtures and procedures specifically designed to confirm the functionality of all features and configurations available in the product.

As part of GDC's Factory Direct program, all product repairs incorporate the most recent changes and enhancements from GDC Engineering departments, assuring optimal performance when the customer puts the product back into service. Only GDC's *Factory Direct Support & Repair* can provide this added value.

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Chapter 1: Xedge Hardware Overview

Introduction

This chapter provides an overview of the major hardware components in an Xedge Switch system. An Xedge switch is comprised of slot controller modules and line interface modules (LIMs) in a compatible chassis, controlled by Xedge switch code. The operational capabilities of a particular switch are defined by the chassis type, the type of slot controllers installed, the LIMs in use by slot controllers, and the type of switch fabric in use, if any. This section provides brief descriptions of these major components.

Identifying Xedge Modules

It is necessary to correctly identify the type and revision level of each Xedge module in order to properly install and configure those modules in your Xedge switch. An abbreviated product name is printed on the front panel of each module. Some identifying information is also located on the Product Identification label affixed to each module.

To locate the Product ID Label on an Xedge module:

- For a slot controller or switch fabric:
  With component side up and front panel to the left, the Product ID label is at the top-right corner of the module.

- For a LIM:
  With component side up and front panel to the right, the Product ID label is at the lower-left corner of the module.

- For an LPM:
  The type of LIM Personality Module on your packet slot controller can be identified via the terminal interface (M,0).
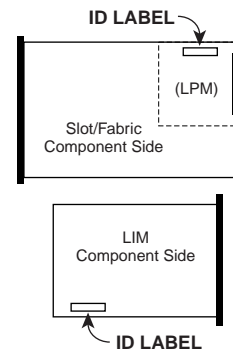
Note   *When handling modules, always use an antistatic wrist strap to prevent static discharge damage to circuitry.*

Xedge Software Versions

Each slot controller has an independent SNMP agent configured with MIBs appropriate to its function. The Xedge operating software (XOS) is stored in flash EPROM of the module, allowing for the download of new operating code for enhancements, new features and updated standards. An Xedge switch can function with more than one type of slot controller installed.

- If your switch contains cell controllers or adaptation controllers, those devices and their LIMs are controlled by Version 6.2 switch code.
- If your switch contains packet controllers, those devices and their LIMs are controlled by Version 7.x switch code.
- If your switch contains a mix of packet and non-packet controllers, the slot-0 controller must be a packet controller.

All Xedge software is pre-loaded at the factory. When you need to upgrade Xedge software in a controller/LIM, or install new modules in an exisiting switch, refer to the detailed procedures provided in the software release and patch notes for that specific controller.

Major Switch Components

Xedge Chassis Systems

An Xedge chassis system includes the rack-mountable shelf and one or more power supplies. GDC manufactures a variety of Xedge chassis, listed below. Note that the information in this manual applies to earlier APEX versions of the chassis, except where noted.

- Xedge 6002 AC Chassis - one or two slot controllers.
- Xedge 6160 AC or DC chassis - up to 4 slot controllers. *(Formerly APEX MAC1 chassis)*
- Xedge 6280 AC or DC chassis - up to 7 slot controllers. *(Formerly APEX IMX chassis)*
- Xedge 6640 AC chassis - up to 16 slot controllers. *(Formerly APEX DV2 chassis)*
- Xedge 6645 DC chassis - 16 slot controllers. *(Formerly APEX NPX chassis)*

Xedge Switch Fabric Modules

In higher density Xedge switches (Xedge 6640, 6645, 6280 or 6160), the Xedge Switch Fabric modules plug into one or two dedicated slots at the front of the chassis, labeled SF Main and SF Standby. In these switches, the Switch Fabric is responsible for transporting cells simultaneously to 16 slot controllers in the switch, at 400 Mbit/s throughput in each direction.

- XM Switch Fabric (1.6 Gbps) supports up to 4 slot sontrollers.
- XS Switch Fabric (2.8 Gbps) supports up to 7 slot sontrollers.
- XH Switch Fabric (6.4 Gbps) supports up to 16 slot controllers.

System Modules

CM - Concentrator Module

- Installs in switch fabric slots of Xedge 6280, 6640 or 6645 systems.
- Supports up to 8 slot controllers, with a cell controller in slot-0.
- Aggregates services to uplinks where no local switching is required.

SMM - System Management Interface Module

- Installs in a dedicated slot at the rear panel of Xedge 6280 or Xedge 6160 systems.
- Provides craft port access
- Provides nvironment alarm monitoring

STM - System Termination Module

- Required in Xedge 6640 or 6645 systems with four or fewer slot controllers.
- Installs in the Standby slot-0 position of the Xedge 6640 or Xedge 6645.
  (STM disallows slot-0 redundancy in its switch.)
- Monitors and conditions the system clock signals.

NTM - Network Timing Modules

- Installs in dedicated slots at the rear panel of Xedge 6160, 6280, 6640 or 6645 systems.
- Two NTM versions (DS1 or E1) provide increased control options for system timing.
- Requires LIMs that have software selectable data clocks ("enhanced" clocking LIMs).

Note   *Refer to [Table 1-1](#) for chassis/module compatibility.*

Table 1-1 Xedge Chassis/Module Compatibility

Controllers	Sw Version	Xedge 6002	Xedge 6160	Xedge 6280	Xedge 6640	Xedge 6645
Xedge ACP	Ver 6.2	✔	✔	✔	✔	✔
Xedge ACS	Ver 6.2	--	✔	✔	✔	✔
Xedge ECC	Ver 6.2	--	✔	✔	✔	✔
Xedge ETH	Ver 6.2	--	✔	✔	✔	✔
Xedge FRC	Ver 6.2	--	✔	✔	✔	✔
Xedge CHFRC	Ver 6.2	--	✔	✔	✔	✔
Xedge CE	Ver 6.2	✔	✔	✔	✔	✔
Xedge VSM	Ver 6.2	✔	✔	✔	✔	✔
Xedge PCX/PCX-2	Ver 7.X	✔	✔	✔	✔	✔
Xedge PCE	Ver 7.X	✔	✔	✔	✔	✔
Xedge PCL	Ver 7.X	✔	--	--	--	--
Xedge ISG2	Ver 7.X	✔	✔	✔	✔	✔

Switch Fabric	Sw Version	Xedge 6002	Xedge 6160	Xedge 6280	Xedge 6640	Xedge 6645
XH	Ver 6.2	--	✔	✔	✔	✔
XS	Ver 6.2	--	✔	✔	--	--
XM	Ver 6.2	--	✔	--	--	--

Other Modules	Sw Version	Xedge 6002	Xedge 6160	Xedge 6280	Xedge 6640	Xedge 6645
CM	Ver 6.2	--	--	✔	✔	✔
SMM	Ver 6.2	--	✔	✔	--	--
STM	Ver 6.2	--	--	--	✔	✔
NTM	Ver 6.2	--	✔	✔	✔	✔

Note *IMPORTANT! To avoid equipment damage, install only supported Xedge modules in appropriate slots of compatible Xedge chassis. Consult your authorized Xedge representative for assistance as needed.*

Note *The ETH controller can only be installed in a slot-0 position of a supported chassis.*
Version 7.x controllers can be installed in any slot as long as there is any Ver 7.x controller in slot-0.

Note *The Xedge 6280, 6640 or 6645 chassis can support redundant slot-0 and redundant switch fabric. When 6640 or 6645 chassis is not configured for slot-0 redundancy, STM must be installed in the redundant slot-0 slot.*

Note *The low density Xedge 6002 has no provision for switch fabric modules. In higher density chassis, the installation of one or more packet controllers (PCX, ISG2, PCE, etc.) will require the XH switch fabric.*

Slot Controller Overview

The following paragraphs describe briefly the capabilities of Xedge controllers and associated LIMs. Depending on the chassis in use and the type of controller serving in slot-0, an Xedge switch can operate with multiple types of Xedge slot controllers, broadly categorized as:

- Xedge 6000 Adaptation Controllers: ACP, ACS, ECC
- Xedge 6000 Cell Controllers: ETH, FRC, CHFRC, CE, VSM
- Xedge MSPx Packet Controllers: PCX, PCE, PCL, ISG2, etc.
  (Note that packet controllers may also have cell and adaptation capabilities.)

Note   *For information on the availability of new Xedge controllers and LIMs, contact your authorized GDC representative.*

Xedge 6000 Adaptation Controllers

Xedge 6000 adaptation controllers employ Version 6.2 switch code to transport services over ATM.

Table 1-2 and *Table 1-3* describe slot controller and LIM identification.
Table 1-4 describes slot controller/LIM compatability.
Table 1-5 describes controller/LIM performance parameters.

CE Slot Controllers

- Constant Bit Rate (AAL1) circuit emulation.
- Supports from 2.4 Kbps up to 4 x DS1/E1 or 2 x T3/E3 ports
- Adaptive clock recovery
- Synchronous timing, loop timing, and Synchronous Residual Time Stamping (as specified in ITU I.363 and ANSI DS1.630 for DS1 and E1)

CHFRC Channelized Frame Controllers

- Provides four, channelized frame-to-ATM interface ports for structured DS1 and E1 services.
- Maximum throughput per port in Frame Relay operation:

Frame Size	Circuit Rate	Frame/Sec	Actual Rate
39-byte	1.536 Mbps	3596	1.122 Mbps
64-byte	1.536 Mbps	2834	1.451 Mbps
512-byte	1.536 Mbps	372	1.524 Mbps
4096-byte	1.536 Mbps	47	1.535 Mbps
39-byte	1.984 Mbps	4519	1.410 Mbps
64-byte	1.984 Mbps	3611	1.849 Mbps
512-byte	1.984 Mbps	479	1.964 Mbps
4096-byte	1.984 Mbps	60	1.535 Mbps

FRC Frame-to-ATM Controller (032M021-001)

- Provides two frame relay, HDLC frame transport, or FUNI interfaces.
- Supports an aggregate throughput above 75 Mbps.
- Maximum throughput for either port in Frame Relay operation:

Frame Size	Circuit Rate	Frame/Sec	Actual Rate
39-byte	10 Mbps	17700	
64-byte	18 Mbps	17700	
512-byte	73 Mbps	8980	
4096-byte	75.2 Mbps	1150	

ETH Slot Controller

- Provides redundant Slot0 operation.

- Provides four-port ethernet/802.3 bridging with RFC 1483 encapsulation enabled and the following throughput:

1 input port to 1 output port over 1 tunnel	Circuit Rate
1518-byte frames	807 pps
1024-byte frames	1190 pps
64-byte frames	13390 pps

4 input ports to 1 output port over 4 tunnels	Circuit Rate
1518-byte frames	3192 pps
1024-byte frames	4656 pps
64-byte frames	21860 pps

VSM Slot Controllers (032P200-001)

- Variable Bit Rate (AAL2, per ITU-T I.363.2) and Constant Bit Rate (AAL1, per ITU-T I.363.1) circuit emulation for structured DS1 or E1 services on a per channel basis.

- Provides up to 4 x DS1 or E1 ports with support for Channel Associated Signaling.

- Supports Nx64K data (AAL1) and 64K PCM voice (AAL2) with CAS and idle channel removal.

VSM Slot Controllers (032M200-001)

- Variable Bit Rate (AAL2, per ITU-T I.363.2) and Constant Bit Rate (AAL1, per ITU-T I.363.1) circuit emulation for structured DS1 or E1 services on a per channel basis.

- Provides up to 4 x DS1 or E1 ports with support for Channel Associated Signaling.

- Support Nx64K data (AAL1)

- 64K PCM or 32K ADPCM (AAL1)

- Idle channel removal

- Silence suppression

- 8K CS-ACELP (per ITU-T G.729a)

- FAX/modem detection with automatic shift to 64K PCM or 32K ADPCM

- FAX/modem detection bypass without CAS (idle code)

- TLP attenuation, CBR traffic shaping, cross-companding types, and echo cancellation (per ITU-T G.156 and G.168)

Xedge 6000 Cell Controllers

The Xedge 6000 Cell controllers perform dedicated ATM cell processing functions such as traffic management and Virtual Channel Identifier/Virtual Path Identifier (VCI/VPI) translation. Physical interfaces connect with other Xedge switches, and attach to LAN hubs, routers, PBX equipment, high performance workstations and other devices with ATM interfaces.

Table 1-2 and *Table 1-3* describe slot controller and LIM identification.
Table 1-4 describes slot controller/LIM compatability.
Table 1-5 describes controller/LIM performance parameters.

ECC(2) Slot Controllers

- Conforms to ITU-T I.610 - OAM Principles for Broadband Networks.

- Conforms to ATM Forum specifications as follows:

- User-Network Interface Version 3.1

- Traffic Management Specification Version 4.0

- Signaling Specification UNI Version 4.0

- ILMI Specification Version 4.0

ACP(2) Slot Controllers

- ATM PDH Controller available with four different ingress/egress cell buffer sizes: 4K/4K, 16K/16K, 16K/64K, or 64K/64K

- Provides advanced modular buffering for up to 256,000 cells per controller.

ACS(2) Slot Controllers

- ATM SDH/SONET Controller available with four different ingress/egress cell buffer sizes: 4K/4K, 16K/16K, 16K/64K, or 64K/64K.

- Provides advanced modular buffering for up to 256,000 cells per controller.

Xedge MSPx Packet Controllers

Xedge MultiService Packet Exchange (packet) controllers employ ATM/MPLS transport for convergence of Layer 2 and Layer 3 switching of "any-to-any" services. This multi-service capability can interconnect remote enterprise sites with emerging Ethernet/IP and legacy services across an MPLS or ATM WAN.

Table 1-2 and *Table 1-3* describe slot controller and LIM identification.
Table 1-4 describes slot controller/LIM compatability.
Table 1-5 describes controller/LIM performance parameters.

ISG2 Slot Controller

- Lowers costs of branch/remote IP access-to-centralized routing resources.
- Supports OSPF, RIP2 Routing, and deterministic static routes.
- Guarantees quality of service by routing IP traffic across Xedge networks based on destination IP address & IP classification. (Traffic shaping and IP QoS)
- Extends IP connectivity and services on converged networks carrying voice, multimedia and low-speed data applications that require explicit service quality.
- Provides standard-based SNMP management interface for Xedge switches.
- Installs in one slot-0 or nonslot-0 position in any Xedge chassis.
- LIMs not required.

PCX Slot Controllers

- Complies with Metro Ethernet Forum (MEF) compliant Ethernet Private Line
- High speed, high capacity packet switching
- Dual control plane for MPLS or ATM transport
- Supports layer 2 or layer 3 VPNs
- Flexible Routing includes PNNI, OSPF-TE
- Installs in two adjacent slot-0 or nonslot-0 positions in any Xedge chassis.
- Supports up to two SERDES-, Utopia-, or Serial-type LIMs, in any combination

PCL Slot Controller

- Cost-effective DS1 IMA to DS3 or E1 IMA to E3 cell-relay transport
- ATM standard compliant ATMF UNI 3.1 solution
- Conformance with IMA 1.0 and IMA 1.1 standards
- NNI support for DS1/E1 IMA or DS3/E3 ATM LIMs
- Fast Ethernet for management and/or Ethernet/IP data (up to 4 connections)
- ATM loopback and diagnostic of physical layer performance
- Selectable PLCP or HEC formats for DS3/E3
- Next generation platform supports migration to Ethernet/IP MPLS based solutions

PCE Slot Controller

- Circuit emulation (T1/E1, DS3/E3, Serial) with clock recovery over Ethernet
- High speed Ethernet, Metro Ethernet & VLAN services
- Gigabit Ethernet trunks for copper (10,100,1000) or GE optical SFP plugs
- Built-in IP router with RIP, OSPF
- Isochronous data transport over Ethernet for telemetry and Doppler acquisition data transport
- Conformance to Ethernet standards including 802.1x port-based access control and 802.1p
- Conformance to SAToP, CESoPSN and TDMoIP specifications for circuit over packet
- Conformance to IETF, MEF, ITU, and IEEE standards.
- Supports a variety of T1, E1, T3, E3, and Serial I/O LIMs.
- When deployed with Xedge PCX technology, Xedge PCE can facilitate TDM or Ethernet convergence over MPLS, VLAN, or Ethernet/IP.

Xedge LIM Overview

Cell and Adaptation and Packet Controllers use Line Interface Modules (LIMs) to interface to the network physical layer. The LIM types vary depending upon the environment, application and the line connection in use (T1, E1, OC3, etc.). Refer to *Chapter 5, Line Interface Modules* for detailed information on each Xedge LIM.

Figure 1-1 shows LIMs attached horizontally or vertically to slot controllers via the midplane connector, depending on the chassis in use. *Figure 1-2* shows LIMs from the rear of the chassis.

Table 1-2 and *Table 1-3* identifies each Xedge LIM with part numbers.
Table 1-4 provides a compatibility matrix of Xedge controllers and LIMs.
Table 1-5 details the performance capabilities of each slot/LIM combination.

Note   *LIMs are controlled by the software version that governs the slot controller to which it is attached.*
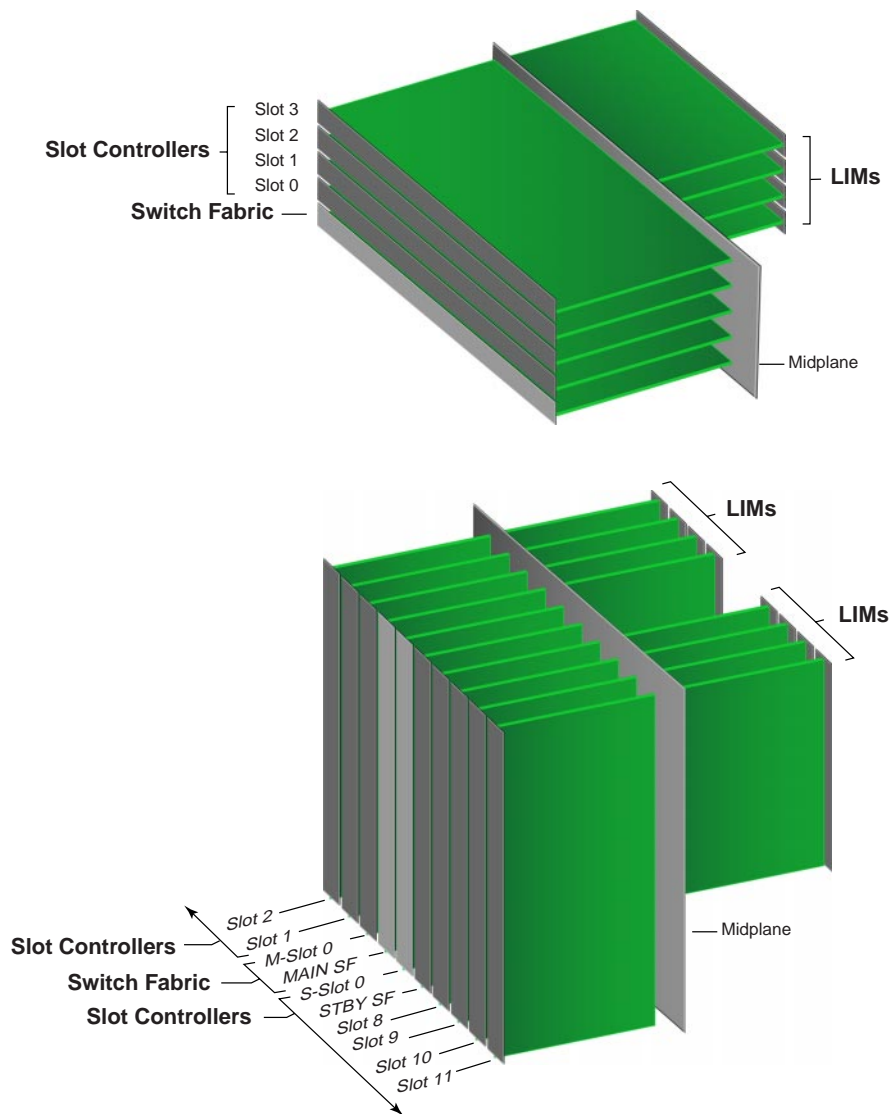
Figure 1-1   Controller/LIM Connectivity

LIM Slot Locations
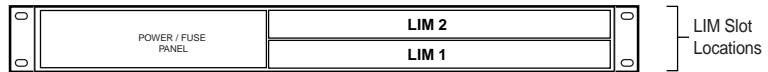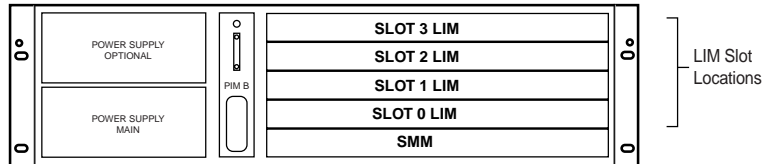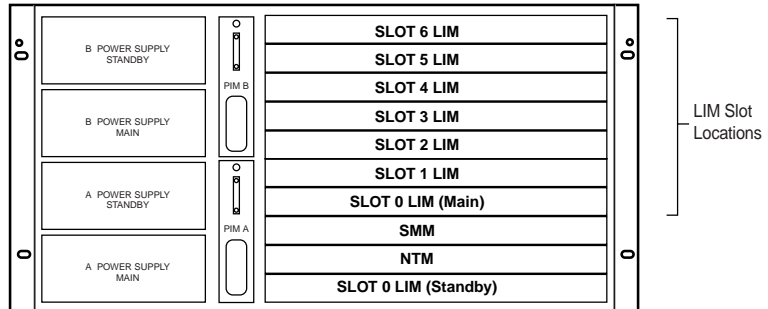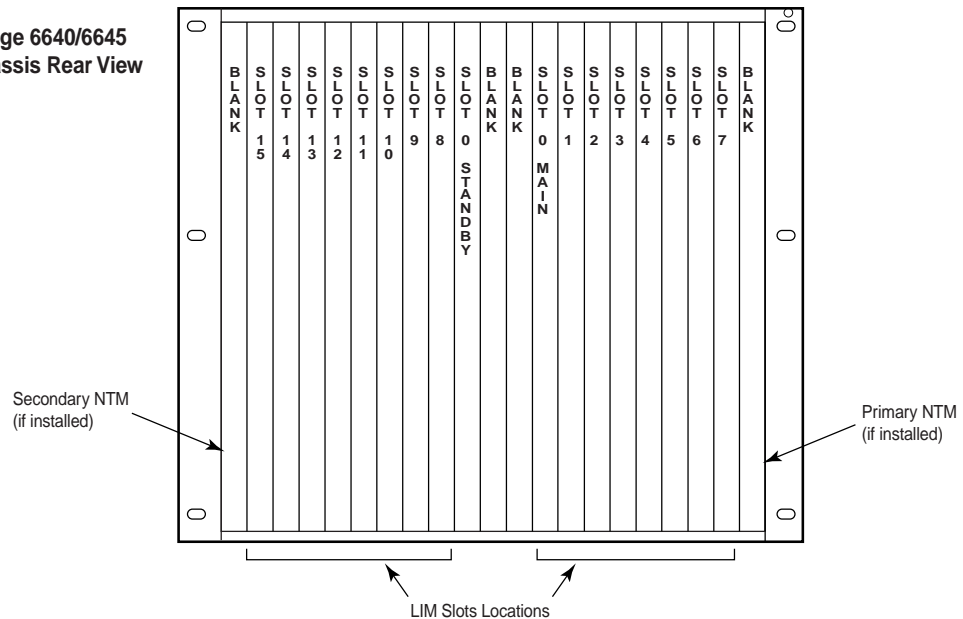
Figure 1-2   Installing LIMs in an Xedge Chassis

Considerations

- LIMs are categorized by type: SD (Serdes); SR (Serial); U (Utopia); E (Enhanced clocking). Where the LIM type column in *Table 1-2* indicates a slot controller, the LIM is restricted to that controller.

- Most packet controllers can accept two of the same LIM type or two different LIM types, depending on the controller's LIM Personality Module (LPM) as provided from the factory. Refer to *Chapter 4, V7.x Packet Controllers* for details on LPM-LIM arrangements.

- The Xedge multi-service switch does not support the following legacy Xedge modules: SCE, VE, ISG(1), ETH, ECC(1), ECC(2), CM, MPG2V, QEDOC, ATM NIC, VJLIM, VJH320, J2, DS1-2C, DS1-4C, E1-2C, E1-4C, DX21 and DX27.

Table 1-2   Xedge Switch Module Identification

Type / Description	Ver/Type	Front Panel	Product No.
Switch Fabric, 6.4 Gbps, for up to 16 Slot Controllers	Ver 6.2X	XH	032P002-004
Switch Fabric, 2.8 Gbps, for up to 7 Slot Controllers	Ver 6.2X	XS	032P002-011
Switch Fabric, 1.6 Gbps, for up to 4 Slot Controllers	Ver 6.2X	XM	032P102-001
Concentrator Module, CM for up to 8 Slot Controllers	Ver 6.2X	CM	032P103-001
System Management Module (Xedge 6160 or 6280 chassis only)	Ver 6.2X	SMM	032P232-001
System Termination Module (Xedge 6640 or 6645, non-redundant slot-0 only)	Ver 6.2X	STM	032P105-001
Slot Controller, ATM Controller PDH 4K/4K	Ver 6.2X	ACP	032M024-001
Slot Controller, ATM Controller PDH 16K/16K	Ver 6.2X	ACP	032M025-001
Slot Controller, ATM Controller PDH 16K/64K	Ver 6.2X	ACP	032M026-001
Slot Controller, ATM Controller PDH 64K/64K	Ver 6.2X	ACP	032M027-001
Slot Controller, ATM Controller SDH/SONET 4K/4K	Ver 6.2X	ACS	032M028-001
Slot Controller, ATM Controller SDH/SONET 16K/16K	Ver 6.2X	ACS	032M029-001
Slot Controller, ATM Controller SDH/SONET 16K/64K	Ver 6.2X	ACS	032M030-001
Slot Controller, ATM Controller SDH/SONET 64K/64K	Ver 6.2X	ACS	032M031-001
Slot Controller, ATM Controller PDH 4K/4K w/logical multicast	Ver 6.2X	ACP	032M024-002
Slot Controller, ATM Controller PDH 16K/16K w/logical multicast	Ver 6.2X	ACP	032M025-002
Slot Controller, ATM Controller PDH 16K/64K w/logical multicast	Ver 6.2X	ACP	032M026-002
Slot Controller, ATM Controller PDH 64K/64K w/logical multicast	Ver 6.2X	ACP	032M027-002
Slot Controller, ATM Controller SDH/SONET 4K/4K w/logical multicast	Ver 6.2X	ACS	032M028-002
Slot Controller, ATM Controller SDH/SONET 16K/16K w/logical multicast	Ver 6.2X	ACS	032M029-002
Slot Controller, ATM Controller SDH/SONET 16K/64K w/logical multicast	Ver 6.2X	ACS	032M030-002
Slot Controller, ATM Controller SDH/SONET 64K/64K w/logical multicast	Ver 6.2X	ACS	032M031-002
Slot Controller, Channelized Frame Controller	Ver 6.2X	CHFRC	032M022-001
Slot Controller, Ethernet to ATM Adaptation Controller	Ver 6.2X	ETH	032M020-001
Slot Controller, Frame Relay Adaptation Controller	Ver 6.2X	FRC	032M021-001
Slot Controller, Circuit Emulation Controller	Ver 6.2X	CE	032M016-003
Slot Controller, Voice Service Module, 48 Channels	Ver 6.2X	VSM	032M033-001
Slot Controller, Voice Service Module, 60 Channels	Ver 6.2X	VSM	032M034-001
Slot Controller, Voice Service Module, 96 Channels	Ver 6.2X	VSM	032M035-011
Slot Controller, Voice Service Module, 120 Channels	Ver 6.2X	VSM	032M036-011
Slot Controller, Voice Service Module (Version 2), 48 Channels	Ver 6.2X	VSM	032M033-021
Slot Controller, Voice Service Module (Version 2), 60 Channels	Ver 6.2X	VSM	032M034-021
Slot Controller, Voice Service Module (Version 2), 96 Channels	Ver 6.2X	VSM	032M035-021
Slot Controller, Voice Service Module (Version 2), 120 Channels	Ver 6.2X	VSM	032M036-021
Slot Controller, Enhanced Cell Controller w/Automatic Protection Switching	Ver 6.2X	ECC2	032P026-001
Slot Controller, Switch Management Controller	Ver 6.2X	SMC	032P232-001
Slot Controller, IP Services Gateway Module	Ver 7.X	ISG2	200P001-002
Slot Controller, Packet Cell Switch with LPM-1 (for Utopia LIMs)	Ver 7.X	PCX	200M001-001
Slot Controller, Packet Cell Switch with LPM-2 (for Utopia/SERDES LIMs)	Ver 7.X	PCX	200M002-001
Slot Controller, Packet Cell Switch with LPM-4 (for SERDES LIMs)	Ver 7.X	PCX	200M004-001
Slot Controller, Packet Cell Switch with LPM-3 (for Serial/SERDES LIMs)	Ver 7.X	PCX	200M003-001

Table 1-2 Xedge Switch Module Identification (Continued)

Type / Description	Ver/Type	Front Panel	Product No.
Slot Controller, Packet Cell Switch with LPM-5 (for Serial/Serial LIMs)	Ver 7.X	PCX	200M007-001
Slot Controller, Packet Cell Switch with LPM-6 (for Serial/Utopia LIMs)	Ver 7.X	PCX	200M013-001
Slot Controller, Packet Cell Switch-2 with LPM-1 (uses Utopia LIMs)	Ver 7.X	PCX-2	200M010-001
Slot Controller, Packet Cell Switch-2 with LPM-2 (Uses Utopia/Serdes LIMs)	Ver 7.X	PCX-2	200M011-001
Slot Controller, Packet Cell Switch-2 with LPM-4 (Uses Serdes LIMs)	Ver 7.X	PCX-2	200M008-001
Slot Controller, Packet Cell Switch-2 with LPM-3 (for Serial/SERDES LIMs)	Ver 7.X	PCX-2	200M014-001
Slot Controller, Packet Cell Switch-2 with LPM-5 (for Serial/Serial LIMs)	Ver 7.X	PCX-2	200M015-001
Slot Controller, Packet Cell Switch-2 with LPM-6 (for Serial/Utopia LIMs)	Ver 7.X	PCX-2	200M017-001
Slot Controller, Packet Cell Link Module with LPM-6 (for selected Serial/U LIMs)	Ver 7.X	PCL	200M006-001
Slot Controller, Packet Circuit Emulator with LPM-CE (Uses selected U LIMs)	Ver 7.X	PCE	200P006-001
LIM, 8-port OC-N/STM-N for Singlemode or Multimode SFP inserts	Enhncd-SD	OC-N/STM-N	200P003-001
LIM, Quad Port Ethernet	ETH only	DAUI	032P024-001
LIM, Quad Port Ethernet 10BASE-T Twisted Pair Interface	ETH only	QTLIM	032P212-001
LIM, Quad Port DS1 with voice support	Enhncd-SR	DS1-4CS	032P098-011
LIM, Dual Port DS1 with voice support	Enhncd-SR	DS1-2CS	032P098-012
LIM, Dual Port DS3 LIM for ATM transport	Serial	DS3-2C	032P046-001
LIM, Dual Port E3 LIM for ATM transport	Serial	E3-2C	032P108-001
LIM, Dual Port E1 with voice support	Enhncd-SR	E1-2CS	032P098-002
LIM, Quad Port E1 with voice support	Enhncd-SR	E1-4CS	032P098-001
LIM, Dual-Port STSX-3c/STM-1, BNC 75 ohm	ACS	DELIM	032P109-001
LIM, Dual Port Intermediate Reach OC-3c/STM-1	ACS	DSLIM	032P066-011
LIM, Single Port Intermediate Reach OC-3c/STM-1	ACS	SSLIM	032P066-012
LIM, Dual Port Short Reach OC-3c/STM-1	ACS	DMLIM	032P066-013
LIM, Single Port Short Reach OC-3c/STM-1	ACS	SMLIM	032P066-014
LIM, Dual Port Long Reach OC-3c/STM-1	ACS	LDSLIM	032P066-015
LIM, Single Port Long Reach OC-3c/STM-1 *(*	ACS	LSSLIM	032P066-016
LIM, Dual Port Short/Intermediate Reach OC-3c/STM-1	ACS	DHLIM	032P066-017
LIM, Dual Port Short/Long Reach OC-3c/STM-1	ACS	LDHLIM	032P066-018
LIM, Dual Port HSSI, Frame (DCE)	Serial	HSSI-DCE	032P022-001
LIM, Dual Port HSSI, Cell (DTE)	Serial	HSSI-DTE	032P022-002
LIM, Dual Port Serial I/O	Enhncd-SR	SI-2C	032P094-002
LIM, Quad Port Serial I/O	Enhncd-SR	SI-4C	032P094-001
LIM, Quad Port Adaptive Serial I/O	Enhncd-SR	ASIO	032P194-001
LIM, Dual-port, short reach, OC-3c/STM-1, with single port APS	Enhncd-SR	155M-2	032P150-011
LIM, Dual-port, intermediate reach, OC-3c/STM-1, with single port APS	Enhncd-SR	155I-2	032P150-012
LIM, Dual-port, long reach, OC-3c/STM-1, with single port APS	Enhncd-SR	155L-2	032P150-013
LIM, Dual-port, short reach, OC-3c/STM-1, with dual port APS	Enhncd-SR	155M-APS	032P150-001
LIM, Dual-port, intermediate reach, OC-3c/STM-1, with dual port APS	Enhncd-SR	155I-APS	032P150-002
LIM, Dual-port, long reach, OC-3c/STM-1, with dual port APS	Enhncd-SR	155L-APS	032P150-003
LIM, Dual port, STM-1 Electrical LIM for ATM transport	Enhncd-SR	155E-2	032P151-001
LIM, Legacy Circuit Emulation 16 link	Serial	LCE-16	032P187-001

Table 1-2   Xedge Switch Module Identification (Continued)

Type / Description	Ver/Type	Front Panel	Product No.
LIM, 16 link Inverse Multiplexing for ATM	Utopia	DSX1-IMA	032P153-003
LIM, 16 link Inverse Multiplexing for ATM	Utopia	E1-IMA	032P153-013
LIM, 16 link Inverse Multiplexing for ATM	Utopia	DSX1-IMA+	032P153-023
LIM, 16 link Inverse Multiplexing for ATM	Utopia	E1-IMA+	032P153-033
LIM, 8 link Inverse Multiplexing for ATM	Utopia	DSX1-8 IMA+	032P153-043
LIM, 8 link Inverse Multiplexing for ATM	Utopia	E1-8 IMA+	032P153-053
LIM, 12 port Analog Voice LIM	Enhncd-SD	ANA-V	(See _Table 1-3_)
LIM, 16 T1/E1 Multi-Protocol LIM	Enhncd-SD	T1/E1 MP	032P210-001
LIM, 28/32 T1/E1 port Multi-Protocol LIM, with DS3/E3 and OC3/OC12 ports	Enhncd-SD	T1/E1 HD	--
NTM, T1 BITS Node Timing Module _(requires an Enhanced LIM)_	Ver 6.2X	NTM-DS1	032P062-001
NTM, E1 BITS Node Timing Module _(requires an Enhanced LIM)_	Ver 6.2X	NTM-E1	032P089-001

Table 1-3   Modular Analog Voice LIM Assemblies

Analog LIM with Intfc Plugins	Ports Max.	Plugin 1	Plugin 2	Plugin 3	Model No.
Basecard with 1 plugin	2	2-port E&M	- -	- -	032M209-001
Basecard with 2 plugins	4	2-port E&M	2-port E&M	- -	032M209-002
Basecard with 3 plugins	6	2-port E&M	2-port E&M	2-port E&M	032M209-003
Basecard with 3 plugins	8	2-port E&M	2-port E&M	4-port FXO	032M209-004
Basecard with 3 plugins	10	2-port E&M	4-port FXO	4-port FXO	032M209-005
Basecard with 2 plugins	6	2-port E&M	4-port FXO	- -	032M209-006
Basecard with 3 plugins	8	2-port E&M	2-port E&M	4-port FXS	032M209-007
Basecard with 3 plugins	10	2-port E&M	4-port FXS	4-port FXS	032M209-008
Basecard with 2 plugins	6	2-port E&M	4-port FXS	- -	032M209-009
Basecard with 3 plugins	10	2-port E&M	4-port FXS	4-port FXO	032M209-010
Basecard with 1 plugin	4	4-port FXS	- -	- -	032M209-011
Basecard with 2 plugins	8	4-port FXS	4-port FXS	- -	032M209-012
Basecard with 3 plugins	12	4-port FXS	4-port FXS	4-port FXS	032M209-013
Basecard with 3 plugins	12	4-port FXS	4-port FXS	4-port FXO	032M209-014
Basecard with 2 plugins	8	4-port FXS	4-port FXO	- -	032M209-015
Basecard with 1 plugin	4	4-port FXO	- -	- -	032M209-016
Basecard with 2 plugins	8	4-port FXO	4-port FXO	- -	032M209-017
Basecard with 3 plugins	12	4-port FXO	4-port FXO	4-port FXO	032M209-018
Basecard with 1 plugin	8	8-port E&M		- -	032M209-019
Basecard with 2 plugins	12	8-port E&M		4-port FXS	032M209-020
Basecard with 2 plugins	12	8-port E&M		4-port FXO	032M209-021
Basecard with 2 plugins	10	8-port E&M		2-port E&M	032M209-022
Basecard with 3 plugins	12	4-port FXO	4-port FXO	4-port FXS	032M209-023

Base Card, Interface Plugins and Accessories

Analog Voice LIM basecard	032P209-001
E&M interface, 8-port 2/4 wire *(see note)*	032P205-001
E&M interface, 2 port, 2/4 wire	032P206-001
FXO interface, 4-port	032P207-001
FXS interface, 4-port	032P208-001
Blank plate (covers empty interface opening in the LIM front panel)	TBD

Note   *The 8-port E&M interface card requires the high density 68-pin D connector to 50-pin amphenol adapter cable (025H605-006) to terminate the voice channels at a customer premise distribution panel or similar device. Refer to <u>Table 8-1</u> for cable description and part number.*

Table 1-4   Xedge Controller/LIM Compatibility Matrix

LIMS	Compatible Slot Controllers											
	CE	CHFRC	FRC	ETH	VSM,	ECC	ACP	ACS	PCX	PCX-2	PCL	PCE
DAUI				✔								
QTLIM				✔								
DS1-2CS	✔	✔	✔		✔		✔		✔	✔		✔
DS1-4CS	✔	✔			✔		2 ports		2 ports	2 ports		✔
DS3-2C	✔						✔		✔	✔	✔	✔
E1-4CS	✔	✔			✔		2 ports		2 ports	2 ports		✔
E1-2CS	✔	✔	✔		✔		✔		✔	✔		✔
E3-2CS	✔						✔		✔	✔	✔	✔
LCE-16							✔		✔	✔	✔	
DELIM								✔				
DSLIM								✔				
SSLIM								✔				
DMLIM								✔				
SMLIM								✔				
LDSLIM								✔				
LSSLIM								✔				
DHLIM								✔				
LDHLIM								✔				
155M-2						✔			✔	✔		
155M-APS						✔			✔	✔		
155I-2						✔			✔	✔		
155I-APS						✔			✔	✔		
155L-2						✔			✔	✔		
155L-APS						✔			✔	✔		
155E-2						✔						
DSX1-IMA						✔			✔	✔		
E1-IMA						✔			✔	✔		
DSX1-IMA+									✔	✔	✔	
E1-IMA+									✔	✔	✔	
DSX1-8 IMA+									✔	✔	✔	
E1-8 IMA+									✔	✔	✔	
HSSI-DTE							✔		✔	✔		
HSSI-DCE			✔									
SI-2C	✔		✔				✔		✔	✔		✔
SI-4C	✔		✔				2 ports		2 ports	2 ports		✔
ASIO	✔						2 ports		2 ports	2 ports		✔
OC-N/STM-N									✔	✔		
ANA-V										✔		
T1/E1 MLPPP										✔		
T1/E1 HD										✔		

Table 1-5 Xedge Controller/LIM Performance Matrix

LIM	Controller	LIM and Slot Controller Description	Maximum Per Link		Physical (Mbps)
			Cell Rate (cps)	Data Rate (Mbps)	
DAUI	ETH	quad AUI Ethernet interface	n/a	to 10	10
QTLIM	ETH	quad 10BaseT Ethernet interface	n/a	10	10
DS1-4CS	CE	quad port DS1-type interface (unstructured)	n/a	1.544	1.544
	CHFRC	quad port DS1-type interface (structured)	n/a	1.536	1.544
DS1-2CS	ACP PCX, PCL	dual port DS1-type interface (PLCP)	3,333	1.413	1.544
		dual port DS1-type interface (HEC)	3,623	1.536	1.544
	CE, FRC	dual port DS1-type interface (unstructured)	n/a	1.544	1.544
	CHFRC	dual port DS1-type interface (structured)	n/a	1.536	1.544
DS1-2CS/4CS	VSM	dual/quad port DS1 supporting voice service	n/a	1.536	1.544
DS3-2C	CE	dual port DS3-type interface (unstructured) supporting ATM service	n/a	44.736	44.736
	ACP PCL	dual port DS3-type interface (PLCP) supporting ATM service	96,000	40.704	44.736
		dual port DS3-type interface (HEC) supporting ATM service	104,268	44.21	44.736
E1-4CS	CE	quad port E1-type interface (unstructured)	n/a	2.048	2.048
	CHFRC	quad-port E1-type interface (structured)	n/a	1.920	2.048
E1-2CS	ACP, PCX, PCL	dual port E1-type interface (HEC)	4,490	1.904	2.048
	CE, FRC	dual port E1-type interface (unstructured)	n/a	2.048	2.048
	CHFRC	dual port E1-type interface (structured)	n/a	1.920	2.048
E1-2CS/4CS	VSM	dual/quad port E1 w/voice service support	n/a	1.984	2.048
E3-2C	CE	dual port E3-type interface (unstructured)	91,405	34.368	34.368
	ACP PCL	dual port E3-type interface (G.751)	72,000	30.528	34.368
		dual port E3-type interface (G.832)	80,000	33.920	34.368
LCE-16	ACP2 PCX	16 port circuit emulation serial interface	400	to 0.064	to 0.064
DELIM	ACS	dual port STSX-3c/STM-1 LIM; BNC 75 ohm coax interface; ATM concatenated framing format over SONET/SDH	353,207	149.76	155.52
DSLIM	ACS	dual port OC-3c/STM-1 LIM; intermediate reach	353,207	149.76	155.52
SSLIM	ACS	single port OC-3c/STM-1 LIM; intermediate reach	353,207	149.76	155.52
DMLIM	ACS	dual port OC-3c/STM-1; short reach	353,207	149.76	155.52
SMLIM	ACS	single port OC-3c/STM-1; short reach	353,207	149.76	155.52
LDSLIM	ACS	dual port OC-3c/STM-1; long reach	353,207	149.76	155.52
LSSLIM	ACS	single port OC-3c/STM-1 LIM; long reach	353,207	149.76	155.52
DHLIM	ACS	dual port OC-3c/STM-1 LIM; intermediate and short reach	353,207	149.76	155.52
LDHLIM	ACS	dual port OC-3c/STM-1 LIM; long and short reach	353,207	149.76	155.52
155M-2	ECC PCX	dual port, short reach, OC-3c/STM-1 LIM w/single port APS supporting advanced ATM service	353,207	149.76	155.52
155I-2	ECC PCX	Dual port, intermediate reach, OC-3c/STM-1 LIM w/ single port APS supporting advanced ATM service	353,207	149.76	155.52
155L-2	ECC PCX	Dual port, long reach, OC-3c/STM-1 LIM w/single port APS supporting advanced ATM service	353,207	149.76	155.52

Table 1-5   Xedge Controller/LIM Performance Matrix (Continued)

LIM	Controller	LIM and Slot Controller Description	Maximum Per Link		Physical (Mbps)
			Cell Rate (cps)	Data Rate (Mbps)	
155M-APS	ECC PCX	Dual port, short reach, OC-3c/STM-1 LIM w/dual port APS supporting advanced ATM service	353,207	149.76	155.52
155I-APS	ECC PCX	Dual port, intermediate reach, OC-3c/STM-1 LIM w/ dual port APS supporting advanced ATM service	353,207	149.76	155.52
155L-APS	ECC PCX	Dual port, long reach, OC-3c/STM-1 LIM w/dual port APS supporting advanced ATM service	353,207	149.76	155.52
155E-2	ECC	Dual port, STM-1 Electrical LIM for ATM service	353,207	149.76	155.52
DSX1-IMA	ECC, PCX	16 link Inverse Multiplexing for ATM service	3,592	1.523	1.544
E1-IMA	ECC, PCX	16 link Inverse Multiplexing for ATM service.	4,490	1.904	2.048
DSX1-IMA+	PCX, PCL	16 link Inverse Multiplexing for ATM service.	3,592	1.523	1.544
E1-IMA+	PCX, PCL	16 link Inverse Multiplexing for ATM service.	4,490	1.904	2.048
DSX1-8 IMA+	PCX, PCL	8 link Inverse Multiplexing for ATM service.	3,592	1.523	1.544
E1-8 IMA+	PCX, PCL	8 link Inverse Multiplexing for ATM service.	4,490	1.904	2.048
HSSI-DTE	ACP, PCX	High speed, dual-port, DTE serial interface	114,615	51.84	51.84
HSSI-DCE	FRC,	High speed, dual-port, DCE serial interface	114,615	51.84	51.84
SI-2C	CE, FRC	Dual port, serial RS422/RS423 compatible, software selectable data clock, RS449, EIA/TIA530, V.35, X21, DCE or DTE input capabilities	n/a	selectable clock rate 2.4-8192 kHz	selectable clock rate 2.4-8192 kHz
	ACP, PCX, PCL		19,321		
SI-4C	CE, FRC	Quad port, serial RS422/RS423 compatible, software selectable data clock, RS449, EIA/TIA530, V.35, X21, DCE or DTE input capabilities	n/a	selectable clock rate 2.4-8192 kHz	selectable clock rate 2.4-8192 kHz
	ACP		19,321		
ASIO (Standard)	CE, PCE, ACP, PCX	Quad-port adaptive serial EIA-530, EIA-530A, EIA-449, ITU-T X.21, ITU-T V.35 and RS-232 interfaces (via Smart Cable).	from 1000 bps to 10 Mbps per port (See note below)		
OC-N/STM-N	PCX	8-port optical LIM for Singlemode or Multimode SFPs	1,412,830	OC3:155.52 OC12: 622	OC3:155.52 OC12: 622
ANA-Voice	PCX2 only	LIM, 12 port Analog Voice LIM	n/a	64K analog	64K analog
T1/E1 MLPPP	PCX2 only	LIM, 16 T1/E1 Multi-Protocol LIM	n/a	T1: 1.544 E1: 2.048	T1: 1.544 E1: 2.048
T1/E1 HD	PCX2 only	LIM, 28/32 T1/E1 port Multi-Protocol LIM, with DS3/E3 and OC3/OC12 ports	n/a	T1: 1.544 E1: 2.048 DS3: 44.736 OC3:155.52 OC12: 622	1.544 2.048 44.736 OC3:155.52 OC12: 622

NTM-DS1	T1 BITS Node Timing Module provides increased control options for system timing. Requires enhanced LIM.
NTM-E1	E1 BITS Node Timing Module provides increased control options for system timing. Requires enhanced LIM.

Note   *Xedge PCX in the above table refers to both PCX and PCX2, except where noted.*

Note   *Future models of the ASIO LIM (ASIO-TTL and ASIO-HSSI) will support higher speed serial interfaces up to 45 Mbps.*

Chapter 2: Xedge Chassis Systems

Overview

This chapter describes how to rackmount the specific Xedge chassis in use, ensure adequate air flow, and make all necessary power and ground connections. This chapter also provides instructions for local management access to the switch via a craft port on the Xedge chassis in use.

Typically, an Xedge switch is shipped from the factory with all modules installed in the chassis ready for hard option setup and software configuration. In some cases, modules are pre-set and pre-configured at the factory for your network application. Consult your Site/Network Documentation Package or your field service representative for special instructions as required.

Table 2-1 describes each Xedge chassis, with specific procedures for each in the pages that follow. *Table 8-1* lists part numbers for all Xedge compatible cabinets, cables and connection panel kits.
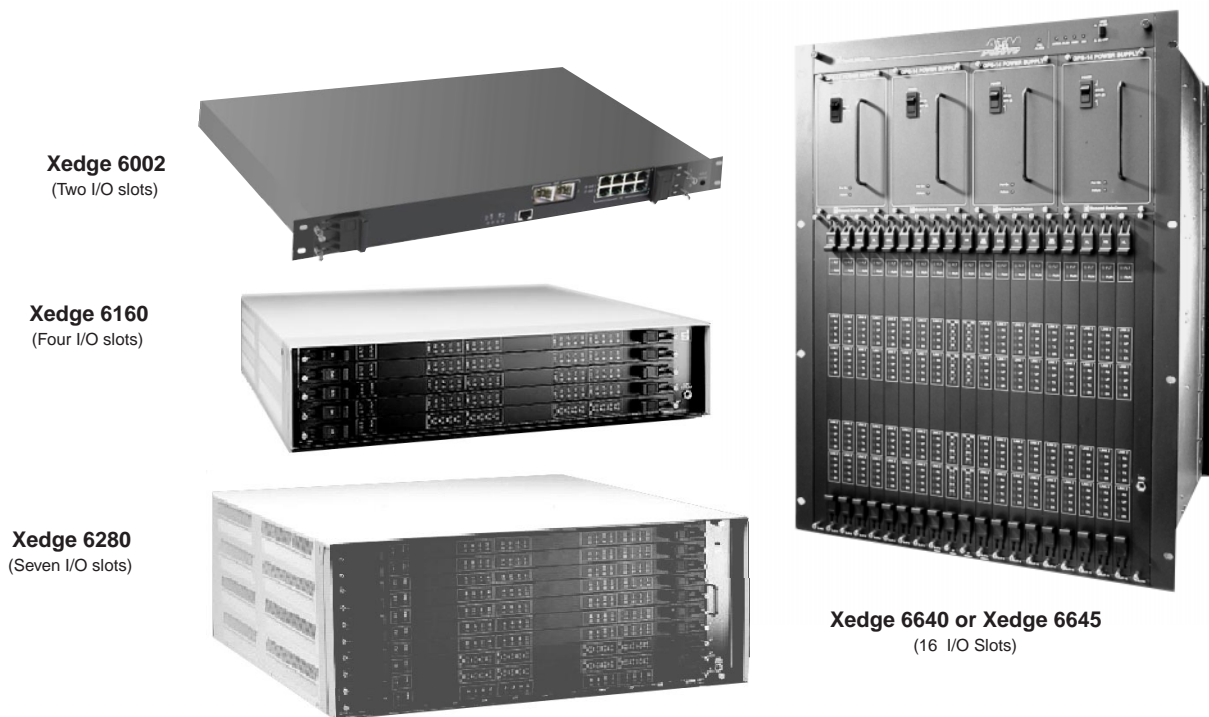

Xedge 6002
(Two I/O slots)

Xedge 6160
(Four I/O slots)

Xedge 6280
(Seven I/O slots)

Xedge 6640 or Xedge 6645
(16 I/O Slots)

Table 2-1 Xedge Chassis Descriptions

		Xedge 6645 Shelf	Xedge 6640 Shelf	Xedge 6280 Shelf	Xedge 6160 Shelf	Xedge 6002 Shelf
Dimensions:	Height Width Depth	666 mm (26.2 in) 482.61mm (19 in) 422 mm (16.6 in)	666 mm (26.2 in. 482.61 mm (19 in) 422 mm (16.6 in)	222.5 mm (8.75 in) 482.61 mm (19 in) 488.95 mm (19.25 in)	112 mm (4.4 in) 482.61 mm (19 in) 476 mm (18.75 in)	440.9 mm (1.74 in) 482.61 mm (19 in) 482.61 mm (19 in)
I/O Slots		16	16	7	4	2
Switch Fabric		1 or 2 XH Modules	1 or 2 XH Modules	1 XS or XH Module	1 XM, XS or XH Module	--
Local Mgmnt Intfc		2 Chassis Rear Panel Ports	2 Chassis Rear Panel Ports	2 SMM Ports	2 SMM Ports	1 Chassis Front Panel Port
Power	DC	-48VDC	--	-48VDC	-48VDC	--
	AC	--	100/120VAC, 50/60Hz 220/240VAC, 50/60Hz	100/120VAC, 50/60Hz 220/240VAC, 50/60Hz	100/120VAC, 50/60Hz 220/240VAC, 50/60Hz	100/120VAC, 50/60Hz 220/240VAC, 50/60Hz
Max Consumption		1300 W	1300 W	750 W	350 W	150 W
Temperature		Operating: 0 to 50 deg. C (32 to 122 deg. F); Storage: -40 to 70 deg. C (-40 to 150 deg. F)				
Relative Humidity		Up to 95% without condensation				

Xedge 6002 Chassis

The Xedge 6002 is a compact, 2-slot chassis with an auto-ranging power supply that automatically adapts to AC power inputs ranging from 90 to 264VAC. For detailed specifications, refer to the table below.

Xedge 6002 Technical Specifications

Table 2-2   Xedge 6002 Chassis Specifications

Xedge 6002 AC Version (P/N 200B010-001)	
Input Voltage Range	90 to 264 VAC (universal power source)
Input Frequency	47 to 63 Hz
Maximum Power Consumption	150 W
Fuse Rating	1.6A Fast Blow 250V
Dimension (H x W x D):	1.74 in (44.09 mm) x 19.0 in (482.60 mm) x 19.0 in (482.60 mm)
Temperature, operating	32 to 122 deg. F (0 to 50 deg. C)
Temperature, non-operating	-40 to 158 deg. F (-40 to70 deg. C)
Humidity	Up to 95% without condensation
Altitude, operating	0 to 10,000 ft (0 to 3,047 m)
Altitude, non-operating	0 to 40,000 ft (0 to 12,191 m)
Compliance	CISPR 22 Class A, FCC 15 Class A, EN55022, EN5524 UL Listed (UL60950) c-UL Listed (CSA C22.2 #950) TUV licensed (EN60950) CE Mark

Module Installation

Refer to *Chapter 3, Switch Fabric and V6.2 Controllers* for procedures on how to properly install and remove modules in and out of the Xedge 6002 chassis.

Note   *IMPORTANT! To avoid equipment damage, install only supported Xedge modules in appropriate slots of the Xedge 6002 chassis. Refer to Table 1-1 and Table 1-4 before installing any modules.*

Xedge 6002 Front/Rear Panel Features

The Xedge 6002 chassis has no provision for a switch fabric module; therefore, only packet-based controllers (*Table 1-1*) can be installed in slot 0 since they have the fabric sufficient for this chassis.

The front panel can accept one double-width packet controller (e.g. Xedge PCX, PCE or PCL). The rear panel can accept one or two LIMs that connect to the controller at the midplane. As an alternative, a single-width packet controller (e.g., Xedge ISG2) can be installed in slot 0, with an additional compatible controller installed in slot 1, such as the Xedge CE, ACP, VSM, or another ISG2.

The Fan Tray assembly and the Fan Filter assembly are mounted on right and left side rails inside the chassis, and can be removed/replaced from the chassis front panel. The Xedge 6002 is supplied with an electrostatic discharge (ESD) wrist strap that attaches to the front panel jack on the chassis. A management (CRAFT) port is also located at the front panel, as shown in the figure below. The power panel and fuse compartment are also located at the rear of the chassis.
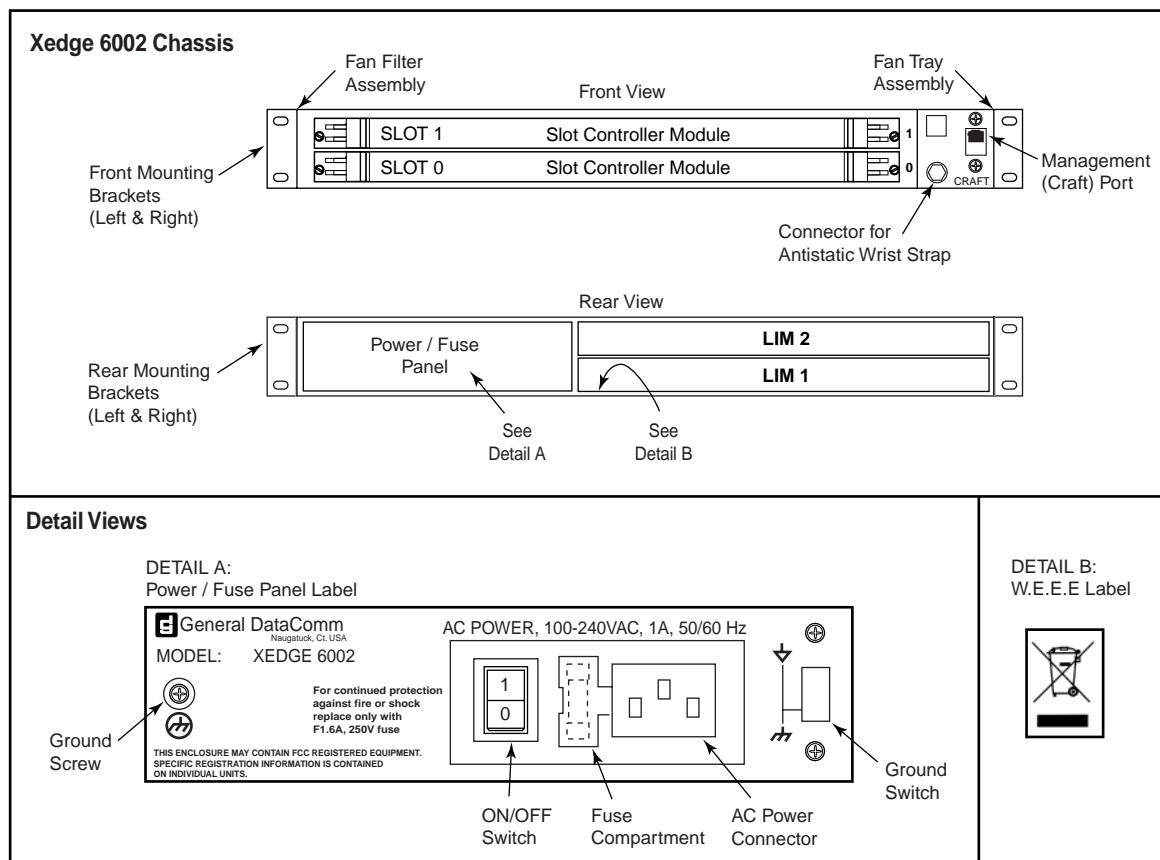

Figure 2-1   Xedge 6002 Chassis, Front and Rear Views

Rack Mounting the Xedge 6002

The Xedge 6002 chassis can only be front- or rear-mounted in a 19-inch open rack or cabinet. Use the mounting brackets and screws provided, as described below. Allow adequate space around the chassis in order to install/remove modules, make cable connections and provide adequate air flow.

1. Using the flathead screws provided, attach the four mounting brackets to the left and right sides of the chassis: two brackets support the front of the chassis, two support the back.

2. Using two screws for each bracket, mount the chassis assembly to the 19-inch rack or cabinet.

3. Install blank panels at empty front/rear slots as necessary.

4. Since air flow is conducted through the sides of an Xedge 6002 chassis, multiple Xedge 6002 chassis may be installed in the rack without space between them.

Note   *IMPORTANT! When mounting the chassis in a rack shared with other type of equipment, ensure that the installation meets the cooling requirements of all equipment. To prevent equipment damage, maintain adequate space between the equipment as required to allow unrestricted air flow.*

Air Flow Requirements

You must install the chassis in a location that permits good air flow through the chassis. As you face the front of the chassis, the fans cool the internal components by drawing cool air through the left side and expelling the warmed air out the right side.

Air flow is provided by the Fan Tray Assembly which has two or four fans, each delivering 13.5 cubic feet per minute (cfm). All fans must be operational to supply adequate air flow. With this cooling arrangement, it is important not to block the air flow through the chassis sides. The maximum temperature for air entering the chassis is 122 deg. F (50 deg. C). Failure to implement these recommendations may result in overheating.

Note   *IMPORTANT! All empty slots must have blank panels installed to maintain proper chassis cooling, EMI shielding, ESD protection, and safety requirements.*

Note   *Refer to the section on* <u>*Xedge 6002 Maintenance*</u> *in this chapter for Fan Tray and Fan Filter procedures.*

Power Supply

The Xedge 6002 chassis has one integral AC power supply. The power supply cannot be accessed or replaced by the user.

Note   *For information on replacing the power supply, contact your authorized Xedge representative.*

Xedge 6002 Connections

The Xedge 6002 chassis provides connectors for power sources, management and grounds. The following paragraphs describe how to make these connections. Note that the Xedge 6002 chassis does not support contact alarm connections.

AC Power for Domestic Sites

For domestic deployments (U.S. and Canada), the Xedge 6002 AC chassis is equipped with one AC power cord (US 120 VAC). Plug the appropriate end into the AC receptacle of the power input module and plug the other end into a polarized outlet that provides the required AC power.

The AC power source should not be under switch control. If the Xedge 6002 is connected to other equipment, it should be powered by the same AC source as that equipment to prevent large circulating currents induced by differences in ground potential. If it is impossible to determine whether the equipment is powered by the same AC source, verify that a potential difference of less than 0.25 V rms exists between the grounding circuits of the respective power outlets.

AC Power for International Sites

For international deployments, the table below lists countries where the Xedge 6002 chassis can be deployed with a customer-supplied AC power cord. Contact your Xedge representative for details.

Austria	France	Luxemburg	Singapore
Australia	Germany	Malta	Slovakia
Belgium	Greece	Mexico	Slovenia
Brazil	Israel	Netherlands	Spain
Bulgaria	Italy	Norway	Sweden
Cyprus	Latvia	Poland	Switzerland
Czech Republic	Lithuania	Portugal	Turkey
Denmark	Hong Kong	Rumania	United Kingdom
Estonia	Hungary	Russia	
Finland	Ireland	Saudi Arabia	

Xedge 6002 Ground Connections

A ground screw and a ground switch located on the rear of the Xedge 6002 chassis provide for the connection or separation of chassis and signal grounds as required. It is common practice to connect chassis and signal ground together (this is the default selection).

Signal ground is the 0 V reference for the digital circuits contained in the chassis and the reference for unbalanced data interfaces such as EIA/TIA-232-E and RS-423. Connecting grounds helps prevent AC power line noise, but a large ground current can flow in the shield and the exchanged signals grounds of a cable (i.e., signal grounds that are in the cable) if it is connected between equipment grounds that have different potentials. To avoid this problem:

• Check that the potential difference between grounds is less than 0.25 V RMS.

• Break the continuity of the shield in the middle of a long cable run.

• Connect the shield to ground at only one end.

• Separate the signal and chassis grounds. In this case, the signal ground should be connected to a customer-provided building ground (100 ohm recommended).

Note   *Local electrical codes and equipment manufacturers may require separation of signal and chassis grounds. Perform one of the Grounding Options procedures below to suit your site requirements.*

Grounding Options

To connect chassis and signal grounds:

1. Connect a spade lug to the ground screw and a ground connection at the site.

2. Slide the ground switch fully to the DOWN position.

To separate chassis and signal grounds:

1. Connect a spade lug to the ground screw and a ground connection at the site.

2. Slide the ground switch fully to the UP position.

Xedge 6002 System Management Connections

For local configuration and management of the switch, the RJ45 connector at the chassis front panel provides local management access via an asynchronous terminal. *Table 2-3* lists the pinouts for this management port. To connect a terminal, perform the following steps:

1. Connect the terminal to the CRAFT connector of the Xedge 6002 chassis.

2. Set the terminal to the following parameters:

   • VT100 emulation

   • 19,200 baud

   • 8 character bits

   • No parity

   • No flow control

Table 2-3   Xedge 6002 Craft Port Pinouts

Pin	Signal
1	--
2	--
3	RXD
4	--
5	GND
6	TXD
7	--
8	--

Note   *When the Xedge 6002 chassis is operating with the Xedge PCL slot controller, the terminal must be set to 9600 baud.*

Xedge 6002 Maintenance

Fan Filter Maintenance

The Fan Filter Assembly is mounted on the left side rail of the chassis. The filter material should be checked regularly for debris and tears. Replace clogged or damaged filter as described below:

1. At the left corner of the chassis front panel, loosen the screw and retaining block assembly.

2. Pull the tab to remove the Fan Filter Assembly. Check the filter material for dirt and wear.

3. If necessary, install a new Fan Filter Assembly. Do not attempt to clean the filter material, as this will disrupt filtering and anti-static properties.

4. Tighten the screw and retaining block assembly into position.

Fan Tray Removal & Replacement

The Fan Tray Assembly is mounted on the right side rail of the chassis. In the event of a fan failure, replace the entire assembly with a spare that has the same number of fans, as described below. Individual fans should only be replaced by a qualified service engineer.

1. If one or more fans have failed, power down the chassis at once from the rear power panel. Disconnect ESD Wrist Strap from the front panel, if connected.

2. At the right corner of the chassis front panel, loosen the screw and retaining block assembly.

3. Pull the tab to remove the Fan Tray Assembly. Your chassis may have two or four fans mounted on the tray. Do not add or remove fans from the tray. Replace with a new Fan Tray Assembly that has the same number of fans, unless instructed otherwise by a service engineer.

4. Tighten the screw and retaining block assembly into position, then power up the chassis.

Table 2-4   Xedge 6002 Fan Accessories

Description	Ordering Part Number
Fan Filter Assembly	010E502-001
Fan Tray Assembly with 4 fans	200C009-001
Fan Tray Assembly with 2 fans	200C009-002

Xedge 6160 Chassis

Xedge 6160 is a compact, standalone 5-slot chassis available in AC and DC power versions. The AC-version of the chassis uses autoranging power supplies that automatically adapt to AC power inputs ranging from 90 to 264VAC. For detailed specifications, refer to the table below.

The Xedge 6160 chassis is shipped from the factory with a door covering the front panel. In cabinet/rack-mount installations, the door may be removed if it interferes with equipment installed below the chassis.

Xedge 6160 Technical Specifications

Table 2-5   Xedge 6160 Chassis Specifications

Xedge 6160 AC Version (P/N 010B203-001), GPS-16A AC Power Supply (P/N 035B011-002)	
Input Voltage Range	90 to 264 VAC
Input Frequency	50 to 60 Hz
Maximum Power Consumption	350 W
Service Current Requirement	15A
Fuse Rating	6.3A, 250 VAC, each power supply
Heat Dissipation	1,195 BTU/hr, maximum
Xedge 6160 DC Version (P/N 010B204-001), DPS-16A DC Power Supply (P/N 041B011-001)	
Input Voltage Range	-42 to -70 VDC
Maximum Power Consumption	350 W
Fuse Rating	10A, 250 VDC, each power supply
Heat Dissipation	1,195 BTU/hr, maximum
Xedge 6160 AC and DC Units	
Dimension (H x W x D):	4.38 in (11.1 cm) x 17.5 in (44.4 cm) x 19.0 in (48.3 cm)
Temperature, operating	32 to 122 deg. F (0 to 50 deg. C)
Temperature, non-operating	-40 to 158 deg. F (-40 to70 deg. C)
Humidity	Up to 95% without condensation
Altitude, operating	0 to 10,000 ft (0 to 3,047 m)
Altitude, non-operating	0 to 40,000 ft (0 to 12,191 m)
Compliance	CISPR 22 Class A UL Listed (UL1950) c-UL Listed (CSA C22.2 #950) TUV licensed (EN60950) CE Mark

Module Installation

Refer to *Chapter 3, Switch Fabric and V6.2 Controllers* for procedures on how to properly install and remove modules in and out of the Xedge 6160 chassis.

Note   *IMPORTANT! To avoid equipment damage, install only supported Xedge modules in appropriate slots of the Xedge 6160 chassis. Refer to <u>Table 1-1</u> and <u>Table 1-4</u> before installing any modules.*

Front/Rear Panel Features

The front of the Xedge 6160 chassis can hold one switch fabric module and up to four slot controller modules (slots 0 through 3). The Xedge 6160 is supplied with an electrostatic discharge (ESD) wrist strap that attaches to the front panel jack on the chassis.

The rear of the chassis can accept up to four LIMs and one System Management Module (SMM), which provides two management (CRAFT) ports. There are two slots for Power Supply Units (main and optional) that can provide power supply redundancy. The Power Input connector is not field replaceable.

Front View

SLOT 3	Slot Controller Module	3
SLOT 2	Slot Controller Module	2
SLOT 1	Slot Controller Module	1
SLOT 0	Slot Controller Module	0
	Switch Fabric	SF

ESD Strap

Connector for
Antistatic Wrist Strap

Mounting
Brackets

POWER SUPPLY OPTIONAL		SLOT 3 LIM
	PIM	SLOT 2 LIM
		SLOT 1 LIM
POWER SUPPLY MAIN		SLOT 0 LIM
		SMM
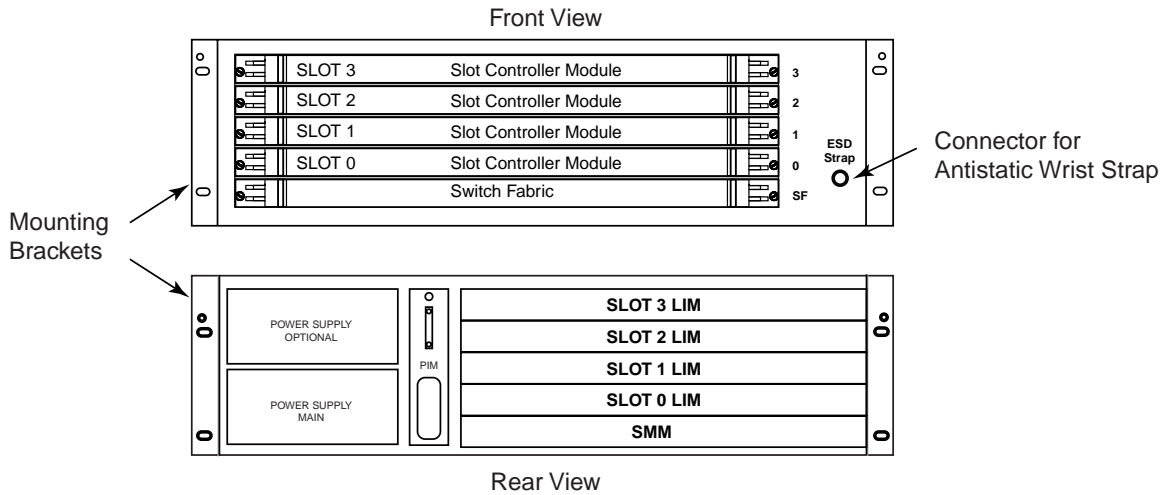
Rear View

Figure 2-2   Xedge 6160 Chassis, Front and Rear Views

Note   *IMPORTANT! All empty slots must have blank panels installed and the Power Input Modules must be installed at all times to maintain proper chassis cooling, EMI shielding, ESD protection, and safety requirements.*

Installing the Xedge 6160

The chassis may be deployed in any of the following arrangements, detailed in the paragraphs that follow. Allow adequate space around the chassis in order to install/remove modules, make cable connections and provide adequate air flow.

- Standalone Desktop
- Front mounted in 19-inch rack/cabinet
- Mid mounted in 23-inch rack/cabinet

Desktop Installation

1. Install four supplied adhesive-backed feet to the embossed areas on the bottom of the chassis.

2. Ensure that the chassis is not positioned directly adjacent to another chassis. This can cause warmed air to flow from one unit into the adjacent unit.

Rack/Cabinet Installation

In the procedure below, select the proper mounting bracket kit and filler panels to fit your 19- or 23-inch rack or cabinet.

- For a 19-inch rack/cabinet, use mounting kit (P/N 010K349-001).
- For a 23-inch rack/cabinet, use mounting kit (P/N 010K350-001).

1. Using the flathead screws provided, attach the four mounting brackets to the left and right sides of the chassis: two brackets support the front of the chassis, two support the back.

2. Using two screws for each bracket, mount the chassis assembly to the rack or cabinet.

3. Install blank panels at empty front/rear slots as necessary.

4. When stacking an odd number of Xedge 6160 chassis in a rack/cabinet, you must add a filler panel, as shown in *Figure 2-3*.

- For a 19-inch rack/cabinet, use the filler panel supplied with your chassis.
- For a 23-inch rack/cabinet, use filler panel (P/N 032C010-001).

Note *IMPORTANT! When mounting the chassis in a rack shared with other types of equipment, ensure that the installation meets the cooling requirements of all equipment. To prevent equipment damage, maintain adequate space between the equipment to allow unrestricted air flow.*
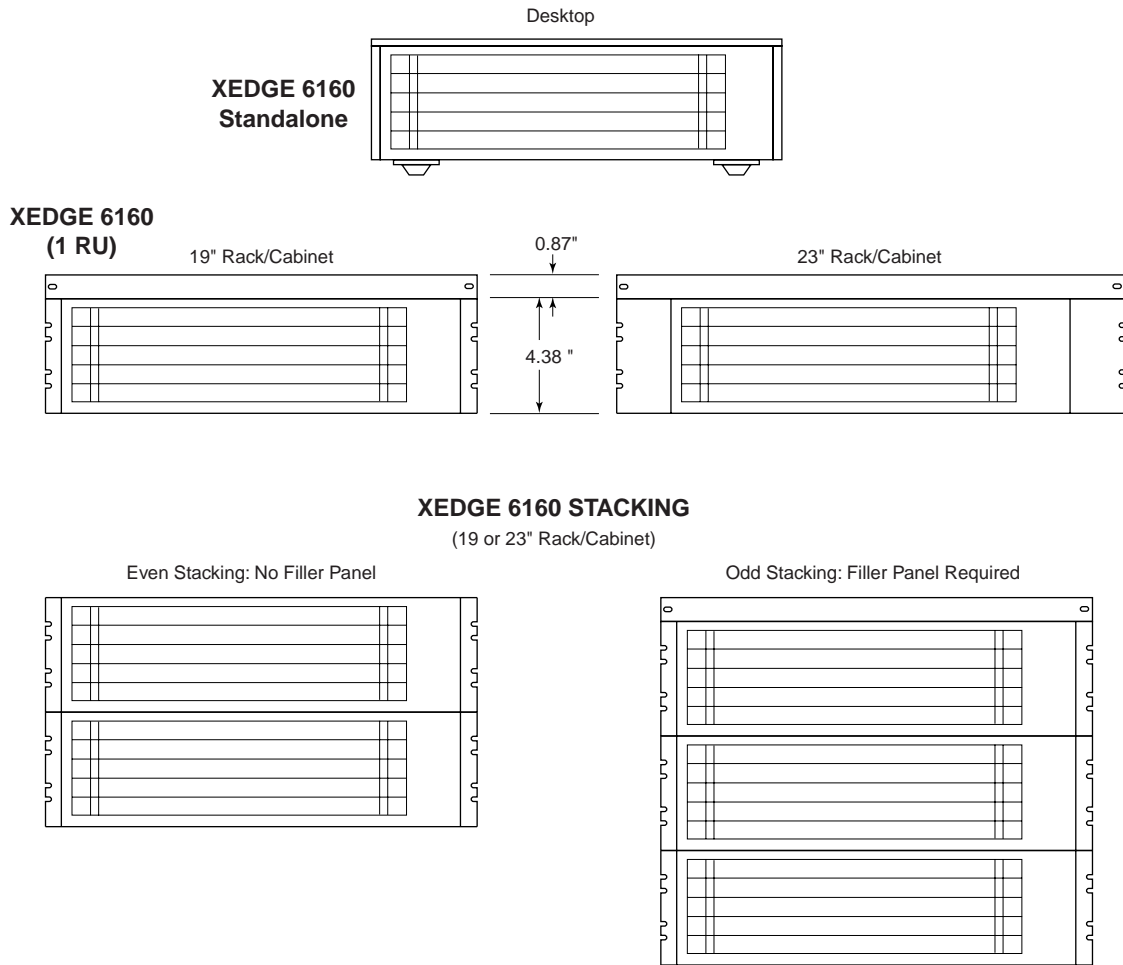
Desktop

**XEDGE 6160
Standalone**

**XEDGE 6160
(1 RU)**

19" Rack/Cabinet   0.87"   23" Rack/Cabinet

4.38 "

XEDGE 6160 STACKING
(19 or 23" Rack/Cabinet)

Even Stacking: No Filler Panel   Odd Stacking: Filler Panel Required

Figure 2-3   Xedge 6160 Chassis Mounting Options

Air Flow Requirements

You must install the chassis in a location that permits good air flow through the chassis. As you face the front of the chassis, the fans cool the internal components by drawing cool air through the left side and expelling the warmed air out the right side.

Air flow is provided by six fans, each delivering 55 cubic feet per minute (cfm). All fans must be operational to supply adequate air flow. With this cooling arrangement, it is important not to block the air flow through the chassis sides. The maximum temperature for air entering the chassis is 122 deg. F (50 deg. C). Failure to implement these recommendations may result in overheating.

Note   *IMPORTANT! To maintain proper chassis cooling, EMI shielding, ESD protection, to prevent equipment damage and to satisfy safety requirements, all empty slots must have a blank filler panel installed.*

Xedge 6160 Power Supplies.

WARNING *Use care when removing/replacing power supplies. High voltages may be present, creating an imminently hazardous situation which, if not avoided, could result in death or serious injury. To comply with safety requirements, you must install a blank panel over each unused power supply slot.*

Note   IMPORTANT! Each power supply requires a minimum load of 3A. When using a single power supply, the lower (main) power supply must be used.

Note   IMPORTANT! Xedge 6160 chassis is available in AC or DC versions. The National Electric Code (NEC) does not allow mixing an AC and a DC power supply in the same chassis.

Remove/Replace Procedure

There are no user-controller hardware option on the power supplies. To remove/replace a supply:

1. Turn off the POWER switch on the power supply you are removing.
2. Loosen the two captive screws on the front panel of the power supply.
3. Pull the power supply out of the slot by its handle. There is slight resistance initially until the power supply connectors disconnect from the slot connectors.
4. On the replacement supply, ensure the POWER switch is off.
5. Remove the blank panel that covers the slot by loosening its two retaining screws. (If the chassis is to have only one power supply, it must be installed in the lower (main) slot.)
6. Carefully insert the power supply into the tracks of the slot.
7. Slide the power supply into the slot until the power supply connectors are firmly seated in the slot connectors.
8. Tighten the two captive screws on the power supply front panel.
9. Turn on the POWER switch.

Special Considerations

In the rare instance that the `Pwr On` indicator does not light or the `Failure` indicator does light, reseat the power supply in its slot by using the preceding instructions. If the `Pwr On` indicator still does not light and/or the `Failure` indicator is still lit, the power supply has failed and you should contact your authorized field service representative.

Xedge 6160 Connections

The Xedge 6160 rear panel provides connectors for power sources, management, grounding and alarm connections. The following paragraphs describe how to make these connections.

AC Power Connections

The AC power source should not be under switch control. If the Xedge 6160 is connected to other equipment, it should be powered by the same AC source as that equipment to prevent large circulating currents induced by differences in ground potential. If it is impossible to determine whether the equipment is powered by the same AC source, verify that a potential difference of less than 0.25 V rms exists between the grounding circuits of the respective power outlets.

Each Xedge 6160 AC chassis is equipped with one AC power cord (US 120 VAC). Export power cords are optional. Plug the appropriate end into the AC receptacle of the power input module and plug the other end into a polarized outlet that provides the required AC power.

The following table provides ordering information for optional AC power cords:

AC Power Cord for:	Part Number
Australia, New Zealand, China	830-002-010
Europe	830-061-002
Italy	830-002-008
Japan	830-002-009
North American (US)	830-068-001
Switzerland	830-061-003
Taiwan, Philippines	830-002-011
UK, Ireland	830-060-102

DC Chassis Power Connections

To connect an Xedge 6160 chassis to a DC power source the following customer-provided components are required:

- Station battery source(s)

- Voltage measured at the field terminal connector must not be less than -42Vdc.

- Insulated copper wire sized to carry 15A at -48Vdc nominal.

EMC Requirements

To comply with EMC requirements, the wire pair between the power distribution point and the chassis cabinet must have at least one twist per inch. If the distribution point and chassis are separated by 5 feet or more, the twisted wire must extend at least 5 feet from the chassis. The twisted pair wiring must incorporate a shielding braid (Alpha Wire Corporation number 2172, or equivalent). The shields braid must be electrically connected to the chassis GND at both ends, at the DC mains entry terminal block GND terminal, and at a clamp bonded to the chassis metal.

Note   *For contact information see Alpha Wire Corporation's website at www.alphawire.com.*

Also for EMC requirements, a ferrite toroid must be added to the DC input wires. The DC battery input wires (-48V, -48VRET) must be wound 6 times (6 turns) around a ferrite toroid (Fair-Rite Products Corporation P/N 2643803802 or equivalent) before the input wires connect to the +V and -V DC input terminals. The 6 turns must be evenly distributed around the toroid and the toroid must be located a maximum of 3 inches from the +V and -V DC input terminals. For redundant power supplies and dual station battery applications, each pair of DC input wires must be wound around a separate toroid.

Note   *For contact information see Fair-Rite Products Corporation's website at www.fair-rite.com.*

For a single station battery source:

1. Connect the positive side of the battery to the terminal marked   **+V**   on the power supply.

2. Connect the negative side of the battery to the terminal marked   **-V**   on the power supply
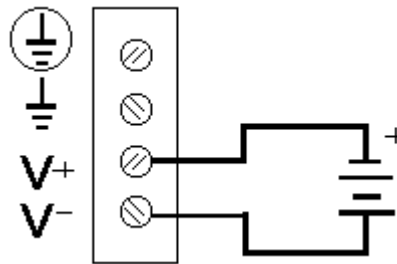
Figure 2-4   Xedge 6160 DC Power Connections

Craft and Alarm Connections

The System Management Module provides connectors for craft and alarm connections:

  • Two DB9 ports (MANAGER and AUXILLIARY) provide local craft access via an asynchronous terminal.
  • One DB-25F connector is used for contact alarms.

Note   *For pinouts and connection parameters on the SMM craft ports and the alarm connector, refer to Chapter 7, System Management Modules .*

Ground Connections

A shorting bar located on the rear of the chassis provide for the connection, separation, or isolation of frame and signal grounds as required (connection is the default).

It is common practice to connect chassis and signal ground together (this is the default selection). Signal ground is the 0 V reference for the digital circuits contained in the chassis and the reference for unbalanced data interfaces such as EIA/TIA-232-E and RS-423. Connecting grounds helps prevent AC power line noise, but a large ground current can flow in the shield and the exchanged signals grounds of a cable (i.e., signal grounds that are in the cable) if it is connected between equipment grounds that have different potentials.

To avoid this problem:

• Check that the potential difference between grounds is less than 0.25 V RMS.

• Break the continuity of the shield in the middle of a long cable run.

• Connect the shield to ground at only one end.

• Separate the signal and chassis grounds. In this case, the signal ground should be connected to a customer-provided building ground (100 ohm recommended).

• Isolate the signal and chassis grounds with a 100-ohm, 1 watt resistor (this limits the current in the signal ground leads and helps prevent AC power line noise).

Some local electrical codes and equipment manufacturers require separation of signal and chassis grounds. In this case, you have to separate the grounds and connect the frame ground to a ground connection at the site.

Grounding Options

The following describes how to implement the various grounding options.

To connect frame and signal grounds:

1. Loosen both ground screws.

2. Slide the shorting bar fully to the left.

3. Tighten both ground screws.

To separate frame and signal grounds:

1. Loosen both ground screws.

2. Slide the shorting bar fully to the right.

3. Tighten both ground screws.

4. Connect the frame ground to a ground connection at the site.

To isolate frame and signal grounds:

1. Loosen both ground screws.

2. Slide the shorting bar fully to the right.

3. Connect a 100-ohm, 1-W resistor between the ground screws.

4. Tighten both ground screws.

Xedge 6280 Chassis

Xedge 6280 is a 7-slot chassis that allows full redundancy by employing main and standby slot-0 controllers, main and standby switch fabric, and backup power supplies. It also accommodates one Network Timing Module (NTM) for advanced system timing configurations. The Xedge 6280 is available in AC and DC power source versions. The AC-version autoranging power supplies automatically adapt to AC power inputs ranging from 90 to 264VAC. For detailed specifications, refer to the table below.

An optional Front Door Kit (P/N 010K386-001) is also available. In cabinet/rack-mount installations, the door may be removed if it interferes with equipment installed below the chassis.

Technical Specifications

Table 2-6   Xedge 6280 Chassis Technical Specifications

Xedge 6280, AC Version (P/N 010B209-001), GPS-16A AC Power Supply (P/N 035B011-002)	
Input Voltage Range	90 to 264 VAC
Input Frequency	50 to 60 Hz
Maximum Power Consumption	700 W (with 2 power supplies)
Service Current Requirement	15A
Fuse Rating	6.3A, 250 VAC, each power supply
Heat Dissipation	2,388 BTU/hr, maximum
Xedge 6280, DC Version (P/N 010B210-001), DPS-16A DC Power Supply (P/N 041B011-001)	
Input Voltage Range	-42 to -70 VDC
Fuse Rating	10A, 250 VAC, each power supply
Heat Dissipation	2,388 BTU/hr, maximum
Xedge 6280, AC and DC Version	
Dimension (H x W x D)	8.75 in (22.2 cm) x 17.7 in (45 cm) x 19.25 in (48.9 cm) With desktop feet installed, add 0.65 in (1.65 cm) to Height.
Weight	35.5 lbs (16.1 kg) with fans, 2 power input modules, 2 power supplies 66 lbs (29.93 kg), fully loaded
Temperature, operating	32 to 122 deg. F (0 to 50 deg. C)
Temperature, non-operating	-40 to 158 deg. F (-40 to70 deg. C)
Humidity	Up to 95% without condensation
Altitude, operating	0 to 10,000 ft (0 to 3,047 m)
Altitude, non-operating	0 to 40,000 ft (0 to 12,191 m)
Compliance	CISPR 22 Class A, UL Listed (UL1950), c-UL Listed (CSA C22.2 #950), TUV licensed (EN60950), CE Mark

Module Installation

Refer to *Chapter 3, Switch Fabric and V6.2 Controllers* for procedures on how to properly install and remove modules in and out of the Xedge 6280 chassis.

Note   *IMPORTANT! To avoid equipment damage, install only supported Xedge modules in appropriate slots of the Xedge 6280 chassis. Refer to Table 1-1 and Table 1-4 before installing any modules.*

Front/Rear Panel Features

The Xedge 6280 front panel can accept one or two slot-0 modules (main/standby), one or two switch fabric modules (main/standby), and up to six additional slot controller modules (slots 1 through 6). The Fan Tray is located to the right of the module slots. The Xedge 6160 is supplied with an electrostatic discharge (ESD) wrist strap that attaches to the front panel jack on the chassis.

The rear of the chassis can accept up to eight LIMs and one System Management Module (SMM), which provides two management (CRAFT) ports. There are two slots for Power Input Modules (PIMs) and four slots for Power Supply Units 0-3:

3: Backup Standby Backup

2: Backup Main Power Supply

1: Standby Power Supply

0: Main Power Supply

This power arrangement can support power input and power supply redundancy.
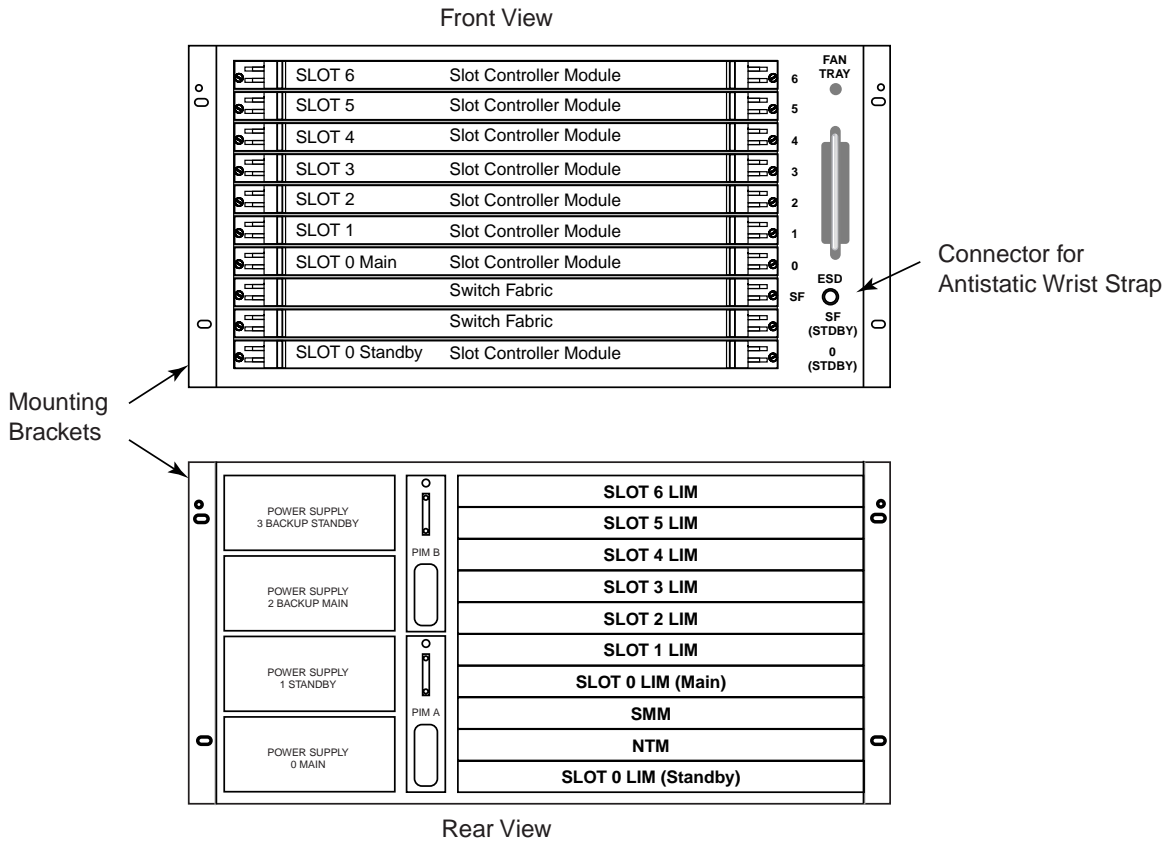
Figure 2-5   Xedge 6280 Chassis, Front and Rear Views

Installing the Xedge 6280

The chassis may be deployed in any of the following arrangements, detailed in the paragraphs that follow. Allow adequate space around the chassis in order to install/remove modules, allow for optional front door (if installed), make cable connections and provide adequate air flow.

- Standalone Desktop

- Front-mounted in 19-inch rack/cabinet

- Mid-mounted in 23-inch rack/cabinet

> **CAUTION** *A fully loaded chassis weighs approximately 66 pounds (30 Kg). Lifting a fully loaded chassis may require two people. Before moving the chassis, take all necessary precautions to prevent equipment damage and avoid personal injury. Be sure to disconnect all cables.*

Desktop Installation

1. Install four supplied adhesive-backed feet to the embossed areas on the bottom of the chassis.

2. Ensure the chassis is not positioned directly adjacent to another chassis. This can cause warmed air to flow from one unit into the adjacent unit.

Rack/Cabinet Installation

In the procedure below, select the proper mounting bracket kit and filler panels to fit your 19- or 23-inch rack or cabinet. If the Xedge 6280 has the optional door kit installed, be sure to allow proper clearance between the bottom of the chassis and top of the unit mounted below.

- Front-mounted in 19-inch cabinet or open rack (with proper bracket kit)

- Mid-mounted in 23-inch cabinet or open rack (with proper bracket kit)

Rack-Mount Kit Description	Front-Mount	Mid-Mount	Kit Part Number
19-inch R/M Bracket Kit	✔	✔	010K382-001
23-inch R/M Bracket Kit	✔	✔	010K383-001
19-inch R/M Mid-Support Kit		✔	010K408-001
23-inch R/M Mid-Support Kit		✔	010K409-001

1. Using the flathead screws provided, attach the four mounting brackets to the left and right sides of the chassis: two brackets support the front of the chassis, two support the back.

2. Using two screws for each bracket, mount the chassis assembly to the rack or cabinet.

3. Install blank panels at empty front/rear slots as necessary.

Note   *IMPORTANT! When mounting the chassis in a rack shared with other equipment, ensure that the installation meets the cooling requirements of all equipment. Maintain adequate space between the equipment to allow unrestricted air flow to prevent equipment damage.*

Air Flow

You must install the chassis in a location that permits good air flow through the chassis. When facing the front of the unit, the fans cool the internal components by drawing cool air through the left side of the chassis and expelling warm air through the right side of the chassis. With this cooling configuration, it is important not to block the air flow through the chassis sides.

Air flow is provided by six 55 cubic feet per minute (cfm) fans. All fans must be operational to supply adequate air flow. The maximum temperature for air entering the chassis is 122 deg. F (50 deg. C). Failure to implement these recommendations may result in overheating.

Note   *IMPORTANT! Do not position a desktop chassis directly adjacent to another. This can cause warmed air to flow from one unit into the adjacent unit.*

Power Input Modules (PIMs)

The PIMs supply AC or DC input power to the unit. Inside each PIM is a fan used to cool the LIMs and power supplies located in the back of the unit. If a fan fails, a red LED will illuminate on the specific module with the inoperative fan. In the event of a fan failure, the PIM must be replaced. The individual fans are not field replaceable items.

CAUTION *Disconnect all power input connections, AC or DC, before installing or removing a PIM. This unit has more than one power supply cord. To reduce the risk of electric shock, disconnect both power input connections, AC or DC, before attempting any service.*

Installiation and Replacement Procedure

Spare AC or DC PIM kits are available from the manufacturer. Use the following part numbers when ordering.

Description	Part Number
AC PIM Kit	010K387-001
DC PIM Kit	010K388-001

1. To install the PIMs, slide the module in on its track until it engages the connector. Use a standard flat-blade screwdriver to tighten the retaining screw that locks the module in place.

2. To remove the PIMs, use a standard flat-blade screwdriver to loosen the retaining screw. Pull the module out slowly.

Note   *IMPORTANT! All empty slots must have blank panels installed and both Power Input Modules must be installed at all times to maintain proper chassis cooling, EMI shielding, ESD protection, and safety requirements.*

Fan Tray Assembly

The Fan Tray Assembly provides air flow and cooling to the switch fabric and slot controller modules located in the front of the unit. If a fan fails a RED LED will illuminate on the Fan Tray. In the event of a fan failure, replace the entire Fan Tray assembly with a spare Fan Tray kit (GDC P/N 010K389-001).

Fan Tray Installation

1. To install the Fan Tray Assembly, slide the Fan Tray along the track and push firmly until it engages the connector in the unit.

2. Using a flat-blade screwdriver, tighten the (2) captive screws on the front panel.

3. To remove the Fan Tray Assembly, loosen the (2) captive screws on the front panel and slide the Fan Tray out of the unit.

Note   *The customer must replace the entire Fan Tray Assembly. Individual fans on the assembly can only be replaced by a qualified service engineer.*

Power Supplies

When the Xedge 6280 chassis is configured for power supply redundancy, the Xedge 6280 remains powered under the following conditions:

•   one power feed fails

•   one power supply fails

To power a half-loaded chassis and provide power redundancy, the chassis requires a minimum of two power supplies. A half-loaded chassis has a maximum power rating of 45A at +5Vdc. The minimum power supply configuration requires one power supply installed in the A Main power supply slot, and a second in the B Main power supply slot.

To power a fully-loaded chassis and provide full power supply redundancy, the chassis requires four power supplies (one in each power supply slot). A fully loaded chassis has a maximum power rating of 90A at +5Vdc.

In addition to providing power supply redundancy, the chassis also protects the switch from catastrophic short circuits in the power supply itself by incorporating blocking diodes on all power supply outputs.

Power Supply Precautions

WARNING *Use care when installing and replacing power supplies because hazardous voltages may be present, creating an imminently hazardous situation which, if not avoided, could result in death or serious injury. To comply with safety requirements, you must install a blank panel to cover each un-used power supply slot.*

Note   *IMPORTANT! Although the Xedge 6280 chassis power supplies are available in AC or DC versions, the National Electric Code (NEC) does not allow installation of an AC and DC power supply in the same chassis. Special keying is provided in the chassis which prevents installing either power supply in the wrong chassis.*

Note   *Each power supply requires a minimum load of 3A or one slot controller, switch fabric, or LIM. When using a dual power supply configuration, the power supplies should be located in the Main A and Main B slots.*

Power Supply Installation

To install a new power supply, perform the following steps:

1. Turn off the POWER switch of the power supply you are installing.

2. Select the slot you wish to use for the installation of the power supply. If you plan to install two power supplies in the chassis, then you must install them in the Main A and Main B power supply slots.

3. Remove the blank panel that covers the slot by loosening its two retaining screws.

4. Carefully insert the power supply into the tracks of the slot.

5. Slide the power supply into the slot until its front panel bottoms out on the chassis.

6. Tighten the two captive screws on the front panel of the power supply.

7. Turn on the POWER switch of the power supply.

Note   *The power supplies have no hardware options.*

Replacement Procedure

To replace a power supply, perform the following steps:

1. Turn off the POWER switch of the power supply you are replacing.

2. Loosen the two captive screws on the front panel of the power supply.

3. Pull the power supply out of the slot by its handle. There is slight resistance initially until the power supply connectors disconnect from the slot connectors.

4. Set the power supply aside.

5. Check that the POWER switch of the replacement power supply is off.

6. Carefully insert the power supply into the tracks of the slot.

7. Slide the power supply into the slot until its front panel bottoms out on the chassis.

8. Tighten the two captive screws on the front panel of the power supply.

9. Turn on the POWER switch of the power supply.

Special Considerations

In the rare instance that the `Pwr On` indicator does not light and/or the Failure indicator does light, reseat the power supply in its slot by using the preceding instructions. If the `Pwr On` indicator still does not light and/or the Failure indicator is still lit, the power supply has failed and you should contact your authorized field service representative.

Craft and Alarm Connections

At the rear of the chassis, the front panel of the System Management Module provides connectors for craft and alarm connections:

- Two DB9 ports (MANAGER and AUXILLIARY) provide local craft access via an asynchronous terminal.

- One DB-25F connector is used for contact alarms.

Note   *For pinouts and connection parameters on the SMM craft ports and the alarm connector, refer to Chapter 7, System Management Modules .*

AC Chassis Power Connections

Note   *When connecting the AC power cord(s) to the unit, ensure the power cord retainer is fully open before inserting the cord. Insert the cord firmly. The power cord must be fully inserted before tightening the power cord retainer. Ensure the AC power plug "bottoms-out" in the AC power receptacle on the unit.*

Note   *If you have a power cord with a "molded ring" about 1-inch from the end of the female plug, the "molded ring" must be inside the power cord retainer (not visible) when the plug is fully inserted in the unit's AC power receptacle.*

Each Xedge 6280 AC chassis is equipped with two AC power cords (US 120 VAC). Export power cords are optional.

Plug the appropriate end into the AC receptacle of the power input module and plug the other end into a polarized outlet that provides the required AC power. For AC mains redundancy, each power input module should be connected to a separate AC source to protect against line input failure. On the AC input PIMs, the power cord retainer should be used to secure the modular power cord (supplied) and prevent accidental disconnection.

The AC power source should not be under switch control. If the Xedge 6280 is connected to other equipment, it should be powered by the same AC source as that equipment to prevent large circulating currents induced by differences in ground potential. If it is impossible to determine whether the equipment is powered by the same AC source, verify that a potential difference of less than 0.25 V rms exists between the grounding circuits of the respective power outlets.

WARNING *This unit has more than one power supply cord. To reduce the risk of electric shock, disconnect both power cords before attempting any service.*

The following table provides ordering information for optional AC power cords:

AC Power Cord for:	Part Number
Australia, New Zealand, China	830-002-010
Europe	830-061-002
Italy	830-002-008
Japan	830-002-009
North American (US)	830-024-003
Switzerland	830-061-003
Taiwan, Philippines	830-002-011
UK, Ireland	830-060-102

DC Chassis Power Connections

For redundancy, each power input module should be connected to a separate DC source to protect against line input failure. To connect an Xedge 6280 chassis to a DC power source requires the following customer-provided components:

- Station battery source(s)

- Voltage measured at the field terminal connector must not be less than -42Vdc.

- Insulated copper wire sized to carry 15A at -48Vdc nominal.

EMC Requirements

The wire pair between the power distribution point and the chassis cabinet must have at least one twist per inch. If the distribution point and chassis are separated by 5 feet or more, the twisted wire must extend at least 5 feet from the chassis. The twisted pair wiring must incorporate a shielding braid (Alpha Wire Corporation number 2172, or equivalent). The shields braid must be electrically connected to the chassis GND at both ends, at the DC mains entry terminal block GND terminal, and at a clamp bonded to the chassis metal.

Note   *For contact information see Alpha Wire Corporation's website at www.alphawire.com.*

A ferrite toroid must be added to the DC input wires. The DC battery input wires (-48V, -48VRET) must be wound 6 times (6 turns) around a ferrite toroid (Fair-Rite Products Corporation P/N 2643803802 or equivalent) before the input wires connect to the +V and -V DC input terminals. The 6 turns must be evenly distributed around the toroid and the toroid must be located a maximum of 3 inches from the +V and -V DC input terminals. For redundant power supplies and dual station battery applications, each pair of DC input wires must be wound around a separate toroid.

Note   *For contact information see Fair-Rite Products Corporation's website at www.fair-rite.com.*

Connecting DC input power wiring to the PIM terminals:

First attach terminals to the wire ends by crimping the wire to the #6 terminal lugs provided in the ACU Terminal Lug Kit (P/N 010K378-001) using a Burndy Electrical Co. Hytool type Y10D. (Call Burndy customer service at 1-800-346-4175 for ordering information.)

For non-redundant power supplies and a single station battery source:

1. Connect the positive side of the battery to the terminals marked **+V** on both power entry modules.

2. Connect the negative side of the battery to the terminals marked **–V** on both power entry modules.

For redundant power supplies and dual station battery source:

1. Connect the positive side of one battery to the terminal marked **+V** on the "A" power input module.

2. Connect the negative side of the same battery to the terminal marked **–V** on the "A" power input module.

3. Connect the positive side of the second battery to the terminal marked **+V** on the "B" power input module.

4. Connect the negative side of the second battery to the terminal marked **–V** on the "B" power input module.
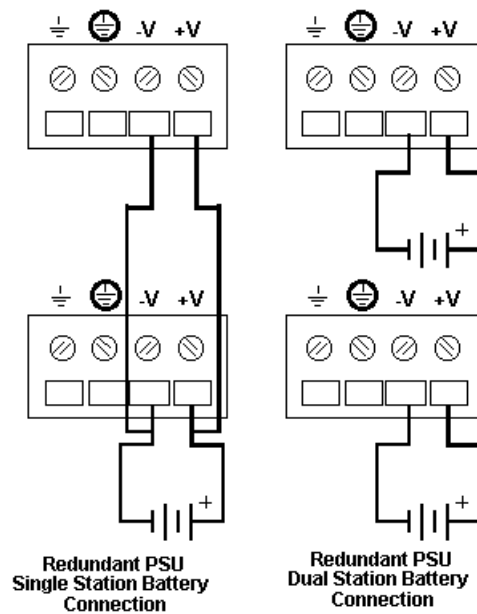
Figure 2-6   Xedge 6280 DC Power Connections

Ground Connections

A shorting bar located on the rear of the Xedge 6280 chassis provide for the connection, separation, or isolation of frame and signal grounds as required (connection is the default).

It is common practice to connect chassis and signal ground together (this is the default selection). Signal ground is the 0 V reference for the digital circuits contained in the chassis and the reference for unbalanced data interfaces such as EIA/TIA-232-E and RS-423. Connecting grounds helps prevent AC power line noise, but a large ground current can flow in the shield and the exchanged signals grounds of a cable (i.e., signal grounds that are in the cable) if it is connected between equipment grounds that have different potentials.

To avoid this problem:

- Check that the potential difference between grounds is less than 0.25 V RMS.

- Break the continuity of the shield in the middle of a long cable run.

- Connect the shield to ground at only one end.

- Separate the signal and chassis grounds.

- Isolate the signal and chassis grounds with a 100-ohm, 1 watt resistor (this limits the current in the signal ground leads and helps prevent AC power line noise).

Some local electrical codes and equipment manufacturers require separation of signal and chassis grounds. In this case, you have to separate the grounds and connect the frame ground to a ground connection at the site.

Grounding Options

The following describes how to implement the various grounding options.

To connect frame and signal grounds:

1. Loosen both ground screws.

2. Slide the shorting bar fully to the left.

3. Tighten both ground screws.

To separate frame and signal grounds:

1. Loosen both ground screws.

2. Slide the shorting bar fully to the right.

3. Tighten both ground screws.

4. Connect the frame ground to a ground connection at the site.

To isolate frame and signal grounds:

1. Loosen both ground screws.

2. Slide the shorting bar fully to the right.

3. Connect a 100-ohm, 1-W resistor between the ground screws.

4. Tighten both ground screws.

Xedge 6640/6645 Chassis

Xedge 6640 and 6645 are 16-slot chassis that allows full redundancy by employing main and standby slot-0 controllers, main and standby switch fabric, and backup power supplies. Both chassis models also accommodate one Fan Tray Assembly and one or two Network Timing Modules (NTM) for advanced system timing configurations.

Module Installation

Refer to *Chapter 3, Switch Fabric and V6.2 Controllers* for procedures on how to properly install and remove modules in and out of the Xedge 6640 chassis.

Note   *IMPORTANT! To avoid equipment damage, install only supported Xedge modules in appropriate slots of the Xedge 6640 chassis. Refer to* Table 1-1 *and* Table 1-4 *before installing any modules.*

Xedge 6640/6645 Technical Specifications

The Xedge 6640/6645 chassis obtain power from one or two power feeds and up to four power supplies for full power redundancy. The Xedge 6640 is an AC-powered chassis that employs GPS-14 AC supplies; the Xedge 6640 is a DC-powered chassis that employs DPS-14 DC supplies. The installation and operation information in this section applies to both the Xedge 6640 and 6645 chassis, except where noted.

- For detailed Xedge 6640 specifications, refer to *Table 2-7*.

- For detailed Xedge 6645 specifications, refer to *Table 2-8*.

Table 2-7   Xedge 6640 Technical Specifications

Xedge 6640 AC Chassis (P/N 010B197-001), GPS-14 AC Power Supply (035P114-001)		
Input Voltage (Nominal)	90-132VAC	198-264VAC *(See Note 1 below.)*
Input Frequency	47-63 Hz	47-63 Hz
Input Current	16A *(See Note 2 below.)*	8A
Service Current Requirement	20A	10A
Heat Dissipation	4,600 BTU/hr maximum	
Dimensions (H x W x D)	24.5 in (62.2 cm) x 19.0 in (48.3 cm) x 16.6 in (42.2 cm)	
Weight	130 lbs (59 kg), fully loaded	
Temperature, operating	32 to 122 deg. F (0 to 50 deg. C)	
Temperature, non-operating	-40 to 158 deg. F (-40 to 70 deg. C)	
Humidity	Up to 95% without condensation	
Altitude, operating	0 to 10,000 ft (0 to 3,047 m)	
Altitude, non-operating	0 to 40,000 ft (0 to 12,191 m)	
Compliance	CISPR 22 Class A UL recognized (UL1459) c-UL recognized (CSA C22.2 #225) TUV licensed (EN60950) CE Mark	

Note   *1. The Xedge 6640 chassis comes with two North American line cords. Non-US line cords are optional.*
              2. At 100VAC, the maximum output current must not exceed 140A to comply with safety requirements.

Table 2-8   Xedge 6645 Chassis Technical Specifications

Xedge 6645 DC Chassis (P/N 010B198-001), DPS-14 DC Power Supply (041P114-001)	
Input Voltage (Nominal)	-48 VDC nominal, (-42 to -70 VDC)
Input Current	27A at -48 VDC
Service Current Requirement	35A
Heat Dissipation	4,600 BTU/hr maximum
Dimensions (H x W x D)	24.5 in (62.2 cm) x 19.0 in (48.3 cm) x 16.6 in (42.2 cm)
Weight	130 lbs (59 kg), fully loaded
Temperature, operating	32 to 122 deg. F (0 to 50 deg. C)
Temperature, non-operating	-40 to 158 deg. F (-40 to 70 deg. C)
Humidity	Up to 95% without condensation
Altitude, operating	0 to 10,000 ft (0 to 3,047 m)
Altitude, non-operating	0 to 40,000 ft (0 to 12,191 m)
Compliance	CISPR 22 Class A UL recognized (UL1459) c-UL recognized (CSA C22.2 #225) TUV licensed (EN60950) CE Mark

Xedge 6640/6645 Front Panel

The figure below illustrates the front panel features of the Xedge 6640/6645 chassis.
Front panel controls and indicators are described in *Table 2-9*.
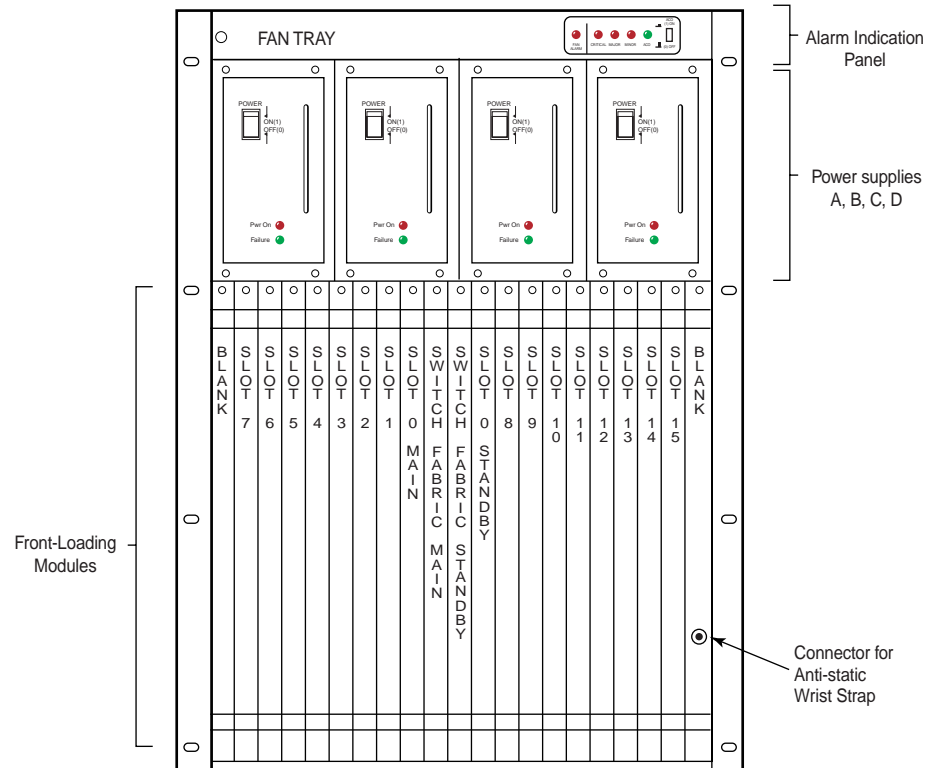
Figure 2-7   Xedge 6640 and Xedge 6645 Front Panel View

Table 2-9   Xedge 6640/6645 Front Panel Controls and Indicators

Location	Panel	Name	Type	Function
Front Panel Controls	Alarm Indication Panel	Alarm Cut-Off (ACO)	Latching pushbutton	Enables **ON (1)** and disables **OFF (0)** the alarm cut-off function, which prevents alarms from opening or closing the audible alarm relay contacts on the rear of the chassis.
	Power Supply Panels	POWER	2-position toggle	Enables **ON (1)** and disables **OFF (0)** the power supply.
Front Panel Indicators	Alarm Panel	FAN ALARM	Red LED	Lights when a chassis fan problem exists.
		CRITICAL	Red LED	Lights when an alarm trap that is configured as critical has occurred.
		MAJOR	Red LED	Lights when an alarm trap that is configured as major has occurred.
		MINOR	Red LED	Lights when an alarm trap that is configured as minor has occurred.
		ACO	Green LED	Lights when alarm cut-off is enabled.
	Power Panel	Pwr On	Green LED	Lights when power supply is enabled and functioning.
		Failure	Red LED	Lights when power supply is off or has failed.

Xedge 6640/6645 Rear Panel

The figure below illustrates the rear panel features of the Xedge 6640/6645 chassis.
Front panel controls and indicators are described in *Table 2-10*.
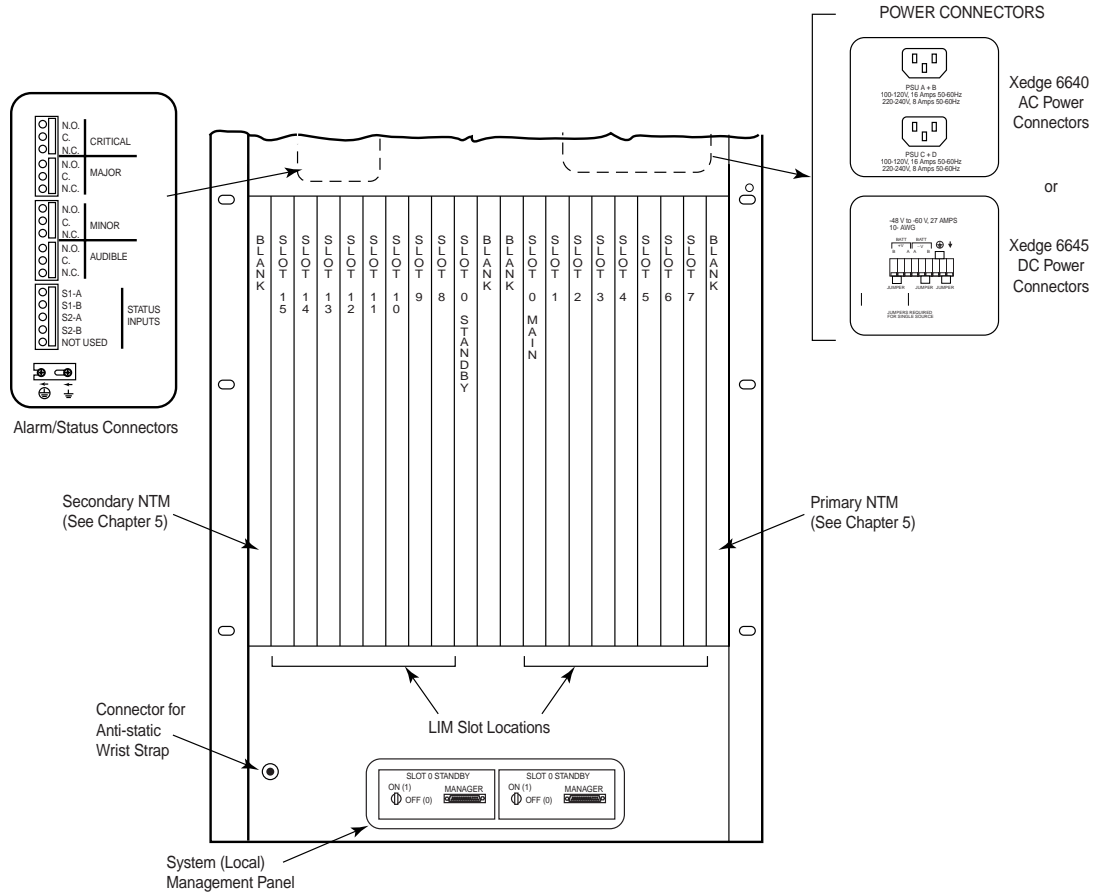
Figure 2-8   Xedge 6640 and Xedge 6645 Rear Panel Views

Note   *The left and right blank panels are intended for Xedge Timing Modules (NTM-DS1 or NTM-E1).*

Table 2-10 Xedge 6640/6645 Rear Panel Controls & Connectors

Location	Connector	Type	Function
Alarm/Status Connector Panel	PSU A + B Power Supply Unit A and B	grounded AC IEC-320 receptacle	Provides connection for an AC power source for the power supplies in slots A and B.
	PSU C + D Power Supply Unit C and D	grounded AC IEC-320 receptacle	Provides connection for AC power source for the power supplies in slots C and D.
	N.O. CRITICAL Normally Open Critical alarm	3-position header	Provides connection to alarm relay contact that opens when a critical alarm occurs.
	C. CRITICAL Common Critical alarm	3-position header	Provides the common connection for the critical alarm relay.
	N.C. CRITICAL Normally Closed Critical alarm	3-position header	Provides connection to alarm relay contact that closes when a critical alarm occurs.
	N.O. MAJOR Normally Open Major alarm	3-position header	Provides connection to alarm relay contact that opens when a major alarm trap occurs.
	C. MAJOR Common Major alarm	3-position header	Provides the common connection for the major alarm relay.
	N.C. MAJOR Normally Closed Major alarm	3-position header	Provides connection to alarm relay contact that closes when a major alarm occurs.
	N.O. MINOR Normally Open Minor alarm	3-position header	Provides connection to alarm relay contact that opens when a minor alarm occurs.
	C. MINOR Common Minor alarm	3-position header	Provides the common connection for the minor alarm relay.
	N.C. MINOR Normally Closed Minor alarm	3-position header	Provides connection to alarm relay contact that closes when a minor alarm occurs.
	N.O. AUDIBLE Normally Open Audible alarm	3-position header	Provides connection to alarm relay that opens when a critical, major or minor alarm occurs. Disabled by ACO function.
	C. AUDIBLE Common Audible alarm	3-position header	Provides the common connection for the audible alarm relay.
	N.C. AUDIBLE Normally Closed Audible alarm	3-position header	Provides connection to alarm relay that closes when a critical, major or minor alarm trap occurs. Disabled by ACO function.
	S1-A STATUS INPUTS S1-B STATUS INPUTS	5-position header	Provides connections for an external device that inputs one user-configurable status.
	S2-A STATUS INPUTS S2-B STATUS INPUTS	5-position header	Provides connections for external device that inputs a 2nd user-configurable status.
	⏚ Frame ground	screw terminal	Provides connection to frame ground. Shorting bar connects frame ground to signal ground, if required.
	▽ Signal Ground	screw terminal	Provides connection to signal ground. Shorting bar connects frame ground to signal ground, if required.
System MGMT Panel	MANAGER (MAIN)	female D25	Provides connection to the craft (local) management interface of main slot-0.
	MANAGER (STANDBY)	female D25	Provides connection to the craft (local) management interface of standby slot 0.
	ON/OFF MAIN	2-position key	Enables `ON (1)` and disables `OFF(0)` craft port access to the main slot 0.
	ON/OFF STANDBY	2-position key	Enables `ON (1)` and disables `OFF(0)` craft port access to the standby slot 0.

Installing the Xedge 6640/6645 Chassis

The chassis may be deployed in any of the following arrangements, detailed in the paragraphs that follow. Allow adequate space around the chassis in order to install/remove modules, make cable connections and provide adequate air flow.

- Front-mounted in 19-inch rack/cabinet
- Flush-mounted in 23-inch rack/cabinet
- Mid-mounted in 23-inch rack/cabinet

⚠️ **CAUTION** *A fully loaded chassis weighs approximately 130 pounds (59 Kg). Lifting a fully loaded chassis requires two people. Before moving the chassis, take all necessary precautions to prevent equipment damage and avoid personal injury. Be sure to disconnect all cables.*

Front-Mount Installation (19-inch Rack/Cabinet)

Use the mounting brackets and screws provided with the chassis, as described below:

1. Position the chassis in the cabinet so that the holes in the mounting brackets are aligned with the holes in the cabinet mounting strips.

2. Secure the brackets to the cabinet mounting strips using the provided screws.

Flush-Mount Installation (23-inch Rack/Cabinet)

Use the optional 23-inch flush-mount kit (P/N 010K362-001), as described below:

1. Attach 23-inch brackets provided with the kit to the factory installed brackets on the chassis.

2. Position the chassis in the cabinet so that the holes in the mounting brackets are aligned with the holes in the cabinet mounting strips.

3. Secure the front and rear brackets to the cabinet mounting strips using the provided screws.

Mid-Mount Installation (19- or 23-inch Rack/Cabinet)

Use the optional mounting kit (P/N 010K359-001), as described:

1. Install the center of gravity bracket to the chassis

- For 19-inch cabinets, affix the wide part of the bracket flush against the chassis.

- For 23-inch cabinets, affix the narrow part of the bracket flush against the chassis.

2. Position the chassis in the cabinet with the bracket holes aligned with the holes in the cabinet mounting strips.

3. Secure the bracket to the cabinet mounting strips using the provided screws.
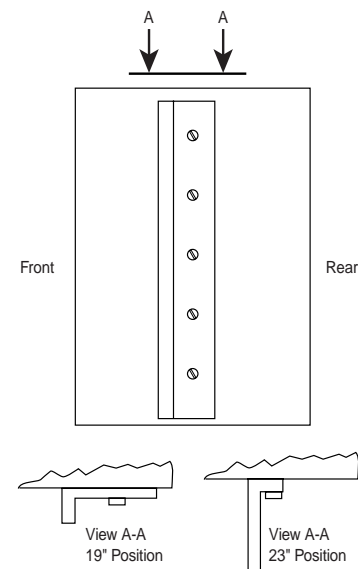
Fan Tray Assembly

The fan tray assembly at the top of the chassis draws air from the bottom of the chassis. The tray is a single assembly unit and is hot-swappable for easy installation and maintenance. Each fan in the tray provides approximately 100 cubic feet per minute (CFM) ventilation. Adequate airflow is required through the system to ensure that the Xedge switch does not overheat.

It is recommended that at least 5.25 inches of clearance be provided above and below the chassis when it is installed in a 19-inch or 23-inch cabinet. In addition, the temperature of air flowing into the system should not be greater than 50 deg C.

Fan Tray Removal

WARNING *Use caution when removing a fan try from a chassis. Avoid the rotating fan blades by following the procedure below.*

1. Loosen the screws that affix the fan tray to the chassis.

2. Slide the module out of the shelf approximately 1 inch.

3. Wait approximately 15 seconds for the fan blades to stop rotating to avoid injury.

4. Slide the module from the shelf completely.

Xedge 6640/6645 Power Supplies

Both chassis are equipped with four slots (slots A, B, C, and D) for the installation of four power supplies. Each pair of power supplies (A-B and C-D has an independent power feed. The installation procedure is the same for both chassis, except where noted.

*   The Xedge 6640 chassis employs GPS-14 AC power supplies. For U.S. installations, each feed requires 20A at 110VAC. For non-US installations, each feed requires 10A at 220VAC service. Each GPS-14 AC power supply requires a minimum load of 3A or one slot controller, switch fabric, or LIM.
*   The Xedge 6645 chassis employs DSP-14 DC power supplies. Each feed requires a 35 A service.

Installation Procedure

WARNING *Use care when installing and replacing power supplies because hazardous voltages may be present, creating an imminently hazardous situation which, if not avoided, could result in death or serious injury. To comply with safety requirements, you must install a blank panel to cover each un-used power supply slot.*

To install a new power supply, perform the following steps:

1. Turn off the POWER switch of the power supply you are installing.

2. Select the slot you wish to use for the installation of the power supply.

3. Remove the blank panel that covers the slot by loosening its four retaining screws.

4. Carefully insert the power supply into the tracks of the slot.

5. Slide the power supply into the slot until its front panel bottoms out on the chassis (to seat the power supply properly requires approximately 35 pounds of force).

6. Tighten the four captive screws on the front panel of the power supply to complete its installation.

7. Turn on the POWER switch of the power supply (the Pwr On indicator should light).

Replacement Procedure

To replace a power supply, perform the following steps:

1. Turn off the POWER switch of the power supply you are replacing.

2. Loosen the four captive screws on the front panel of the power supply.

3. Pull the power supply out of the slot by its handle. There is slight resistance initially until the power supply connectors disconnect from the slot connectors.

4. Set the power supply aside.

5. Check that the POWER switch of the replacement power supply is off.

6. Carefully insert the power supply into the tracks of the slot.

7. Slide the power supply into the slot until its front panel bottoms out on the chassis (to seat the power supply properly requires approximately 35 pounds of force).

8. Tighten the four captive screws on the front panel of the power supply to complete its physical installation.

9. Turn on the POWER switch of the power supply (the Pwr On indicator should light).

Special Considerations

In the rare instance that the Pwr On indicator does not light and/or the Failure indicator does light, reseat the power supply in its slot by using the preceding instructions. If the Pwr On indicator still does not light and/or the Failure indicator is still lit, the power supply has failed and you should contact your authorized field service representative.

Power Redundancy

When the Xedge 6640/6645 chassis is configured for power supply redundancy, the Xedge switch remains powered under the following circumstances:

   •   one power feed fails

   •   one power supply fails

To power up a half-loaded chassis and provide power supply redundancy the chassis requires a minimum of two power supplies (a half-loaded chassis has a maximum power rating of 82.5A at +5Vdc). This minimum power supply configuration requires one power supply in the A or B power supply slot and a second power supply in the C or D power supply slot.

To power up a fully-loaded chassis and provide full power supply redundancy, the chassis requires four power supplies, one in each power supply slot, (a fully-loaded chassis has a maximum power rating of 165 A at +5Vdc).

In addition to providing power supply redundancy, the chassis also protects the switch from catastrophic shorts that may occur in a power supply by incorporating blocking diodes on all power supply outputs

Xedge 6640 AC Power Connections

Note   *IMPORTANT! Before making AC power connections, ensure that the chassis is the Xedge 6640 AC model.*

The upper rear panel of the Xedge 6640 chassis contains connectors for the required power source. There are two connectors for two AC power cables. The upper connector feeds AC to the power supplies installed in slots A and B and the lower connector feeds AC to the power supplies installed in slots C and D. For power source redundancy, connect these cables to independent AC mains. Two AC power cords (US 120 VAC) are supplied with each Xedge 6640 chassis. Export AC power cords are optional. The following table provides ordering information for optional AC power cords:

AC Power Cord for:	Part Number
Australia	S-010-H014-008
Continental Europe	S-010-H013-008
Italy	S-010-H016-008
North American (US)	830-002-108
UK	S-010-H015-008

Xedge 6645 DC Power Connections

Note   *IMPORTANT! Before making DC power connections, ensure that the chassis is the Xedge 6645 DC model.*

EMC Requirements

To comply with EMC requirements, the wire pair between the power distribution point and the chassis cabinet must have at least one twist per inch. If the distribution point and chassis are separated by 5 feet or more, the twisted wire must extend at least 5 feet from the chassis. The twisted pair wiring must incorporate a shielding braid (Alpha Wire Corporation number 2172, or equivalent). The shields braid must be electrically connected to the chassis GND at both ends, at the dc mains entry terminal block GND terminal, and at a clamp bonded to the chassis metal.

Note   *For contact information see Alpha Wire Corporation's website at www.alphawire.com.*

Also for EMC requirements, a ferrite toroid must be added to the DC input wires. The DC battery input wires (-48V, -48VRET) must be wound 6 times (6 turns) around a ferrite toroid (Fair-Rite Products Corporation P/N 2643803802 or equivalent) before the input wires connect to the +V and -V DC input terminals. The 6 turns must be evenly distributed around the toroid and the toroid must be located a maximum of 3 inches from the +V and -V DC input terminals. For redundant power supplies and dual station battery applications, each pair of DC input wires must be wound around a separate toroid.

Note   *For contact information see Fair-Rite Products Corporation's website at www.fair-rite.com.*

Non-redundant power supplies and single station battery source:

Xedge 6645 chassis provides a 9-position terminal block for connection to -48Vdc batteries. For installations using one battery, connect the battery to the terminal block using 10-gauge wire:

1. Turn off the POWER switch of the power supply.

2. Connect the positive side of the battery to the BATT +V A terminal.

3. Connect the negative side of the battery to the BATT -V A terminal.

4. Use 10-gauge wire to jumper the BATT +V B terminal to the unlabeled terminal immediately to the right of it.

5. Use 10-gauge wire to jumper the BATT -V B terminal to the unlabeled terminal immediately to the left of it.

Redundant power supplies and dual station battery source:

Xedge 6645 chassis provides a 9-position terminal block for connection to -48Vdc batteries. For power source redundancy, connect two batteries to the terminal block using 10-gauge wire:

1. Turn off the POWER switch of the power supply.

2. Connect the positive side of one battery (battery A) to the BATT +V A terminal.

3. Connect the negative side of the same battery (battery A) to the BATT -V A terminal.

4. Connect the positive side of a second battery (battery B) to the BATT +V B terminal.

5. Connect the negative side of the same battery (battery B) to the BATT -V B terminal.

Xedge 6640/6645 Ground Connections

At the Xedge 6640/6645 chassis rear panel, make connections to the following terminals as required for your site/applications:

- A shorting bar at the rear panel, below the alarm and status input connectors can be used for the connection, separation, or isolation of frame and signal grounds as required.

- Two pem nuts located above the alarm and status input connectors can be used for connection to frame ground as required.

At the Xedge 6645 chassis rear panel, a 9-position terminal block can be used for connection to frame and signal ground. Two terminals provide connection to frame ground; one terminal provides connection to signal ground. Connections to these terminals are optional.

Grounding Options

To connect frame and signal grounds:
1. Loosen both ground screws.
2. Slide the shorting bar fully to the left.
3. Tighten both ground screws.

To separate frame and signal grounds:
1. Loosen both ground screws.
2. Slide the shorting bar fully to the right.
3. Tighten both ground screws.
4. Connect the frame ground to a ground connection at the site.

To isolate frame and signal grounds:
1. Loosen both ground screws.
2. Slide the shorting bar fully to the right.
3. Connect a 100-ohm, 1-W resistor between the ground screws.
4. Tighten both ground screws.

Grounding Guidelines

It is common practice to connect chassis and signal ground together (this is the default selection). Signal ground is the 0 V reference for the digital circuits contained in the chassis and the reference for unbalanced data interfaces such as EIA/TIA-232-E and RS-423. Connecting grounds helps prevent AC power line noise, but a large ground current can flow in the shield of a cable if it is connected between equipment grounds that have different potentials.

To avoid this problem:
- Check that the potential difference between grounds is less than 0.25 V RMS.
- Break the continuity of the shield in the middle of a long cable run.
- Connect the shield to ground at only one end.
- Separate the signal and chassis grounds.
- Isolate the signal and chassis grounds with a 100-ohm, 1 watt resistor (this limits the current in the signal ground leads and helps prevent AC power line noise).
5. Some local electrical codes and equipment manufacturers require separation of signal and chassis grounds. In this case, you have to separate the grounds and connect the frame ground to a ground connection at the site.

Xedge 6640/6645 System Management Connections

The two DB-25 connectors (MANAGER) at the chassis rear panel provide local management access to the Slot-0 Main and Slot-0 Standby controllers via an asynchronous terminal for local configuration and management of the switch. *Table 2-11* lists the pinouts for this management port.

Note   *The Craft Port Security Key must be in the ON position to enable craft access to the slot-0 controller.*

1. Depending on which slot-0 controller is in use, connect the terminal to the associated female DB-25 MANAGER connector (main or standby).

2. Set the terminal to the following parameters:

    •   VT100 emulation

    •   19,200 baud

    •   8 character bits

    •   No parity

    •   No flow control

    •   Data Terminal Ready (DTR, pin 20) high from terminal.

Table 2-11 Xedge 6640/6645 Craft Port Pinouts

Pin	Signal
1	GND
2	TXD
3	RXD
4	--
5	--
6	DSR
7	GND
8	--
9	--
10	--
11	--
12	--
13	--
14	--
15	--
16	--
17	--
18	--
19	--
20	DTR
21	--
22	--
23	--
24	--
25	--

Alarm Connections

The chassis provides header connections to relay contacts that close/open upon the occurrence of an alarm trap that the user configures as **critical**, **major**, or **minor**. These relay contacts are available for the connection of user-provided alarm equipment that is external to the chassis.

The alarm relays have a rating of 24V at 1.5 A. Each relay has three contacts:

- N.O. (Normally Open)
- N.C. (Nornally Closed)
- C (Common)

The header connections use 0.045-inch square, 0.4-inch long wirewrap posts. Use five turns of 20 or 22 AWG wire, six turns of 24 AWG wire, or seven turns of 26 AWG wire for making connections to these posts. Refer to *Table 2-10* for pinouts.

Status Input Connections

The chassis provides header connections for one or two status inputs from a user-provided external device(s). When making a connection to the status inputs, a series resister (Rs) must be used to limit current flow through the circuit. The value of the resistor is determined by the battery voltage used in your specific installation. Refer to *Figure 2-9* for the recommended resistor values.
Refer to *Table 2-10* for pinouts.
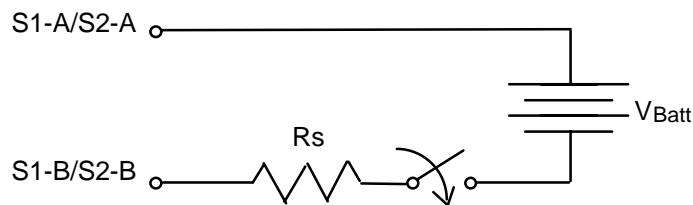
If V_{Batt} = 24 Vdc nominal, then Rs = 0 to 500 ohms.

If V_{Batt} = 48 Vdc nominal, then Rs = 2500 to 4500 ohms.

Figure 2-9   Typical Status Input Connection Diagram

Chapter 3: Switch Fabric and V6.2 Controllers

Installation Overview

All Xedge Slot Controllers and Switch Fabric plug into front slots of an Xedge switch chassis. This modular design and packaging allows a wide variety of Xedge switch node configurations. Front panel LEDs provide monitoring of system status. *Table 2-1* shows Xedge modules installed in the various Xedge chassis systems. Before beginning an installation, read this section in its entirety to become familiar with the major components in your Xedge switch.

This chapter describes hardware characteristics, setup and installation of the following Xedge modules in the chassis.

- • Adaptation Controllers (CE, FRC, CHFRC, VSM)

- • Cell Controllers (ETH, ACP, ACS, ECC)

- • Switch Fabric Modules (XM, XS, XH)

- • Concentrator Module (CM)

Installing Other Xedge Modules

- • See *Chapter 4, V7.x Packet Controllers* to set up/install PCX, PCL, PCE or ISG2.

- • See *Chapter 5, Line Interface Modules* to set up/install Xedge LIMs

- • See *Chapter 6, Network Timing Modules* to setup/install the NTM-DS1 or NTM-E1.

- • See *Chapter 7, System Management Modules* to set up/install the SMM in a 6160/6280 chassis.

- • Refer to *Chapter 8, Cables & Peripherals* as needed for your switch/environment.

- • An Xedge 6640 or 6645 system will require the System Termination module (STM), when there are four or fewer controllers installed. The STM can only be installed in the Slot-0 Standby position. There are no front panel indicators, and no user-selectable switches or jumpers.

Note   *Be aware that the SMM can only be installed in a dedicated slot at the rear of the Xedge 6160/Xedge 6280 chassis. Otherwise, damage to the SMM or the chassis midplane connectors will occur.*

Note   *As of Xedge Version 6.2 and later, the following legacy modules are not supported: SMC, SCE, VE, ISG(1), MPG2V, QEDOC, ATM NIC, VJLIM, VJH320, J2, DS1-2C, DS1-4C, E1-2C, E1-4C, DX21 and DX27.*

Hardware Installation Guidelines

- This section describes the hardware setup and installation of only the following modules:
  Xedge Cell controllers (ETH, ACP, ACS, ECC),
  Xedge Adaptation Controllers (CE, FRC, CHFRC, VSM), and
  Xedge Switch Fabric Modules (XM, XS, XH).

- When handling Xedge Slot Controllers and Switch Fabric modules, always use an antistatic wrist strap to prevent static discharge damage to the electronic circuits.

- To avoid damaging the EMI springs when installing a module in a chassis, carefully insert the module into its slot and fasten its front panel captive screws to the chassis before installing the next module. Similarly, modules should be removed one at a time, that is, unfasten the captive screws of one module and carefully remove that module from its slot before removing the next module. If the EMI springs are damaged, contact your authorized field service representative.

- Refer to *Chapter 2, Xedge Chassis Systems* to make power, management and cable connections and for additional information on your specific Xedge Chassis.

- Once all modules are installed and connected, refer to the Xedge 6000 Version 6.2 Configuration Guide (032R400-V620) for detailed configuration procedures.

Basic Installation Procedure

1. Set the jumper and/or switches for each Slot Controller and Switch Fabric module as required in your network. Refer to the appropriate section in this chapter for details on each module.

2. For all controllers, set the boot mode rotary switch as described below. *Table 3-1* lists the available options. (Refer to *Rotary Switch Setup (All Controllers)* as needed.)

   - For the Slot-0 Controller, set the rotary switch to **0**.
   - For the Slot-0 standby controllers, set the rotary switch to **4**.
   - For all other slots, set the rotary switch to **8**.

3. For the CE, ETH, FRC and CHFRC controllers, set jumpers or switches on the circuit board as required for your environment. Refer to the specific instructions provided in this chapter. Note that the ACP, ACS, VSM, ECC controllers have no user-selectable jumpers.

4. Determine which slot to use for each module, according to the following guidelines:

   - Switch Fabric modules use only the switch fabric main or standby slot, whichever is applicable to your Xedge system.
   - Slot Controller modules that will serve as the slot-0 controller must use the Slot-0 Main and Slot-0 Standby positions.
   - In a switch with a variety of Xedge cell, adaptation and packet controllers, a packet controller must serve as the slot-0 controller(s).
   - Non Slot-0 controllers can use any of the remaining slots.

5. Remove the blank panel that covers the slot by loosening its two retaining screws.

6. Insert the edges of the module into the tracks of the slot and slide the module inward until it stops. All Slot Controller modules can be installed using "hot-swap" methods.

   - If the module has front panel captive screws, tighten the two screws to seat the rear connectors with the midplane connector.
   - If the module has front panel latches, push the latches a little further so that the rear connectors mate with midplane connectors. Close the latches when the closures clear the front edge of the chassis latch bar.

7. Refer to *Chapter 5, Line Interface Modules* to setup and install compatible LIMs as required for capable slot controllers.

8. Configure the modules as required using the Xedge 6000 Version 6.2 Configuration Guide.

Rotary Switch Setup (All Controllers)

Each Slot Controller module has a 16-position rotary switch that controls the way the slot initializes. Select the correct position for the configuration of your system. *Table 3-1* lists the function for each valid switch position. Detailed definitions for each boot mode are provided below.

You MUST set the rotary switches on each Slot-0 Controller for redundant Slot-0 operation. This is accomplished by setting one slot controller as **Main** (switch setting **0**), and the other as **Standby** (switch setting **4**). If set improperly, redundant operation will not function.

Boot Mode Definitions

*   Normal Boot
    In this mode, the slot attempts to read **mpro1.cod** from the flash EPROM. If the file cannot be found, then the slot attempts to perform a TFTP boot from Slot-0. In the case of Slot-0, this mode allows you to download code via the manager port.

*   TFTP Boot
    In this mode, the slot ignores a local or **mpro1.cod** file and attempts to TFTP **/mpro1.cod** from Slot-0. In the case of Slot-0, the slot will not attempt to perform a TFTP boot.

*   Boot Menu
    In this mode, the slot comes up running boot mode menus. This provides a subset of the conventional user interface that is sufficient for configuring the slot so that a TFTP can be performed. In the case of Slot-0, this mode allows you to download code via the manager port.

*   Format Disk Boot Mode
    In this mode, the slot automatically formats the flash EPROM on boot up. After using this mode, the boot switch should be reset to the normal setting.

Table 3-1   Boot Mode Rotary Switch Functions

Switch Position	Slot Position	Boot Mode
0	Main Slot-0	Normal boot mode
2	Main Slot-0	Boot Menu mode
4	Standby Slot-0	Normal boot mode
6	Standby Slot-0	Boot Menu mode
8	Non Slot-0	Normal boot mode
9	Non Slot-0	TFTP Boot mode
A	Non Slot-0	Boot Menu mode
F	--	Format Disk boot mode

Special Considerations

*   Rotary Switch positions 1, 3, 5, 7, and B through E are unused.

*   The ECC and the ISG slot controllers do not support redundant Slot-0 system configurations.

*   The STM must be used in the Slot-0 Standby position of a Xedge 6640 or Xedge 6645 system.

Slot Controller Setup

The following describes the front panel and onboard features of the ACP, ACS, ECC, ETH, VSM, CE, CHFRC and FRC controllers. Indicators and jumpers operate in the same manner except where noted. The ACP, ACS, VSM, ECC controllers have no user-selectable jumpers.

Front Panel Indicators

For ECC Controller Only

- **LINK FAULT** Indicator (ECC only)
  Illuminates red when a fault condition exists on one of the associated LIM link.

- **FLT** Indicator
  Illuminates red when a problem prevents the controller from functioning. Normally off.

- **RUN** Indicator
  Illuminates while the controller is powered on and operating.

For ACP, ACS, ETH, VSM, CE, CHFRC and FRC Controllers:

- **FLT** Indicator
  Illuminates red when a problem prevents the controller from functioning. Normally off.

- **RUN** Indicator
  Illuminates while the controller is powered on and operating.

- Link Indicators (**Link 1**, **Link 2**, **Link 3**)
  Four groups of Link indicators illuminate as described below. Link 2 and Link 3 indicators are inactive when the controller is installed with a two-channel LIM.

  RX Indicator
  Flashes yellow when the link is receiving data.

  UP Indicator
  Illuminates green while the link is functional.

  TX Indicator
  Flashes yellow when the link is transmitting data.

  ER Indicator (Normally off)
  ER on while UP is on indicates detection of a line defect.
  ER on with UP off indicates a line alarm condition.
  ER flashing indicates a LIM fault.
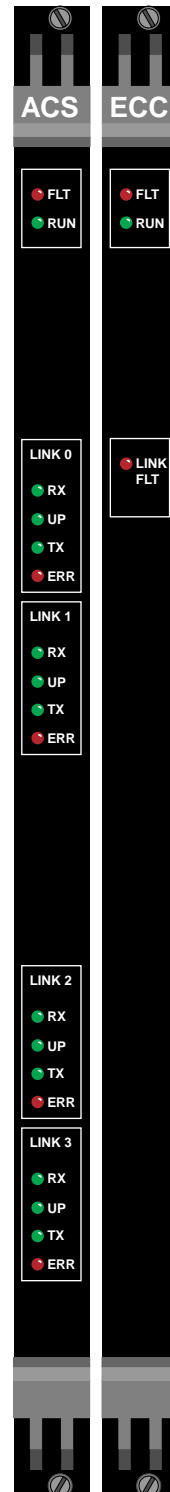
Figure 3-1   Typical Slot Controller Front Panels (Shown: ACP and ECC)

Note   *Instead of RX, UP, TX and ER indicators for each link, the ECC Slot Controller has one* **LINK FAULT** *indicator for all links.*

CE Hardware Settings

The jumpers on the CE slot controller must be configured or checked before installing the module in the chassis. *Table 3-2* and the accompanying figure describe the location and function of each jumper. Hold the board as shown with the component side facing you and the front panel to the left. In this position, references to "right" or "left" in the table are the "right" or "left" jumper positions.


CE CIRCUIT BOARD

FRONT PANEL

JP10

JP2

JP1

JP3
Not used

Pos. 1

JP6

ROTARY
SWITCH

Pos. 8

Slot 0 DOC
(Daughter Option Card)

LEGEND

Open pins;
Not covered by jumper.

Jumper in left position.

Jumper in right position.
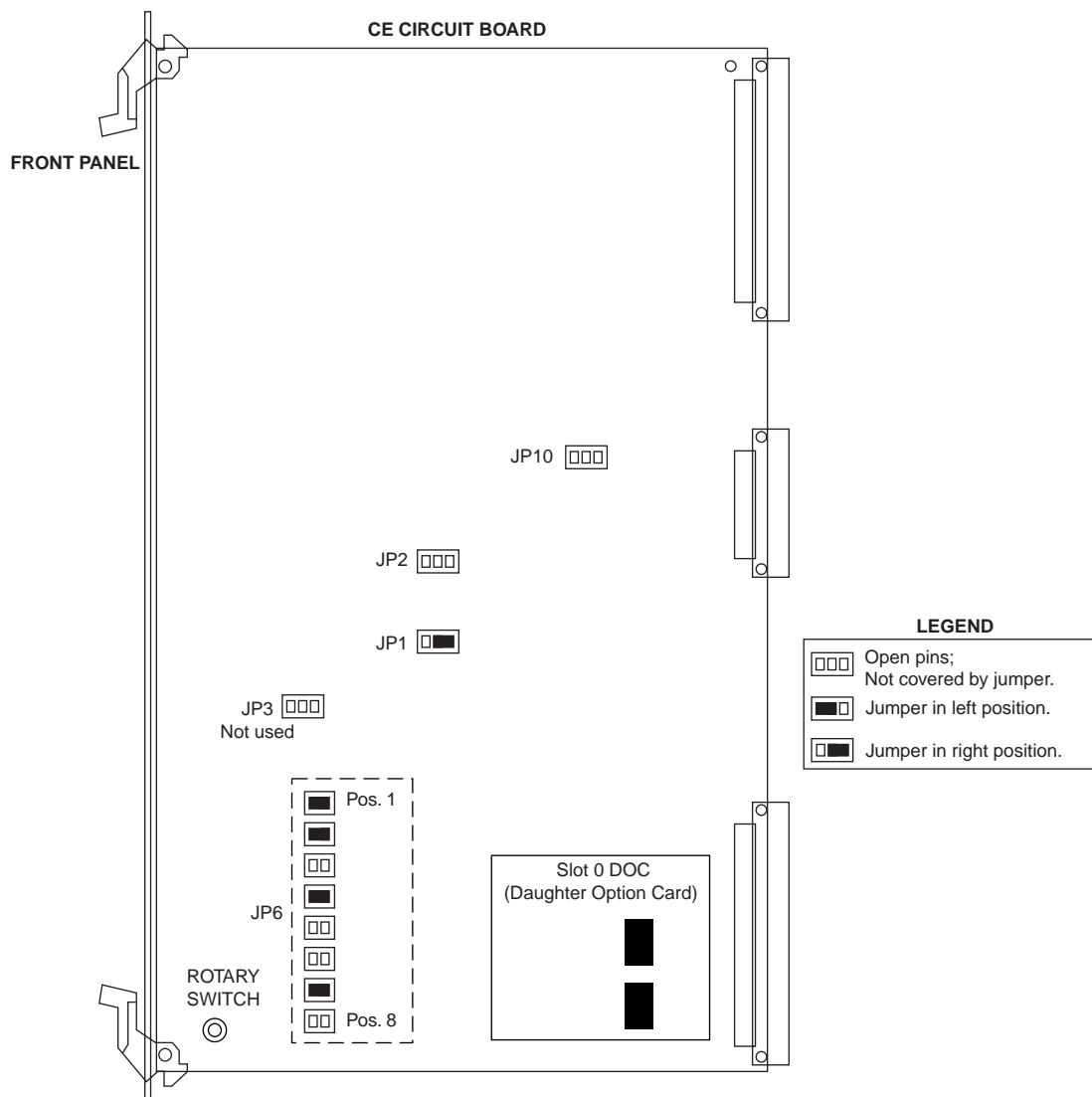
Table 3-2 CE Slot Controller Jumper Settings

Jumper	Position	Functions	Comments
JMP1	Right	Mandatory setting; do not change position.	
JMP6	1, 2, 4, 7	Mandatory setting as shown in figure; do not change. Determines PROM and flash EPROM size compatibility.	
JMP2	Right	Selects 50 Mhz operation.	JMP2 and JMP10 are codependent. Set 50 MHz with XH or 25 MHz with XP. When CE controller is in a switch with controllers operating only at the 25 MHz rate, the CE controller must be set to operate in XP mode at 25 MHz.
	Left	Selects 25 Mhz operation.	
JMP10	Right	Selects XP mode.	
	Left	Selects XH mode.	

ETH, FRC, CHFRC Hardware Settings

The jumpers on the ETH, FRC or CHFRC slot controller must be configured or checked before installing the module in the chassis. *Figure 3-2* and *Table 3-3* show the location and describe the function of pin pairs on each jumper.
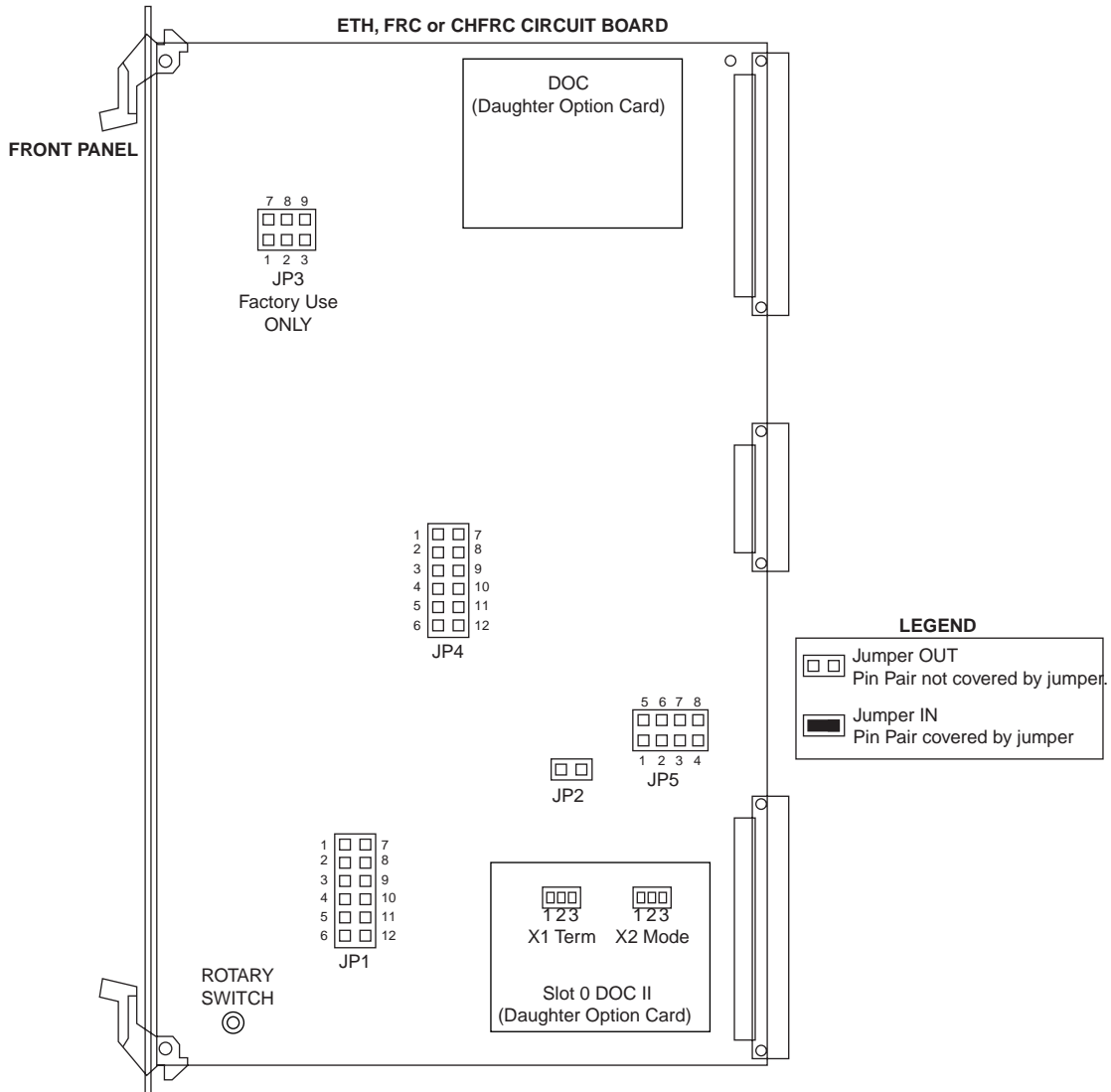
Figure 3-2   ETH, FRC and CHFRC Jumper and Switch Locations

Table 3-3   ETH, FRC and CHFRC Jumpers

Jumper	Pin Pair	Position	Description
JP1	1-7	IN	n/a
	2-8	OUT	n/a
	3-9	IN	n/a
	4-10	OUT	n/a
	5-11	IN	n/a
	6-12	IN	Program Flash
JP2	1-2	IN	50 MHz (XH Switch Fabric mode)
JP3	NOT USED	(Factory Use Only)	
JP5	1-5	OUT (Default)	IN to disable ATM cell output to switch fabric
	2-6	OUT (Default)	IN for XP Switch Fabric.
	3-7	OUT (Default)	IN disables transport CPU watchdog
	4-8	IN (Default)	OUT sets timing for 68040 (U45) writes. IN sets timing for 68060 (U45) writes.

Jumper	Pin Pair	U41 Component Type			Description
		27C010	**29C010**	**29C040**	
JP4	1-7	Out	Out	In	Factory Use only
	2-8	Out	Out	Out	Factory Use only
	3-9	Out	Out	In	Factory Use only
	4-10	Out	Out	Out	Factory Use only
	5-11	Out	In	In	Factory Use only
	6-12	n/a	n/a	n/a	Factory Use only

Jumper	Pin Pair	Position	Mode or Connection Type	Application
X1 (Term)	1-2	IN	Y-Cable	For ETH Only Slot-0 Redundant Mode (Standby))
	2-3	IN	Parallel Cable	
X2 (Mode)	2-3	OUT	Enhanced Redundancy	
	2-3	IN	Basic Redundancy	
X1 (Term)	2-3	OUT	Parallel Cable	For ETH, FRC, CHFRC Non Slot-0 Mode
X2 (Mode)	2-3	IN	Basic Redundancy	

Note   *JP4 is a FACTORY USE jumper that only appears on older models of ETH, FRC and CHFRC controllers.*

Switch Fabric Setup

The following describes the front panel and onboard features of the Xedge Switch Fabric modules: XH, XS, XM and CM. Indicators and jumpers operate in the same manner except where noted.

Front Panel Indicators

All Xedge switch fabric modules have front panel TX and RX LEDs that correspond to each slot controller interface. The CM has LEDs for eight interfaces (S0 - S7). The XH, XS and XM have LEDs for 15 interfaces (S0 - S15). The front panel LEDs on the XM and CM can be set to one of three display modes by setting an onboard jumper.

- **FLT** Indicator
  Illuminates red when a problem prevents the Switch Fabric from functioning. Normally Off.

- **RUN** Indicator
  Steady On while the Swtich Fabric is powered on and operating. Normally On. *(See Redundant Fabric, below)*

- **TX** Indicator
  Illuminates when data is sent from the associated slot controller to the Switch Fabric.

- **RX** Indicator
  Illuminates when data is received at the associated slot controller from another controller in the switch.

Health Checks

Once every second, the Slot-0 Controller sends a health check request cell to all active controllers in the switch via the Switch Fabric module. Each active controller responds to the Slot-0 Controller with a health check response cell via the Switch Fabric module.

This health check request/response sequence causes the **TX** and **RX** LEDs on the Switch Fabric module to blink once every second for each active Slot Controller.

Redundant Switch Fabric

The XH, XM or CM Switch Fabric modules can be installed as Main or Standby fabric in a redundant system. When in-service, the **RUN** LED is steady On. When out-of-service, the **RUN** LED flashes.
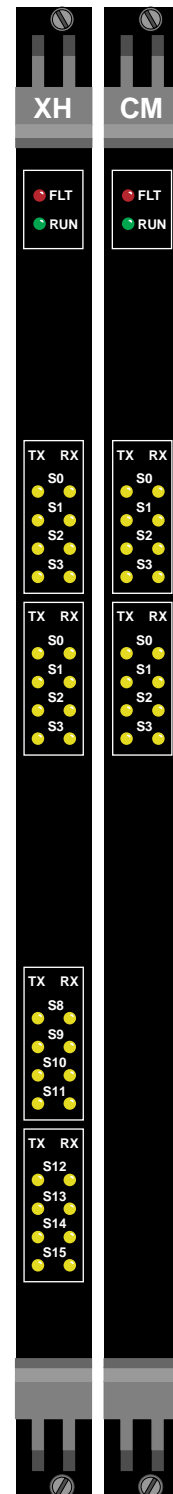
Figure 3-3   Switch Fabric Modules (XH and CM Shown)

Note   *IMPORTANT! In a redundant system, always put the Switch Fabric in Standby mode (out-of-service) before hot-swapping the module. The out-of-service Switch Fabric module can then be removed without interrupting communication in the switch.*

XH/XS Switch Fabric Hardware Setup

The Xedge XH Switch Fabric module is intended for use in the Xedge 6640 and Xedge 6645 chassis. The XS Switch Fabric module intended for the Xedge 6280 chassis. Onboard jumpers control XH/XS traffic priority and modes of operation: XH mode (50 MHz), or XP mode (25 MHz).

The jumpers on the XH/XS Switch Fabric must be configured or checked before installing the module in the chassis. _Figure 3-4_ and _Table 3-4_ show the location and describe the function of pin pairs on each jumper. Hold the board as shown with the component side facing you and the front panel to the left. In this position, references to "upper" or "lower" in the table are the "upper" or "lower" jumper positions.
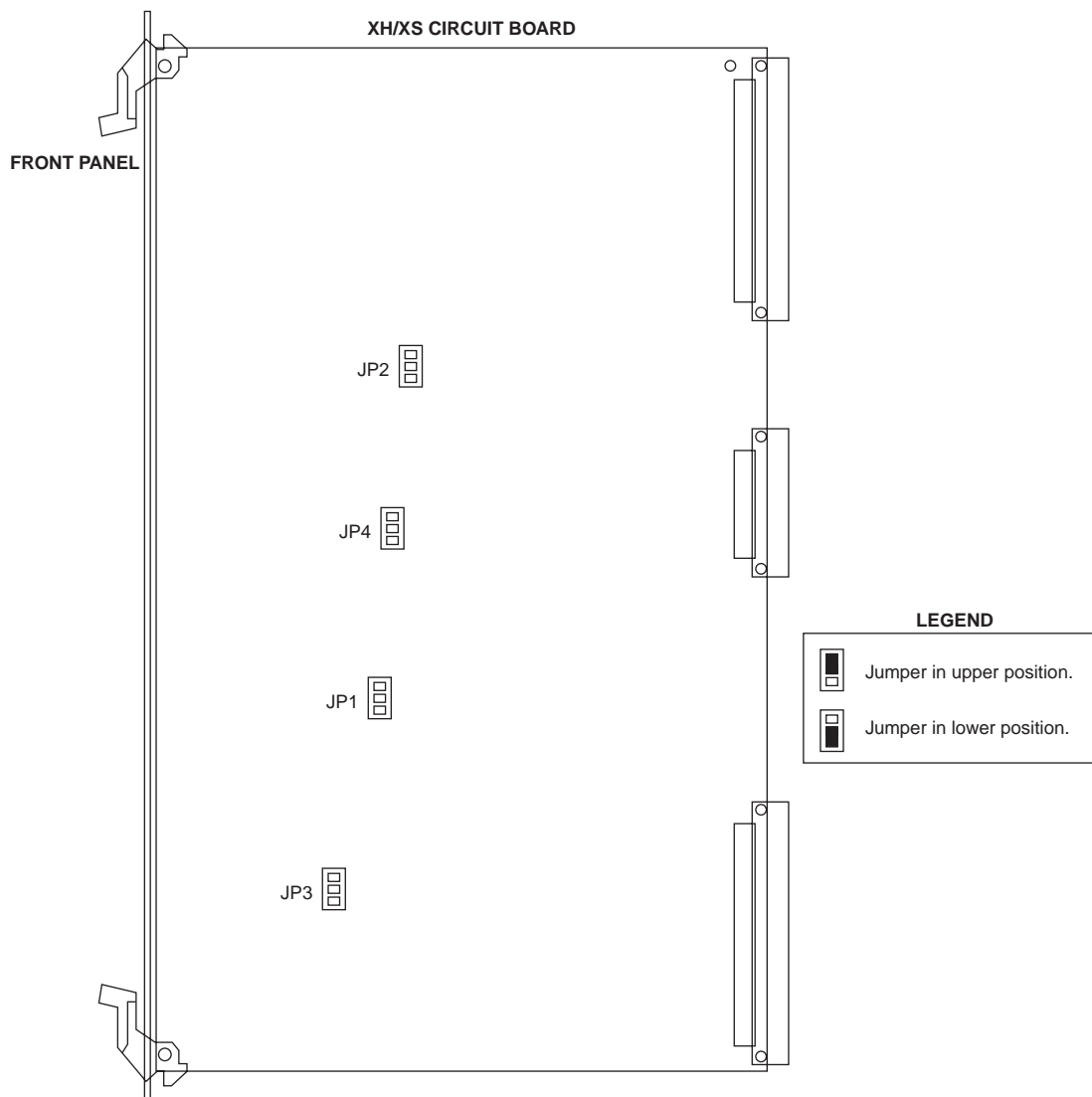

Figure 3-4   XH/XS Jumper Locations

Note   _In the Xedge 6160 or 6280 chassis with one or more packet controllers installed (PCX, ISG2, PCE, etc.) the XH switch fabric module(s) must be used._

Table 3-4   XH/XS Switch Fabric Jumper Settings

Jumper	Position	Setting	Description
JP1 (See *Table 3-5*)	Upper	25 MHz	Required for 25 MHz operation (XP emulation)
	Lower	50 MHz	Required for 50 MHz operation (Normal operation)
JP2	Upper	High Mode	High priority cells have preference over low priority cells. Cells in the low priority queue are only sent when the high priority queue is empty. (Normal operation)
	Lower	High/Low Mode	Low priority cells and high priority cells are equal. Both queues are examined alternately.
JP3 (See *Table 3-5*)	Upper	XP Mode	Sets fabric for XP emulation (25 MHz)
	Lower	XH Mode	Sets fabric for XH operation (Normal)
JP4 (See *Table 3-5*)	Upper	50 MHz	Required for 50 MHz operation (XH mode)
	Lower	25 MHz	Required for 25 MHz operation (XP emulation)

Table 3-5   Setting Jumpers for XH/XP Mode

	JP1 Position	JP2 Position	JP3 Position	JP4 Position
For XP Mode at 25 MHz	Upper	Either position (See *Table 3-4*)	Upper	Lower
For XH Mode at 50 MHz	Lower		Lower	Upper

Special Considerations

• Setting Priority Mode (J2)
  For normal operation, set JP2 to the upper position (High Mode) to ensure the high priority cells are always sent before low priority cells. Be aware that if most of the traffic is high priority, the low priority cells may never get delivered because there will always be high priority cells to process. In this situation, set JP2 to the lower position (High/Low Mode) to ensure that cells in both queues are processed alternately.

• Setting XH/XP Mode
  Jumpers JP1, JP3 and JP4 are codependent. As shown in *Table 3-5*, set 50 MHz with XH (normal operation) or 25 MHz with XP (XP emulation).

XM Switch Fabric Module

The XM Switch Fabric module can control up to four slot controllers and is intended for use in the Xedge 6160 desktop system. The XM operates at 50 MHz only (XH mode). The front panel LEDs on the XM can be set to operate in three different display modes by setting jumper JP 2.

The jumpers on the XM Switch Fabric must be configured or checked before installing the module in the chassis. *Figure 3-5* and *Table 3-6* show the location and describe the function of pin pairs on each jumper. Hold the board as shown with the component side facing you and the front panel to the left. In this position, references to "upper" or "lower" in the table are the "upper" or "lower" jumper positions.
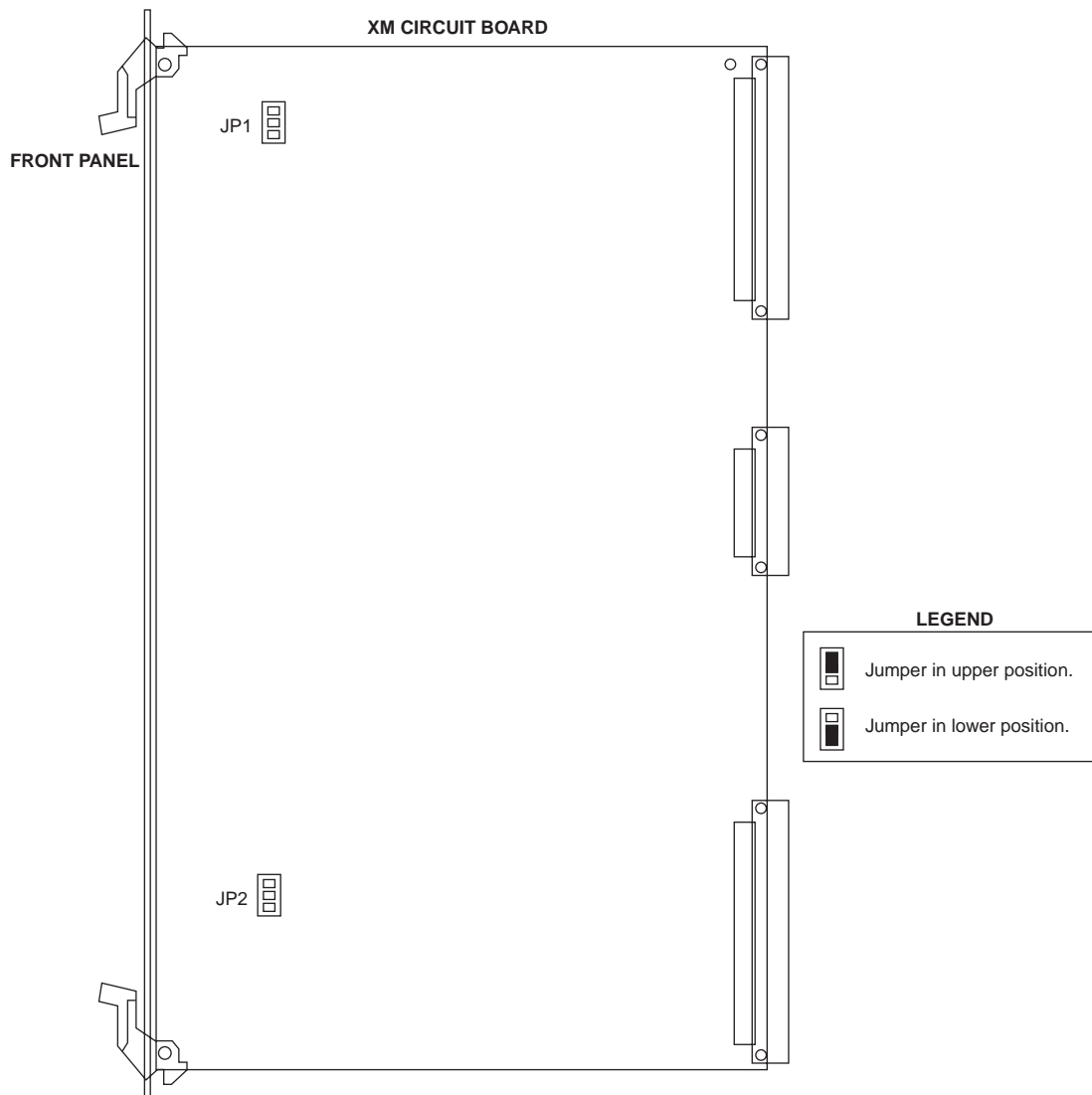
Figure 3-5   XM Jumper Locations

Table 3-6 XM Switch Fabric Jumper Settings

Jumper	Position	Setting	Description
JP1	Upper	High Mode	High priority cells have preference over low priority cells. Cells in the low priority queue are only sent when the high priority queue is empty. (Normal operation)
	Lower	High/Low Mode	Low priority cells and high priority cells are equal. Both queues are examined alternately.
JP2	Upper	RX/TX LEDs flash only when the module is in-service. (Normal operation)	
	Lower	RX/TX LEDs are always off.	
	No jumper	RX/TX LEDs will flash if the module is in-service and out-of-service	

Special Considerations

- Setting Priority Mode (J1)
  For normal operation, set JP1 to the upper position (High Mode) to ensure the high priority cells are always sent before low priority cells. Be aware that if most of the traffic is high priority, the low priority cells may never get delivered because there will always be high priority cells to process. In this situation, set JP1 to the lower position (High/Low Mode) to ensure that cells in both queues are processed alternately.

- Setting LED Display (J2)
  JP2 enables or disables the flashing TX/RX LEDs when cells are transmitted or received. For normal operation, set JP2 to the upper position (pins 1-2 jumpered) to enable LEDs to flash only when the XM module is in service.

CM Switch Fabric Module

The CM Switch Fabric module can control up to eight slot controllers and is intended for use in the Xedge 6160 or Xedge 6280 systems. The front panel LEDs on the XM can be set to operate in three different display modes by setting jumper JP 1. *Table 3-7* and the figure below describe the jumper location and positions. Hold the board as shown with the component side facing you and the front panel to the left. In this position, references to "upper" or "lower" in the table are the "upper" or "lower" jumper positions.

CM CIRCUIT BOARD

FRONT PANEL

JP1

LEGEND

Jumper in upper position.

Jumper in lower position.
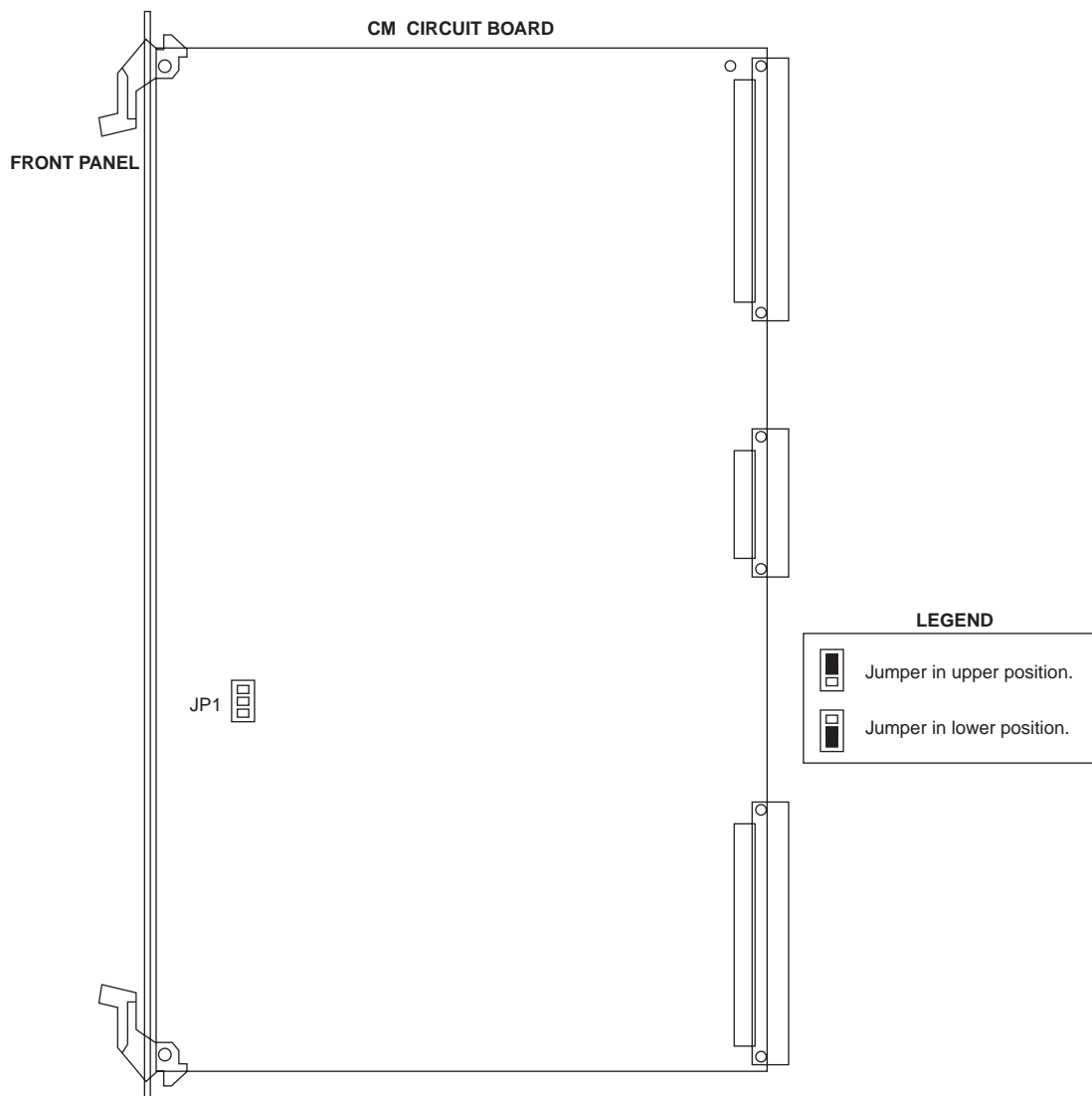
Table 3-7   CM Switch Fabric Jumper Settings

Jumper	Position	Description
JP1	Upper	RX/TX LEDs flash only when the module is in-service. (Normal operation)
	Lower	RX/TX LEDs are always off.
	No jumper	RX/TX LEDs will flash if the module is in-service and out-of-service

Special Considerations

- JP2 enables or disables the flashing TX/RX LEDs when cells are transmitted or received. For normal operation, set JP2 to the upper position (pins 1-2 jumpered) to enable LEDs to flash only when the XM module is in service.

Chapter 4: V7.x Packet Controllers

Installation Overview

All Xedge Packet Slot Controllers plug into front slots of an Xedge switch chassis. This modular design and packaging allows a wide variety of Xedge switch node configurations. Front panel LEDs provide monitoring of system status. *Table 2-1* shows Xedge modules installed in the various Xedge chassis systems. Before beginning an installation, read this section in its entirety to become familiar with the major components in your Xedge switch.

This chapter describes hardware characteristics, setup and installation of the following Xedge Pacxket Slot Controller in the chassis.

- Xedge IP Services Gateway (ISG2)

- Xedge Packet Cell Switch (PCX and PCX-2)

- Xedge Packet Cell Link (PCL)

- Xedge Packet Circuit Emulator (PCE)

Note   *In this chapter, infomation on the PCX also applies to the PCX-2 except where noted.*

Installing Other Xedge Modules

- See *Chapter 3, Switch Fabric and V6.2 Controllers* to set up/install cell or adaptation modules.

- See *Chapter 5, Line Interface Modules* to set up/install Xedge LIMs

- See *Chapter 6, Network Timing Modules* to setup/install the NTM-DS1 or NTM-E1.

- Refer to *Chapter 8, Cables & Peripherals* as needed for your switch/environment.

- An Xedge 6640 or 6645 system will require the System Termination module (STM), when there are four or fewer controllers installed. The STM can only be installed in the Slot-0 Standby position. There are no front panel indicators, and no user-selectable switches or jumpers.

Note   *Xedge packet controllers are equipped with front panel management access ports. Therefore, the SMM is not required at the rear of the Xedge 6160/Xedge 6280 chassis.*

Removal Procedure

1. Loosen the two captive screws on the front panel of the module to be replaced.

2. Open the latches on the front panel of the module.

3. Gently pull the module out of the slot by its latches. There is slight resistance initially until the module connectors disconnect from the slot connectors.

4. Place the removed module in anti-static packaging.

Hardware Installation Guidelines

- This section describes the hardware setup and installation of the following packet controller modules: ISG2, PCX, PCL and PCE.

- When handling Xedge Slot Controllers, always use an antistatic wrist strap to prevent static discharge damage to the electronic circuits.

- To avoid damaging the EMI springs when installing a module in a chassis, carefully insert a module into its slot and fasten its front panel captive screws to the chassis before installing the next module. Similarly, modules should be removed one at a time; that is, unfasten the captive screws of one module and remove it from the slot before removing the next module. In the event of damage to the EMI springs, contact your authorized field service representative.

- Refer to *Chapter 2, Xedge Chassis Systems* to make power, management and cable connections and for additional information on your specific Xedge Chassis.

- Once all modules are installed and connected, refer to the Xedge MSPx Version 7.3.X Configuration Guide (032R401-V73x) for detailed configuration procedures.

Basic Installation Procedure

1. There are no user-selectable jumpers on Xedge packet controllers. Jumper P3 is for factory use only and should remain in the original Pin 2-3 position.

2. For all controllers, set the boot mode rotary switch (S1) as follows:

   - For the ISG2 controller, refer to S1 settings in *Table 4-1*.
   - For the PCX controllers (PCX and PCX-2), refer to S1 settings in *Table 4-2*.
   - For the PCL controller, refer to S1 settings in *Table 4-4*.
   - For the PCE controller, refer to S1 settings in *Table 4-6*.

3. Determine which slot to use for each module, according to the following guidelines:

   - Controllers that serve as the slot-0 controller must use the Slot-0 Main position. In a redundant system, only ISG2 modules can use Slot-0 Main and Slot-0 Standby positions.
   - In a switch with a variety of Xedge cell, adaptation and packet controllers, a packet controller must serve as the slot-0 controller(s).
   - Non Slot-0 controllers can use any of the remaining slots.

4. Remove the blank panel that covers the slot by loosening its two retaining screws.
   To remove/replace an existing module, refer to .

5. Carefully insert the edges of the module into the tracks of the slot.

6. Holding both latches on the module front panel outward, gently slide the module into the slot until its front panel bottoms out on the chassis.

7. Close the latches after their closures clear the front edge of the chassis latch bar.

8. Tighten the two captive screws on the front panel of the module.

9. Refer to *Chapter 5, Line Interface Modules* to setup and install compatible LIMs as required:

   - For PCX, refer to *Table 4-3* for compatible LIMs.
   - For PCL, refer to *Table 4-5* for compatible LIMs.
   - For PCE, refer to *Table 4-7* for compatible LIMs.

10. Configure the packet controllers and their LIMs as required using the Xedge MSPx 7.x Configuration Guide.

ISG2 Controller Overview

Xedge Switch Version 7.10 and later supports the IP Services Gateway (ISG2) Slot Controller. The ISG2 is a single-width slot controller for Xedge Switches.

Features & Benefits

- Lowers costs of branch/remote IP access-to-centralized routing resources.

- Supports OSPF, RIP2 Routing, and deterministic static routes.

- Guarantees quality of service by routing IP traffic across Xedge networks based on destination IP address & IP classification.

- Reliably extends IP connectivity and services on converged networks carrying voice, multimedia and low-speed data applications that require explicit service quality.

- Traffic shaping; IP QoS

- Establishes a resilient foundation for future application/feature development.

- Provides standard-based SNMP management interface for Xedge switches.

- Installs in a single slot 0 or non-slot 0 position in any Xedge 6000 chassis.

Traffic Management

ISG2 offers superior traffic management capabilities to assure that priority traffic (for example, real-time IP flows such as IP video packets) is not perturbed when the destination route encounters congestion from bursty traffic. Each ISG2 module acts on priorities based on destination IP addresses, and assures QoS across the wide-area network. Through intelligent tunnel management and queueing, ISG2 buffers up to 1000 frames to handle burst traffic.

Routing

ISG2 determines routes based on IP destination addresses. ISG2 builds layer-3 tunnels across the Xedge cloud to other ISG2s and selected Layer-3 devices (e.g., centralized router resources or external routers connected to the network via MPLS or ATM interfaces). Each ISG2 supports more than 128 IP tunnels which may be established using OSPF, RIP2, or deterministic MPLS/ATM routes, or by selecting a specific ISG2 tunnel as a local site's default gateway. ISG2 can be configured with auto re-routing, along with variations on limited and restricted re-routing.
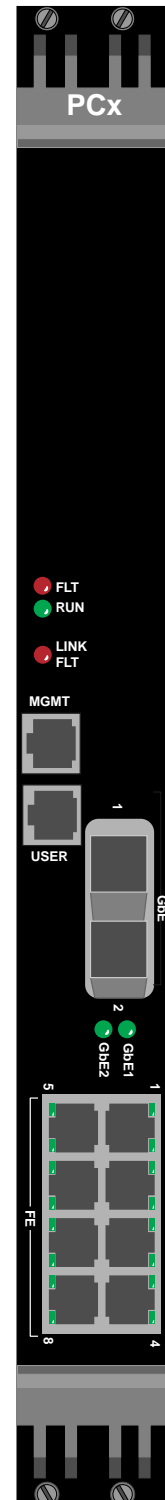
Power Up or Reboot Sequence

1. All three LED indicators off.
2. LNK FLT on, FLT and RUN alternately flashing.
3. RUN on, FLT flashing, LNK FLT on.
4. RUN on, FLT off, followed by normal LED indications as described in *Table 4-1*.

ISG2 Hardware Settings
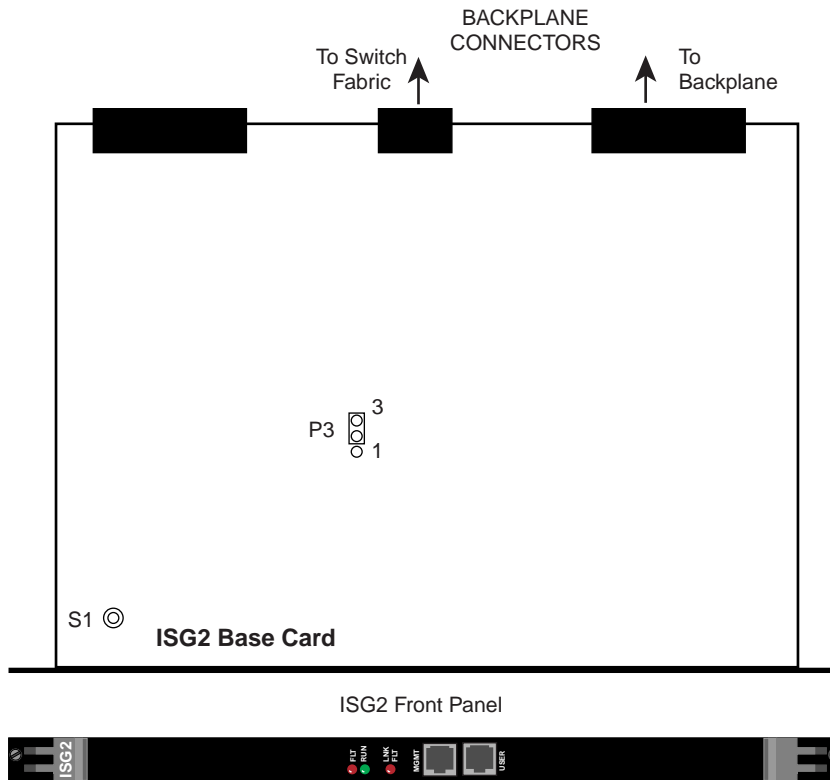
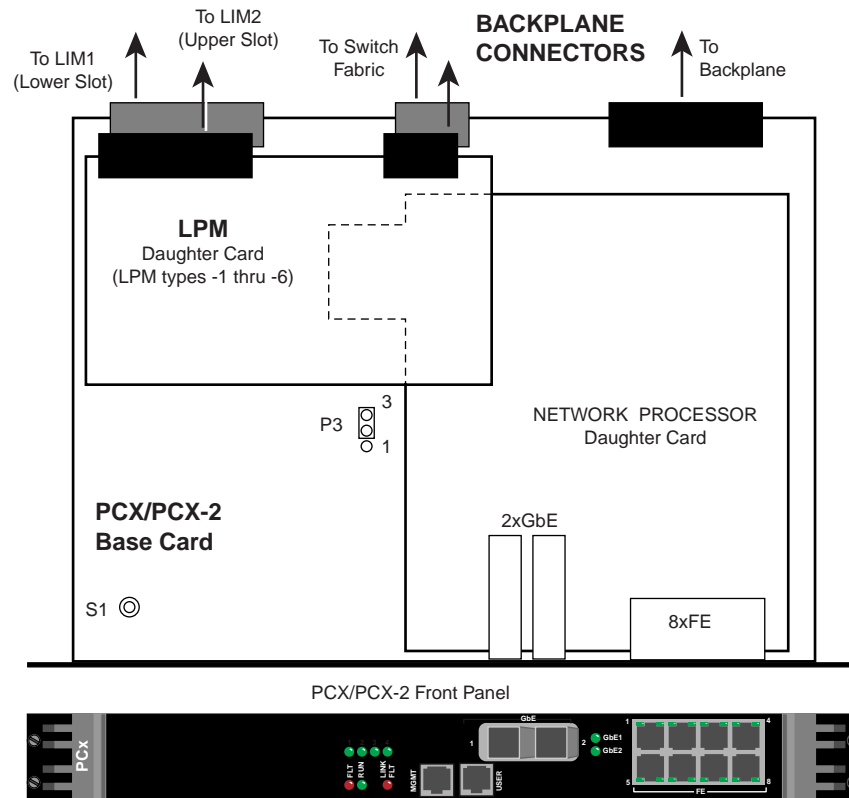**Figure 4-1**   ISG2 Card Layout

Table 4-1   ISG2 Controls and Indicators

Items	Designation	Description
Front Panel LEDs	FLT LED	FLT (red) is normally off; Lit when a problem prevents the Slot Controller from functioning.
	RUN LED	RUN (green) illuminates when the Slot Controller is powered on and operating.
	LNK FLT	LNK FLT (red) is not supported in this release.
Jumper	P3	Only for use in factory tests. For normal operation, this jumper must be set to Pins 2 and 3, as shown above.
10/100 8-pin modular jacks	MGMT	Connects to Prosphere Server or the network of the ProSphere Server.
	USER	Connects to the Ethernet network.
16-position Rotary Switch	S1 *(See Figure 4-2)*	Set to 0 when ISG2 is in Main Slot 0 of any Xedge 6000 chassis. Set to 4 when ISG2 is in Standby Slot 0 of Xedge 6280, 6640 or 6645 chassis. Set to 8 when ISG2 is in Non-slot 0 of any Xedge chassis (slot 0 must be PCx or ISG2). Set to F to delete all user-defined configuration files and XOS code (i.e. to factory default).

Note   *IMPORTANT ! Be aware that when S1 is set to F, all user configuration files and XOS code will be erased from the card. This setting should be used with caution, and you must reset S1 back to 0, 4 or 8 immediately after reboot to prevent inadvertent erasure with subsequent reboots.*

Note   *Additional S1 settings can be used to reboot the card to kernel for troubleshooting purposes, under the guidance of your authorized Xedge field service representative.*

ISG2 Slot Locations

Xedge 6002

Non Slot 0

| SLOT 1 | Slot Controller Module | 1 | Craft |

Slot 0 ISG2 in Slot 0

Xedge 6160

Non Slot 0

SLOT 3	Slot Controller Module	3
SLOT 2	Slot Controller Module	2
SLOT 1	Slot Controller Module	1
		0 ESD Strap
	Switch Fabric	SF

Slot 0 ISG2 in Slot 0

Xedge 6280

Non Slot 0

SLOT 6	Slot Controller Module	6	FAN TRAY
SLOT 5	Slot Controller Module	5
SLOT 4	Slot Controller Module	4
SLOT 3	Slot Controller Module	3
SLOT 2	Slot Controller Module	2
SLOT 1	Slot Controller Module	1
		0 ESD
	Switch Fabric	SF
	Switch Fabric	SF (STDBY) / 0 (STDBY)

Slot 0 ISG2 in Main Slot 0 / Stdby Slot 0

Xedge 6640/6645

Non Slot 0   Non Slot 0

(Blank) | SLOT 7 | SLOT 6 | SLOT 5 | SLOT 4 | SLOT 3 | SLOT 2 | SLOT 1 | Switch Fabric | Switch Fabric | SLOT 8 | SLOT 9 | SLOT 10 | SLOT 11 | SLOT 12 | SLOT 13 | SLOT 14 | SLOT 15 | (Blank)

Slot 0 ISG2
in Main Slot 0/Stdby Slot 0

Figure 4-2   Installing the ISG2 in an Xedge Chassis

Note   *Refer to [Table 4-1](#) to properly set the S1 rotary switch on the ISG2 for the intended chassis and slot. Refer to the Xedge V7.x Configuration Guide for complete instructions on slot-0 configuration and operational guidelines. Slot-0 redundancy is not supported in an Xedge 6002 or Xedge 6160 chassis.*

PCX/PCX-2 Controller Overview

Xedge Switch Version 7.2 and later supports the Xedge PCX-2 slot controller. Both the PCX-2 and the earlier PCX device have two daughter cards: an LPM card and a network processor.

NOTE: In this section, the information applies to both the PCX-2 and PCX controllers, except where noted.

Features & Benefits

- Complies with Metro Ethernet Forum (MEF) compliant Ethernet Private Line
- High speed, high capacity packet switching
- Dual control plane for MPLS or ATM transport
- Supports layer 2 or layer 3 VPNs
- Flexible Routing includes PNNI, OSPF-TE
- Reduces OPEX and CAPEX

Traffic Management

PCx offers superior traffic management capabilities to assure that priority traffic (for example, real-time IP flows such as IP video packets) is not perturbed when the destination route encounters congestion from bursty traffic. Each PCx module acts on priorities based on destination IP addresses, and assures QoS across the wide-area network. Through intelligent tunnel management and queueing, PCx buffers up to 1000 frames to handle burst traffic.

Routing

PCx determines routes based on IP destination addresses. Layer-3 tunnels are built across the Xedge cloud to other PCx devices and selected Layer-3 devices (e.g., centralized router resources or external routers connected to the network via MPLS or ATM interfaces). Each PCx supports more than 256 IP tunnels which may be established using OSPF, RIP2, deterministic MPLS/ATM routes, or by selecting a specific PCx tunnel as a local site's default gateway. PCx can be configured with auto re-routing with variations on limited and restricted re-routing.

Ethernet Connections

The Ethernet interface is provided by connectors on the PCX-2 base card.
For the PCX, the Ethernet connectors are located on the GENPC daughter card.

- Gigabit Ethernet connectivity is provided by two GbE ports which require small format pluggable (SFP) inserts.
- Fast Ethernet connectivity is provided by eight 10/100 Mbps FE ports.
- FE Activity and GbE Activity LEDs are described in *Table 4-2*.

Power Up or Reboot Sequence

1. All three LED indicators off.
2. LNK FLT on, FLT and RUN alternately flashing.
3. RUN on, FLT flashing, LNK FLT on.
4. RUN on, FLT off, followed by normal LED indications as described in *Table 4-2*.

PCX/PCX-2 Hardware Settings

PCX/PCX-2 Front Panel

Table 4-2 PCx Controls and Indicators

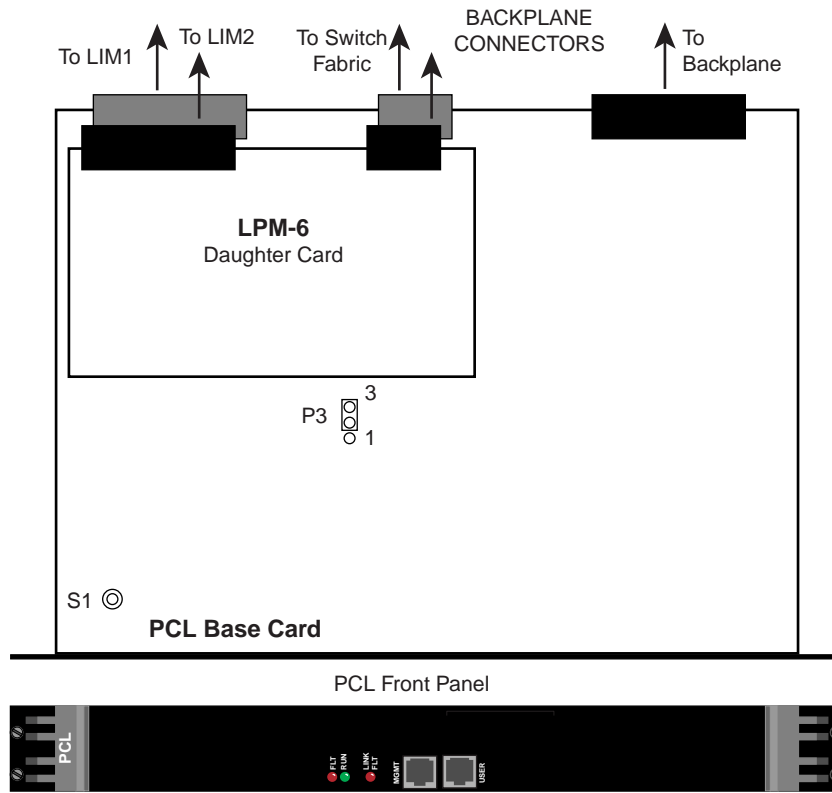| Items	Designation	Description
Front Panel LEDs	FLT LED	FLT (red) is normally off; Lit when a problem prevents the Slot Controller from functioning.
	RUN LED	RUN (green) illuminates when the Slot Controller is powered on and operating.
	LNK FLT	LNK FLT (red) is not supported in this release.
	GbE 1/2	Two Gigabit Ethernet ports; LEDs indicate active connection when lit.
	FE 1 - 8	Eight 10/100 Mbps Fast Ethernet ports: Left (top) LED indicates 100 Mbps operation when lit. Right (bottom) LED indicates active connection when lit.
Jumper	P3	Only for use in factory tests. For normal operation, this jumper must be set to Pins 2 and 3, as shown above.
10/100 8-pin modular jacks	MGMT	Connects to Prosphere Server or the network of the ProSphere Server.
	USER	Connects to the Ethernet network.
16-position Rotary Switch	S1 *(See Figure 4-3)*	Set to 0 when Slot 0 PCx is in main slot 0 and slot 1 of Xedge 6160/6280. Set to 0 when Slot 0 PCx is in standby slot 0 and slot 8 of Xedge 6640/6645. Set to 8 when PCx is in non-slot 0 of any chassis (slot 0 must be a PCx or ISG2). Set to F to delete all user-defined configuration files and XOS code (i.e. to factory default)

Note   *IMPORTANT ! Be aware that when S1 is set to F, all user configuration files and XOS code will be erased from the card. This setting should be used with caution, and you must reset S1 back to 0, 4 or 8 immediately after reboot to prevent inadvertent erasure with subsequent reboots.*

Note   *Additional S1 settings can be used to reboot the card to kernel for troubleshooting purposes, under the guidance of your authorized Xedge field service representative.*

PCx/PCx-2 Slot Locations
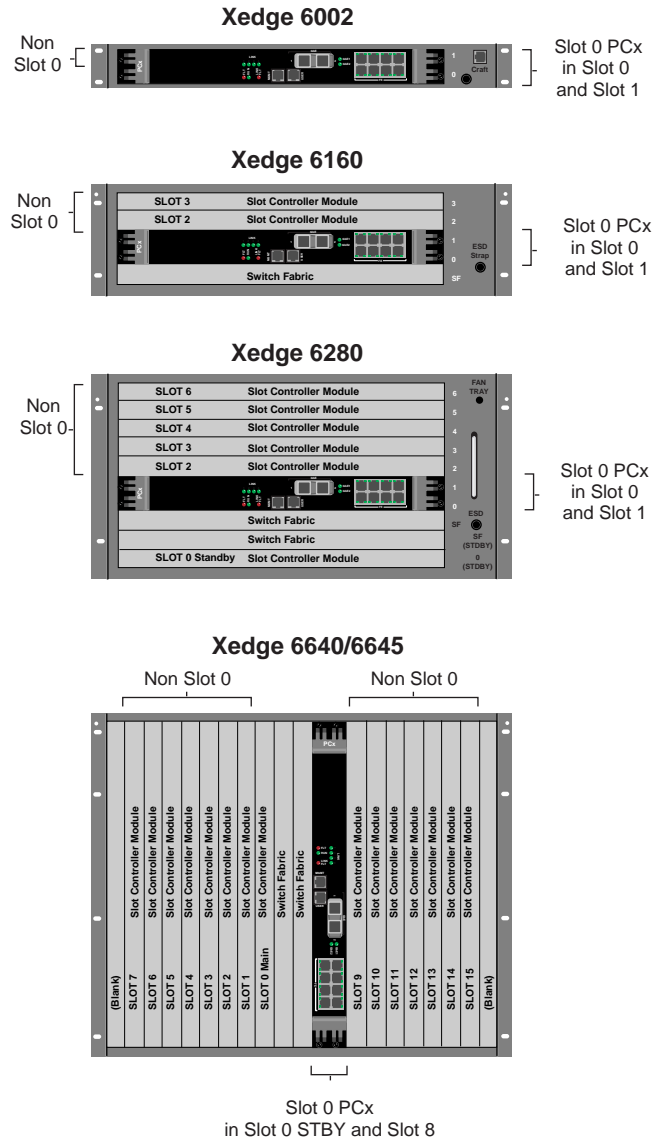
Figure 4-3   Installing the PCx/PCx-2 in an Xedge Chassis

Note   *Refer to Table 4-2 to properly set the S1 rotary switch on the PCx/PCx-2 for the intended chassis and slot.*

Note   *The PCx/PCx-2 card cannot be installed in Main Slot 0 of Xedge 6640 or 6645 chassis.*

Note   *For any Xedge chassis, Slot 0 PCx/PCx-2 redundancy cannot be provided.*

PCX/PCX-2 Assembly

The PCX/PCX-2 assemblies consists of a base card, a Network Processor daughtercard, and a LIM Personality Module (LPM) daughtercard. This assembly can support two Line Interface Modules (LIM1 and LIM2) installed at backplane connectors, shown in the figure accompanying *Table 4-2*.

- The PCX/PCX-2 base card has a single connection to the main backplane, a single connection to the switch fabric and a single connection to LIM1 (lower LIM slot).

- The LPM daughtercard provides an additional connection to the switch fabric and to LIM 2 (upper LIM slot). The type of LPM in use will determine the type and slot location of LIMs.

- The Network Processor daughtercard provides Ethernet connectivity at the front panel.

Note   *At the Physical Layout screen, a PCx with LIM cards installed will be displayed as* **Unknown**. *This does not affect the functionality of the PCx or its associated LIMs.*

LPM/LIM Applications

PCX/PCX-2 is shipped with one of six types of LPM cards. Depending on the LPM, various combination of SERDES, Utopia or Serial LIMs can be installed as LIM1 and LIM2, as defined below.

PCX-2 Assembly	LPM in Use	LIM1 (lower LIM slot)	LIM2 (upper LIM slot)
200M010-001	LPM-1	Utopia LIM	Utopia LIM
200M011-001	LPM-2	Utopia LIM	SERDES LIM
200M008-001	LPM-4	SERDES LIM	SERDES LIM
200M014-001	LPM-3	Serial LIM	SERDES LIM
200M015-001	LPM-5	Serial LIM	Serial LIM
200M017-001	LPM-6	Serial LIM	Utopia LIM

.

PCX Assembly	LPM in Use	LIM1 (lower LIM slot)	LIM2 (upper LIM slot)
200M001-001	LPM-1	UTOPIA LIM	UTOPIA LIM
200M002-001	LPM-2	UTOPIA LIM	SERDES LIM
200M004-001	LPM-4	SERDES LIM	SERDES LIM
200M003-001	LPM-3	Serial LIM	SERDES LIM
200M007-001	LPM-5	Serial LIM	Serial LIM
200M013-001	LPM-6	Serial LIM	UTOPIA LIM

Supported Line Interface Modules (LIMS)

Table 4-3 lists LIMs supported by the PCX and/or PCX-2. To set up/install LIMs, refer to *Chapter 5, Line Interface Modules* . To configure LIMs, refer to the Xedge V7.3.x Configuration Guide.

Table 4-3   Xedge LIMs for PCx Module

Xedge LIMs	Application	Part No.	Type	Compatibility
STM-N/OC-N	8-Port OC-N	200P003-001	SERDES	PCX/PCX2
155M-2	2-port OC-3, short reach with single port APS	032P150-011	Utopia	PCX/PCX2
155I-2	2-port OC-3, intermed. reach with single port APS	032P150-012	Utopia	PCX/PCX2
155L-2	2-port OC-3, long reach with single port APS	032P150-013	Utopia	PCX/PCX2
155M-APS	2-port OC-3, short reach with dual port APS	032P150-001	Utopia	PCX/PCX2
155I-APS	2-port OC-3, intermed. reach with dual port APS	032P150-002	Utopia	PCX/PCX2
155L-APS	2-port OC-3, long reach with dual port APS	032P150-003	Utopia	PCX/PCX2
DS3-2C	2-port DS3 LIM for ATM transport	032P046-001	Serial	PCX/PCX2
DS1-2CS	2-port DS1	032P098-012	Serial	*(Future)*
DS1-4CS	4-port DS1 *(See note)*	032P098-011	Serial	PCX/PCX2
E1-2CS	2-port E1	032P098-002	Serial	*(Future)*
E1-4CS	4-port E1 *(See note)*	032P098-001	Serial	PCX/PCX2
E3-2C	2-port E3 LIM for ATM transport	032P108-001	Serial	PCX/PCX2
HSSI-DCE	2-port HSSI LIM, Frame (DCE)	032P022-001	Serial	*(Future)*
HSSI-DTE	2-port HSSI LIM, Cell (DTE)	032P022-002	Serial	PCX/PCX2
SI-2C	2-port serial I/O	032P094-002	Serial	PCX/PCX2
SI-4C	4-port serial I/O *(See note)*	032P094-001	Serial	PCX/PCX2
ASIO	4-port adaptive serial I/O *(See note)*	032P194-001	Serial	PCX/PCX2
155E-2	2-port STM-1 electrical LIM for ATM transport	032P151-001	Utopia	*(Future)*
LCE-16	Legacy circuit emulation 16 link LIM	032P187-001	Serial	PCX/PCX2
DSX1-IMA	16 link Inverse Multiplexing for ATM LIM	All IMA and IMA+ LIMS	Utopia	PCX/PCX2
E1-IMA	16 link Inverse Multiplexing for ATM LIM		Utopia	PCX/PCX2
ANA-Voice	LIM, 12-port port Analog Voice LIM	(See *Table 1-3*)	SERDES	*PCX-2 only*
T1/E1 MP	LIM, 16-port T1/E1 Multi-Protocol LIM	032P210-001	SERDES	*PCX-2 only*
T1/E1 HD	LIM, 28/32-port T1/E1 Multi-Protocol LIM, with DS3/E3 and OC3/OC12 ports	TBD	SERDES	*PCX-2 only*

Note   *For the DS1-4SC, E1-4CS, ASIO and SI-4C LIMs, the PCx and PCx-2 controllers can employ two of the available four ports.*

PCL Controller Overview

Xedge Switch Version 7.20 and later supports the Xedge Packet Cell Link (PCL). PCL is a dual-width card that support all features found in the ISG2 along with the added features listed below.

Features & Benefits

- Cost-effective DS1IMA to DS3 or E1 IMA to E3 cell-relay transport

- ATM standard compliant ATMF UNI 3.1 solution

- Conformance with IMA 1.0 and IMA 1.1 standards

- NNI support for both DS1/E1 IMA or DS3/E3 ATM

- Fast Ethernet for management and/or Ethernet/IP data (up to 4 connections)

- ATM loopback and diagnostic of physical layer performance

- Optional choice of PLCP and HEC formats for DS3/E3

- Xedge platform supports migration to Ethernet/IP MPLS applications

Routing

PCL determines routes based on IP destination addresses. PCL builds layer-3 tunnels across the Xedge cloud to other PCL devices and selected Layer-3 devices (e.g., centralized router resources or external routers connected to the network via MPLS or ATM interfaces). Each PCL supports from 20 to 40 IP tunnels which may be established using OSPF, RIP2, or deterministic MPLS/ATM routes, or by selecting a specific PCL tunnel as a local site's default gateway. PCL can be configured with auto re-routing, along with variations on limited and restricted re-routing.

Power Up or Reboot Sequence

1. All three LED indicators off.
2. LNK FLT on, FLT and RUN alternately flashing.
3. RUN on, FLT flashing, LNK FLT on.
4. RUN on, FLT off, followed by normal LED indications as described in *Table 4-4*.

PCL Hardware Settings

To LIM1   To LIM2   To Switch Fabric   BACKPLANE CONNECTORS   To Backplane

LPM-6
Daughter Card

P3   3
       1

S1
PCL Base Card
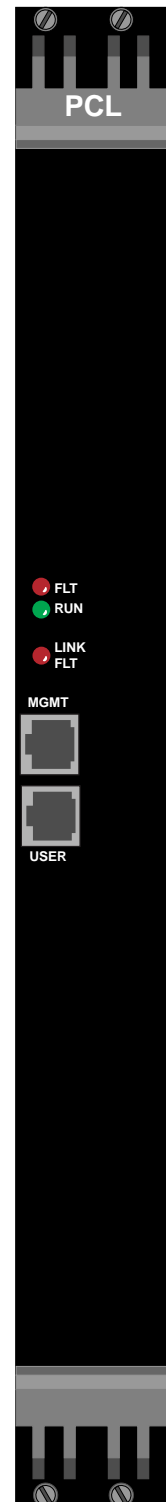
PCL Front Panel

Table 4-4   PCL Controls and Indicators

Items	Designation	Description
Front Panel LEDs	FLT LED	FLT (red) is normally off; Lit when a problem prevents the Slot Controller from functioning.
	RUN LED	RUN (green) illuminates when the Slot Controller is powered on and operating.
	LNK FLT	LNK FLT (red) is not supported in this release.
Jumper	P3	Only for use in factory tests. For normal operation, this jumper must be set to Pins 2 and 3, as shown above.
10/100 8-pin modular jacks	MGMT	Connects to Prosphere Server or the network of the ProSphere Server.
	USER	Connects to the Ethernet network.
16-position Rotary Switch	S1 *(See Figure 4-4)*	Set to 0 when Slot 0 PCL is in main slot 0 and slot 1 of Xedge 6002/6160/6280. Set to F to delete all user-defined configuration files and XOS code (i.e. to factory default)

Note   *IMPORTANT ! Be aware that when S1 is set to F, all user configuration files and XOS code will be erased from the card. This setting should be used with caution, and you must reset S1 back to 0, 4 or 8 immediately after reboot to prevent inadvertent erasure with subsequent reboots.*

Note   *Additional S1 settings can be used to reboot the card to kernel for troubleshooting purposes, under the guidance of your authorized Xedge field service representative.*

PCL Slot Locations

Xedge 6002
(Typical Installation)

Slot 0 PCL
in Slot 0
and Slot 1

Xedge 6160
(Future Installation)

Non
Slot 0

SLOT 3	Slot Controller Module
SLOT 2	Slot Controller Module
	Switch Fabric

Slot 0 PCL
in Slot 0
and Slot 1

Xedge 6280
(Future Installation)

Non
Slot 0

SLOT 6	Slot Controller Module
SLOT 5	Slot Controller Module
SLOT 4	Slot Controller Module
SLOT 3	Slot Controller Module
SLOT 2	Slot Controller Module
	Switch Fabric
	Switch Fabric
SLOT 0 Standby	Slot Controller Module

Slot 0 PCL
in Slot 0
and Slot 1

Xedge 6645 / 6640
(Future Installation)

Non Slot 0   Non Slot 0

Slot 0 PCL
in Slot 0 STBY and Slot 8

Figure 4-4   Installing the PCL in an Xedge Chassis

Note   *The current release of the Xedge PCL controller is intended for installation only in the Xedge 6002 chassis. Future releases will support additional Xedge chassis.*

Note   *Refer to Table 4-4 to properly set the S1 rotary switch on the PCL for the intended chassis and slot.*

Note   *The PCL card cannot be installed in Main Slot 0 of Xedge 6640 or 6645 chassis.*

Note   *For any Xedge chassis, Slot 0 PCL redundancy cannot be provided.*

PCL Assembly

The PCL assembly consists of a PCL base card and a LIM Personality Module (LPM-1) daughtercard. This assembly can support two Line Interface Modules (LIM1 and LIM2) installed at backplane connectors, as shown in the figure accompanying *Table 4-4*

- The PCL base card has a single connection to the main backplane, a single connection to the switch fabric and a single connection to LIM1.

- The LPM-6 daughtercard provides an additional connection to the switch fabric, and a connection to a second LIM (LIM2).

LPM/LIM Applications

The PCL is shipped with the LPM-6 daughtercard which accepts a varied combination of Serial and Utopia LIMs installed as LIM1 and LIM2, as defined below.

PCL Assembly	LPM in Use	LIM1 (behind PCL)	LIM2 (behind LPM-6)
200M006-001	LPM-6 only	Serial LIM *(See Table 4-5)*	Utopia LIM *(See Table 4-5)*

Note   *At the Physical Layout screen, a PCL with LIM cards installed will be displayed as* **Unknown**. *This does not affect the functionality of the PCL or its associated LIMs.*

Supported Line Interface Modules (LIMS)

Table 4-5 lists Xedge LIMs supported by the PCL. To set up hardware options and install LIMs for the PCL, refer to *Chapter 5, Line Interface Modules* . To configure LIMs, refer to the Xedge V7.x Configuration Guide.

Table 4-5   Xedge LIMs for PCL Module

Xedge LIMs	Application	Part No.	LIM Type	PCL Compatibility
155M-2	2-port OC-3, short reach with single port APS	032P150-011	Utopia	*(Future)*
155I-2	2-port OC-3, intermed. reach with single port APS	032P150-012	Utopia	*(Future)*
155L-2	2-port OC-3, long reach with single port APS	032P150-013	Utopia	*(Future)*
155M-APS	2-port OC-3, short reach with dual port APS	032P150-001	Utopia	*(Future)*
155I-APS	2-port OC-3, intermed. reach with dual port APS	032P150-002	Utopia	*(Future)*
155L-APS	2-port OC-3, long reach with dual port APS	032P150-003	Utopia	*(Future)*
155E-2	2-port STM-1 electrical LIM for ATM transport	032P151-001	Utopia	*(Future)*
DSX1-IMA+	16 link Inverse Multiplexing for ATM LIM	Supports all IMA+ LIMs	Utopia	Supported
E1-IMA+	16 link Inverse Multiplexing for ATM LIM		Utopia	Supported
DS3-2C	2-port DS3 LIM for ATM transport	032P046-001	Serial	Supported
E3-2C	2-port E3 LIM for ATM transport	032P108-001	Serial	Supported
DS1-2CS	2-port DS1	032P098-012	Serial	*(Future)*
DS1-4CS	4-port DS1	032P098-011	Serial	*(Future)*
E1-2CS	2-port E1	032P098-002	Serial	*(Future)*
E1-4CS	4-port E1	032P098-001	Serial	*(Future)*
HSSI-DCE	2-port HSSI LIM, Frame (DCE)	032P022-001	Serial	*(Future)*
HSSI-DTE	2-port HSSI LIM, Cell (DTE)	032P022-002	Serial	*(Future)*
SI-2C	2-port serial I/O	032P094-002	Serial	*(Future)*
LCE-16	Legacy circuit emulation 16 link LIM	032P187-001	Serial	*(Future)*

PCE Controller Overview

Xedge Switch Version 7.3 and later supports the Xedge Packet Circuit Emulation Module (PCE). The PCE is a dual-width card that support all features found in the ISG2 along with the added features listed below.

Features & Benefits

- Circuit emulation (T1/E1, DS3/E3, Serial) with clock recovery over Ethernet, MPLS, VLAN, IP

- High speed Ethernet, Metro Ethernet & VLAN services

- Gigabit Ethernet ports for electrical (10,100,1000), or for Gig-E optical Small Form Factor Pluggable (SFP) transceivers

- Built-in IP router with RIP, OSPF

- Adaptive time independent data transport

- Conforms with IEEE 1588 Precision Time Protocol.

- Conformance to Ethernet standards including 802.1x port-based access control and 802.1p

- Conformance to SAToP, CESoPSN and TDMoIP

- Secure configuration and management via SNMP or MIB editor over Telnet/ craft connection, or via ProSphere Network Management System.

Traffic Control

The Xedge PCE offers a variety of traffic control mechanisms, including 802.1x port-based access control to regulate subscriber traffic during congestion events. This mechanism assures that priority traffic (e.g., real-time IP/ Ethernet flows) is not perturbed when the destination route encounters bursty traffic congestion.

The PCE also provides tunnel management and traffic queueing as part of its integrated QoS capabilities that include 802.1p support.

Power Up or Reboot Sequence

1. All three LED indicators off.

2. LNK FLT on, FLT and RUN alternately flashing.

3. RUN on, FLT flashing, LNK FLT on.

4. RUN on, FLT off, followed by normal LED indications as described in *Table 4-6*.
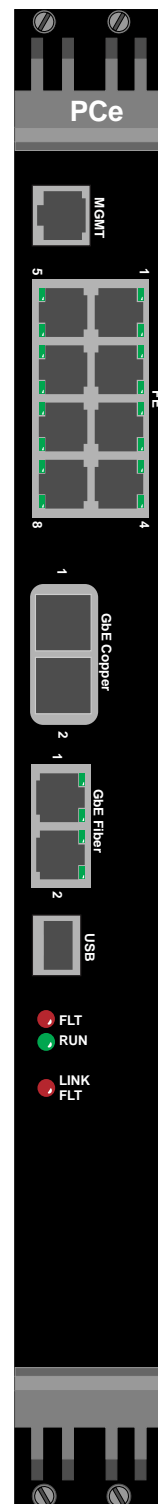
PCE Hardware Settings
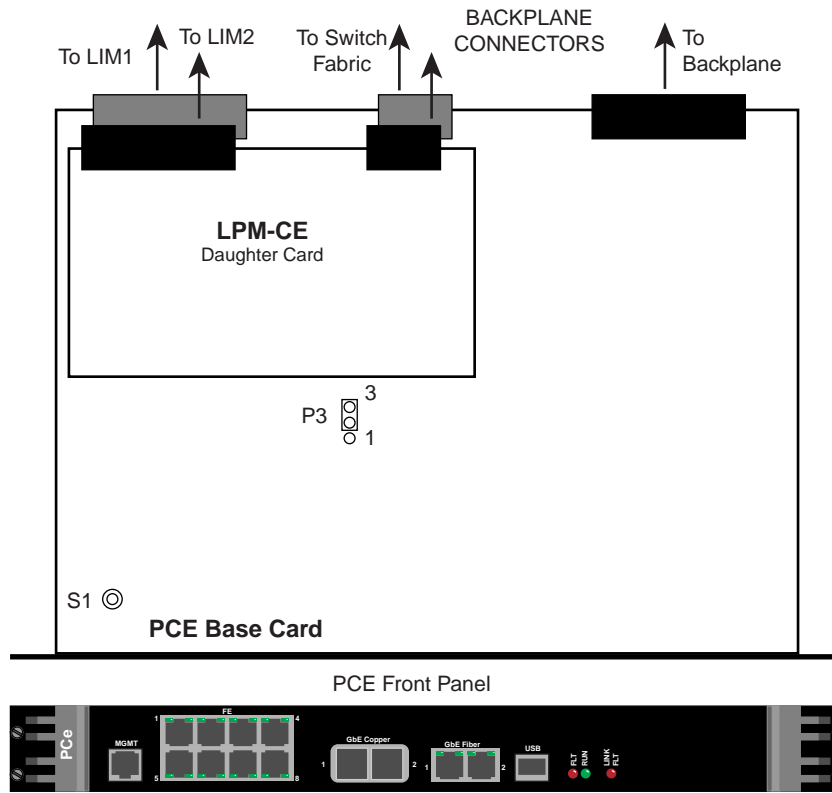
PCE Front Panel

Table 4-6   PCE Controls and Indicators

Items	Designation	Description
Front Panel LEDs	FLT LED	FLT (red) is normally off; Lit when a problem prevents the Slot Controller from functioning.
	RUN LED	RUN (green) illuminates when the Slot Controller is powered on and operating.
	LNK FLT	LNK FLT (red) is not supported in this release.
Jumper	P3	Only for use in factory tests. For normal operation, this jumper must be set to Pins 2 and 3, as shown above.
10/100 8-pin modular jacks	MGMT	Connects to Prosphere Server or the network of the ProSphere Server.
	USER	Connects to the Ethernet network.
16-position Rotary Switch	S1 *(See Figure 4-5)*	Set to 0 when Slot 0 PCE is in main slot 0 and slot 1 of Xedge 6002/6160/6280. Set to F to delete all user-defined configuration files and XOS code (i.e. to factory default)

Note   *IMPORTANT ! Be aware that when S1 is set to F, all user configuration files and XOS code will be erased from the card. This setting should be used with caution, and you must reset S1 back to 0, 4 or 8 immediately after reboot to prevent inadvertent erasure with subsequent reboots.*

Note   *Additional S1 settings can be used to reboot the card to kernel for troubleshooting purposes, under the guidance of your authorized Xedge field service representative.*

PCE Slot Locations
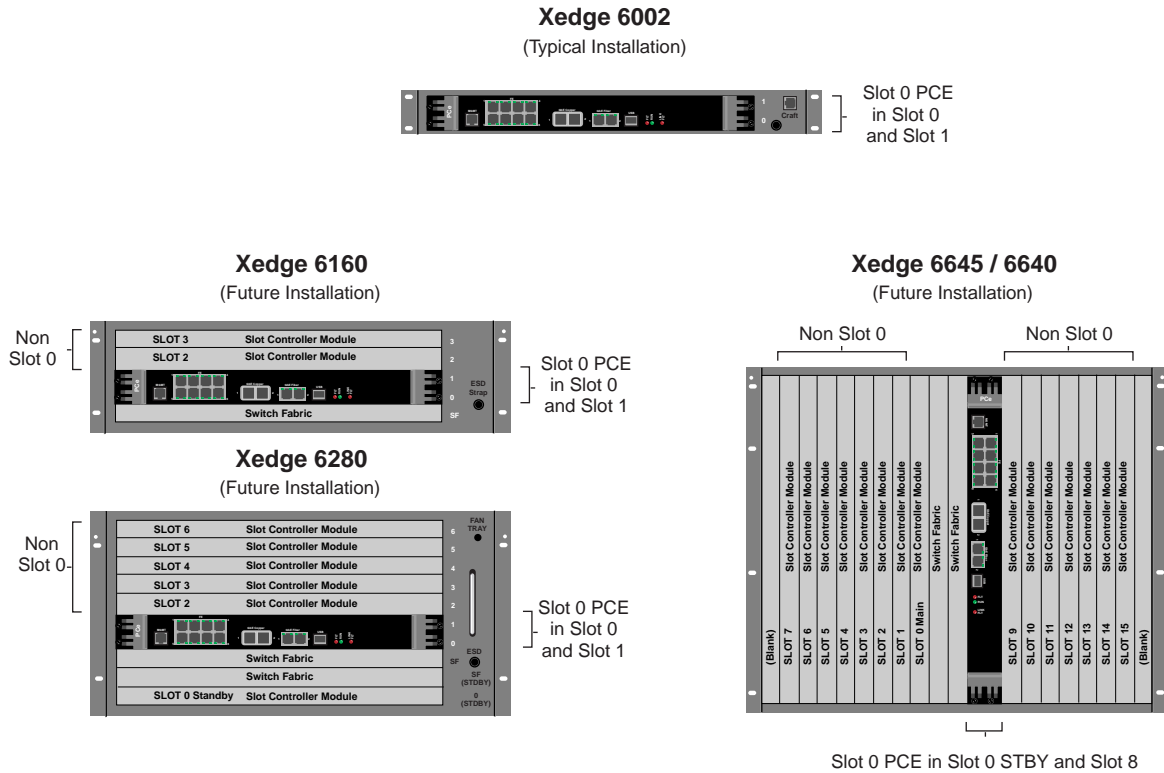
Figure 4-5   Installing the PCE in an Xedge Chassis

Note   *The current release of the Xedge PCE controller is intended for installation only in the Xedge 6002 chassis. Future releases will support additional Xedge chassis.*

Note   *Refer to Table 4-6 to properly set the S1 rotary switch on the PCE for the intended chassis and slot.*

Note   *The PCE card cannot be installed in Main Slot 0 of Xedge 6640 or 6645 chassis.*

Note   *For any Xedge chassis, Slot 0 PCE redundancy cannot be provided.*

PCE Assembly

The PCE assembly consists of a PCE base card and a LIM Personality Module (LPM-1) daughtercard. This assembly can support two Line Interface Modules (LIM1 and LIM2) installed at backplane connectors, as shown in the figure accompanying *Table 4-6*

- The PCE base card has a single connection to the main backplane, a single connection to the switch fabric and a single connection to LIM1.

- The LPM-CE daughtercard provides an additional connection to the switch fabric, and a connection to a second LIM (LIM2).

LPM/LIM Applications

The PCE is shipped with the LPM-CE daughtercard which accepts a varied combination of Serial LIMs installed as LIM1 and LIM2, as defined below.

PCE Assembly	LPM in Use	LIM1 (lower LIM slot)	LIM2 (upper LIM slot)
200M009-001	LPM-CE only	See *Table 4-7*	See *Table 4-7*

Note   *At the Physical Layout screen, a PCE with LIM cards installed will be displayed as* `Unknown`. *This does not affect the functionality of the PCE or its associated LIMs.*

Supported Line Interface Modules (LIMS)

Table 4-7 lists Xedge LIMs supported by the PCE. To set up hardware options and install LIMs for the PCE, refer to *Chapter 5, Line Interface Modules* . To configure LIMs, refer to the Xedge V7.3.x Configuration Guide.

Table 4-7   Xedge LIMs for PCE Module

Xedge LIMs	Application	Part No.	LIM Type	PCE Compatibility
DS3-2C	2-port DS3 LIM for ATM transport	032P046-001	Serial	Supported
DS1-2CS	2-port DS1	032P098-012	Serial	Supported
DS1-4CS	4-port DS1	032P098-011	Serial	Supported
E1-2CS	2-port E1	032P098-002	Serial	Supported
E1-4CS	4-port E1	032P098-001	Serial	Supported
E3-2C	2-port E3 LIM for ATM transport	032P108-001	Serial	Supported
SI-2C	2-port serial I/O	032P094-002	Serial	Supported
SI-4C	4-port serial I/O	032P094-001	Serial	Supported
ASIO	4-port adaptive serial I/O	032P194-001	Serial	Supported

Chapter 5: Line Interface Modules

Installation Overview

This section describes the front panel features, hard options and installation of the Xedge Line Interface Modules (LIMs). All LIMs are the same size and plug into universal slots at the rear of an Xedge chassis. All LIMs provide status LEDs that show the operational status of each physical port. LIMs also support alarms and performance monitoring. All LIMs have loopback settings from the line and from the controller for diagnostic purposes.

- *Table 1-2* and *Table 1-3* identify Xedge LIMs.

- *Figure 1-2* shows the location of LIMs as seen from the rear of the chassis.

- *Table 1-1* and *Table 1-4* provide a compatibility matrix of Xedge chassis, controllers and LIMs.

- *Table 1-5* details the performance capabilities of each controller/LIM combination.

Note   *LIMs are controlled by the software version that governs the slot controller to which it is attached.*

LIM Table of Contents

Installation Guidelines

In a new Xedge switch, the slot controllers and LIMs are shipped from the factory already installed in the chassis. This section provides basic procedures on the proper removal, replacement, setup and cabling of Xedge LIMs. See *Figure 5-1* for proper LIM locations in any Xedge chassis.

- When installing modules in a replacement chassis, remove the blank panels that cover each slot by loosening the two retaining screws.

- When handling LIMs, always use an antistatic wrist strap to prevent static discharge damage to the electronic circuits.

- It is not necessary to power down the chassis when swapping modules.

- To avoid damaging the EMI springs when installing a module in a chassis, carefully insert the module into its slot and fasten its front panel captive screws to the chassis before installing the next module. Similarly, modules should be removed one at a time, that is, unfasten the captive screws of one module and carefully remove that module from its slot before removing the next module. If the EMI springs are damaged, contact your authorized field service representative.

- Before installing any module, first set any jumpers or switches for your specific network configuration, as described in this chapter.

- For the DS3-2C, E3-2C and 155E-2 LIMs, be sure to comply with all domestic and international Class A EMI-RFI suppression requirements by installing the supplied ferrite beads (see *Figure 5-22* and *Figure 5-23*).

- Be aware that dedicated slots at the rear of the Xedge 6280, 6640 and 6645 chassis are intended for Network Timing Modules (NTM) only. Refer to *Chapter 6, Network Timing Modules* for information.

Note   *Refer to Chapter 2, Xedge Chassis Systems for additional information and procedures specific to your Xedge Chassis, including grounding, rack-mounting, power requirements, etc.*

LIM Removal/Replacement

1. Loosen the two captive screws on the front panel of the LIM and open the latches of the LIM you are replacing.

2. Gently pull the LIM out of the slot by its latches. There is slight resistance until the LIM connectors disconnect from the slot connectors. Place the LIM in anti-static packaging.

3. On the replacement LIM, set the jumper and/or switches for each module as required in your network. Refer to the appropriate section in this chapter for details on each LIM.

4. Determine the proper slot location for the particular LIM by referring to the slot/LIM compatibility information listed in *Table 1-4*.

5. Insert the edges of the LIM into the tracks of the slot and slide the module inward until it stops.

6. Tighten the two captive screws on the front panel of the LIM.

7. Connect the appropriate I/O lines to the LIM's front panel input connectors using the proper cables as listed in this chaper and in *Chapter 8, Cables & Peripherals* .

8. If necessary for your environment, be sure to comply with all domestic and international Class A EMI-RFI suppression requirements by installing the supplied ferrite beads for your chassis type, as shown in *Figure 5-22* or *Figure 5-23*).

9. The LIM is under the control of its slot controller. Refer to the Xedge Configuration Guide for the controller (Version 6.2 or Version 7.x) to properly configure the LIM.

Xedge 6002
Chassis Rear View

| POWER / FUSE PANEL | LIM 2 |
| | LIM 1 |

LIM Slot
Locations

Xedge 6160
Chassis Rear View

POWER SUPPLY OPTIONAL		SLOT 3 LIM
	PIM B	SLOT 2 LIM
		SLOT 1 LIM
POWER SUPPLY MAIN		SLOT 0 LIM
		SMM

LIM Slot
Locations

Xedge 6280
Chassis Rear View

B POWER SUPPLY STANDBY		SLOT 6 LIM
	PIM B	SLOT 5 LIM
		SLOT 4 LIM
B POWER SUPPLY MAIN		SLOT 3 LIM
		SLOT 2 LIM
A POWER SUPPLY STANDBY		SLOT 1 LIM
	PIM A	SLOT 0 LIM (Main)
		SMM
A POWER SUPPLY MAIN		NTM
		SLOT 0 LIM (Standby)

LIM Slot
Locations

Xedge 6640/6645
Chassis Rear View

BLANK | SLOT 15 | SLOT 14 | SLOT 13 | SLOT 12 | SLOT 11 | SLOT 10 | SLOT 9 | SLOT 8 | SLOT 0 STANDBY | BLANK | BLANK | SLOT 0 MAIN | SLOT 1 | SLOT 2 | SLOT 3 | SLOT 4 | SLOT 5 | SLOT 6 | SLOT 7 | BLANK

Secondary NTM
(if installed)

Primary NTM
(if installed)

LIM Slots Locations

Figure 5-1   Installing LIMs in an Xedge Chassis

OC-N / STM-N Overview

The OC-N / STM-N is an 8-port optical LIM intended for use only with a PCX slot controller for high speed ATM connections and Packet over SDH/SONET. It supports a maximum cell rate of 1,412,830 cells/sec and a physical line rate of 622 Mbps.

Front Panel Features

The front panel connectors provide easy port access to the eight ports. Each port requires a Singlemode or Multimode SFPs (Small Format Plugable) insert to be operable. Available SFPs are listed below:

- Singlemode: OC-N/STM-N SR (2K) 1310nm
- Singlemode: OC-N/STM-N IR (15K) 1310nm
- Singlemode: OC-N/STM-N LR (40K) 1310nm
- Singlemode: OC-N/STM-N LR (80K) 1550nm
- Multimode: OC3/STM1-SR (2k) 1310 nm

The front panel LEDs indicate LIM communication status. All LEDs are controlled by the PCx software. There are two LED indicators associated with each port.

- When lit, `IS` indicates that the port is enabled.
- When lit, `AL` indicates an alarm condition.

Hardware Setup

Cabling

Optical connector cables compatible with the installed SFPs are user-supplied.

Jumpers

Jumpers on the OC-N/STM-N LIM are for factory use only.

Installation

The OC-n / STM-N LIM occupies a rear panel slot of the switch that is associated with the corresponding PCX scontroller. When handling LIMs, always use an antistatic wrist strap to prevent static discharge damage to the electronic circuits.

1. Install the LIM into an empty PCx slot at the back panel of the chassis.

2. Insert the edges of the module into the tracks of the slot and slide the module inward until it stops. (LIMs are "hot-swappable".)

3. Refer to <u>OC-N/STM-N Applications on page 5-5</u> to determine your LIM application.

4. Connect the appropriate I/O line(s) to the LIM's front panel input connectors using the proper cables.

5. Refer to the Xedge Version 7.3 Configuration Guide to properly configure the LIM for your application.
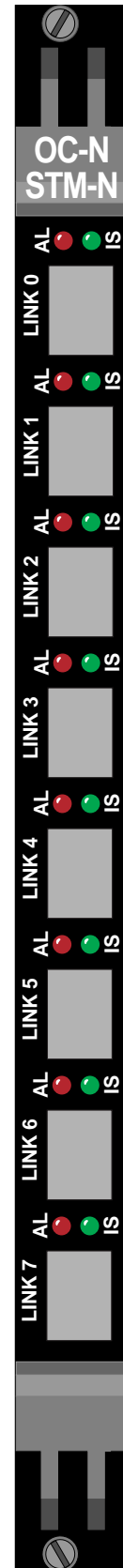
OC-N/STM-N Applications

The OC-N/STM-N LIM with the PCX can be configured to support a variety of LIM applications. The LIM card is physically divided into two parts of four links each. The following matrix demonstrates the permitted link locations for each LIM application, including Automatic Protection Switching (APS) applications.

Permitted Link Locations

LIM Applications	Link0	Link1	Link 2	Link 3	Link 4	Link 5	Link 6	Link 7
Eight OC-3s	OC-3	OC-3	OC-3	OC-3	OC-3	OC-3	OC-3	OC-3
Four OC-3s with APS	OC-3	APS	OC-3	APS	OC-3	APS	OC-3	APS
Two OC-3s; One OC-12	OC-3	OC-3	--	--	OC-12	--	--	--
Two OC-3s with APS; One OC-12 with APS	OC-3	APS	OC-3	APS	OC-12	APS	--	--
Four OC-3s; One OC-12	OC-12	--	--	--	OC-3	OC-3	OC-3	OC-3
Two OC-3s with APS; One OC-12 with APS	OC-12	APS	--	--	OC-3	APS	OC-3	APS
Two OC-12s with APS	OC-12	APS	--	--	OC-12	APS	--	--

Note   *The limitation of the switch fabric is two OC-3s.*

Note   *For detailed information on configuring the OC-N/STM-N LIM for use with the PCx Slot Controller, refer to the Xedge V7x Configuration Guide.*

ASIO LIM

The ASIO LIM is a quad port LIM intended for use with the CE, ACP, PCx or the PCE slot controller for clear channel circuit emulation over Ethernet or ATM cell switching. It supports data rates from 1000 bps to 10 Mbps in 1 bps increments.

Front Panel Features

The front panel connectors provide easy access to the ports. Each port supports EIA-530, EIA-530A, EIA-449, ITU-T X.21, ITU-T V.35 and RS-232 via programmable SCC technology (Smart Cable Connectors).

The front panel LEDs indicate LIM communication status. All LEDs are controlled by the slot controller software. There are two LED indicators associated with each port.

- When lit, **IS** indicates that the port is enabled.
- When lit, **LB** indicates a loopback test in progress.

Hardware Setup

Cabling

SCC trechnology

Jumpers

Jumpers on the ASIO LIM are for factory use only.

Installation

The ASIO LIM occupies a rear panel slot of the switch that is associated with the corresponding controller. When handling LIMs, always use an antistatic wrist strap to prevent static discharge damage to the electronic circuits.

1. Install the LIM into an empty slot at the back panel of the chassis.

2. Insert the edges of the module into the tracks of the slot and slide the module inward until it stops. (LIMs are "hot-swappable".)

3. Connect the appropriate I/O line(s) to the LIM's front panel input connectors using the proper cables.

4. Refer to your Xedge Configuration Guide to properly configure the LIM for your application.

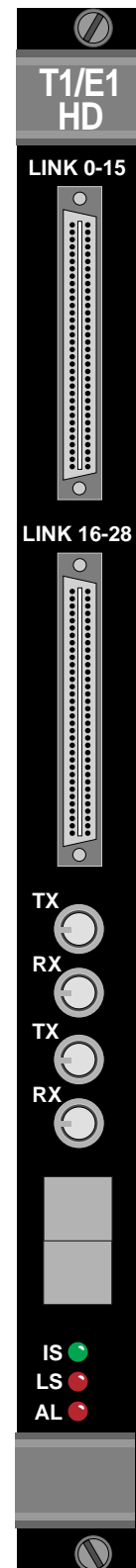**Figure 5-2**   ASIO LIM Front Panel Features

Note   *Future models of the ASIO LIM (ASIO-TTL and ASIO-HSSI) will support higher speed serial interfaces up to 45 Mbps.*

Analog Voice LIM

The Xedge ANA Voice LIM supports from four to as many as 12 voice channels in a variety of voice protocols by means of interface cards on the LIM base card:

- Up to three FXS and/or FXO interface cards in 4-port increments, in any combination.

- One 2/4 W E&M interface card with 8 ports. Can be used with one FXS or FXO interface card for an additional 4 ports.

Front Panel Features

The front panel connectors provide easy access to the ports. The front panel LEDs indicate LIM communication status. All LEDs are controlled by the slot controller software. There are two LED associated with each port.

Hardware Setup

Cabling

RJ-45 8-pin modular jacks. When the 8-port E&M interface card is installed, an adapter cable (GDC P/N 025H605-006) is required to terminate the voice channels at a customer premise distribution panel or similar device.

Jumpers

Jumpers on the Analog Voice LIM are for factory use only.

Installation

The Analog Voice LIM occupies a rear panel slot of the switch that is associated with the corresponding controller. When handling LIMs, always use an antistatic wrist strap to prevent static discharge damage to the electronic circuits.

1. Install the LIM into an empty slot at the back panel of the chassis.

2. Insert the edges of the module into the tracks of the slot and slide the module inward until it stops. (LIMs are "hot-swappable".)

3. Connect the appropriate I/O line(s) to the LIM's front panel input connectors using the proper cables.

4. Refer to the Xedge Version 7.3 Configuration Guide to properly configure the LIM for your application.
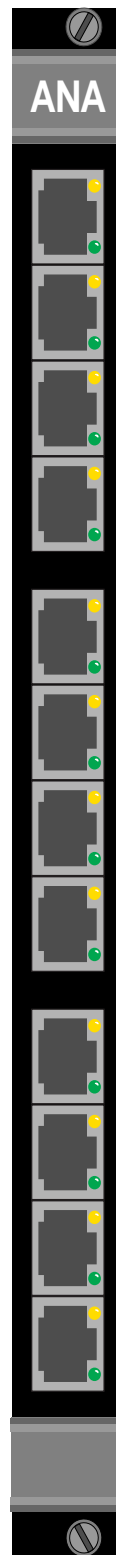
Figure 5-3   Analog Voice LIM Front Panel Features

T1/E1 16 Port MP LIM

The T1/E1 Multi-Protocol LIM is a 16-port LIM intended for use with the PCx-2 slot controller for three modes of circuit emulation (SAT0P, CESoP, AAL-1) or the Multi-Link Point-to-Point Protocol. It supports T1 data rates up to 1.544 Mbps, and E1 data rates up to 2.048 Mbps.

Front Panel Features

The front panel connectors provide easy access to the ports. The front panel LEDs indicate LIM communication status. All LEDs are controlled by the slot controller software:

- **IS** LED illuminates when the link is in-service.
- **LS** LED illuminates when there is a receive loss of signal alarm for the link.
- **AL** LED illuminates during loopback tests; Blinks when the link hardware detects an out-of-frame error on the receive line.

Front Panel Connectors

- **LINK 0-15** is a female 68-pin amplimite connector for attaching external communication devices to links 0 through 15.
- *Table 5-1* shows the front panel cable assembly and lists the pin/signal designations.

Hardware Setup

Jumpers

Jumpers on the T1/E1 MP LIM are for factory use only.

Installation

The T1/E1 MP LIM occupies a rear panel slot of the switch that is associated with the corresponding controller. When handling LIMs, always use an antistatic wrist strap to prevent static discharge damage to the electronic circuits.

1. Install the LIM into an empty slot at the back panel of the chassis.

2. Insert the edges of the module into the tracks of the slot and slide the module inward until it stops. (LIMs are "hot-swappable".)

3. Connect the appropriate I/O line(s) to the LIM's front panel input connectors using the proper cables.

4. Refer to the Xedge Version 7.3 Configuration Guide to properly configure the LIM for your application.
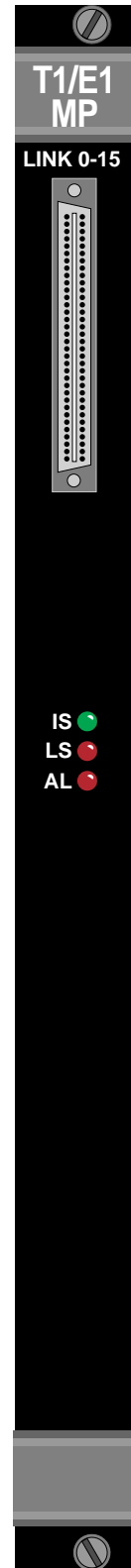
Figure 5-4   T1/E1 MultiProtocol LIM Front Panel Features

Table 5-1

027H703-008
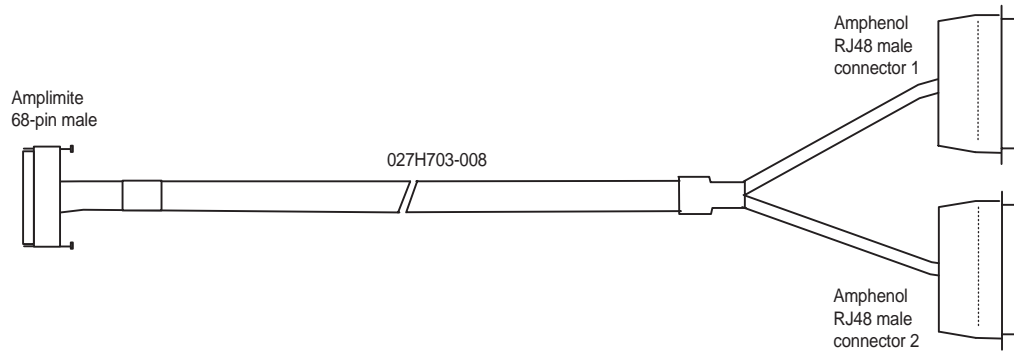
DS1 #	Signal	Amplimite 68-Pin	RJ48M/Amphenol 50-Pin Connector (1)		DS1 #	Signal	Amplimite 68-Pin	RJ48M/Amphenol 50-Pin Connector (2)	
1	TX Ring	26	26		9	TX Ring	31	26	
	TX Tip	60	1			TX Tip	65	1	
	RX Ring	8	27			RX Ring	13	27	
	RX Tip	42	2			RX Tip	47	2	
	N/A		28			N/A		28	
	N/A		3			N/A		3	
2	TX Ring	22	29		10	TX Ring	27	29	
	TX Tip	56	4			TX Tip	61	4	
	RX Ring	4	30			RX Ring	9	30	
	RX Tip	38	5			RX Tip	43	5	
	N/A		31			N/A		31	
	N/A		6			N/A		6	
3	TX Ring	21	32		11	TX Ring	28	32	
	TX Tip	55	7			TX Tip	62	7	
	RX Ring	3	33			RX Ring	10	33	
	RX Tip	37	8			RX Tip	44	8	
	N/A		34			N/A		34	
	N/A		9			N/A		9	
4	TX Ring	20	35		12	TX Ring	29	35	
	TX Tip	54	10			TX Tip	63	10	
	RX Ring	2	36			RX Ring	11	36	
	RX Tip	36	11			RX Tip	45	11	
	N/A		37			N/A		37	
	N/A		12	1		N/A		12	2
5	TX Ring	19	38		13	TX Ring	30	38	
	TX Tip	53	13			TX Tip	64	13	
	RX Ring	1	39			RX Ring	12	39	
	RX Tip	35	14			RX Tip	46	14	
	N/A		40			N/A		40	
	N/A		15			N/A		15	
6	TX Ring	34	41		14	TX Ring	23	41	
	TX Tip	68	16			TX Tip	57	16	
	RX Ring	16	42			RX Ring	5	42	
	RX Tip	50	17			RX Tip	39	17	
	N/A		43			N/A		43	
	N/A		18			N/A		18	
7	TX Ring	33	44		15	TX Ring	24	44	
	TX Tip	67	19			TX Tip	58	19	
	RX Ring	15	45			RX Ring	6	45	
	RX Tip	49	20			RX Tip	40	20	
	N/A		46			N/A		46	
	N/A		21			N/A		21	
8	TX Ring	32	47		16	TX Ring	25	47	
	TX Tip	66	22			TX Tip	59	22	
	RX Ring	14	48			RX Ring	7	48	
	RX Tip	48	23			RX Tip	41	23	
	N/A		49			N/A		49	
	N/A		24			N/A		24	
	Unused		50			Unused		50	
	Unused		25			Unused		25	

NOTE: For all DS1 (1-16), TX Ring & TX Tip are wired as a twisted pair; RX Tip & RX Ring are wired as a twisted pair.

T1/E1 32 Port HD LIM

The T1/E1 High Density LIM is a 32-port LIM intended for use with the PCx-2 slot controller for aggregation of T1, E1, OC-3, OC-12, E3 and DS3 circuits across a packet network. It supports the following rates:

- T1 data rates up to 1.544 Mbps
- E1 data rates up to 2.048 Mbps
- DS3 data rates up to 44.736 Mbps
- OC3 rates up to 599.03 Mbps

Front Panel Features

The front panel connectors provide easy access to the ports. The front panel LEDs indicate LIM communication status. All LEDs are controlled by the slot controller software:

- **IS** LED illuminates when the link is in-service.
- **LS** LED illuminates when there is a receive loss of signal alarm for the link.
- **AL** LED illuminates during loopback tests; Blinks when the link hardware detects an out-of-frame error on the receive line.

Front Panel Connectors

- **LINK 0-15** and **LINK 16-28** are female 68-pin amplimite connectors for attaching external communication devices to links 0 through 28.
- *Table 5-1* shows the front panel cable assebly and lists the pin/signal designations.

Hardware Setup

Jumpers

Jumpers on the T1/E1 HD LIM are for factory use only.

Installation

The T1/E1 HD LIM occupies a rear panel slot of the switch that is associated with the corresponding controller. When handling LIMs, always use an antistatic wrist strap to prevent static discharge damage to the electronic circuits.

1. Install the LIM into an empty slot at the back panel of the chassis.

2. Insert the edges of the module into the tracks of the slot and slide the module inward until it stops. (LIMs are "hot-swappable".)

3. Connect the appropriate I/O line(s) to the LIM's front panel input connectors using the proper cables.

4. Refer to the Xedge Version 7.3 Configuration Guide to properly configure the LIM for your application.

Figure 5-5   T1/E1 HD LIM Front Panel Features

DS3-2C Overview

The DS3-2C LIM is a two port DS3 LIM for ATM transport that can be used with a variety of controllers listed in *Table 1-4*.

Front Panel indicators

- **IS** illuminates when link is in-service.

- **OS** illuminates when link is out of service. Glows dimly when the LIM is in a not communicating correctly with the Slot Controller.

- **LB** illuminates during line loopback tests.

- **RD** illuminates when there is a receive (red) loss of frame alarm or loss of signal.

- **BL** illuminates when there is a receive blue alarm indication signal (AIS) alarm.

- **LS** illuminates when there is a receive loss of signal alarm.

- **YL** illuminates when there is a receive yellow alarm (FERF- Far End Receive Failure).

- **ER** illuminates when there is an error on the link receive line. (A parity error is an example of an error that causes ER to light.)

Front Panel Connectors

- The DS3-2C LIM uses one 75-ohm coaxial cable each for transmit and receive, following $\sqrt{F}$ law. (Insertion loss per ANSI T1.102, Figure-9.)

- **LINK 0 TX** is a 75-ohm BNC connector for the link 0 transmit line.
  LINK 0 RX is a 75-ohm BNC connector for the link 0 receive line.

- **LINK 1 TX** is a 75-ohm BNC connector for the link 1 transmit line.
  LINK 1 RX is a 75-ohm BNC connector for the link 1 receive line.

- IMPORTANT! Refer to *Class A EMI-RFI Suppression Requirements* (*Figure 5-22*) to comply with all domestic and international standards.
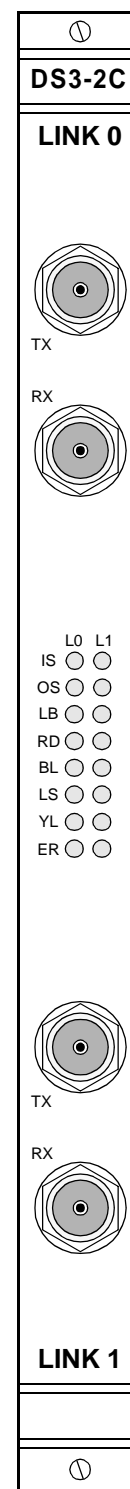
Figure 5-6   DS3-2C LIM Front Panel Features

E3-2C Overview

The E3-2C LIM is a two port E3 LIM for ATM transport that can be used with a variety of controllers listed in *Table 1-4*.

Front Panel Indicators

- **IS** illuminates when link is in-service.
- **OS** illuminates when link is out of service. Glows dimly when the LIM is in a not communicating correctly with the Slot Controller.
- **LB** illuminates during line loopback tests.
- **RD** illuminates when there is a receive (red) loss of frame alarm or loss of signal.
- **BL** illuminates when there is a receive blue alarm indication signal (AIS) alarm.
- **LS** illuminates when there is a receive loss of signal alarm.
- **YL** illuminates when there is a receive yellow alarm (Far End Receive Failure).
- **ER** (Receive Line Error) is not used.

Front Panel Connectors

- The E3-2C LIM uses one 75-ohm coaxial cable each for transmit and receive, following $\sqrt{F}$ law. The maximum insertion loss is 12 db at 17.184 MHz.

- **LINK 0 TX** is a 75-ohm BNC connector for the link 0 transmit line.
  LINK 0 RX is a 75-ohm BNC connector for the link 0 receive line.

- **LINK 1 TX** is a 75-ohm BNC connector for the link 1 transmit line.
  LINK 1 RX is a 75-ohm BNC connector for the link 1 receive line.

- IMPORTANT! Refer to *Class A EMI-RFI Suppression Requirements* (*Figure 5-22*) to comply with all domestic and international standards.

Jumper Settings

Each E3-2C LIM link has a jumper (*Figure 5-7*) that must be set prior to installing the LIM in the chassis. When the jumper is set, the receive shield is connected to chassis ground. When removed, the receive shield is isolated from chassis ground.
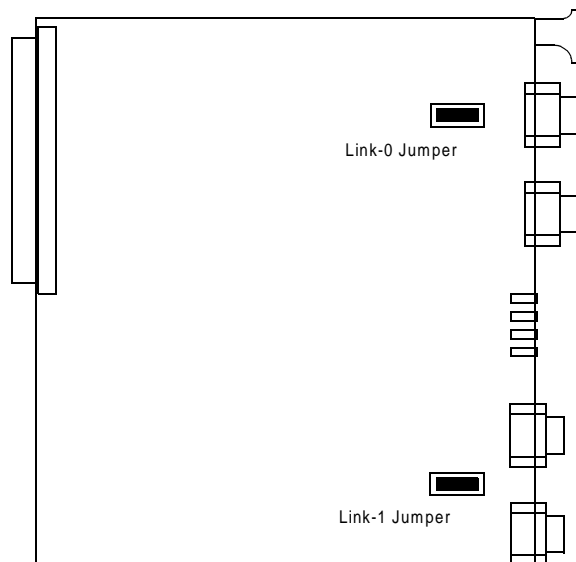
Figure 5-7   E3-2C LIM Front Panel Features and Jumper Positions
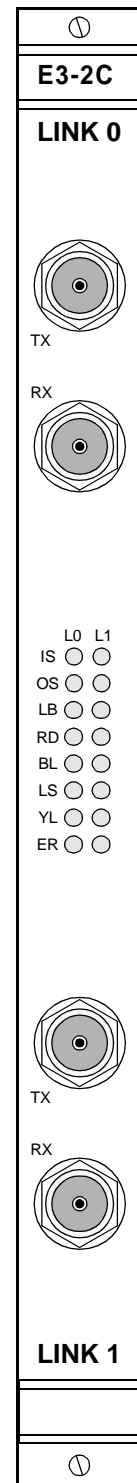
DS1-2CS and DS1-4CS Overview

The DS1-2CS and the DS1-4CS LIMs are 2- and 4-port DS1 LIMs with voice capability that can be used with a variety of controllers listed in *Table 1-4*.

Front Panel Indicators

- **IS** LED illuminates when the link is in-service.

- **LS** LED illuminates when there is a receive loss of signal alarm for the link.

- **AL** LED illuminates during loopback tests; Blinks when the link hardware detects an out-of-frame error on the receive line.

Front Panel Connectors

- **LINK 0** and **LINK 1** on the DS1-2CS LIM are female DB-15 connectors for the Link 0 and Link 1 T1 transmit and receive line.

- **LINK 0**, **LINK 1**, **LINK 2**, **and LINK 3** on the DS1-4CS LIM are female DB-15 connectors for the Link 0, Link 1, Link 2 and Link 3 T1 transmit and receive lines, respectively.

- *Table 5-2* lists the pin/signal designation.

Cabling

- The DS1-2CS and DS1-4CS LIM uses one 100-ohm shielded twisted pair each for transmit and receive, following $\sqrt{F}$ law. Maximum insertion loss is approximately 2.8 db at 772 kHz (655-feet of 22 AWG wire). The cables are terminated with a male DB-15 connector.
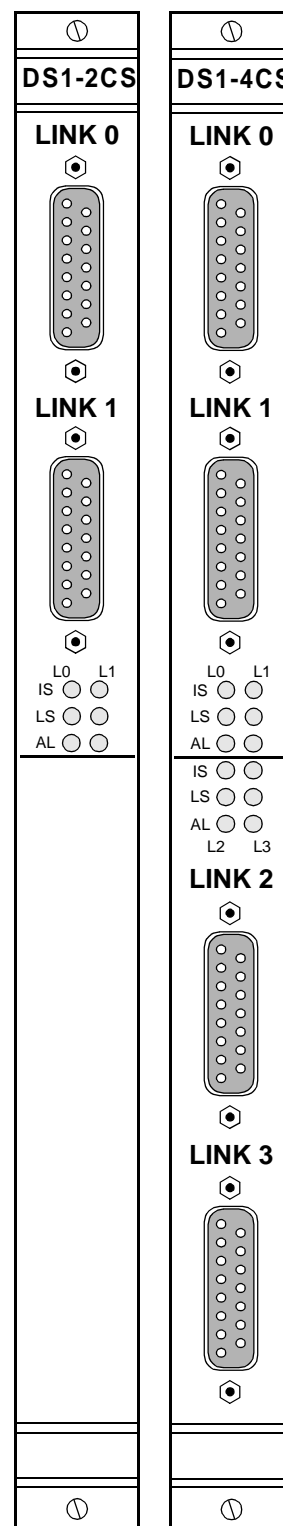
Hardware Settings

Each link on the DS1 LIM has a group of jumpers that must be set as a 100 ohm link type. The jumpers are located near their associated link connector on the LIM, as shown in the figure below. Two jumpers for each channel must be positioned in the upper row of pins as shown.
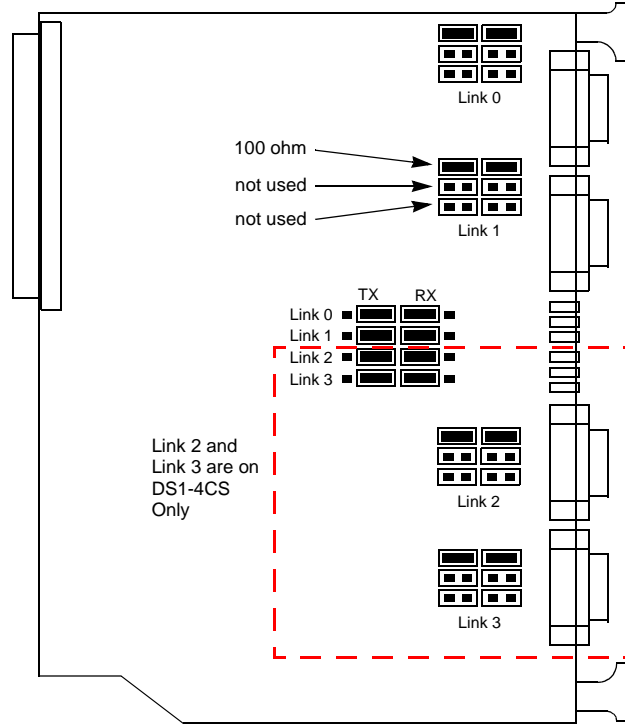
Figure 5-8   DS1-2CS and DS1-4CS LIM Jumper Positions

TX-RX Shield Jumper Setting

On the DS1 LIMs, you must ensure TX and RX jumpers are positioned properly in order to connect TX and RX shields to chassis ground. These jumpers are located towards the center of the LIM, as shown in *Figure 5-8*. There are four rows of six pins, one row for each Link. The left-most set pins are the TX setting for each Link; the right-most set of pins are the RX setting for each Link.

• With the jumpers set as shown in *Figure 5-8*, the TX and RX shields for each Link (DB15 pins 12 and 10, respectively) are connected to chassis ground.

• Setting the jumpers to the left and right outermost positions isolates the transmit and receive shields, respectively, from chassis ground.

Table 5-2   DS1 LIM Pinouts

Pin Number	Signal Designation
1	Receive signal
3	Transmit signal
9	Receive return
11	Transmit return
10	Receive shield
12	Transmit shield

E1-2CS and E1-4CS LIM Overview

The E1-2CS and the E1-4CS LIMs are 2- and 4-port E1 LIMs with voice capability that can be used with a variety of controllers listed in *Table 1-4*.

Front Panel indicators

- **IS** LED illuminates when the link is in-service.

- **LS** LED illuminates when there is a receive loss of signal alarm for the link.

- **AL** LED illuminates during loopback tests; Blinks when the link hardware detects an out-of-frame error on the receive line.

Front Panel Connectors

- **LINK 0** and **LINK 1** on the E1-2CS LIM are female DB-15 connectors for Link 0 and Link 1 E1 transmit and receive line.

- **LINK 0**, **LINK 1**, **LINK 2**, **and LINK 3** on the E1-4CS LIM are female DB-15 connectors for Link 0, Link 1, Link 2 and Link 3 T1 transmit and receive lines, respectively.

- *Table 5-3* lists the pin/signal designations.

E1-2CS or E1-4CS Cabling

The E1-2CS and E1-4CS LIM links are cabled according to the configured link type:
120-ohm balanced or 75-ohm unbalanced.

- When configured for 120-ohm balanced mode, use one 120-ohm twisted pair each for transmit and receive, following $\sqrt{F}$ law. The maximum insertion loss is 6-db at 1024-kHz.

- When configured for 75-ohm unbalanced mode, use one 75-ohm coaxial cable each for transmit and receive, following $\sqrt{F}$ law. The maximum insertion loss is 6-db at 1024-kHz.

   - For E1-2C or E1-4C LIMs in 75-ohm mode, you must use the DB 15-to-BNC adapter, Part Number 029H212-001.

   - For E1-2CS or E1-4CS LIMs in 75-ohm mode, you must use the DB 15-to-BNC adapter, Part Number 029H214-001.
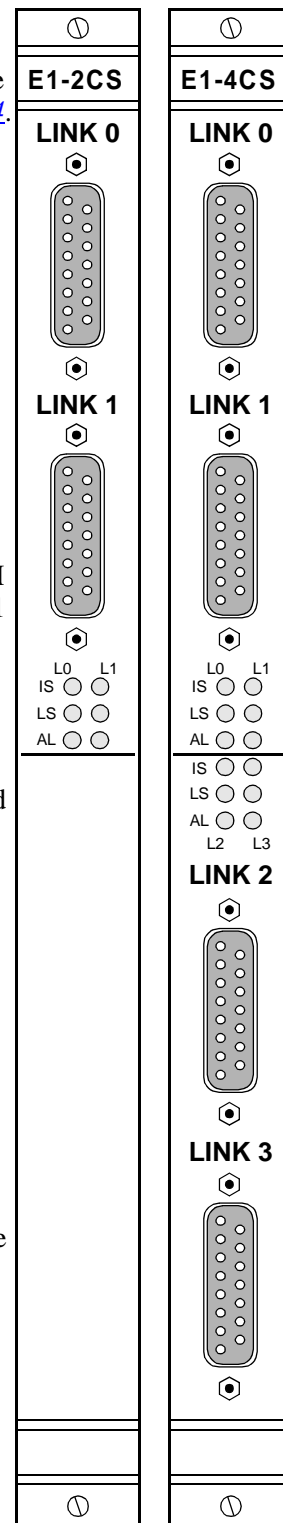
Figure 5-9   E1-2CS and E1-4CS LIM Front Panels

Hardware Settings
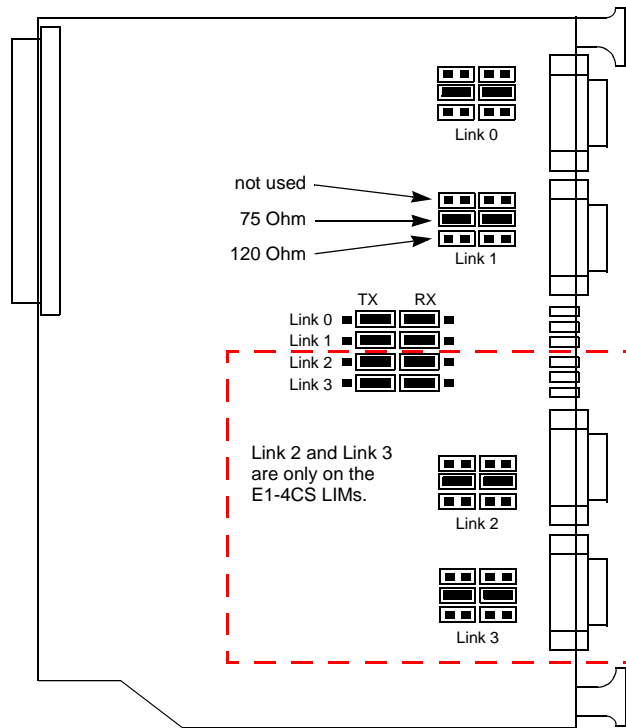
Figure 5-10   E1-2CS and E1-4CS LIM Jumper Positions

Link Type Jumper Settings

Each link on the E1-2CS or E1-4CS LIM has a group of jumpers that must be set to 75 ohms unbalanced or 120 ohms balanced operation. The jumpers are located near their associated link connector (*Figure 5-10*). The two jumpers for each channel must be positioned in either the middle row of pins (75 ohms unbalanced) or the lower row (120 ohms balanced)

TX-RX Shield Jumper Setting

On the E1 LIMs, you must ensure TX and RX jumpers are positioned properly in order to connect TX and RX shields to chassis ground. These jumpers are located towards the center of the LIM, as shown in *Figure 5-10*. There are four rows of six pins, one row for each Link. The left-most set pins are the TX setting for each Link; the right-most set of pins are the RX setting for each Link.

• With the jumpers set as shown in *Figure 5-10*, the TX and RX shields for each Link (DB15 pins 12 and 10, respectively) are connected to chassis ground.

• Setting the jumpers to the left and right outermost positions isolates the transmit and receive shields, respectively, from chassis ground.

Table 5-3   E1-2CS and E1-4CS LIM Pinouts

Pin Number	Signal Designation
1	Receive signal
3	Transmit signal
9	Receive return
11	Transmit return
10	Receive shield
12	Transmit shield

155 Series LIMs Overview

The 155 series of OC-3/STM- LIMs are intended for use with a variety of controllers listed in *Table 1-4*. These dual port optical LIMs with Automatic Protection Switching support single mode, multimode or long reach single mode configurations, as described below. When APS is off, the LIM has two working links. The APS feature can be software configured to be active or inactive.

- The 155M-2 LIM is a dual-port, short reach, OC-3c/STM-1 LIM with single port APS. It uses two SC fiber connectors for the link interface. When configured for APS, the LIM has one working link, backed up by one APS protection link.

- The 155I-2 LIM is a dual-port, intermediate reach, OC-3c/STM-1 LIM with single port APS. It uses two SC fiber connectors for the link interface. When configured for APS, the LIM has one working link, backed up by one APS protection link.

- The 155L-2 LIM is a dual-port, long reach, OC-3c/STM-1 LIM with single port APS. It uses two SC fiber connectors for the link interface. When configured for APS, the LIM has one working link, backed up by one APS protection link.
  (If loop testing, see note below.)

- The 155M-APS LIM is a dual-port, short reach, OC-3c/STM-1 LIM with dual port APS. It uses four SC fiber connectors (two working, and two APS protection) for the link interface. When configured for APS, the LIM has two working links, each backed up by an APS protection link dedicated to it.

- The 155I-APS LIM is a dual-port, intermediate reach, OC-3c/STM-1 LIM with dual port APS. It uses four SC fiber connectors (two working, and two APS protection) for the link interface. When configured for APS, the LIM has two working links, each backed up by an APS protection link dedicated to it.

- The 155L-APS LIM is a dual-port, long reach, OC-3c/STM-1 LIM with dual port APS. It uses four SC fiber connectors (two working, and two APS protection) for the link interface. When configured for APS, the LIM has two working links, each backed up by an APS protection link dedicated to it.
  (If loop testing, see note below.)
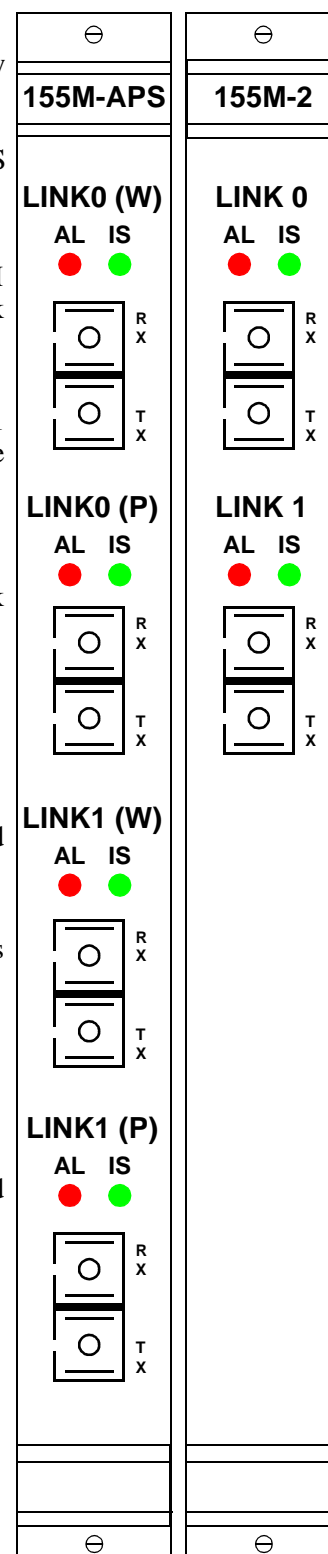
Note   *When loop testing a long-reach 155 Series LIM, the TX signal must be attenuated by 15dB. Without attenuation, the receiver input may be overdriven.These are dual port optical LIMs with Automatic Protections Switching include the 155M-2, 155I-2, 155L-2, 155M-APS, 155I-APS, 155L-APS*

155 Series Specifications and Cabling

Table 5-4   Technical Specifications, 155 Series OC-3c/STM-1 Optical LIMs

LIM Type/ Part Number	Power Range (dBm)				Wavelength (+50/-50 nm)	Fiber Type (core/cladding)	Dispersion Limitation
	Receiver Sensitivity		Transmitter Launch Power				
Short Reach	**Min**	**Max**	**Min**	**Max**		**Multimode**	
032P150-001	-23	-8	-15	-8	1310 nm	62.5/125 microns	2 km*
032P150-001	-23	-8	-15	-8	1310 nm	62.5/125 microns	2 km*

Intermediate Reach	Min	Max	Min	Max		Single Mode	
032P150-002	-28	-8	-15	-8	1310 nm	8/125 microns	34 km**
032P015-012	-28	-8	-15	-8	1310 nm	8/125 microns	34 km**

Long Reach	Min	Max	Min	Max		Single Mode	
032P150-003	-34	-10	-5	+0	1310 nm	8/125 microns	65 km**
032P015-013	-34	-10	-5	+0	1310 nm	8/125 microns	65 km**

Typical Network Attenuation Factors	
Component	**Attenuation**
Single Mode Cable	0.5 dB.km
Multimode Cable	1.0 dB/km
Cable Connector	1.0 dB
Cable Splice	0.5 dB
Power Penalty, Single Mode	1.0 dB
Power Penalty, Multimode	2.0 dB
Higher Order Losses	0.5 dB (Multimode only)
Clock Recovery Module	1.0 dB

NOTES:	* Power penalty calculation is beyond the scope of this manual. ** Calculation uses a maximum dispersion of 2.8 ps/nm km and a 1.0 dB power penalty.

Note   *For additional cabling information, such as part numbers and descriptions of all Xedge cables, refer to Chapter 8, Cables & Peripherals .*

155x-2 and 155x-APS LIMs Front Panel Indictors

- **AL** (Alarm) LED illuminates RED when link is enabled and a LIM fault exists. When off, the link is disabled or no LIM fault exists.

- **IS** (In Service)LED illuminates GREEN when link is enabled and there is valid communication with the associated Slot Controller. When off, the link is disabled or there is no Slot Controller communication. In the diagnostic mode, this LED flashes.

Only 155x-2 LIMs Front Panel Connectors

- **Link 0 Rx** is the SC type fiber connector for Link-0 receive.

- **Link 0 Tx** is the SC type fiber connector for Link-0 transmit.

- **Link 1 Rx** is the SC type fiber connector for Link-1 receive.

- **Link 1 Tx** is the SC type fiber connector for Link-1 transmit.

Only 155x-APS LIMs Front Panel Connectors

- **Link 0 (W)** (Working Receive) is the SC type fiber connector carrying receive traffic for Link-0 in a non-failover condition.

- **Link 0 (W)** (Working Transmit) is the SC type fiber connector carrying transmit traffic for Link-0 in a non-failover condition.

- **Link 0 (P) Rx** (Protection Receive) is the SC type fiber connector carrying receive traffic for Link-0 in a failover condition.

- **Link 0 (P) Tx** (Protection Transmit) is the SC type fiber connector carrying transmit traffic for Link-0 in a failover condition.

- **Link 1 (W) Rx** (Link 1 Working Receive) is the SC type fiber connector carrying receive traffic for Link-1 in a non-failover condition.

- **Link 1 (W) Tx** (Link 1 Working Transmit) is the SC type fiber connector carrying transmit traffic for Link-1 in a non-failover condition.

- **Link 1 (P) Rx** (Link 1 Protection Receive) is the SC type fiber connector carrying receive traffic for Link-1 in a failover condition.

- **Link 1 (P) Tx** (Link 1 Protection Transmit) is the SC type fiber connector carrying transmit traffic for Link-1 in a failover condition.

155 Series Jumper Settings

There are no user-selectable jumpers on the 155 series LIM. The X1 jumper shown in the figure below is for factory use only. It is shown here for reference only. The **`Normal (store)`** position shown (Pins 1 and 2) is just for storing the jumper. That is, removing the jumper from this "store" position has no effect on the operation of the LIM.
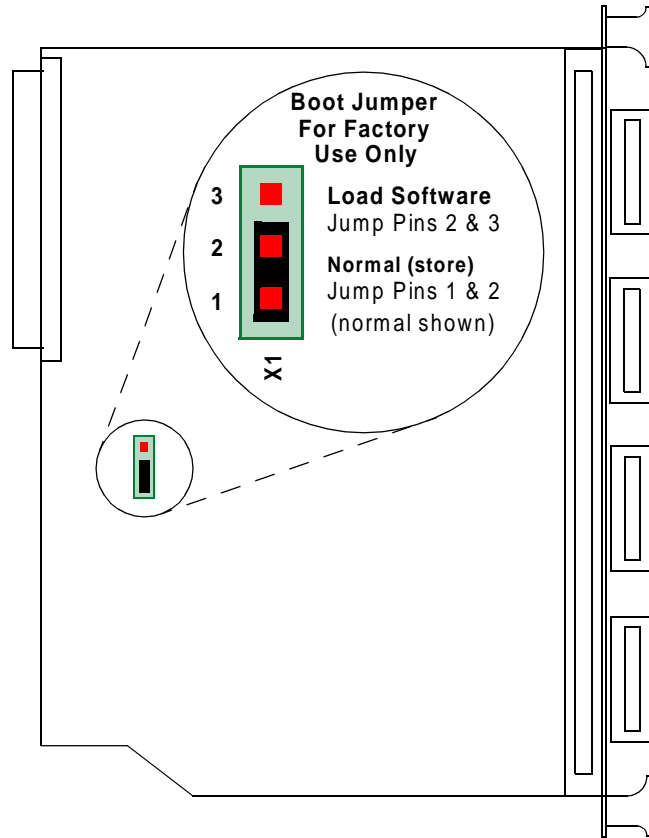
Figure 5-11 155 Series OC-3c/STM-1 Optical LIMs Jumper Position (155M-APS shown)

155E-2 STM-1 Electrical LIM Overview

The 155E-2 STM-1 Electrical LIM can be used with a variety of controllers listed in *Table 1-4*. This dual port STM-1 electrical interface LIM transmits/receives data over a pair of 75 ohm coaxial cables at a speed of 155.52 Mbps, using the concatenated framing format for ATM over the SONET/SDH as defined in ITU-T I.432, ANSI T1.646 and Bellcore GR-253-CORE. The 155E-2 LIM is clock-friendly and capable of interfacing with the Xedge system timing reference bus.

Front Panel Indictors

- **AL** (Alarm) LED illuminates RED when link is enabled and a LIM fault exists at the associated link. When off, the link is disabled or no LIM fault exists.

- **IS** (In Service)LED illuminates GREEN when the associated link is enabled and there is valid communication with the associated Slot Controller. When off, the link is disabled or there is no Slot Controller communication. In the diagnostic mode, this LED flashes.

Front Panel Connectors

- **Link 0 Tx** is the coaxial BNC connector for the Link-0 transmit signal.
- **Link 0 Rx** is the coaxial BNC connector for the Link-0 receive signal.
- **Link 1 Tx** is the coaxial BNC connector for the Link-1 transmit signal.
- **Link 1 Rx** is the coaxial BNC connector for the Link-2 receive signal.
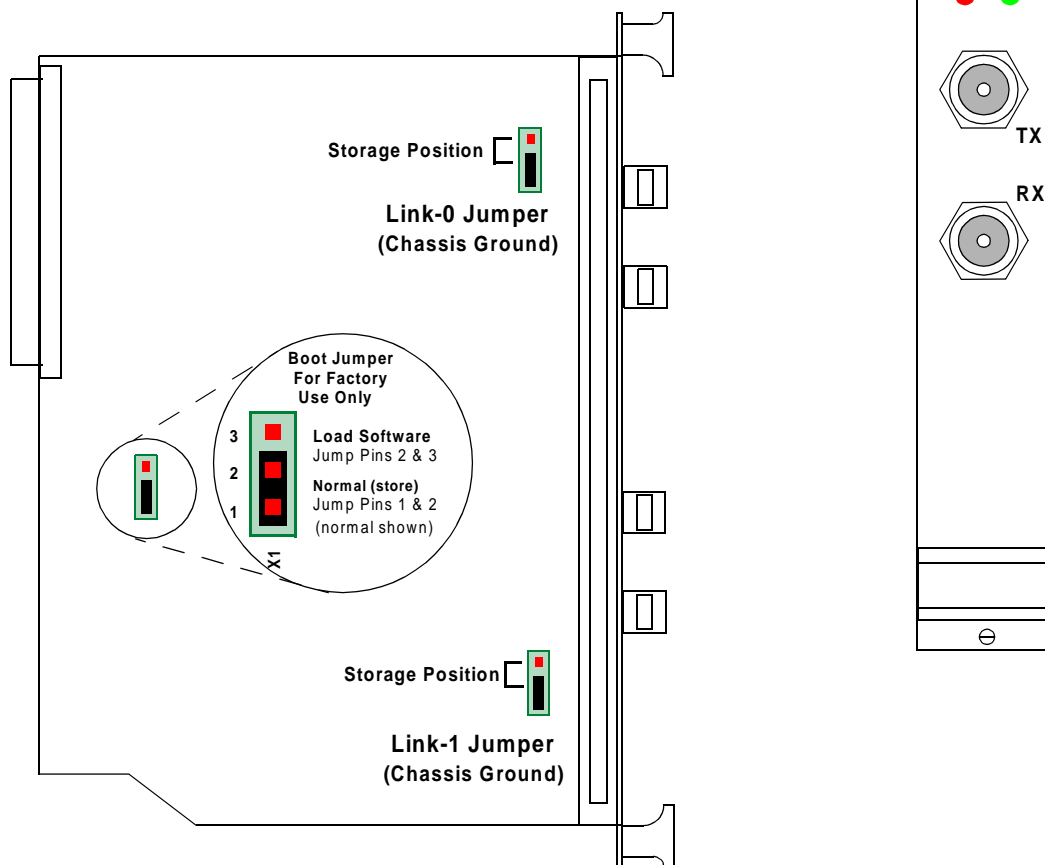
Figure 5-12   155E-2 STM-1 Electrical LIM Front Panel and Jumper Positions,

155E-2 STM-1 Chassis Ground Jumper

The 155E-2 has a Chassis Ground jumper for each link that must be set prior to installing the LIM. With the jumper positioned closer to pin 1 (as shown in *Figure 5-12*), the shield on the associated RX connector is connected to chassis ground. With the jumper positioned away from pin 1 (storage position), the shield is not connected to chassis ground.

Important Shield Grounding Considerations

Disconnecting the shield-to-chassis ground connection via a jumper for each RX link may be desirable in some installations with specific RFI/EMI problems. In general, the shield must be connected to a chassis ground on ONE end of the cable only to allow the shield conductor to drain RF energy to ground without carrying any ground loop currents. Connecting the shield to chassis at both ends of the cable is NOT recommended.

155E-2 STM-1 Boot Jumper (Factory Use Only)

The Boot Jumper is for factory use only. It is shown in *Figure 5-12* for reference only. The `Normal (store)` position shown (Pins 1 and 2) is just for storing the jumper. That is, removing the jumper from this "store" position has no effect on the operation of the jumper settings on the 155E-2 LIM.

Cabling

- The 155E-2 LIM uses one 75-ohm coaxial cable each for transmit and receive, following $\sqrt{F}$ law. Maximum insertion loss is approximately 12.7 db at 78 MHz.

- IMPORTANT! Refer to *Class A EMI-RFI Suppression Requirements* (*Figure 5-22*) to comply with all domestic and international Class A EMI-RFI suppression requirements.

HSSI (DTE/DCE) LIM Overview

The HSSI DTE/DCE LIMs can be used with a variety of controllers listed in *Table 1-4*. These are two-port HSSI Frame (DCE) or HSSI Cell (DTE) LIMs. The front panel features are the same for either LIM, except where noted.

Front Panel Indicators

- **IS** (In-Service) LED illuminates when the associated link is enabled.

- **OS** (Out-of-Service) LED illuminates when the associated link is disabled.

- TX (Transmit Data) LED illuminates when transmit data is present at the associated link interface.

- **RX** (Received Data) LED illuminates when received data is present at the associated link.

- **LB** (Loopback)LED illuminates when a local loopback is present on the associated link.

Front Panel Connectors

- **LINK 0** is a female 50-pin connector for attaching external communication devices to Link 0.

- **LINK 1** is female 50-pin connector for attaching external communication devices to Link 1.
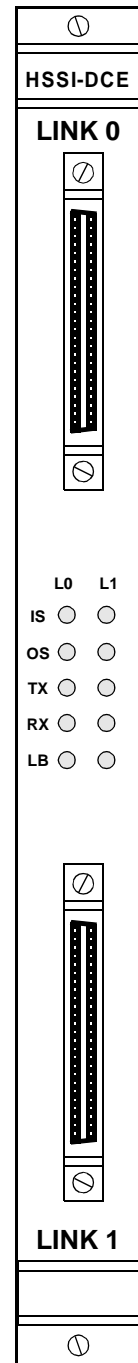
Figure 5-13   Front Panel, HSSI LIM

HSSI LIM Connector Pinouts

In the table below, a designation of `0/1` indicates Link0/Link1 signal.

Table 5-5   Link 0 and Link 1 Connector Pinouts

Pin	Signal	Description
1	Ground	Ground
2	RXC0/1+	Receiver Signal Element Timing (DTE input/DCE output)
3	DCERDY0/1+	DCE is ready to operate (DTE input/DCE output)
4	RXD0/1+	Received Data (DTE input/DCE output)
6	TXC0/1+	Transmitter Signal Element Timing (DTE input/DCE output)
7	Ground	Ground
8	DTERDY0/1+	DTE is ready to operate (DCE input/DTE output)
9	TXCK0/1+	Transmitter Signal Element Timing (DCE input/DTE output)
10	LOOPA0/1+	Used to request data loopback test mode (DCE input/DTE output)
11	TXD0/1+	Transmit Data (DCE input/DTE output)
12	LOOPB0/1+	Used to request data loopback test mode (DCE input/DTE output)
13	Ground	Ground
19	Ground	Ground
24	TMODE0/1+	Indicates that the local DCE is in a test mode (DTE input/DCE output)
25	Ground	Ground
26	Ground	Ground
27	RXC0/1-	Receiver Signal Element Timing (DTE input/DCE output)
28	DCERDY0/1-	DCE is ready to operate (DTE input/DCE output)
29	RXD0/1-	Received Data (DTE input/DCE output)
31	TXC0/1-	Transmitter Signal Element Timing (DTE input/DCE output)
32	Ground	Ground
33	DTERDY0/1-	DTE is ready to operate (DCE input/DTE output)
34	TXCK0/1-	Transmitter Signal Element Timing (DCE input/DTE output)
35	LOOPA0/1-	Used to request data loopback test mode (DCE input/DTE output)
36	TXD0/1-	Transmit Data (DCE input/DTE output)
37	LOOPB0/1-	Used to request data loopback test mode (DCE input/DTE output)
38	Ground	Ground
44	Ground	Ground
49	TMODE0/1-	Indicates that the local DCE is in a test mode (DTE input/DCE output)
50	Ground	Ground

Serial I/O (SI-2C) LIM Overview

The SI-2C LIM has a 2-port serial interface and is intended for use with the PCX or PCL slot controllers

Front Panel Indicators

Two LEDs per link indicate In Service (IS) and LoopBack (LB).

- **IS** (In Service) LED illuminates when the LIM controller has finished configuring the LIM, and the associated link is in service.

- **LB** (Loopback) LED illuminates during a digital, link or line loopback.

SI-2C LIM Cabling

Table 5-6 lists cables by interface and DTE/DCE mode of operation.

Table 5-6   Cable Compatibility

GDC Part Number	Cable for Connecting EIA/TIA Alt A to:
027H444-005	RS449 DTE
027H445-005	RS449 DCE
027H442-005	EIA/TIA530 DCE
027H443-005	EIA/TIA530 DTE
027H446-005	V.35 DCE
027H447-005	V.35 DTE
027H440-005	X21 DCE
027H441-005	X21 DTE

DCE/DTE Configuration

The SI-2C LIM must be properly configured for DCE or DTE operation on all links before installation in the Xedge chassis. When shipped from the factory in **DCE mode**, the resistor packs for each link are positioned in the default DCE Port socket locations, as shown in *Figure 5-14*.

If your application requires the LIM is configured for DTE mode, you must perform the following steps for each link:

1. Move the 16-pin resistor pack from the **DCE PORT 0** socket to the adjacent empty DTE socket labeled **DTE PORT 0**.

2. Move the 16-pin resistor pack from the **DCE PORT 1** socket to the adjacent empty DTE socket labeled **DTE PORT 1**.

Note   *IMPORTANT! The resister packs are the only 16-pin DIP (Dual Inline Package) on the board. Use care when removing and installing the resistor packs. Do not bend or break the pins.*
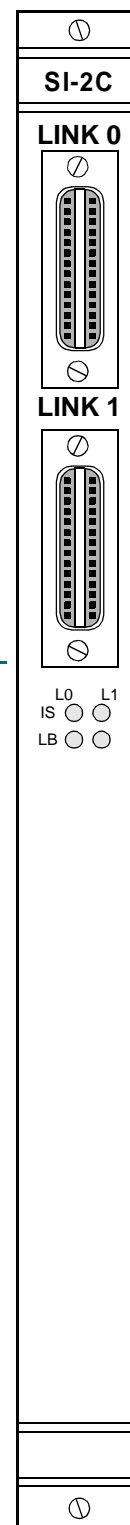
Front Panel Connectors

The SI-2C LIM front panel provides two 26-pin high density connectors, one for each link. An EIA 530-A Alternate A (female) connector is used for each input link. *Table 5-7* lists the pin/signal designations for the SI-2C LIM front panel connectors. The pin-outs for all connectors are the same.

Table 5-7   SI-2C Pinout Description

Pin Number	Signal Name
1	SHIELD
2	BA(A), Tran Data
3	BB(A), Rec Data
4	CA(A), Req to Send
5	CB(A), Clr to Send
6	CC, DCE Rdy
7	AB, Signal Common
8	CF(A), Rec Line Signal Det
9	DD(B), DCE Rec Timing
10	CF(B)
11	DA(B), DTE Tran Timing
12	DB(B), DCE Tran Timing
13	CB(B)
14	BA(B)
15	DB(A)
16	BB(B)
17	DD(A)
18	LL, Local Loopback
19	CA(B)
20	CD, DTE Rdy
21	RL, Remote Loopback
22	CE, Ring Ind
23	AC, Signal Common
24	DA(A)
25	TM, Test Mode
26	Not Connected

Shielding Jumper

Each link has a shield connection on pin 1. This shield connection can be connected to chassis ground using a jumper. The default configuration on the SI-2C LIM connects the shield to the chassis ground (jumper is installed). If you want the shield connected to chassis ground, skip this section. If you are unsure of your configuration, consult a system engineer familiar with your site.

You have the option of disconnecting the shield-to-chassis ground connection via a jumper for each link labeled SHIELD 0, 1, 2, or 3 (*Figure 5-14*). This may be desirable in some installations with specific RF/EMI problems.

In general, the shield must be connected to a chassis ground on ONE end of the cable only. This allows the shield conductor to "drain" RF energy to ground without carrying any "ground loop" currents. Connecting the shield to chassis at both ends of the cable is NOT recommended.

To disconnect the shield for each link, remove the jumper labeled SHIELD 0, 1, 2, or 3 for each link. The jumpers are located just behind the SI-2C LIMs front panel.
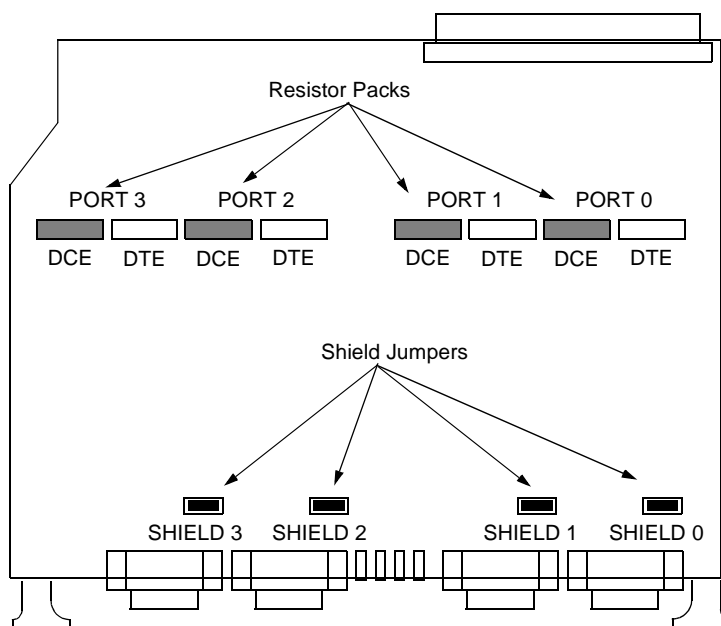
Figure 5-14   S1-2C Jumper Locations

LCE-16 LIM Overview

The LCE-16 LIM can be used with a variety of controllers listed in *Table 1-4*. This 16-port circuit emulation LIM sends ATM cells to the controller.

Front Panel Indicators

- **IS** (In Service) GREEN LED ON indicates all the enabled links are in the up state, or no link is enabled. LED OFF indicates an operational problem; LIM may require a restart. LED blinking indicates at least one link is in a diagnostics state.

- **AL** (Alarm) RED LED ON indicates a fault on at least one enabled link. LED OFF indicates none of the enabled links has a fault condition.

- **IS** and **AL** blinking indicates lost communication between LIM and controller.

Front Panel Connectors

- **LINK 0-7** is the 100-pin high density connector for transmit/receive signals.

- **LINK 8-15** is the 100-pin high density connector for transmit/receive signals.

Front Panel Jumper

There are no user-selectable jumpers on the LCE-16 series LIM. The X1 jumper shown below for reference purposes, is for factory use only. The **Normal store** position (Pins 1 and 2) is for storing the jumper. Removing the jumper from this position has no effect on LIM operation.
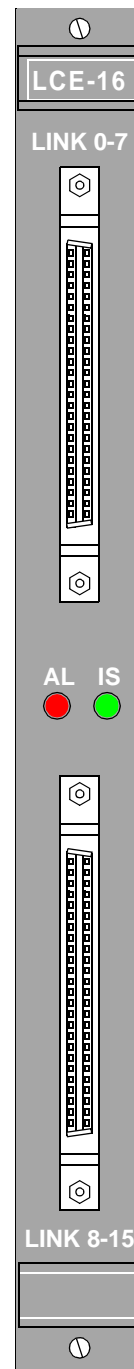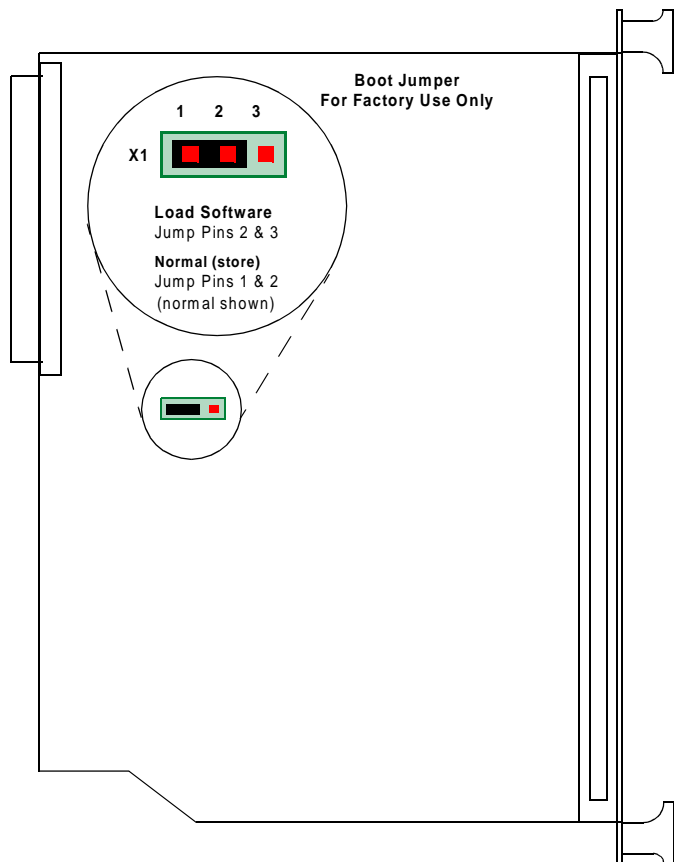
Figure 5-15   LCE 16 LIM Front Panel and Jumper Location

LCE-16 Connector Pin/Signal Designations

Table 5-8 shows the link, pin/signal and input/output designations for the front panel Link 0-7 and Link 8-15 connectors. All A/B signal pairs listed in the Signal Name column require twisted pair wiring. Refer to Note 1 and Note 1 at the end of this table for additional information.

Table 5-8   Connector Pin / Signal / Input / Output List, Link 0-7 and Link 8-15

Link	Pin	Signal Name	Input/ Output	Pin	Signal Name	Input/ Output
0/8	1	Chassis Ground	n/a	51	Receive Data-A (RD-A)	Output
0/8	2	Carrier Detect-A (DCD-A)	*(see Note 2)*	52	Receive Data-B (RD-B)	Output
0/8	3	Transmit Data-A (TD-A)	Input	53	Receive Timing-A (RT-A)	Output
0/8	4	Transmit Data-B (TD-B)	Input	54	Receive Timing-B (RT-B)	Output
0/8	5	Transmit Timing-A (TT-A)	*(see Note 1)*	55	External Timing-A (ET-A)	Input
0/8	6	Transmit Timing-B (TT-B)	*(see Note 1)*	56	External Timing-B (ET-B)	Input
0/8	7	Clear to Send-A (CTS-A)	Output	57	Request to Send-A (RTS-A)	Input
0/8	8	Clear to Send-B (CTS-B)	Output	58	Request to Send-B (RTS-B)	Input
0/8	9	DCE Ready-A (DSR-A)	Output	59	DTE Ready-A (DTR-A)	Input
0/8	10	DCE Ready-B (DSR-B)	Output	60	DTE Ready-B (DTR-B)	Input
0/8	11	Chassis Ground	n/a	61	Signal Common	n/a
0/8	12	Carrier Detect-B (DCD-B)	*(see Note 2*	62	Signal Common	n/a
1/9	13	Receive Data-A (RD-A)	Output	63	Transmit Data-A (TD-A)	Input
1/9	14	Receive Data-B (RD-B)	Output	64	Transmit Data-B (TD-B)	Input
1/9	15	Receive Timing-A (RT-A)	Output	65	Transmit Timing-A (TT-A)	*(see Note 1)*
1/9	16	Receive Timing-B (RT-B)	Output	66	Transmit Timing-B (TT-B)	*(see Note 1)*
1/9	17	External Timing-A (ET-A)	Input	67	Clear to Send-A (CTS-A)	Output
1/9	18	External Timing-B (ET-B)	Input	68	Clear to Send-B (CTS-B)	Output
1/9	19	Request to Send-A (RTS-A)	Input	69	DCE Ready-A (DSR-A)	Output
1/9	20	Request to Send-B (RTS-B)	Input	70	DCE Ready-B (DSR-B)	Output
1/9	21	DTE Ready-A (DTR-A)	Input	71	Chassis Ground	n/a
1/9	22	DTE Ready-B (DTR-B)	Input	72	Chassis Ground	n/a
2/10	23	Receive Data-A (RD-A)	Output	73	Transmit Data-A (TD-A)	Input
2/10	24	Receive Data-B (RD-B)	Output	74	Transmit Data-B (TD-B)	Input
2/10	25	Receive Timing-A (RT-A)	Output	75	Transmit Timing-A (TT-A)	*(see Note 1)*
2/10	26	Receive Timing-B (RT-B)	Output	76	Transmit Timing-B (TT-B)	*(see Note 1)*
2/10	27	External Timing-A (ET-A)	Input	77	Chassis Ground	n/a
2/10	28	External Timing-B (ET-B)	Input	78	Chassis Ground	n/a
3/11	29	Receive Data-A (RD-A)	Output	79	Transmit Data-A (TD-A)	Input
3/11	30	Receive Data-B (RD-B)	Output	80	Transmit Data-B (TD-B)	Input
3/11	31	Receive Timing-A (RT-A)	Output	81	Transmit Timing-A (TT-A)	*(see Note 1)*
3/11	32	Receive Timing-B (RT-B)	Output	82	Transmit Timing-B (TT-B)	*(see Note 1)*
3/11	33	External Timing-A (ET-A)	Input	83	Chassis Ground	n/a
3/11	34	External Timing-B (ET-B)	Input	84	Chassis Ground	n/a
4/12	35	Receive Data-A (RD-A)	Output	85	Transmit Data-A (TD-A)	Input

Table 5-8   Connector Pin / Signal / Input / Output List, Link 0-7 and Link 8-15 (Continued)

Link	Pin	Signal Name	Input/ Output	Pin	Signal Name	Input/ Output
4/12	36	Receive Data-B (RD-B)	Output	86	Transmit Data-B (TD-B)	Input
4/12	37	Receive Timing-A (RT-A)	Output	87	Transmit Timing-A (TT-A)	(see Note 1)
4/12	38	Receive Timing-B (RT-B)	Output	88	Transmit Timing-B (TT-B)	(see Note 1)
4/12	39	External Timing-A (ET-A)	Input	89	Signal Common	n/a
4/12	40	External Timing-B (ET-B)	Input	90	Signal Common	n/a
5/13	41	Receive Data-A (RD-A)	Output	91	Transmit Data-A (TD-A)	Input
5/13	42	Receive Data-B (RD-B)	Output	92	Transmit Data-B (TD-B)	Input
5/13	43	Receive Timing-A (RT-A)	Output	93	Transmit Timing-A (TT-A)	(see Note 1)
5/13	44	Receive Timing-B (RT-B)	Output	94	Transmit Timing-B (TT-B)	(see Note 1)
5/13	45	External Timing-A (ET-A)	Input	95	Signal Common	n/a
5/13	46	External Timing-B (ET-B)	Input	96	Signal Common	n/a
6/14	47	Receive Data-A (RD-A)	Output	97	Transmit Data-A (TD-A)	Input
1/9	48	Carrier Detect-A (DCD-A)	(see Note 2)	98	Signal Common	n/a
7/15	49	Receive Data-A (RD-A)	Output	99	Transmit Data-A (TD-A)	Input
1/9	50	Carrier Detect-B (DCD-B)	(see Note 2)	100	Signal Common	n/a

Note   1. *When the Clock Mode configuration parameter is DCE, TT-A and TT-B are Outputs.*
         When the Clock Mode configuration parameter is DTE, TT-A and TT-B are Inputs.

         2. *This is a bi-directional input or output signal. Direction is set using the Clock Mode and DCD Control*
         Usage configuration parameters.

Optional EIA530/EIA232 Distribution Panel Kit for LCE-16 LIM

The optional EIA530/EIA232 Distribution Panel Kit (P/N 032M130-001) contains the following components:

- 19/23-inch rack-mount EIA530/EIA232 Distribution Panel with 16 DB25 connectors corresponding to the 16 links of the LCE-16 LIM.

- Extender Cables (2) which extend the LCE-16 front panel LINK 0-7 and LINK 8-15 connectors to the EIA530/EIA232 Distribution Panel.

Table 5-9, *Table 5-10* and *Table 5-11* list the signals and Input/Output functions available on the EIA530/EIA232 Distribution Panel DB25 connectors, labeled `Ch 0` through `Ch 15`..

Table 5-9   Ch 0, 1, 8, and 9 DB25 Connectors, EIA530/EIA232 Distribution Panel

DB25 Pin Number	Signal Name	DB25 Pin Number	Signal Name
2	Transmit Data-A (TD-A)	12	Transmit Timing-B (TT-B)
14	Transmit Data-B (TD-B)	17	Receive Timing-A (RT-A)
3	Receive Data-A (RD-A)	9	Receive Timing-B (RT-B)
16	Receive Data-B (RD-B)	20	DTE Ready-A (DTR-A)
4	Request to Send-A (RTS-A)	23	DTE Ready-B (DTR-B)
19	Request to Send-B (RTS-B)	24	External Timing-A (ET-A)
5	Clear to Send-A (CTS-A)	11	External Timing-B (ET-B)
13	Clear to Send-B (CTS-B)	1	Chassis Ground
6	DCE Ready-A (DSR)	7	Signal Common
22	DCE Ready-B (DSR)	8	Carrier Detect-A (DCD-A)
15	Transmit Timing-A (TT-A)	10	Carrier Detect-B (DCD-B)

Table 5-10 Ch 2, 3, 4, 5, 10, 11, 12, and 13 DB25 Connectors, EIA530/EIA232 Distribution Panel

DB25 Pin Number	Signal Name	DB25 Pin Number	Signal Name
2	Transmit Data-A (TD-A)	17	Receive Timing-A (RT-A)
14	Transmit Data-B (TD-B)	9	Receive Timing-B (RT-B)
3	Receive Data-A (RD-A)	24	External Timing-A (ET-A)
16	Receive Data-B (RD-B)	11	External Timing-B (ET-B)
15	Transmit Timing-A (TT-A)	1	Chassis Ground
12	Transmit Timing-B (TT-B)	7	Signal Common

Table 5-11 Ch 6, 7, 14 and 15 DB25 Connectors, EIA530/EIA232 Distribution Panel

DB25 Pin Number	Signal Name
2	Transmit Data-A (TD-A)
3	Receive Data-A (RD-A)
1	Chassis Ground
7	Signal Common

DSX-1 and E1 IMA/IMA+ LIM Overview

Xedge Inverse Multiplexing (IMA) LIMs for ATM can be used with a variety of controllers listed in *Table 1-4*. The IMA and IMA+ LIMs provide an 8 or 16-link physical DS1 or E1 interface. The Xedge PCL controller must use the DSX-1/E1 "IMA+" LIMs. Front panel, jumpers, connectors and pinouts are the same for all IMA-capable LIMs, except where noted.

Front Panel Indicators

- **IS** (In Service) GREEN LED ON indicates all the enabled links are in the up state, or no link is enabled. LED OFF indicates an operational problem; LIM may require a restart. LED blinking indicates at least one link is in a diagnostics state.

- **AL** (Alarm) RED LED ON indicates a fault on at least one enabled link. LED OFF indicates none of the enabled links has a fault condition.

- **IS** and **AL** blinking indicates lost communication between LIM and controller.

Front Panel Connectors

- **LINK 0-7** is 50-pin Telco connector for transmit/receive tip and ring signals. **LINK 8-15** is 50-pin Telco connector for transmit/receive tip and ring signals.

- IMPORTANT! Refer to *Class A EMI-RFI Suppression Requirements* (*Figure 5-22*) to comply with all domestic and international standards.

Front Panel Jumper

The X9 jumper, shown below, is used primarily by the factory to set the LIM for Boot Mode in order to load software. For normal operation, the jumper should be in the **Normal** position (Pins 2 and 3) to store the jumper. The user should only set the jumper to Boot Mode under the guidance of a GDC service representative.
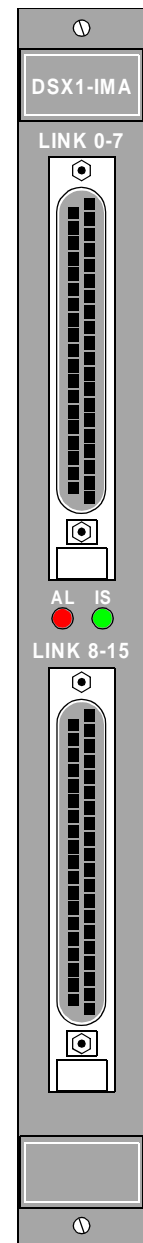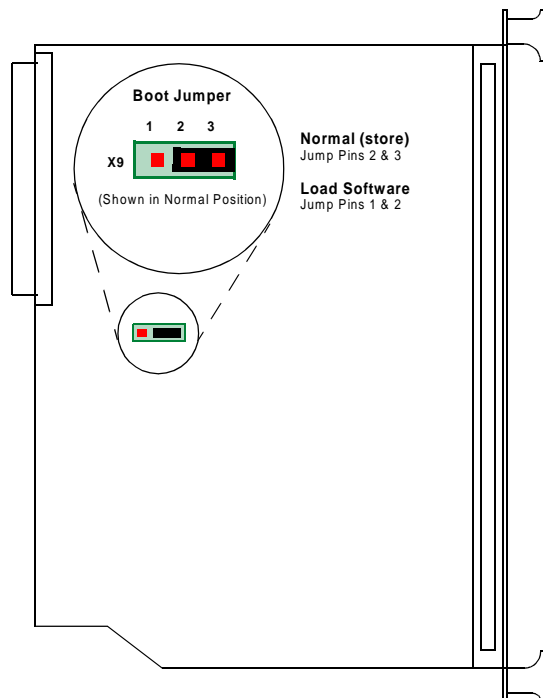
Figure 5-16 DSX1-IMA LIM and E1-IMA LIM Front Panel and Jumper Location

DSX1/E1 IMA Connector Pin/Signal Assignments

All models of the 16-port IMA and IMA+ LIMs use both columns of pinouts listed in the table below. The 8-port IMA/IMA+ LIMs use only the pinouts described in the left column.

Table 5-12 Link 0/7 and Link 8-15 Connector Pinouts

For all 8-/16-port IMA/IMA+ LIMs		For all 16-port IMA/IMA+ LIMs only	
Pin Number	**Signal Name/Link Number**	**Pin Number**	**Signal Name/Link Number**
1	Receive 1 Ring	1	Receive 9 Ring
26	Receive 1 Tip	26	Receive 9 Tip
2	Transmit 1 Ring	2	Transmit 9 Ring
27	Transmit 1 Tip	27	Transmit 9 Tip
4	Receive 2 Ring	4	Receive 10 Ring
29	Receive 2 Tip	29	Receive 10 Tip
5	Transmit 2 Ring	5	Transmit 10 Ring
30	Transmit 2 Tip	30	Transmit 10 Tip
7	Receive 3 Ring	7	Receive 11 Ring
32	Receive 3 Tip	32	Receive 11 Tip
8	Transmit 3 Ring	8	Transmit 11 Ring
33	Transmit 3 Tip	33	Transmit 11 Tip
10	Receive 4 Ring	10	Receive 12 Ring
35	Receive 4 Tip	35	Receive 12 Tip
11	Transmit 4 Ring	11	Transmit 12 Ring
36	Transmit 4 Tip	36	Transmit 12 Tip
13	Receive 5 Ring	13	Receive 13 Ring
38	Receive 5 Tip	38	Receive 13 Tip
14	Transmit 5 Ring	14	Transmit 13 Ring
39	Transmit 5 Tip	39	Transmit 13 Tip
16	Receive 6 Ring	16	Receive 14 Ring
41	Receive 6 Tip	41	Receive 14 Tip
17	Transmit 6 Ring	17	Transmit 14 Ring
42	Transmit 6 Tip	42	Transmit 14 Tip
19	Receive 7 Ring	19	Receive 15 Ring
44	Receive 7 Tip	44	Receive 15 Tip
20	Transmit 7 Ring	20	Transmit 15 Ring
45	Transmit 7 Tip	45	Transmit 15 Tip
22	Receive 8 Ring	22	Receive 16 Ring
47	Receive 8 Tip	47	Receive 16 Tip
23	Transmit 8 Ring	23	Transmit 16 Ring
48	Transmit 8 Tip	48	Transmit 16 Tip

Standard Cabling

The IMA LIMs are supplied with two 25-twisted pair cables for transmit/receive tip and ring signals. The LIMS are supplied with cable tie wraps for securing the cable connectors to the LIM connectors opposite from the retaining screw as shown in *Figure 5-18*.
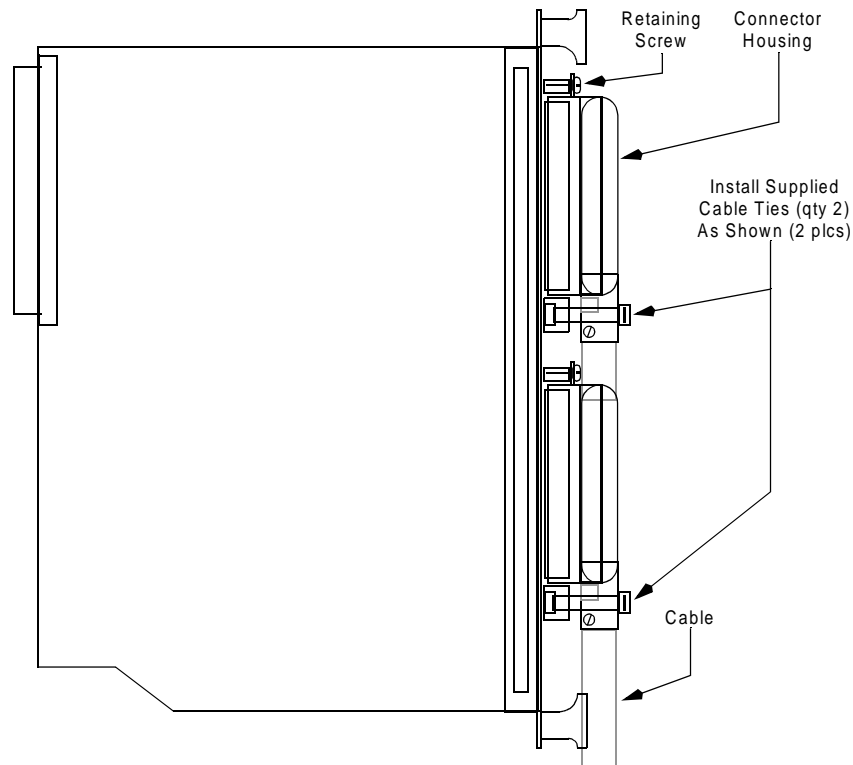
Figure 5-17   Standard Cabling Installation (shown from LIM connector side view)

Optional cabling schemes for IMA LIMs are described in the following paragraphs:

- *Optional T1/E1 8-Port Break-out Cable Assembly*
- *Optional DS1 Distribution Panel Kit*
- *Optional 120 Ohm E1 Distribution Panel Kit*
- *Optional 75 Ohm E1 Distribution Panel Kit*

Note   *IMPORTANT! For all IMA applications, refer to Class A EMI-RFI Suppression Requirements (Figure 5-22) to comply with all domestic and international standards.*

Optional T1/E1 8-Port Break-out Cable Assembly

One T1/E1 8-port Break-out Cable Assembly (S-032H016-001) is used for each front panel 50-pin Telco connector of an IMA LIM (E1 or DSX1). *Figure 5-18* demonstrates the P9 pinout arrangement at the upper LIM connector (Links 0 - 7). Pinouts at both LIM connectors are listed in *Table 5-12*.

Figure 5-18   Optional Cabling: T1/E1 8-Port Break-out Cable Assy

Note   *IMPORTANT! For all IMA applications, refer to Class A EMI-RFI Suppression Requirements (Figure 5-22) to comply with all domestic and international standards.*

Optional DS1 Distribution Panel Kit

The optional DS1 Distribution Panel Kit (032M131-001) contains the following components:

- Two 100 Ohm, 25-Twisted Pair, Shielded Cable (P/N 025H601-006)

- One RJ48M to RJ48C Distribution Panel (S-032A011-001)

Figure 5-19   Connection Diagram, DS1 Distribution Panel Kit (one link shown)

Optional 120 Ohm E1 Distribution Panel Kit

The optional 120 Ohm E1 Distribution Panel Kit (032M164-001) contains the following components:

- Two 120 Ohm, 25-Twisted Pair, Shielded Cables (025H602-006)
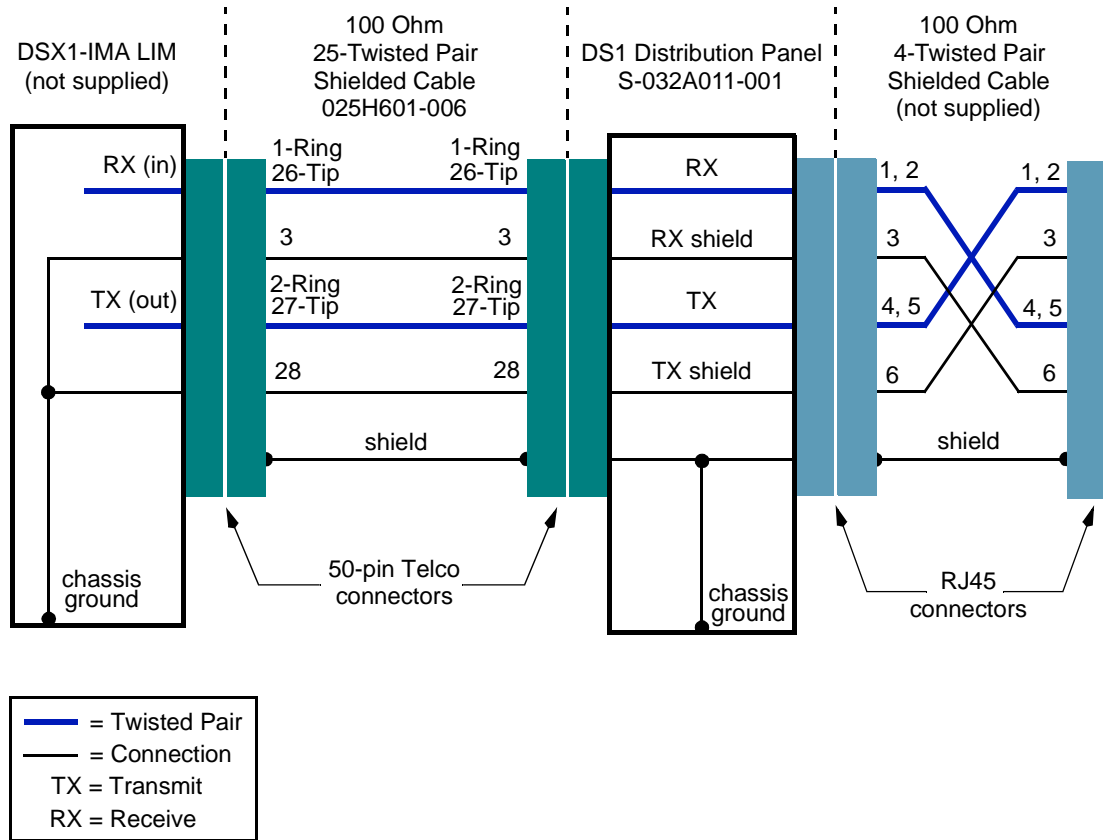- One RJ48M to RJ48C Distribution Panel (S-032A011-001)

Figure 5-20   Connection Diagram, 120 Ohm E1 Distribution Panel Kit (one link shown)

Optional 75 Ohm E1 Distribution Panel Kit

The optional 75 Ohm E1 Distribution Panel Kit (032M165-001) contains the following components:

- Two 120 Ohm, 25-Twisted Pair, Shielded Cables (025H602-006)

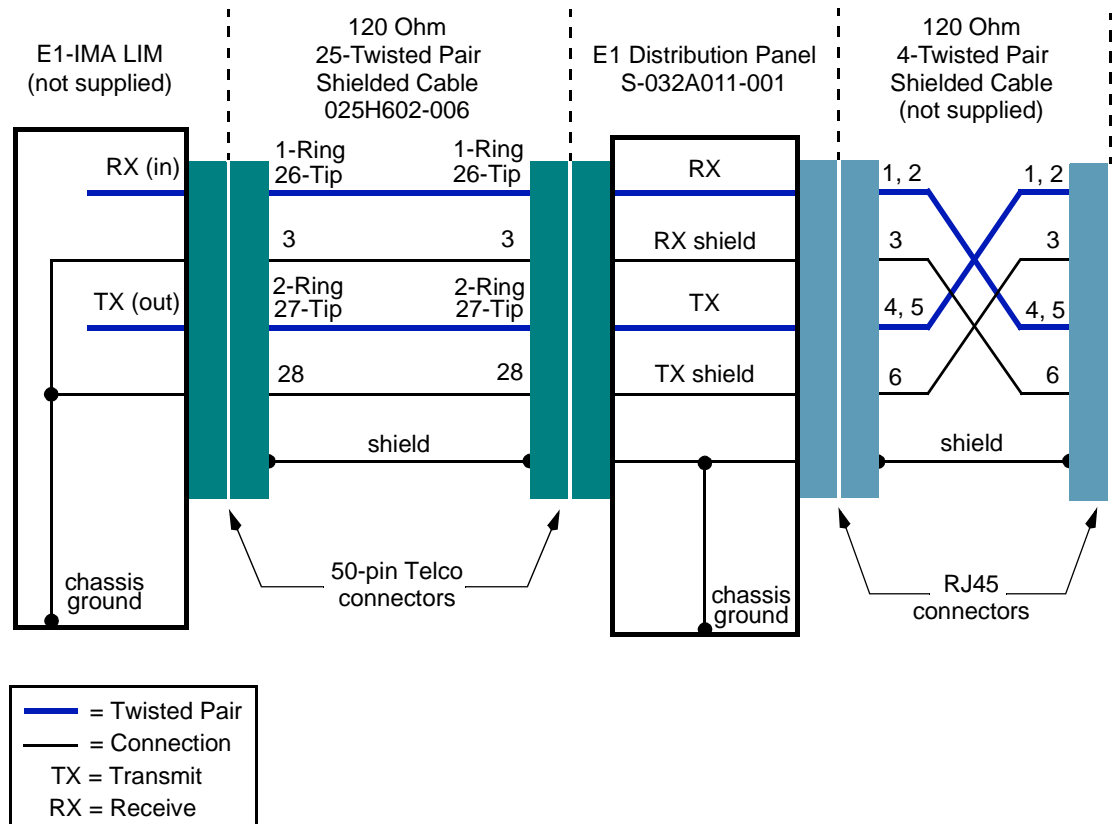- One RJ48M to RJ48C Distribution Panel (S-032A011-001)

- 16 120 Ohm, 4-Twisted Pair, Shielded Cables (027H270-0X5)

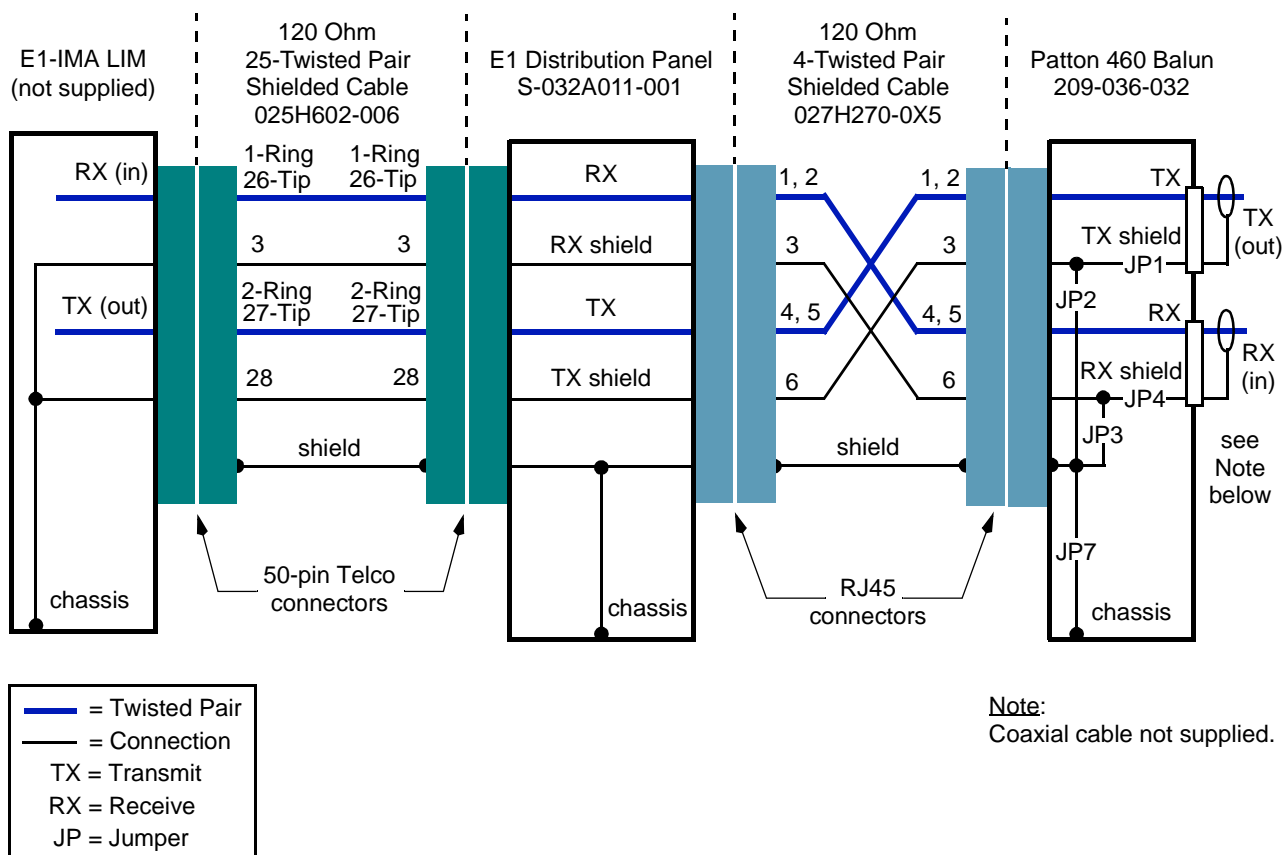- One Patton 460 Balun (209-036-032)

Figure 5-21   Connection Diagram, 75 Ohm E1 Distribution Panel Kit (one link shown)

Class A EMI-RFI Suppression Requirements

With the DS3-2C, E3-2C and 155E-2 LIMs, be sure to comply with all domestic and international Class A EMI-RFI suppression requirements by installing the proper ferrite beads on the TX and RX cables, as shown in the figures below. Note that ferrite bead type and placement varies depending on the Xedge chassis in use.

Note   *IMPORTANT! The TX and RX cables must use the Belden Coaxial Cable, P/N 9054 or equivalent. Slot/LIM applications in the Xedge 6002 may require additional ferrite beads. Consult your Xedge representative.*
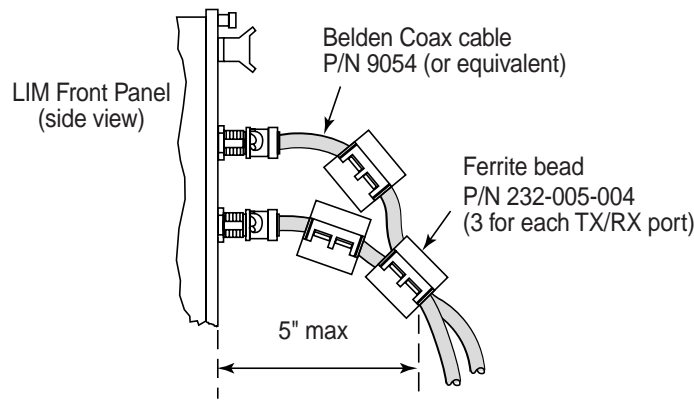
Xedge 6640, 6645, 6280 and 6160 Chassis Only

Figure 5-22   LIM Class A EMI-RFI Suppression in Xedge High Density Chassis
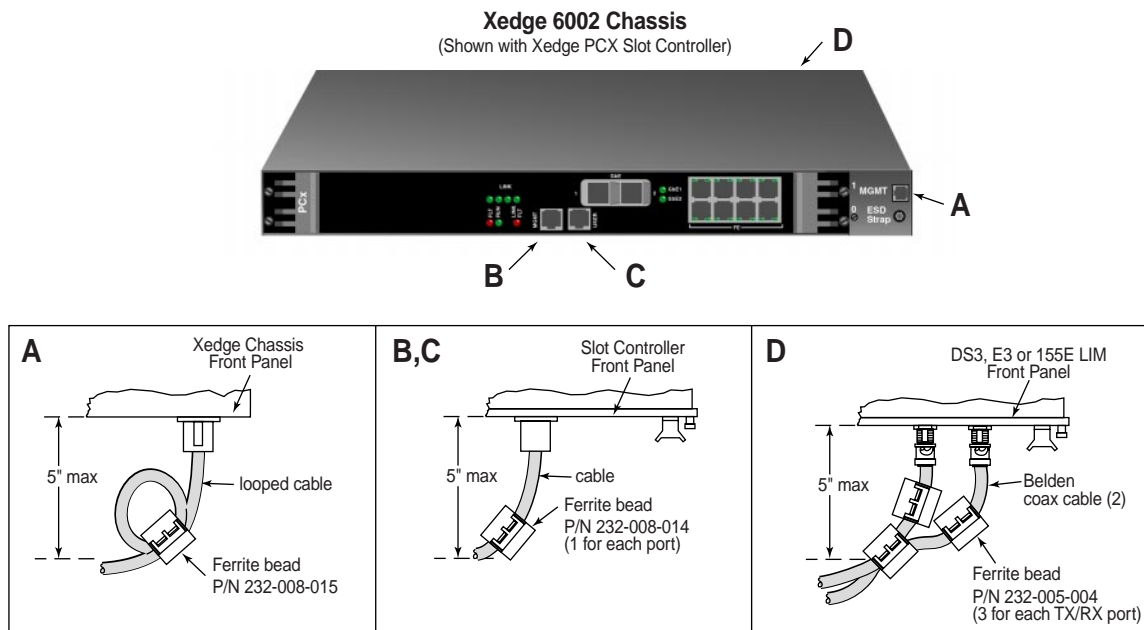
Xedge 6002 1RU Chassis Only

Figure 5-23   LIM Class A EMI-RFI Suppression in the Xedge 6002 Chassis

Chapter 6: Network Timing Modules

Overview

All Xedge Node Timing Modules (NTMs) are the same size and plug into a special slot on the back panel of the Xedge 6280, 6640 or 6645 chassis. The modules provide front panel connectors and LEDs for quick assessment of the NTM communication status. This chapter describes installing the Xedge NTM-DS1 and Xedge NTM-E1.

Installation Guidelines

The following installation guidelines apply to all Xedge NTMs.

- When handling NTMs, always use an antistatic wrist strap to prevent static discharge damage to the electronic circuits.
- Before installing any NTM, first set any jumpers or switches for your specific network configuration, as described in this chapter.
- NTMs can only be installed in the reserved slots shown in the Xedge 6280 or Xedge 6640/6645 chassis (*Figure 2-6* or Figure 2-8, respectively).
- Once all NTMs are installed and connected, refer to the appropriate Xedge configuration manual listed on the inside cover of this document for detailed configuration procedures, as necessary.

Basic Installation Procedure

Any NTM occupies the reserved slots located on the far left or far right slots at the rear panel of the switch. To install and configure any NTM, perform the following steps:

1. For the NTM-E1, set the jumper for your network requirements, as described in this chapter. (Note that the NTM-DS1 has no user-selectable jumpers).

2. Install the NTM into the reserved Primary or Secondary slots on the back panel of the Xedge chassis, as shown in (*Figure 2-6* or Figure 2-8.

3. Insert the edges of the module into the tracks of the slot and slide the module inward until it stops.

4. Connect the appropriate I/O line(s) to the NTM's front panel connectors, using the proper cable(s) as listed in *Table 8-1*. Any special cabling requirements are discussed in the E1 or DS1 section of this chapter.

DS1 Node Timing Module (NTM-DS1)

Front Panel Indicators

- **RUN** LED Flashing Green indicates that the NTM is starting up and loading required files.
  LED ON Green indicates that the NTM start-up is complete, all required files are loaded, and the NTM is active in the system.

- **FLT** (Fault) LED ON Red continuously during start-up is normal.
  LED ON Red continuously after start-up indicates that the NTM has failed.

- **TX RC/DR** (Transmitting Received Clock/Derived Clock)
  LED ON Green indicates that the NTM has been initialized, is configured, and is transmitting properly.

- **TA RC** (Transmitting AIS Received Clock)
  LED ON Red indicates that the NTM is transmitting an alarm indication signal because it is initializing and/or waiting for its configuration from the Slot-0 Controller.

- **TA DR** (Transmitting AIS Derived Clock)
  LED ON Red indicates that the NTM is transmitting an alarm indication signal because it is initializing and/or waiting for its configuration from the Slot-0 Controller. It may also indicate that both line reference clocks have failed.

- **RA RC/DR** (Receiving AIS Received Clock/Derived Clock)
  LED ON Red indicates that the NTM is receiving an alarm indication signal.

- **LS RC/DR** (Receiving LOS Received Clock/Derived Clock)
  LED ON Red indicates that the NTM is detecting a loss of signal alarm condition.

- **OF (RC/DR)** Receiving OOF (Received Clock/Derived Clock)
  LED ON Red indicates that the NTM is detecting an out of frame alarm condition.

- **ER (RC/DR)** Receiving BER (Received Clock/Derived Clock)
  LED ON Red indicates that the NTM is detecting a bit error rate alarm condition.

- **LOCK** (Locked) LED ON Yellow indicates that the NTM oscillator is locked to the selected reference timing source.

- **PRI** (Primary) LED ON Yellow indicates that the NTM has been configured as the primary transmit reference timing source of the node.

Front Panel Connectors

- **RC-IN** is a DB-15 female connector that accepts BITS signals from an external clock system.

- **DR-OUT** is a DB-15 female; sends derived BITS signals to an external clock system.

Jumpers

There are no user-selectable jumpers to set on the NTM-DS1.
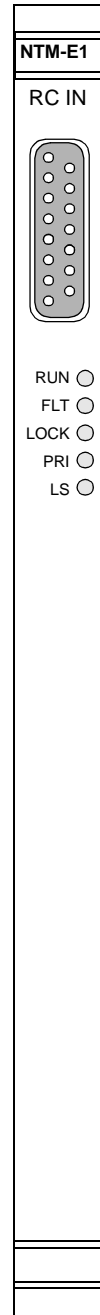
Figure 6-1   NTM-DS1 Front Panel

Cabling

The NTM-DS1 uses 100 ohm shielded twisted pair each for transmit and receive, following $\sqrt{F}$ law. The maximum insertion loss is 2.8 db at 772 kHz. The cables terminate with male DB15 connectors. *Table 6-1* lists pinout designations for the front panel connectors.

Table 6-1   DS1 Node Timing Module

Connector	Pin Number	Signal Name
Received Clock Input (RC IN)	1	Transmit signal
	9	Transmit return
	3	Receive signal
	11	Receive return
	shield	Chassis ground
Derived Clock Output (RC IN)	1	Transmit signal
	9	Transmit return
	3	Receive signal
	11	Receive return
	shield	Chassis ground

E1-Node Timing Module (NTM-E1)

Front Panel Indicators

- **RUN** LED Flashing Green indicates that the NTM is starting up and loading required files. LED ON Green indicates that the NTM start-up is complete, all required files are loaded, and the NTM is active in the system.

- **FLT** (Fault) LED ON Red continuously during start-up is normal.
  LED ON Red continuously after start-up indicates that the NTM has failed.

- **LOCK** (Locked) LED ON Yellow indicates that the NTM oscillator is locked to the selected reference timing source.

- **PRI** (Primary) LED ON Yellow indicates that the NTM has been configured as the primary transmit reference timing source of the node.

- **LS** (Receiving LOS Received Clock)
  LED ON Red indicates that the NTM is detecting a loss of signal alarm condition.
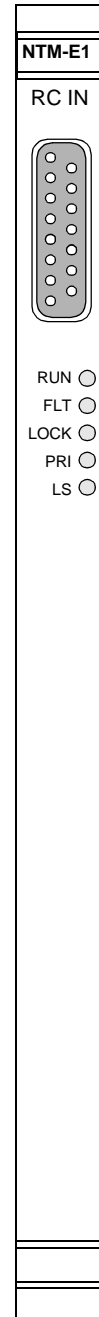
Front Panel Connectors

- **RC-IN** is a DB-15 female connector that accepts BITS signals from an external clock system.

Jumper Settings

The Input Impedance jumper, shown below, allows you to select the input impedance for the RC IN connector signals: 75 ohms or 120 ohms.

The Chassis Ground jumper, shown below, allows you to select balanced (**BAL**) or unbalanced (**UNBAL**) for the RC IN connector signals. In Unbalanced mode, pin 3 is connected to chassis ground. In Balanced mode, pin 3 is isolated from chassis ground..

Figure 6-2   NTM-E1 Front Panel and Jumper Positions

Note   *IMPORTANT! Disconnecting the shield-to-chassis ground connection via the jumper for the RC IN link may be desirable in some installations with specific RF/EMI problems.*

Cabling

The NTM-E1 uses 120 ohm shielded twisted pair, following $\sqrt{F}$ law. The maximum insertion loss is 6 db at 2048 kHz. The cable terminates with male DB15 connectors. _Table 6-2_ lists pinout designations for the front panel connectors.

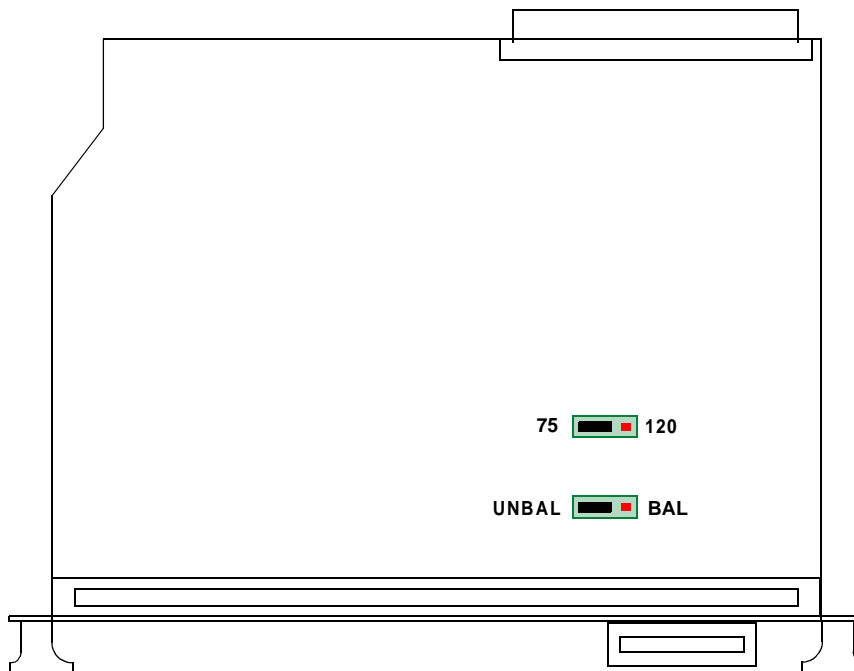The NTM-E1 can also use a 75 ohm coaxial cable, following $\sqrt{F}$ law. The maximum insertion loss is 6 db at 2048 kHz. With this cable, a DB15 to BNC adaptor is required.

Table 6-2   E1 Node Timing Module

Connector	Pin Number	Signal Name
Received Clock Input (RC IN)	3 (Balanced mode)	Receive return
	3 (Unbalanced mode)	Chassis ground
	11	Receive signal
	shield	Chassis ground

Chapter 7: System Management Modules

Overview

The Xedge System Management Module (SMM) plugs into a special slot on the back panel of the Xedge 6160 or Xedge 6280 chassis. The SMM provides two craft ports for system management and an alarm port for external alarm monitoring. The front panel features a serial port lock with removable key and alarm LEDs for monitoring the Xedge system status. This chapter describes installing the Xedge SMM in a Xedge 6160 or 6280 switch.

Installation Guidelines

- When handling the SMM, always use an antistatic wrist strap to prevent static discharge damage to the electronic circuits.

- There are no user-configurable jumpers or switches on the SMM card.

- SMMs can only be installed in the reserved slots shown in *Figure 7-1*.

- Once the SMM is installed and connected as described in this section, no further configuration is necessary.

Installation Procedure

The SMM plugs into a dedicated slot on the rear panel of a Xedge 6280 or Xedge 6160 switch. These are the only slots that have female connectors that will accept the male pins on the SMM connectors. Do not attempt to plug an SMM into any other slot.

- For the Xedge 6160, install the SMM at the bottom slot at the rear of the chassis.

- For the Xedge 6280, install the SMM at the third slot from the bottom at the rear of the chassis.
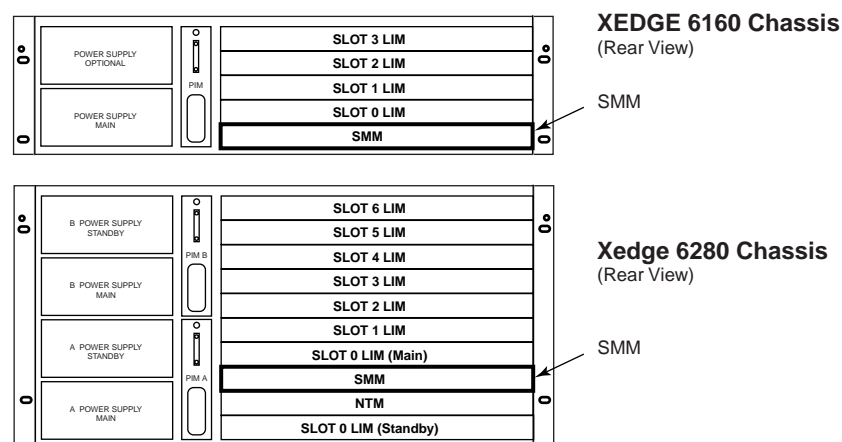

Figure 7-1   Proper SMM Locations

Note   *IMPORTANT! Use only the specially designated slots listed above for each chassis model. Attempting to insert the SMM in an incorrect slot can cause damage to the SMM connector or chassis midplane connector.*

SMM Switches and Indicators

Figure 7-2 shows the front panel switches, indicators and connectors for the SMM. Alarms are divided into Major, Minor, and Fan Module alarms, described below.

- **Major Alarm** is the Major alarm cut-off switch.

  - When set to **ON** and a major alarm condition exists, the major alarm signal is not passed to the ALARM INFO connector; the ACO LED is ON.

  - When set to **OFF** and a major alarm condition exists, the major alarm signal is passed to the ALARM INFO connector; the ACO LED is OFF.

  - **ACO** LED illuminates green when the major alarm cut-off switch is set to the ON position and a major alarm condition exists.

  - **Major Alarm** LED illuminates red when a major alarm condition exists.

- **Minor Alarm** is the Minor alarm cut-off switch.

  - When set to the **ON** position and a minor alarm condition exists, the minor alarm signal is not passed to the ALARM INFO connector, and the ACO LED is illuminated.

  - When set to the **OFF** position and a minor alarm condition exists, the minor alarm signal is passed to the ALARM INFO connector, and the ACO LED is OFF.

  - **ACO** LED illuminates green when the minor alarm cut-off switch is set to the ON position and a minor alarm condition exists.

  - **Minor Alarm** LED illuminates red when a minor alarm condition exists.

- **Fan Module Alarm** LED illuminates red when a failure occurs in the fan module assembly.
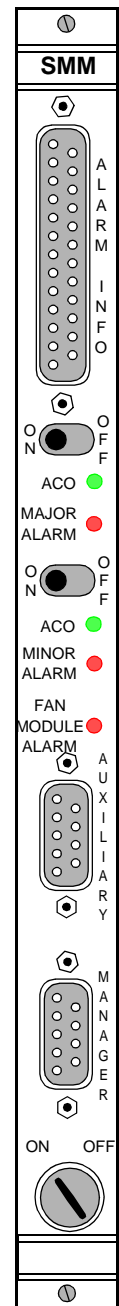
Figure 7-2   SMM Front Panel

SMM Craft Port Connectors

The MANAGER craft port connector allows you to attach an asynchronous terminal for local configuration and management of the switch via Slot-0.

The AUXILIARY port is typically used by field service personnel to connect to Slot-1 of the Xedge 6160 switch for troubleshooting/debugging purposes. (Slot-1 is not used for system configuration.)

For security, the MANAGER and AUXILLIARY craft ports can be locked using the front panel ON/OFF rotary switch lock, as shown in *Figure 7-2*. Refer to *Table 7-1* for craft port pinouts.

- To lock a port: Use the actuator/key at the MANAGER or AUXILLIARY switch to set the associated craft port to OFF, then pull out the key. That craft port connector is now locked.

- To unlock a port: Insert the actuator/key at the MANAGER or AUXILLIARY switch and set the switch to ON. That craft port connector is now unlocked.

To connect a terminal, perform the following steps:

1. Connect the terminal to the MANAGER female DB-9 connector at the SMM front panel. If you are using redundant Slot-0, use a "Y" cable (P/N 028H350-X06) to connect both the MANAGER and AUXILLIARY port connectors to the terminal.

2. Set the terminal to the following parameters:

    VT100 emulation
    19,200 baud
    8 character bits
    No parity
    No flow control
    Data Terminal Ready (DTR, pin 4) high from terminal.

Table 7-1   SMM Craft Port Pinouts

Pin	Signal
1	GND
2	TXD
3	RXD
4	DTR
5	GND
6	--
7	RTS
8	CTS
9	--

Note   *At the SMM craft port connectors, RTS (Pin 7) is tied internally to CTS (Pin 8).*

Alarm Info Connector

The female DB-25 Alarm Info connector is used for external alarm monitoring conditions. The signals are intended for dry circuits that do not switch load currents (*Table 7-2*).

Table 7-2 SMM Alarm Info Connector Pinouts

Pin No.	Signal	Description
1	SW1H	Switch 1 High - contact sensing
2	SW2H	Switch 2 High - contact sensing
3	SW1L	Switch 1 Low - contact sensing
4	SW1L	Switch 2 Low - contact sensing
5	MAJC1	Major Alarm Contact Set 1 - normally closed
6	MAJ01	Major Alarm Contact Set 1 - normally open
7	MAJP1	Major Alarm - common pin
8	MAJC2	Major Alarm Contact Set 2 - normally closed
9	MAJO2	Major Alarm Contact Set 2 - normally open
10	MAJACO	Major ACO Common Pin - modified by the ACO switch
11	MINC1	Minor Alarm Contact Set 1 - normally closed
12	MIN01	Minor Alarm Contact Set 1 - normally open
13	MINP1	Minor Alarm - common Pin
14	MINC2	Minor Alarm Contact Set 2 - normally closed
15	MIN02	Minor Alarm Contact Set 2 - normally open
16	MINACO	Minor ACO Common Pin - modified by the ACO switch

Note   *Shorting pins 1 and 3 allows (via the Alarm Handler) actuation of the slot 0 Event Table messages and SNMP Traps. Messages and traps associated with these pins will be referenced to User Input 1.*

              Shorting pins 2 and 4 allows (via the Alarm Handler) actuation of the slot 0 Event Table messages and SNMP Traps. Messages and traps associated with these pins will be referenced to User Input 0.

Chapter 8: Cables & Peripherals

Table 8-1   Xedge System Cabinets, Chassis, Cables & Peripherals

	Part No.
Cabinet, EP-6/D	010B214-001
Cabinet, EP-6/DC	010B215-001
Chassis, Xedge 6002, 2 I/O slots, fan chassis, integral power module, 100 to 120V AC power,	200B010-001
Chassis, Xedge 6002, 2 I/O slots, fan chassis, integral power module, -48 to -24V DC power,	-- Not Available --
Chassis, Xedge 6160, 4 I/O slots, up to two GPS-16A AC power modules	010B203-001
Chassis, Xedge 6160, 4 I/O slots, up to two DPS-16A DC power modules	010B204-001
Chassis, Xedge 6280, 7 I/O slots, up to four GPS-16A AC power modules	010B209-001
Chassis, Xedge 6280, 7 I/O slots, up to four DPS-16A DC power modules	010B210-001
Chassis, Xedge 6640, 16 I/O slots, up to four GPS-14 AC power modules	010B197-001
Chassis, Xedge 6645, 16 I/O slots, up to four DPS-14 DC power modules	010B198-001
GPS-16A Power Module, auto-range, 90-264V AC power	035B011-002
DPS-16A Power Module, -42 to -70V DC power	041B011-001
GPS-14 Power Module, auto-range, 90-264 AC power	035P114-001
DPS-14 Power Module, -42 to -70V DC power	041P114-001
Ethernet/Craft Port Management Cables	
Cable, DB9 female-to-DB25-male to Xedge	028H303-025
Cable, Ethernet RJ45 straight through, 1, 2, 7, 10, 14, 20, 25, 50 or 100 ft (Mgmt or User port)	S-078H010-XXX
Cable, Ethernet RJ45 crossover, 15 or 25 ft (Mgmt or User port)	S-078H011-XXX
Cable, Ethernet RJ45 straight through shielded, 5, 15, 25 or 100ft (Mgmt or User port)	027H251-XXX
Cable, 10 Base-T crossover (only category 3)	S-078H006-025
Cable, 10 Base-T straight through (only category 4), 5, 15, 25, 50 or 100 ft	021H101-XXX
Cable, RJ45 to DB9F Data/Management	027H260-010
Adapter, DB9F to RJ45 (used with S-078H010-XXX for Xedge 6002 Craft port)	029H015-001
Cable, DB9 female to DB25 male crossover (to SMM Craft Port)	028H303-025
Cable, DB25 male to DB25 male straight through (to SMM Craft Port)	028H502-025
Cable, DB25 female to DB25 male straight through (to SMM Craft Port)	028H506-025
Cable, DB9 female to DB9-male, PC to SMM Craft Port	027H329-025
Cable, DB25 male to DB9-male, terminal to SMM Craft Port	028H346-025
Cable, DB25 male to DB9-male, modem to SMM Craft Port	028H329-025

Table 8-1   Xedge System Cabinets, Chassis, Cables & Peripherals (Continued)

	Part No.
Xedge Cables	
Cable, DB25-to-DB25 modem to Xedge	028H311-025
Cable, DB25-to-wire wrap pins	025H001-025
Cable, Y DB25 M/M Cable for Xedge 6640 Slot 0 Redundant	028H618-X06
Cable, Xedge 6160 Slot 0 Redundant Y cable	028H350-X06
Cable, 56K/V.90 Modem	S-060A303-001
Cable, Octopus Cable for LCE16	027H701-003
Copper/Coax Cables for Data/Voice LIMs	
Cable, DB15 male-to-female straight-through, 5, 10, 15, 25 or 50 ft	027H425-XXX
Cable, DB15 male-to-female crossover, 5, 10, 15, 25 or 50 ft	027H426-XXX
Cable, 75-ohm DB 15-to-BNC adapter for E1-2CS/4CS LIM	029H214-001
Cable, DB37 female-to-DB25-male (Xedge to TMS-CLK), 5, 15, 25, 50 or 100 ft	027H621-XXX
Cable, 50-pin male-to-male (HSSI LIM), 2, 10, 15, 25 or 50 ft	027H623-XXX
Cable, DB15 male-to-DB25-male (Xedge DS1 to CSU), 15, 25 or 50 ft	027H330-XXX
Cable, DB15 male-to-male straight-through with SL/LK, 10, 15, 25 or 50 ft	022H016-XXX
Cable, DB15 male-to-male E1 120 ohm, 5, 10, 25 or 50 ft	027H595-XXX
Adapter Cable, 68-pin D-type high density to 50-pin amphenol, 6 ft	025H604-006
Adapter Cable, 68-pin D-type high density to two 50-pin amphenol, 8 ft	027H703-008
Copper/Coax Cables for Data LIMs	
Cable, DB37 male-to-female straight-through, 5, 15, 25 or 50 ft	027H608-XXX
Cable, DB37 female-to-DB25-male (Xedge to TMS RS-449/422), 5, 15, 25, 50 or 100 ft	027H615-XXX
Cable, DB37 female-to-DB25-female (Xedge to LAN*TMS), 5, 15, 25, 50 or 100 ft	027H616-XXX
Cable, Xedge HSSI male-to-male crossover	027H620-002
Cable, Xedge RS-449/V.35 female DTE	027H590-015
Cable, Xedge RS-449/V.35 male DTE	027H591-015
Cable, Xedge RS-449/V.11 OCM	027H593-005
Cable, Serial I/O to X.21 DCE	027H440-005
Cable, Serial I/O to X.21 DTE	027H441-005
Cable, Serial I/O to EIA/TIA 530 DCE	027H442-003
Cable, Serial I/O to EIA/TIA 530 DTE	027H443-003
Cable, Serial I/O to RS449 DCE	027H444-005
Cable, Serial I/O to RS449 DTE	027H445-005
Cable, Serial I/O to V.35 DCE (5-, 14-, 15-ft)	027H446-XXX
Cable, Serial I/O to V.35 DTE (5-, 14-, 15-ft)	027H447-XXX
Cable, Coax 75 ohm with BNC connector, 10, 25, 50 or 100 ft	026H001-XXX

Table 8-1   Xedge System Cabinets, Chassis, Cables & Peripherals (Continued)

	Part No.
Fiber Optic Cables for Data LIMs	
Cable, Fiber Patch Cable, Duplex, LC-LC, Singlemode 9/125 Micron Fiber, 7 Meter	200H012-XXX
Cable, FC/PC to FC/PC Single Mode Fiber (3, 9, 20, 100 ft)	029H008-XXX
Cable, Duplex, SC to FC Single Mode Fiber (10, 20, 50 or 100 ft)	029H011-XXX
Cable, Duplex, SC to SC Single Mode (10, 20, 50 or 100 ft)	029H010-XXX
Cable, Duplex, SC/PC to SC/PC Multi Mode Fiber (10, 20, 50 or 100 ft)	029H006-010
Miscellaneous	
Cable, 100 Ohm (DS1), 25-twisted pair shielded cable	025H601-006
Cable, 120 Ohm (E1), 25-twisted pair shielded cable	025H602-006
Cable, 120 Ohm (E1), 4-twisted pair shielded cable	027H270-0X5
Cable, Optional Distribution Panel, RJ48M to RJ48C (for DS1 or E1 IMA LIM)	S-032A011-001
Cable, Optional Adapter, Patton 460 Balun 75 Ohm adapter (for E1 IMA LIM)	209-036-032
Kit, EIA530/EIA232 Distr Panel with two extender cables (for LCE-16 LIM)	032M130-001
Kit, 100 Ohm DS1 Distr Panel with 2-100 Ohm (DS1), 25-twisted pair shielded cables (DSX-IMA)	032M131-001
Kit, 120 Ohm E1 Distr Panel Kit with 2-120 Ohm, 25-twisted pair shielded cables (E1-IMA)	032M164-001
Kit, 75 Ohm E1 Distr Panel with 2-120 Ohm, 25-twisted pair shielded cables, 75 Ohm adapter and 16 120 Ohm 4-twisted pair shielded cables (E1-IMA)	032M165-001
Assy, Optional T1/E1 8-Port Break-out Cable, 50-pin RJ48M to 8 RJ45C (for any IMA LIMs)	S-032H016-001xx
Kit, E&M 2-port 2/4-wire Interface Plugin Card for Xedge ANA-Voice LIM	TBD
Kit, E&M 8-port 2/4-wire Interface Plugin Card for Xedge ANA-Voice LIM	TBD
Kit, FXS Interface Plugin Card for Xedge ANA-Voice LIM	TBD
Kit, FXO Interface Plugin Card for Xedge ANA-Voice LIM	TBD

General DataComm

The Best Connections in the Business