Alcatel-Lucent 7705

SERVICE AGGREGATION ROUTER | RELEASE 7.0.R4

SAR-X CHASSIS INSTALLATION GUIDE

Alcatel·Lucent

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Table of Contents

Table of Contents

List of Tables

List of Tables

List of Figures

List of Figures

Preface

About This Guide

This guide provides an overview of the Alcatel-Lucent 7705 Service Aggregation Router SAR-X chassis, recommendations for preparing the site, procedures for installing and grounding the chassis in a standard 19-inch utility rack, and instructions for connecting and provisioning the chassis.

After the hardware installation process is completed, see the List of Technical Publications below for details on the boot process, software configuration, and Command Line Interface (CLI) information to configure system and network parameters.

> **Note:** This manual generically covers Release 7.0 content and may contain some content that will be released in later maintenance loads. Please refer to the 7705 SAR OS 7.0.Rx Software Release Notes, part number 3HE10099000xTQZZA, for information on features supported in each load of the Release 7.0 software.

> **Note:**
>
> In Release 7.0, support for the following hardware has been deprecated:
>
> • CSMv1
> • 7705 SAR-F
> • 8-port Ethernet Adapter card, version 1
> • 16-port T1/E1 ASAP Adapter card, version 1
>
> These components are no longer recognized in the release.

List of Technical Publications

The 7705 SAR OS documentation set is composed of the following guides:

- 7705 SAR OS Basic System Configuration Guide

  This guide describes basic system configurations and operations.

- 7705 SAR OS System Management Guide

  This guide describes system security and access configurations as well as event logging and accounting logs.

- 7705 SAR OS Interface Configuration Guide

  This guide describes card and port provisioning.

- 7705 SAR OS Router Configuration Guide

  This guide describes logical IP routing interfaces, filtering, and routing policies.

- 7705 SAR OS MPLS Guide

  This guide describes how to configure Multiprotocol Label Switching (MPLS), Resource Reservation Protocol for Traffic Engineering (RSVP-TE), and Label Distribution Protocol (LDP).

- 7705 SAR OS Services Guide

  This guide describes how to configure service parameters such as service access points (SAPs), service destination points (SDPs), customer information, and user services.

- 7705 SAR OS Quality of Service Guide

  This guide describes how to configure Quality of Service (QoS) policy management.

- 7705 SAR OS Routing Protocols Guide

  This guide provides an overview of dynamic routing concepts and describes how to configure them.

- 7705 SAR OS OAM and Diagnostics Guide

  This guide provides information on Operations, Administration and Maintenance (OAM) tools.

Warnings and Notes

Observe the warnings and notes in this guide to avoid injury or equipment damage during installation and maintenance. Follow standard safety procedures and guidelines when working with and near electrical equipment. Warning statements and notes are provided in each chapter.
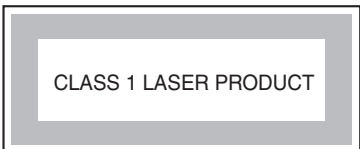
Audience

This guide is intended for network installers and system administrators who are responsible for installing, configuring, or maintaining networks. This guide assumes you are familiar with electronic and networking equipment.

Information Symbols

Table 1 describes symbols contained in this guide.

Table 1: Information Symbols

Symbol	Meaning	Description
	Danger	This symbol warns that improper handling and installation could result in bodily injury. An electric shock hazard could exist. Before you begin work on this equipment, be aware of hazards involving electrical circuitry, be familiar with networking environments, and perform accident prevention procedures.
	Warning	This symbol warns that improper handling and installation could result in equipment damage or loss of data.
	Caution	This symbol warns that improper handling may reduce your component or system performance.
	Note	This symbol provides additional operational information.
CLASS 1 LASER PRODUCT		Class 1 laser products are identified in this document. Only approved Class 1 replaceable laser transceivers should be used with those products.

Technical Support

If you purchased a service agreement for your 7705 SAR router and related products from a distributor or authorized reseller, contact the technical support staff for that distributor or reseller for assistance. If you purchased an Alcatel-Lucent service agreement, follow this link to contact an Alcatel-Lucent support representative and to access product manuals and documentation updates:

<div align="center">http://support.alcatel-lucent.com</div>

Mandatory Regulations

In This Chapter

The following sections describe the mandatory regulations that govern the installation and operation of the 7705 SAR-X:

- List of Terms
- General Requirements
- Canada Regulations
- United States Regulations
- European Union Regulations
- Australia/New Zealand Regulations
- China Regulations
- South Korea Regulations

List of Terms

Table 2 lists the mandatory regulations terms used in this guide.

Table 2: List of Terms

Term	Expansion
ACMA	Australian Communications and Media Authority
ACTA	Administrative Council for Terminal Attachments
ANSI	American National Standards Institute
AS/NZ	Australian/New Zealand standard
CBN	Common Bonding Network
CE	Conformité Européene
CFR	Code of Federal Regulations
CSA International	Canadian Standards Association International
DC-C	Common DC Return
DC-I	Isolated DC Return
EEC	European Economic Community
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EN	European Standards
ETSI	European Telecommunications Standards Institute
FCC	Federal Communications Commission
IBN	Isolated Bonding Network
ICES	Interference Causing Equipment Standard
IEC	International Electrotechnical Commission
IEE	Institute of Electrical Engineers (UK)
LVD	Low Voltage Directive
NRTL	Nationally Recognized Testing Laboratory
OSHA (USA)	Occupational Safety and Health Administration (USA)

Table 2: List of Terms (Continued)

Term	Expansion
RoHS	Restriction of the use of certain Hazardous Substances
SELV	Safety Extra Low Voltage
TNV1	Telecommunications Network Voltage, class 1
TNV2	Telecommunications Network Voltage, class 2
TNV3	Telecommunications Network Voltage, class 3
UL	Underwriters Laboratories
WEEE	Waste Electrical and Electronic Equipment

General Requirements

The sections that follow outline the mandatory regulations that govern the installation and operation of the 7705 SAR-X. The information in this section also describes instructions and information related to overall conformance with the mandatory regulations. You must adhere to these instructions so that your system meets regulatory requirements.

⚠️ **Warning:**

- There are no user-serviceable parts in this unit. Refer servicing to qualified personnel.
- The 7705 SAR-X should be connected to a DC branch circuit with a maximum 10 A circuit breaker or fuse that meets the requirements for branch circuit protection.
- A suitable disconnect device, such as a circuit breaker or switch, must be provided in the DC branch circuit and must be used to disconnect power to the system during servicing.

Anti-static Measures

Figure 1 shows the ESD awareness label used on Alcatel-Lucent products to alert personnel to the presence of ESD-sensitive devices in the product. The necessary ESD precautions must be taken whenever this symbol is present on the product.

Figure 1: ESD Awareness Label

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This guide uses the following icon and associated text to provide special information relating to ESD-sensitive activities or situations.

⚠

Warning:

- ESD damage can occur if components are mishandled. The 7705 SAR-X chassis and equipment rack must be properly grounded. A typical grounding point is one of the ground studs on the 7705 SAR-X chassis or a properly grounded rack or work bench.
- Always wear an ESD-preventive wrist or ankle strap connected to a nearby ground point that is connected to the site grounding point when working on the 7705 SAR-X.

The risk of damage to an ESD-sensitive device is reduced considerably after assembly in a circuit designed to protect sensitive components; however, the following basic precautions should be taken to reduce ESD to harmless levels.

- Handle all units as if they contained ESD-sensitive devices unless they are known not to contain ESD-sensitive parts.
- Wear an anti-static ESD strap on your wrist or heel prior to and while touching or handling units containing ESD-sensitive devices.
- For surfaces with resistance to ground in excess of 100 MΩ, such as ordinary tile, either cover them with properly grounded static dissipative runners or wax them with a static dissipative wax.
- Store (even temporarily), pack, and ship units in anti-static bags or containers.
- Do not handle units and components unnecessarily. Use the plastic faceplate to handle circuit boards.
- Do not use synthetic bristled brushes or acid brushes to clean units.
- Handle failed units with the same precautions as working units.

Grounding

When a 7705 SAR-X chassis is properly installed in a grounded equipment rack, the rack provides ESD grounding for the chassis. Before a 7705 SAR-X chassis is installed, connect the ESD wrist strap to a grounded rack or other ground point. After the 7705 SAR-X chassis is installed in a grounded rack, connect the anti-static wrist strap to the ESD strap ground point (the ground stud or plug), as indicated on the faceplate.

Unit Repair

The following stringent precautions are recommended to protect ESD-sensitive devices during repair to the 7705 SAR-X.

- Ground the work bench to the earth and cover the work surface with an anti-static or static dissipative material bonded to the bench. A field service kit or equivalent can be used if an adequate work bench is not available.
- Use a wrist strap of 250 kΩ to 2 MΩ that contacts your skin and is connected to the bolt that bonds the covering to the bench or safety ground.
- Ground all electrical equipment through a 3-wire power cord.
- Do not allow clothing to touch the unit or ESD-sensitive device under repair.
- Keep units in their original containers until actually needed, as units containing ESD-sensitive devices are delivered from the manufacturer with protective packing (containers or conductive foam).
- Keep containers that have units with ESD-sensitive devices in contact with the anti-static work surface, and make sure your anti-static wrist strap is connected before removing parts from containers. Devices should be handled by their bodies. Contact the lead only when necessary.
- Ensure test setups have the correct voltage polarity.
- Do not use VOM-type meters to measure resistance, as this can damage electrostatic-sensitive devices.
- Use only anti-static (metallized) desoldering tools.

Equipment Interconnection Points

Interconnection points of the 7705 SAR-X are defined as the following connectors:

SELV:

- T1/E1 ports
- Ethernet ports
- Time of Day (ToD)/pulse-per-second (PPS) Out port
- External Alarms connector
- Management (Mgmt) port
- Console port
- System Synchronization Input (Sync In) connector
- Optical Management Console (OMC) port
- USB port
- DC battery input (when less than 60 VDC)

TNV2:

- DC battery input (when $\geq$ 60 VDC, up to 80 VDC)

Primary:

- AC power input

Primary AC Power Supply

The primary AC power supply input connector can only be connected to a primary supply source (from a hydro company or motor generator set).

SELV

Connect SELV circuits on this equipment only to other circuits that comply with the requirements of SELV circuits as defined in CSA C22.2 No. 60950-1, UL 60950-1, EN 60950-1, AS/NZS 60950-1, and IEC 60950-1.

Prevention of Access

The 7705 SAR-X must be accessible only to authorized, trained service personnel. Install this apparatus in a restricted access location or similar environment to prevent unauthorized access.

Environmental Requirements for Installation

For information on the environmental requirements for installing the 7705 SAR family of products, see Installation Locations.

Laser Interface

The 7705 SAR-X uses a fiber-optic communications method and is an FDA and IEC Class 1 Laser product. Only trained service personnel thoroughly familiar with laser radiation hazards should install or remove the fiber-optic cables and cards in this system.

Protective Safety Ground (Earth)

The cable used for safety ground should be at least the same gauge as the supply conductors, green, or green and yellow, in color, and of sufficient length to connect the building earth point to the chassis ground connection (refer to Chassis Ground Wiring for specific instructions on connecting the chassis ground).

EMC Compliance

EMC compliance may require the use of shielded cables or other special accessories. Where required, these special accessories must be installed as per the instructions.

To maintain EMC compliance, cables that are shielded and grounded at both ends must be used on the following interfaces and connectors:

- 10/100/Gigabit Ethernet combination (XOR) interfaces (either RJ-45 or SFP)
- T1/E1 interfaces
- Mgmt port
- Console port
- ToD/PPS Out port
- External Alarms connector
- Sync In connector
- OMC port
- USB port

Regulatory Symbols

The 7705 SAR-X uses various regulatory approvals symbols. They may be used on product markings such as approvals labels. These symbols are described in IEC 60417.

Figure 2 and Figure 3 show symbols of a terminal that you must connect to earth ground before you make any other connections to the equipment. Figure 4 shows the symbol for an AC-powered chassis, indicating that the chassis has fuses in both Line and Neutral; that is, it uses double pole/neutral fusing.

Figure 2: Protective Earth (ground)

9717

Figure 3: Earth (ground)

9718

Figure 4: Double Pole/Neutral Fusing

24999

Canada Regulations

This section describes the mandatory regulations that govern the installation and operation of the 7705 SAR-X in Canada.

Industry Canada Regulations

ICES-003: Interference-Causing Equipment Standard - Information Technology Equipment (ITE) - Limits and methods of measurement

➡️ **Note:** Changes or modifications not expressly approved by Alcatel-Lucent could void the user's authority, granted by Alcatel-Lucent's certification by Industry Canada, to operate the equipment.

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

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

IC CS-03: Specification for Terminal Equipment, Terminal Systems, Network Protection Devices, Connection Arrangements and Hearing Aids Compatibility

This product meets the applicable Industry Canada technical specifications with respect to IC CS-03: Specification for Terminal Equipment, Terminal Systems, Network Protection Devices, Connection Arrangements and Hearing Aids Compatibility.

The product registration number indicating compliance for the 7705 SAR-X is:

IC: 1737F-0018A

EMC Compliance

EMC compliance requires the use of shielded cables or other special accessories. These special accessories must be installed as per the instructions.

United States Regulations

This section describes the mandatory regulations that govern the installation and operation of the 7705 SAR-X in the United States.

Federal Communications Commission

FCC Part 15

→ **Note:** Changes or modifications not expressly approved by Alcatel-Lucent could void the user's authority, granted by Alcatel-Lucent's certification by the FCC, to operate the equipment.

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

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

FCC Part 68

The T1 network interface on the 7705 SAR-X meets the FCC specifications.

This equipment complies with Part 68 of the FCC rules and the requirements adopted by the ACTA.

The product identification number indicating compliance for the 7705 SAR-X is: GQ6DENAN7705SAR-X

In the event that repairs to this equipment are needed, contact Technical Support.

NRTL

This equipment is certified by the NRTL as meeting the requirements of UL 60950-1, Safety of Information Technology Equipment.

NRTL Approval for External DC Supplies

When the system is equipped with an AC rectifier, the rectifier must have NRTL-accredited approval. In addition, low-voltage DC outputs must meet UL 60950-1 SELV requirements. High-voltage DC sources must meet UL 60950-1 hazardous voltage secondary source requirements.

Food and Drug Administration

This product complies with 21 CFR 1040.10 and 1040.11 regulations, which govern the safe use of lasers. Only qualified service personnel, thoroughly familiar with laser radiation hazards, should install or remove the fiber-optic cables used in this system. You can find information about the safe use of lasers in ANSI Z 136.1: Safe Use of Lasers and ANSI Z 136.2: Safe Use of Lasers in Optical Fiber Communications Systems. You can obtain these documents and other instructional material from:

<div align="center">

Laser Institute of America
13501 Ingenuity Drive, Suite 128
Orlando, FL 32826

http://www.laserinstitute.org

</div>

European Union Regulations

This section describes the mandatory regulations that govern the installation and operation of the 7705 SAR-X in the European Union.

Declaration of Conformity

Hereby, Alcatel-Lucent declares that the equipment documented in this publication is in compliance with the essential requirements and other relevant provisions of Directive 2004/108/EC, Directive 2006/95/EC and 2011/65/EU.

The technical documentation as required by the Conformity Assessment procedure is kept at the Alcatel-Lucent location that is responsible for this product. For more information, please contact your local Alcatel-Lucent Customer Service Organization.

EU Compliance Statement

This product has been CE marked in accordance with the requirements of European Directives 2004/108/EC, the Electromagnetic Compatibility (EMC) Directive; 2006/95/EC, the Low Voltage Directive (LVD); and 2011/65/EU, the Restriction of the use of certain Hazardous Substances in Electrical band Electronic Equipment (RoHS2).

EMC/EMI Compliance

The equipment complies with the following EMC and EMI specification: EN 300 386 Class A.

General

This equipment must be permanently grounded.

Laser Interface

The equipment uses laser devices that are rated in accordance with IEC 60825-1 as Class 1 devices.

Safety Approval for DC Systems

The DC source for the equipment must meet the requirements of a SELV source as defined in EN 60950-1. For 60V station battery systems, the source is considered TNV-2 as per IEC/EN 60950-1 and must have reinforced insulation from the AC mains.

The equipment complies with the following Product Safety specification: EN 60950-1.

Protective Earth

Protective earth is referred to as chassis ground in this document. A green, or green and yellow, colored earth wire must be connected from the site equivalent of the mains earth connection to all shelves in accordance with IEE Wiring Regulations (16th edition). This connection is made via the chassis ground connection (refer to Chassis Ground Wiring for specific instructions on connecting the protective earth). The protective earth is also carried by the mains plug and socket (for AC systems only).

Eco-Environmental

Packaging Collection and Recovery Requirements

Countries, states, localities, or other jurisdictions may require that systems be established for the return and/or collection of packaging waste from the consumer, or other end user, or from the waste stream. Additionally, reuse, recovery, and/or recycling targets for the return and/or collection of the packaging waste may be established.

For more information regarding collection and recovery of packaging and packaging waste within specific jurisdictions, please contact the appropriate environmental health and safety organization.

Recycling / Take-back / Disposal of Product

Electronic products bearing or referencing the symbol shown in Figure 5, when put on the market within the European Union, shall be collected and treated at the end of their useful life in compliance with applicable European Union and local legislation. They shall not be disposed of as part of unsorted municipal waste. Due to materials that may be contained in the product, such as heavy metals or batteries, the environment and human health may be negatively impacted as a result of inappropriate disposal.

➡ **Note:** In the European Union, the WEEE symbol (a wheeled trash bin that has been crossed out and is positioned above a solid bar) indicates that the product was put on the market after 13 August 2005. This product is compliant with the WEEE marking requirements of DIRECTIVE 2002/96/EC Waste Electrical and Electronic Equipment (WEEE).

Figure 5: WEEE Symbol for post-August 13, 2005 Product

21828

Moreover, in compliance with legal requirements and contractual agreements, where applicable, Alcatel-Lucent will offer to provide for the collection and treatment of Alcatel-Lucent products bearing the logo at the end of their useful life, or products displaced by Alcatel-Lucent equipment offers. For information regarding take-back of equipment by Alcatel-Lucent, or for more information regarding the requirements for recycling/disposal of product, please contact your Alcatel-Lucent Account Manager or Alcatel-Lucent Takeback Support at takeback@alcatel-lucent.com.

Material Content Compliance

European Union (EU) Directive 2011/65/EU, "Restriction of the use of certain Hazardous Substances in electrical and electronic equipment" (RoHS 2), restricts the use of lead, mercury, cadmium, hexavalent chromium, and certain flame retardants in electrical and electronic equipment. This Directive applies to electrical and electronic products placed on the EU market after 2 January 2013, with various exemptions, including an exemption for lead solder in network infrastructure equipment. Alcatel-Lucent products shipped to the EU after 2 January 2013 comply with the EU RoHS 2 Directive. Alcatel-Lucent ensures that equipment is assessed in accordance with the Harmonised Standard EN 50581:2012 (CENELEC) on "Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances".

Australia/New Zealand Regulations

This section describes the mandatory regulations that govern the installation and operation of the 7705 SAR-X in Australia and New Zealand.

ACMA Regulations

The 7705 SAR-X complies with the ACMA requirements, and the product is marked with the 'A Tick' under the Supplier Code N594 or with the new RCM logo under the Supplier Code E762.

EMC

This Class A digital apparatus complies with AS/NZS CISPR22.

Telecom

The product meets the applicable ACMA technical specifications: AS/ACIF S016.

Safety

All products supplied in Australia are to be safe and are to comply with an applicable Australian Standard electrical safety standard.

The 7705 SAR-X complies with the AS/NZS 60950.1—Business Equipment, Computers, Telecommunications requirements.

China Regulations

The statements that follow are the product conformance statements that apply to the 7705 SAR-X when deployed in China.

Safety

The equipment complies with the Product Safety specification of IEC 60950-1.

Eco-Environmental

Packaging Collection and Recovery Requirements

Jurisdictions in China may require that systems be established for the return and/or collection of packaging waste from the consumer, or other end user, or from the waste stream. Additionally, reuse, recovery, and/or recycling targets for the return and/or collection of the packaging waste may be established.

For more information regarding collection and recovery of packaging and packaging waste within specific jurisdictions, please contact the appropriate environmental health and safety organization.

Material Content Compliance

The People's Republic of China Ministry of Information Industry has published a regulation (Order #39) and associated standards regarding restrictions on hazardous substances (China RoHS). The legislation requires all Electronic and Information Products (EIP) to comply with certain labeling and documentation requirements. Alcatel-Lucent products manufactured on or after 1 March 2007, that are intended for sale to customers in the China market, comply with these requirements.

In accordance with the People's Republic of China Electronic Industry Standard "Marking for the Control of Pollution Caused by Electronic Information Products" (SJ/T11364-2006), customers may access the Alcatel-Lucent Hazardous Substances Table, in Chinese, from the following location:

http://www.alcatel-sbell.com.cn/wwwroot/images/upload/private/1/media/ChinaRoHS.pdf

Altitude Limit

Alcatel-Lucent products use the symbol shown in Figure 6 on the approvals label to indicate that the product is only to be used at altitudes equal to or less than 2000 m (6562 ft) above sea level.

Figure 6: Altitude Limit Symbol

23467

仅适用于海拔2000m 以下地区安全使用¨ 或类似的警告语句

"Only used at altitudes no higher than 2000 m above sea level"

South Korea Regulations

The seller and user will be notified that this equipment is suitable for electromagnetic equipment for office work (Class A) and it can be used outside the home.

이 기기는 업무용(A급)으로 전자파적합기기로서 판매자 또는 사용자는 이 점을

주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다

South Korea's "Electrical Communication Basic Law" requires EMC testing and certification. Certified equipment will be labeled with the KC mark and certification number shown below:

Certification number: MSIP-REM-ALU-7705SAR-X.

7705 SAR-X Chassis Installation Guide

7705 SAR-X Overview

In This Chapter

This chapter provides an introduction to the Alcatel-Lucent 7705 SAR-X:

- Overview of the 7705 SAR-X
- 7705 SAR-X Components
- 7705 SAR-X System Installation Process

Overview of the 7705 SAR-X

The 7705 SAR-X is a full-featured IP/MPLS service aggregation router that is used for mobile backhaul, fixed networks, and vertical markets. It offers a high switching capacity and port density, unmatched IPv4 and IPv6 functionality (including a full IPv6 subnet range for IPv6 static routes and interface IP addresses), label BGP route selection, MPLS scalability, deep buffering, hardware-enabled encryption (IPSec and NGE), and NAT, in a compact 1 RU footprint.

The fixed configuration of the 7705 SAR-X replaces the CSM module found in the 7705 SAR-8 and 7705 SAR-18 with a circuit board that is integrated into the chassis. This circuit board supports all the control and switching functions of the system, and provides Ethernet and T1/E1 interfaces, connectors for system management, synchronization, and alarms, and LED indicators.

The 7705 SAR-X has preassigned parameters. The software and hardware architecture is similar to other SAR products in that the IOM is a virtual entity, existing in software and supported by the system hardware. The I/O ports are grouped and virtualized into slots (MDAs) for convenience of assignment. The result of this design is that the CLI identifiers for the IOM and MDAs do not need to be physically provisioned. The fixed configuration of the 7705 SAR-X restricts the router to port-level provisioning; however, the IOM and MDA numbering must still be specified in CLI commands.

The CLI syntax follows the structure of IOM number/MDA number/port number. The IOM is always 1; the MDA must be specified as 1 for T1/E1 ports and 2 or 3 for Ethernet ports, as shown in Table 21. The port number is specified as a variable that can have a value from 1 to 8 for T1/E1 ports and from 1 to 7 for Ethernet ports, depending on how the port is configured; see Table 21. The circuit board appears in the CLI as CSM A.

7705 SAR-X Components

Chassis

The 7705 SAR-X is a fan-cooled, rack-mountable, IP20 design chassis that is available in two variants. The AC-powered variant has a single-feed AC input that can be connected to a 100 to 240 VAC, 50/60 Hz power source. The DC-powered variant has a dual-feed DC input that can be connected to a single or dual +24/48/60 VDC power source. Both variants have two grounding points, one at the rear of the chassis and one at the front. Both variants also have the following faceplate features (see 7705 SAR-X Connectors and LEDs for a description of these features):

- Optical Management Console (OMC) port
- RJ-45 Ethernet Management (Mgmt) port
- USB port
- RJ-45 Time of Day (ToD)/pulse-per-second (PPS) Out port
- RJ-45 Console port
- eight T1/E1 RJ-45 ports
- four 10/100/Gigabit Ethernet combination (XOR) RJ-45/SFP ports
- eight 10/100/Gigabit Ethernet SFP ports
- two 10GigE SFP+ ports
- 1.0/2.3 50 Ω System Synchronization Input (Sync In) connector
- DB-15 External Alarms connector
- Alarm Cut Off (ACO) button

Both variants can be ordered with conformal coating. Conformal coating provides extra protection to sensitive electronic components against environmental contaminants when the 7705 SAR-X is deployed in harsh environments. For more details on whether this option is required, contact your Alcatel-Lucent representative.

The chassis is actively cooled by fans that provide draw-through (pull-based) cooling. Field-replaceable fan filters are used with the fans.

➡ **Note:** For Central Office-type environments, filters must be replaced at least every 90 days, more often as necessary based on local conditions. See Replacing the Fan Filter for the procedure on how to replace a fan filter.

Mounting brackets for the 7705 SAR-X chassis are factory-installed and are used to mount the unit horizontally in a 19-inch rack.

The 7705 SAR-X chassis can also be mounted vertically. Vertical installation can use a Vertical Rack Mount Kit (part number 3HE09608AA), which is ordered separately. Refer to the Vertical Rack Mount Kit Installation Guide (document number 3HE 10249 AAAA TQZZA) for installation information.

Figure 7 shows an AC-powered 7705 SAR-X chassis faceplate, and Figure 8 shows a DC-powered 7705 SAR-X chassis faceplate. Figure 9 shows the grounding point located at the rear the of 7705 SAR-X chassis.

Figure 7: AC-Powered 7705 SAR-X Chassis Faceplate
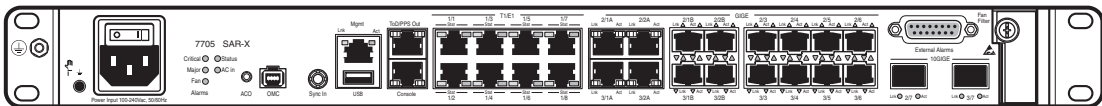
Figure 8: DC-Powered 7705 SAR-X Chassis Faceplate
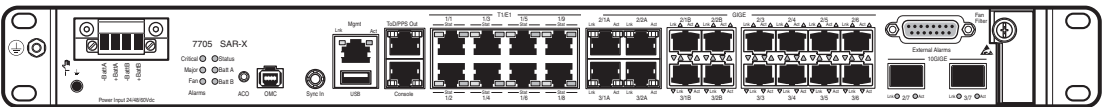
Figure 9: Grounding Point at the Rear of a 7705 SAR-X Chassis

Interface Ports

The 7705 SAR-X chassis is equipped with the following T1/E1 and Ethernet interface ports that provide access for a wide variety of interface speeds and types:

- 8 x T1/E1 RJ-45 ports for TDM PW - the ports are numbered 1/1 to 1/8; the odd-numbered ports are located on the top row and the even-numbered ports are located on the bottom row

- 4 x 10/100/Gigabit Ethernet combination (XOR) ports that can be individually configured for either RJ-45 or SFP - the RJ-45 ports are numbered 2/1A, 2/2A (top row), 3/1A, 3/2A (bottom row), and the SFP ports are numbered 2/1B, 2/2B (top row), 3/1B, 3/2B (bottom row)
- 8 x 10/100/Gigabit Ethernet SFP ports - the ports are numbered 2/3 to 2/6 (top row) and 3/3 to 3/6 (bottom row)
- 2 x 10GigE SFP+ ports - The ports are numbered 2/7 and 3/7

Note:

- The T1/E1 ports must be either all T1 or E1; there cannot be a mix of the two types.
- The combination ports are configured using the `xor-mode` command; see the 7705 SAR OS Interface Configuration Guide, "Ethernet Commands", for more information.
- When making connections to the T1/E1 and Ethernet ports, shielded cable must be used to maintain EMC compliance. For vertical markets, double-shielded cables are required for Ethernet XOR copper interfaces and Ethernet SFP copper interfaces.

Synchronization and Management Connectors

The 7705 SAR-X chassis is equipped with the following connectors that provide access for system synchronization and management functions:

- RJ-45 Ethernet Mgmt port - provides a dedicated system management interface that is segregated from other data traffic
- RJ-45 Console port - provides an RS-232 serial device management connection to a CLI access terminal
- RJ-45 ToD/PPS Out connector - provides a connection that is used to send a Time of Day and an RS-422 1 PPS signal
- 1.0/2.3 Sync In connector - a 50 Ω coaxial connector that can be used to receive an external synchronization input signal
- DB-15 External Alarms connector - provides dry contacts for three alarm outputs and four inputs. See External Alarms Connector for more information on external alarms and pinout assignments
- OMC port - provides an interface that is used for passive multiplexing shelf management
- USB port - supports USB storage devices that can be used to store accounting records, logs, and TiMOS images

Flash Devices

The 7705 SAR-X chassis is shipped with two 256 Mbyte flash memory devices that store system boot software, OS software, and configuration files and logs. The flash devices facilitate the commissioning process as the devices can be installed pre-programmed with the desired software and configuration files.

Note: The flash devices are not field-replaceable. Replacement of the devices is done as a service repair.

Chassis Cooling

The 7705 SAR-X chassis components are actively cooled by five internal non-replaceable fans that are always on. The fans are intelligently speed-controlled based on environmental conditions. In the event of a fan failure, all remaining fans go to full speed and a Fan alarm is raised. See 7705 SAR-X Connectors and LEDs.

Warning: There is sufficient cooling even if one of the fans fails. To avoid any system damage or functional performance degradation due to an additional fan failure, the chassis must be replaced within 96 h (4 days) when a 'FAN Failure' is declared via a critical alarm.

7705 SAR-X System Installation Process

To install a 7705 SAR-X chassis, perform the installation procedures in the following order:

Step 1. Prepare the site.

Step 2. Unpack the chassis.

Step 3. Mount and ground the chassis.

Step 4. Prepare and connect the input power cables to an AC or DC power source.

Step 5. Install the SFPs.

Step 6. Power up the system.

Step 7. Connect the network cables.

Step 8. Provision (preconfigure) the system.

Site Preparation

In This Chapter

This chapter provides information about preparing your site to install a 7705 SAR-X chassis:

- Warnings and Notes
- System Specifications
- Installation Locations
- Installation Site Assessment

Warnings and Notes

Danger:

- Installation and servicing must be done only by trained service personnel familiar with potential electrical, mechanical, and laser radiation hazards.
- The 7705 SAR-X needs a disconnect device on each power feed (such as an external circuit breaker, switch, or fuse) to disconnect DC power from the DC variant. Disconnect both A and B feeds before servicing. For the AC variant, disconnect the AC power cord to remove power.
- The 7705 SAR-X chassis and equipment rack must be properly grounded. Chassis ground cables are not included. Lack of proper grounding (earthing) of the equipment may result in a safety hazard and excessive electromagnetic emissions.
- Before making the chassis ground connection, ensure that all power is OFF from the DC circuit or AC power source.
- Be aware of all operating equipment in the area of the 7705 SAR-X installation. Make safe any exposed power equipment, such as breaker panel bus bars or power connectors on any nearby equipment. Either shut off the power, if possible, or install safety guards or mats over exposed power points and cables. Tools used for power connections should be insulated in an appropriate manner for the task.
- The 7705 SAR-X uses a fiber-optic communications method and is a Class 1 laser product. Only trained service personnel familiar with laser radiation hazards should install or remove fiber-optic cables and modules in this system.

Warning:

- To properly transport and relocate a 7705 SAR-X chassis, do the following:
  - → disconnect power to the chassis by opening the disconnect devices or removing the AC power cord
  - → detach all cables from the 7705 SAR-X; remove the protective ground connection last
  - → if the 7705 SAR-X is installed in a rack, carefully remove it from the rack
  - → repackage the 7705 SAR-X in its original packaging or an appropriately sized shipping container for relocation
- The 7705 SAR-X systems powered by DC power should be installed in restricted access areas, such as a dedicated equipment room or an equipment closet, in accordance with Articles 110-16, 110-17, and 110-18 of the National Electric Code ANSI/ NFPA 70.
- To provide necessary stability, ensure that the equipment rack is bolted to the floor. Ceiling brackets are useful to provide additional stability.
- When wiring the unit, the chassis ground connection must always be made first and disconnected last.
- When mounting the chassis in a rack, ensure that the rack complies with all requirements outlined in Chassis Location Requirements.
- Maintain a clearance of at least 2.5 in. (6.4 cm) at the front of the 7705 SAR-X chassis for cable management.
- Maintain a clearance of at least 2 in. (5.1 cm) on each side of the 7705 SAR-X chassis to ensure adequate airflow.
- The 7705 SAR-X chassis ground must be connected to the building ground, using either a direct connection or a ground bus.
- Electrostatic discharge (ESD) damage can occur if the 7705 SAR-X is mishandled. Always wear an ESD-preventive wrist or ankle strap and always connect an ESD strap to a nearby ground point that is connected to the site grounding point when working on the 7705 SAR-X. Typical ground points include a properly grounded rack or work bench.
- The washers and nut used to secure the chassis ground wire on the ground stud must only be used for that purpose.
- Do not install equipment that appears to be damaged.
- Install the 7705 SAR-X chassis in the equipment rack before installing SFPs.
- Failure to comply with the equipment rack and chassis instructions as outlined in Installation Locations and Chassis Location Requirements may cause thermal failure.

Caution: When a T1/E1 port that is configured for T1 is connected to external equipment or is in physical loopback, ensure that the external equipment's transmit signal is attenuated according to the distance of the T1/E1 port receiver. Adjust LBO settings such that the T1/E1 port receiver's nominal input voltage level is < 3Vp. Refer to "Configuring T1 Line Buildout" in the 7705 SAR OS Interface Configuration Guide for detailed information on attenuating transmit signals.

Warnings and Notes

➡ **Note:**

- Prepare the equipment rack and site before installing the 7705 SAR-X chassis. Plan the chassis placement near the power sources and network interface connections.
- A 7705 SAR-X chassis weighs approximately 9.7 lbs (4.4 kg).
- Always install the heaviest equipment on the bottom of the rack to keep the center of gravity of the equipment rack as low as possible.
- The 7705 SAR-X chassis includes factory-installed, rack-mounting brackets for mounting in a 19-inch equipment rack.

System Specifications

Chassis Specifications

Table 3: 7705 SAR-X Chassis Specifications

Parameter	Description
Dimensions (H x W x D) (without mounting brackets)	1.7 x 17.4 x 10.0 in. (4.3 x 44.2 x 25.4 cm)
Chassis weight	9.7 lbs (4.4 kg)
Mounting	Horizontal or vertical Mount in a standard 19-inch equipment rack Rack-mount brackets are factory-installed for 19-inch NEBS mounting

Environmental Specifications

Table 4: Environmental Specifications

Parameter	Description
Shipping and storage temperature	–40 to 158ºF (–40 to 70ºC)
Normal operating temperature	–40 to 149ºF (–40 to 65ºC)
Cold start temperature	–40ºF (–40ºC)
Normal relative humidity	5 to 95% (non-condensing), not to exceed 0.024 lb of water per 1.0 lb of air (35 g of water per 1.0 cubic meter of air)
Altitude range	Between 197 ft (60 m) below sea level and 5906 ft (1800 m) above sea level (70 kPa to 106 kPa)
Shock and vibration	Very low levels for continuous duration disturbance (similar to modern office building, for example) Shock: 3 g half sine 11 ms Vibration: 0.1 g from 5 to 100 Hz
Earthquake	Suitable for high-risk areas (Zone 4)

Table 4: Environmental Specifications (Continued)

Parameter	Description
Pollution degree [1]	2
Enclosure classification [2]	IP20
Rated Voltage/Current (DC)	+24/48/60 VDC, 6/3/2.5 A
Operating voltage range (DC)	+20 to +30 VDC, –40 to –75 VDC
Rated voltage/Current (AC)	100–240 VAC, 1.2–0.6 A, 50/60 Hz
Operating voltage range (AC)	85 VAC to 264 VAC, 47 to 63 Hz
Acoustic noise level	< 72 dB (Declared Sound Power)

Notes:

1. Pollution degree as defined in IEC 60950.

2. Classification as defined in IEC 60529.

7705 SAR-X Power Consumption

Table 5 lists the power consumption estimates for the 7705 SAR-X chassis, and Table 7 lists the maximum heat dissipation.

Table 5: Chassis Power Consumption

Description [1]	Typical Power (W)	Maximum Power (W)
7705 SAR-X (AC system)	100 W	129 W
7705 SAR-X (DC system)	109 W	143 W

Note:

1. Power consumption values include the power consumption of the pluggable optics (see Table 6).

Table 6 lists the maximum power consumption for the Alcatel-Lucent approved SFP, SFP+, and XFP modules. Not all types are applicable to all chassis, adapter cards, and modules. Contact your Alcatel-Lucent representative for information on SFP, SFP+, and XFP module availability and applicability.

Table 6: Maximum Power Consumption for Approved Pluggable Optics

Component	Type	Maximum Power (W)
10/100/1000Base Ethernet Optic (and Copper-RJ45) Module	SFP	1 W
OC-3/STM-1 SONET/SDH Optic (and Electrical) Module	SFP	1 W
10GBase (and low-power DWDM) Ethernet Optic Module	SFP+	1.5 W
10GBase (DWDM) high-power Ethernet Optic Module	SFP+	2 W
10GBase Ethernet Optic Module	XFP	3.5 W

→ **Note:** The ambient temperature outside the 7705 SAR will influence the SFP case temperature, depending on which chassis the SFP is installed in. The maximum system inlet ambient temperature to SFP temperature rise is as follows:

- up to 10°C for the 7705 SAR-18, 7705 SAR-8 Shelf V2, 7705 SAR-F, and 7705 SAR-X
- up to 15°C for the 7705 SAR-A, 7705 SAR-M, 7705 SAR-W, and 7705 SAR-Wx
- up to 20°C for the 7705 SAR-8, 7705 SAR-H, and 7705 SAR-Hc

Ensure that the SFP to be installed supports an operating temperature range that accommodates the expected temperature rise inside the chassis.

Table 7: Heat Dissipation

	Power Consumption (W) (Worst Case)	Maximum Heat Dissipation (BTU/hr) [1]
7705 SAR-X (AC system)	129 W	440 BTU/hr
7705 SAR-X (DC system)	143 W	488 BTU/hr

Note:

1.   BTU/hr = watts $\times$ 3.41214

CBN and IBN Grounding Requirements

The 7705 SAR-X supports both Common Bonding Networks (CBN) and Isolated Bonding Networks (IBN) for systems using a DC power source. The battery terminals that are labeled +BattA, –BattA, +Batt B, and –Batt on the chassis are floating inputs relative to digital or chassis ground within the chassis. For systems using an AC power source, only CBN is supported.

See Chassis Ground Wiring for information on grounding the chassis

Power and Cabling Requirements

Danger:
- Only electrical service personnel should perform wiring and cabling to the system.
- Power cables must meet local electrical code requirements.
- All power to the equipment rack or cabinet should be disconnected before the installation.
- When removing power cables from the system, first disconnect the power from the source and then disconnect the cables from the 7705 SAR-X.

DC Power Requirements

- An external DC-rated circuit breaker or fuse with a recommended current rating of 10 A (maximum) must be located conveniently close to the equipment. This is intended as the disconnect device. A ganged breaker that simultaneously disconnects both sides of the supply line is also acceptable.
- The minimum AWG power conductor for the DC input connections must be based on the application, and on the local codes, practices, and regulations applicable for the region. The acceptable range is 12 to 16 AWG.

AC Power Requirements

- A standard 120 or 240 VAC outlet.
- One of the following AC power cords (the AC power cord is not supplied with the 7705 SAR-X chassis):
  - → 3HE10040AAAA (for North America)
  - → 3HE10041AAAA (for Europe)

Cabling Requirements

Warning:
- To meet surge protection requirements, the shield on any open-ended cable must be grounded by attaching the shield to a convenient chassis ground point, using hardware suitable to provide a solid electrical and mechanical connection. In addition, ensure that there is sufficient strain relief to remove any mechanical strain on the ground connection due to cable movement.
- The intra-building ports of the equipment or sub-assembly are suitable for connection to intra-building or unexposed wiring or cabling only. The intra-building ports of the equipment or sub-assembly must not be metallically connected to interfaces that connect to the Outside Plant (OSP) or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 2 ports as described in GR-1089-CORE) and require isolation from the exposed OSP cabling. The addition of primary protectors is not sufficient protection in order to connect these interfaces metallically to OSP wiring. Connection to external OSP wiring must be made through an external CSU prior to exiting the building.
- Bare conductors must be coated with an appropriate antioxidant compound before crimp connections are made. All unplated connectors, braided straps, and bus bars must be brought to a bright finish and then coated with an antioxidant before they are connected.
- The 7705 SAR-X is suitable for use in DC-I, DC-C, or AC powered installations. There are no connections between the battery return and chassis ground within the 7705 SAR-X.

Storage

To store an uninstalled 7705 SAR-X, repackage it in its original packaging or an appropriately sized container and keep it in a dry, dust-free, temperature-controlled environment.

Table 8: Storage Specifications (Both Variants)

Parameter	Description
Storage and shipping temperature	From –40 to 158ºF (–40 to 70ºC)
Non-condensing relative humidity	Within 5 to 95%

Installation Locations

⚠️ **Warning:**

- The 7705 SAR-X must not be installed in the same compartment as the batteries, which can give off gas. Out-gassing from batteries not only could have corrosive effects, but could also result in an explosion. If batteries are located in the same cabinet, the battery compartment must be completely sealed off from all other equipment and must be properly ventilated for safety as required by product safety standards and local codes and statutes.

- Follow the equipment rack manufacturer's instructions for proper rack installation. Failure to comply with the requirements and the location requirements outlined in this section and in Chassis Location Requirements may impede proper airflow and may result in the system overheating.

The 7705 SAR-X is intended to be installed at cell sites or other facilities that provide weather protection and an extended temperature-controlled environment. The 7705 SAR-X is not intended for installation outdoors.

The 7705 SAR-X is designed to work in an environment equivalent to a modern office building, where protection is provided from contaminants including mold growth, precipitation, volatile or corrosive chemicals, hygroscopic dust, insects, pests, or vermin entering the product.

When a 7705 SAR-X is installed in an outside plant, such as a cell site, hut, cabinet, or outside plant enclosure, it must be installed in an environment where, except during installation and servicing, the compartment is sealed or properly filtered.

The product must be protected from ingress of contaminants such as outside air, conductive pollution, volatile or corrosive elements (for example, salt-laden air), hygroscopic dust, insects, pests, or vermin.

Protection is typically achieved by deploying the product in a cabinet that is sealed and is provided either with air-to-air heat exchangers or with air-conditioning and/or heaters as required for the local climate. If the cabinet is the type that allows outside air to ventilate the cabinet, it must have Hydrophobic Membrane filters, at the air inlet and air exit, with all other parts properly sealed against outside contaminants and moisture.

Typically, cabinets that comply with Telcordia GR-487, Generic Requirements for Electronic Equipment Cabinets, provide this level of protection.

The humidity levels in the cabinet must be controlled to ensure a relative humidity level between 5% and 95% (non-condensing). The dew point threshold in the cabinet must not be crossed.

Conformal coating provides extra protection to sensitive electronic components against environmental contaminants when the 7705 SAR-X is deployed in harsh environments. For more details on whether this option is required, contact your Alcatel-Lucent representative.

Airflow on the 7705 SAR-X is defined as EC Class (S) SR-SL per GR3028. For proper thermal performance, the following conditions must be met.

- The rack must be constructed using channel or angle rack uprights that are a minimum 1.25 in. (3.2 cm) deep and maximum 5 in. (12.7 cm) wide.
- For seismic applications, the rack must be an approved Seismic Frame.
- Deployment of a 7705 SAR-X in a closed cabinet is not recommended. If a closed cabinet must be used, it must not restrict shelf airflow in any way. Furthermore, it must not cause the shelf inlet bulk air temperature to rise above that defined in Chassis Location Requirements under worst-case environmental conditions, including any preheating of the cabinet air by other equipment.
- The mounting holes in the equipment rack or cabinet must align with the mounting holes on the chassis mounting brackets.

Chassis Location Requirements

⚠ **Warning:** Failure to comply with the location requirements outlined in Installation Locations and in this section may impede proper airflow, which may result in equipment failure due to overheating.

Horizontal Mounting

Observe the following requirements when installing a 7705 SAR-X chassis horizontally.

- Allow at least 2 in. (5.1 cm) clearance on the sides of the chassis for proper airflow and at least 2.5 in. (6.4 cm) in front of the chassis for cable management.
- Ensure that the 7705 SAR-X chassis is located in an area that can provide an inlet air temperature no greater than 149°F (65°C) under full system power loading combined with worst-case environmental deployment conditions.
- Ensure that the 7705 SAR-X chassis intake is not located immediately adjacent to the exhaust of another chassis such that preheated air above 149°F (65°C) is drawn into the system.
- Ensure that the inlet and exhaust of the 7705 SAR-X chassis is free of obstructions from cabling, mounting hardware, or other electronic equipment in the areas shown in Figure 10 and described in Table 9.

Figure 10: Chassis Clearance Requirements (View from Top)
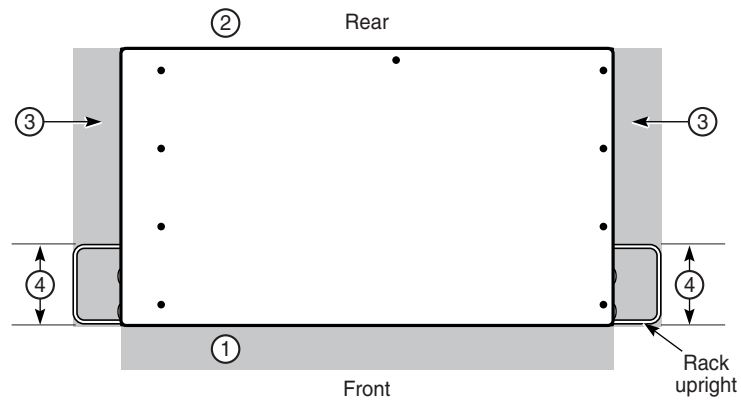
Table 9: Chassis Clearance Specifications

Key	Description
1	Front: 2.5 in. (6.4 cm) required for cable management
2	Rear: No clearance required
3	Side: 2 in. (5.1 cm) minimum required for airflow
4	Rack channel width: 5 in. (12.7 cm) maximum **Note**: The side venting on the chassis must not otherwise be obstructed by metal places or other rack structures

Vertical Mounting

The 7705 SAR-X can be installed vertically with or without the Vertical Rack Mount Kit (part number 3HE09608AA).

➡ **Note:** Vertical mounting is not a NEBS-compliant option for the 7705 SAR-X system.

Vertical Mounting Without a Vertical Rack Mount Kit

Observe the following requirements when installing the system vertically without a Vertical Rack Mount Kit.

- Ensure that the chassis is installed with the fans at the top, since the fans draw air out of the chassis.
- Ensure that the chassis is installed above a concrete or other non-combustible surface, such as a drip tray, for safety compliance.
- Allow at least 2 in. (5.1 cm) clearance on the sides of the chassis for proper airflow and at least 2.5 in. (6.4 cm) in front of the chassis for cable management.
- Ensure that the 7705 SAR-X chassis is located in an area that can provide an inlet air temperature no greater than 149°F (65°C) under full system power loading combined with worst-case environmental deployment conditions.
- Ensure that the 7705 SAR-X chassis intake is not located immediately adjacent to the exhaust of another chassis such that preheated air above 149°F (65°C) is drawn into the system.
- Ensure that the inlet and exhaust of the 7705 SAR-X chassis is free of obstructions from cabling, mounting hardware, or other electronic equipment in the areas shown in Figure 10 and described in Table 9.

Vertical Mounting With a Vertical Rack Mount Kit

Observe the following requirements when installing the system vertically with a Vertical Rack Mount Kit.

- Refer to the Vertical Rack Mount Kit Installation Guide (document number 3HE 10249 AAAA TQZZA) for installation information.
- When the Vertical Rack Mount Kit is used, the bottom baffle acts as a drip tray; therefore, no surface restrictions apply.
- Ensure that the chassis is installed with the fans at the top, since the fans draw air out of the chassis.
- Maintain a clearance of at least 2.5 in. (6.4 cm) in front of the chassis for cable management.
- Ensure that the 7705 SAR-X chassis is located in an area that can provide an inlet air temperature no greater than 149°F (65°C) under full system power loading combined with worst-case environmental deployment conditions.

Installation Site Assessment

Before installing equipment at a site, the characteristics of the site should be considered to determine whether they will adversely affect the reliability of the equipment. The following section discusses some of the site factors to consider prior to deploying equipment.

Geographical Location

Different geographical locations carry different risk factors. For example, coastal installations with prevailing winds from the sea may be affected by Airborne Sea Salt Particles (ASSP), which can be carried many kilometers inland. As well, installations near ancient seabeds that have very high levels of salt in the soil may be affected by ASSP during windy drought conditions. Mountainous regions near coasts cause unique fog conditions. High humidity environments often cross dew point thresholds at night.

Consider whether the installation site is in an area that has the potential to experience any of the following seasonal influences: hurricanes, cyclones, tidal or river flooding, recent volcanic activity, or forest fires.

Examine the local surrounding environment of the installation site for proximity to possible sources of contaminants that may cause or accelerate corrosion, especially in the presence of high humidity.

Possible sources of contaminants include: landfills, fertilizer manufacturing, farming, sewage, geothermal activity, swamps or marshes, oceans, ancient seabeds, power generation, automotive and diesel combustion, fossil fuel processing, cement plants, construction sites, steel blast furnaces, steel electric furnaces, coke plants, pulp manufacturing, chlorine plants, rubber manufacturing, paint manufacturing, aluminum manufacturing, ore smelting, tobacco smoke, and battery manufacturing.

If there is any uncertainty surrounding the concentration of various contaminants at the installation site, then Corrosion Classification Coupons may be used to classify the severity of the environment according to the standard ISA 71.04.

Installation Site Type

The site must provide the appropriate environment for the installed equipment. This usually involves controlling ingress of contaminants and ensuring that humidity remains as low as possible.

Installations are typically in a hut, parking garage, room, or cabinet. Installation in data centers or telecom centers do not usually have high pollution levels but could still have high humidity levels.

Room

Is the room connected to the heating, ventilation, and air conditioning (HVAC) system of the building? What protection is there to prevent ingress of dust, pollution, and humidity? To seal the environment properly, ensure that any doors, windows, vents, holes, or conduits are sealed or gasketed appropriately to ensure that the HVAC system can control the environment. These must be checked as part of routine site maintenance.

If outside air is brought in for ventilation, does it pass through a filter? What is the type and rating of the filter? Filters can help but the type of filter must be appropriate for the pollutants you are trying to exclude. For example, a standard fiberglass type air filter only prevents large debris and dirt from entering, but will do nothing to prevent entry of small particles (such as ASSP), humid air or gaseous contaminants. It is important to understand the local conditions and consider what type of filtering is most appropriate. Minimum Efficiency Reporting Value (MERV) charts may serve as a good source to understand particle sizes and filter options.

One simple yet effective way to keep pollutants out is to ensure that positive pressure is maintained inside the room or cabinet as compared to the outside by having fans blowing properly filtered air into the room.

Does the site have an air conditioner or dehumidifier? Is the rating and capacity adequate for the space? Where does the dehumidifier or air conditioner water drainage go?

Humidity reduction is one of the key elements in corrosion control. Air conditioners and dehumidifiers are recommended to reduce local relative humidity at the site. Another method is to keep the temperature in the cabinet high enough to maintain the relative humidity at less than 50%. Condensate, if allowed to stay in the site or enclosure, will evaporate over time and lead to higher relative humidity and corrosion.

Cabinet

There are three major classifications of cabinets.

- Direct Air Cooled (DAC) cabinets bring air into the cabinet to cool the equipment. DAC cabinets may or may not be filtered. Unfiltered air intake and exhaust is not recommended since issues will occur if unfiltered air is allowed into the cabinet. The ideal filter is a hydrophobic filter (GORE) since it filters particles smaller than 1 micron. Hydrophobic filters will prevent passage of water droplets but still allow water vapor to pass. Some chemical pollutants may require carbon or other types of filters particularly suited to the type of pollution.

- Heat Exchange (HEX) cabinets use a sealed cabinet and a heat exchanger to withdraw heat from the cabinet interior without bringing outside air into the cabinet. This results in no contamination influx and low humidity within the cabinet.

- Air Conditioned (AC) cabinets use a mechanical or Thermal Electric Cooling (TEC) refrigeration unit to handle higher levels of heat in high-power installations. AC implementation is similar to HEX since the cabinet should be sealed. Proper AC implementation should never allow unfiltered air into the cabinet interior.

Site Influences

Is backup power generation located in the same area as the communications equipment? Are batteries located in the same area as the equipment?

Backup generators that are located in the same enclosed area as the communications equipment may cause a great deal of site pollution, such as nitrous oxides and hydrogen sulphides, which can be detrimental to the long-term reliability and performance of equipment. A best practice is to house motor generator sets in a separate enclosure from the communications equipment. Batteries will outgas during charge and discharge cycles. These gases are very corrosive and may also be explosive in sufficient concentration. Batteries should always be housed in a properly vented enclosure or compartment, separate from the communications equipment.

Is the equipment located above the water grade? Is there adequate water drainage and leak controls?

Many areas are prone to flooding during rainy season or spring thaws, and it is important for the site to be located above typically anticipated flood levels, or to have sump pumps to keep the installation site dry. Drainage with backflow preventers should be installed if the site has provision for water sources, such as cooling towers.

What protection is there to prevent entry of insects, pests, and vermin?

Pests and vermin such as insects, mice, and spiders prefer warm, sheltered areas. All entries into the enclosure or shelter should be appropriately sealed and regularly maintained.

Site Assessment Checklists

The following site assessment checklists are intended to act as a tool in assessing the potential risks that must be managed at an installation site. The checklists are not intended to provide an exhaustive list of all risk factors, but rather to indicate some of the most common risks.

The first two checklists indicate environmental factors that may result in malfunctioning or failing equipment if the installation site is not appropriately deployed and maintained to counteract the detrimental effects of the environment. For each risk factor that is present, you must consider how to best design the installation site to avoid the negative effects of the risk factor. For the final checklist, any question that is answered in the negative indicates that measures must be taken to correct the installation site appropriately to reduce the risk of equipment damage.

Seasonal Influences

Is the installation site in an area with the potential to experience any of these seasonal influences?

Table 10: Seasonal Influences

Influence	Yes	No
Hurricanes		
Cyclones		
Tidal or river flooding		
Recent volcanic activity		
Forest fires		

Local Risk Factors

Is the local surrounding environment of the installation site in proximity to possible sources of contaminants or other risk factors that may cause or accelerate corrosion?

Table 11: Local Risk Factors

Risk Factor	Yes	No
Landfills		
Fertilizer manufacturing		
Farming		
Sewage		
Geothermal activity		
Swamps or marshes		
Oceans		
Ancient seabeds		
Power generation		
Automotive and diesel combustion		
Fossil fuel processing		
Cement plants		
Construction sites		
Steel blast furnaces		
Steel electric furnaces		
Coke plants		
Pulp and paper manufacturing		
Chlorine plants		
Rubber manufacturing		
Paint manufacturing		
Aluminum manufacturing		
Ore smelting		
Tobacco smoke		

Table 11: Local Risk Factors (Continued)

Risk Factor	Yes	No
Battery manufacturing		
Mountains near a coastline		
High humidity regions		
Fossil fuel use, such as open fires used by locals for cooking or burning farming byproducts		

Specific Characteristics of the Installation Site

Does the installation site exhibit characteristics that may require upgrade or repair?

Table 12: Specific Characteristics of the Installation Site

Characteristic	Yes	No
Is the installation site in a room that is part of the building HVAC system?		
Does the installation site have protection to prevent ingress of dust?		
Does the installation site have protection to prevent ingress of pollution?		
Does the installation site have protection to prevent ingress of humidity?		
If outside air is brought in for ventilation, does it pass through a filter?		
If outside air is brought in for ventilation through a filter, is the type and rating of the filter appropriate to the environmental conditions?		
Does the site have an air conditioner?		
• Is the rating and capacity adequate for the space?		
• Is there proper drainage of water from the air conditioner?		
Does the site have a dehumidifier?		
• Is the rating and capacity adequate for the space?		
• Is there proper drainage of water from the dehumidifier?		
Is backup power generation located in a separate area from the communications equipment?		
Are batteries located in a separate area from the communications equipment?		
Is the equipment located above the water grade?		
Are there adequate water drainage and leak controls?		
Is there protection present to prevent entry of insects, pests, and vermin?		

Installing and Grounding the Chassis

In This Chapter

This chapter provides information on installing and grounding a 7705 SAR-X chassis:

- Unpacking the Chassis
- Installing the Chassis in a Rack
- Chassis Ground Wiring

Unpacking the Chassis

⚠️ **Warning:** If the 7705 SAR-X is to be relocated at a later time, observe the following to properly transport and relocate the chassis:

- disconnect power to the chassis by opening the disconnect devices
- detach all cables from the router
- if the router is installed in a rack, carefully remove it from the rack
- repackage the router in the original packaging or an appropriately sized container for relocation

Unpacking Precautions

Review the following list to avoid injury and to prevent damage to the 7705 SAR-X.

- The shipping weight of the chassis is approximately 9.7 lbs (4.4 kg).

- The chassis is shipped in a heavy corrugated cardboard container and is encased in a foam tray. It is acceptable to discard the packaging container in accordance with local practices for disposal and recycling; however, it may be desirable to save a small quantity of undamaged original packaging containers and materials for reuse. For example, the packaging container could be reused for shipment of a 7705 SAR-X to a Repair Center or for future relocation.

- Keep the chassis wrapped in the anti-static packaging until you are ready to install it.

- When unpacking the chassis, grab it from the sides; do not grab it from the connector end.

Figure 11 displays the components of a packed 7705 SAR-X chassis. Table 13 lists the 7705 SAR-X packing components.

Figure 11: Unpacking the 7705 SAR-X Chassis
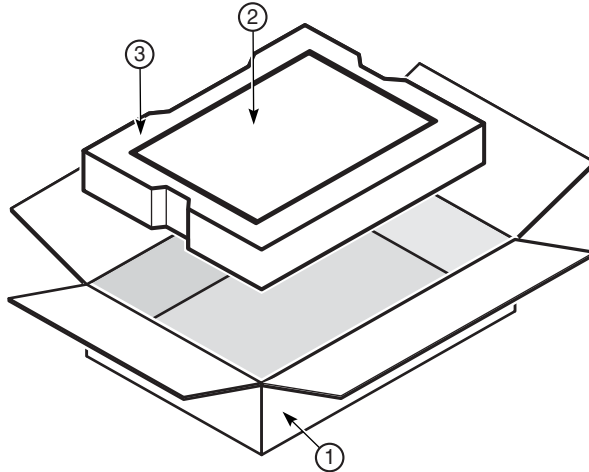
22716

Table 13: 7705 SAR-X Packing Components

Key	Description
1	Shipping container
2	7705 SAR-X chassis (wrapped in an anti-static bag)
3	Package foam tray

→ **Note:** Wear an anti-static wrist strap when unpacking the chassis to prevent damage to the equipment due to ESD.

To unpack the chassis, open the carton and follow these steps:

Step 1. Grasp the chassis by its sides and carefully lift it out of the carton; place the chassis on a flat surface.

Step 2. Remove the package foam tray.

Step 3. Remove the protective anti-static wrapping when you are ready to install the chassis.

Installing the Chassis in a Rack

Danger: Only trained and qualified personnel should install or replace this equipment.

Warning:

- Always wear an ESD-preventive wrist or ankle strap and always connect an ESD strap to a nearby ground point that is connected to the site grounding point when working on the 7705 SAR-X. Typical ground points include a properly grounded rack or work bench.
- Failure to comply with the location requirements outlined in Installation Locations and Chassis Location Requirements may impede proper airflow, which may result in equipment failure due to overheating.
- Non-conductive coatings (such as lacquer and enamel) must be removed from threads and other contact surfaces to ensure electrical conductivity. Thread-forming screws with paint piercing washers may be used for this purpose during installation.
- When rack-mounting the chassis in an equipment rack, do not stack one 7705 SAR-X chassis or any other equipment directly on top of another 7705 SAR-X chassis, such that the bottom chassis is supporting other devices. Each chassis must be secured in the rack with the appropriate mounting apparatus.

Rack-Mounting the Chassis

The 7705 SAR-X chassis is designed for installation in a 19-inch rack. The rack-mount brackets are factory-installed for horizontal mounting. Figure 12 illustrates the installation of the chassis in a rack. Table 14 lists the rack-mounting components.

The 7705 SAR-X chassis can also be mounted vertically. Vertical installation can use a Vertical Rack Mount Kit (part number 3HE09608AA), which is ordered separately. Refer to the Vertical Rack Mount Kit Installation Guide (document number 3HE 10249 AAAA TQZZA) for installation information.

Figure 12: Installing the 7705 SAR-X Chassis in a Rack
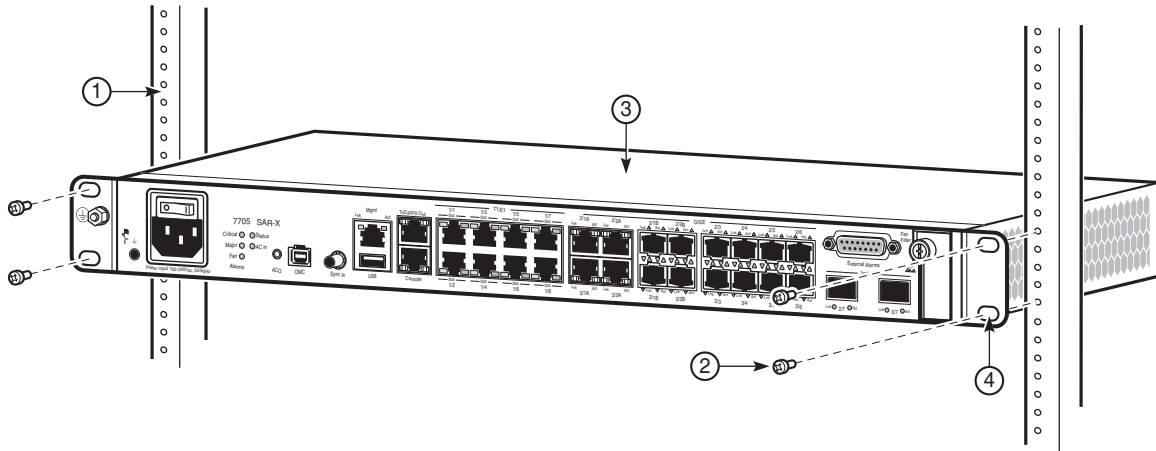
Table 14: Rack-Mounting Components

Key	Description
1	Equipment rack
2	Rack-mounting screws
3	7705 SAR-X chassis
4	Rack-mounting bracket

Before you begin, verify that:

- the equipment rack is securely installed, anchored, and grounded. Refer to the rack manufacturer's documentation for instructions.
- nearby equipment, including breaker panel bus bars and power connectors, is made safe. Either shut off the power, if possible, or install safety guards or mats over exposed power points and cables.

Required tools:

- screwdriver appropriate for the rack-mount screws

To install the chassis in the rack:

Step 1. Lift the 7705 SAR-X and position it in the rack.

Step 2. Align the mounting holes on each bracket with the mounting holes on the rack upright.

Insert a screw into each mounting hole and tighten each screw.

Step 3. Ground the chassis to the building ground. See Chassis Ground Wiring.

Replacing the Fan Filter

Required hardware:

*   Fan filter replacement kit (3HE09257AA)

Use this procedure to replace a fan filter on the 7705 SAR-X:

Step 1. Unscrew by hand the knob that secures the fan filter to the chassis and slide out the filter. See Figure 13.

Figure 13: Removing the Fan Filter From the Chassis
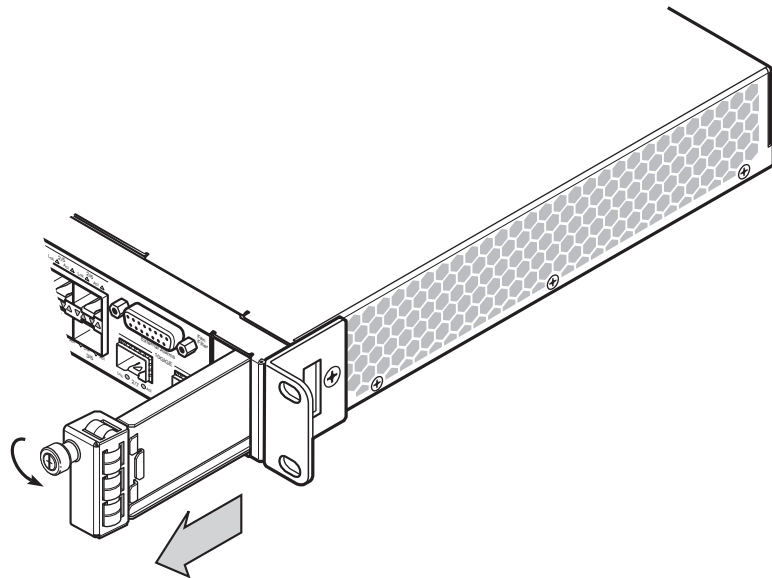
25164

Step 2. Detach the frame from the fan filter by sliding the frame back and then pulling it outward. See Figure 14.

Figure 14: Detaching the Fan Filter Frame
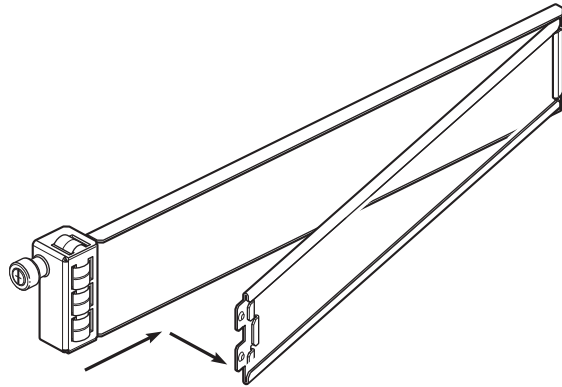
25172

Step 3. Remove the old fan filter media and replace it with a new one. See Figure 15.

Figure 15: Replacing the Fan Filter Media

Remove

Replace
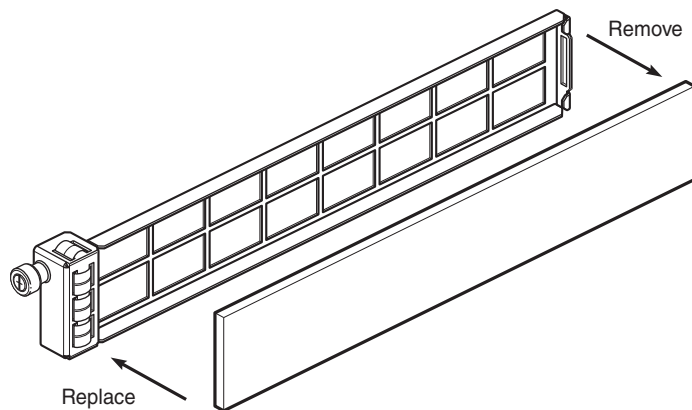
25166

Step 4. Reattach to the fan filter the frame that was removed in Step 2.

Step 5. Insert the fan filter back into the chassis and hand-tighten the knob that secures the fan filter to the chassis. See Figure 16.

Figure 16: Inserting the Fan Filter Back Into the Chassis
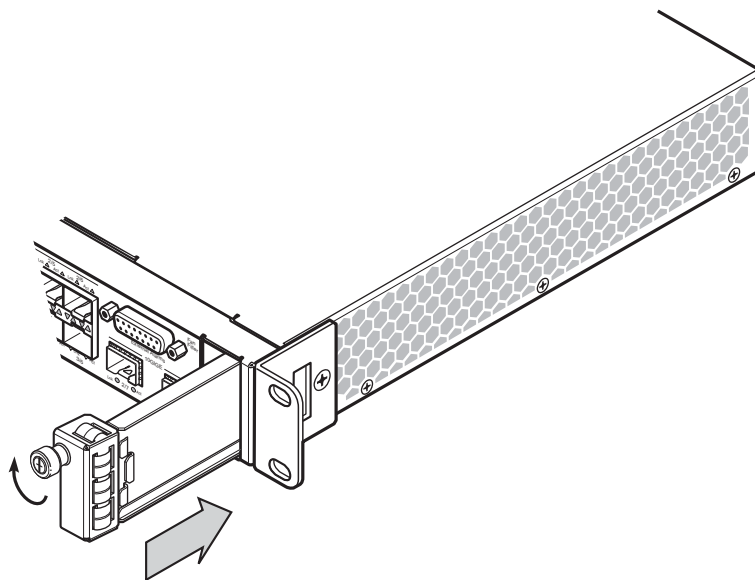
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Chassis Ground Wiring

To ensure that the equipment is connected to earth ground, use the following instructions to prepare the ground wire and make the connection. The ground wire is not provided. The length of the ground wire depends on the location of the 7705 SAR-X chassis and proximity to the proper grounding facilities. A copper ground wire with a green or green/yellow colored insulation jacket (minimum #16 AWG) should be used.

The 7705 SAR-X chassis has two ground points that can be used as a permanent connection to the earth (building) ground. One is a double-hole ground point that is located at the rear of the chassis. It comes with M10-32 screws that are installed in the ground holes. These screws have pre-installed washers. An additional chassis ground point is located on the mounting bracket beside the AC or DC power entry block. This ground point is a standard ground lug with a Keps hex nut and star washer. Only one ground point should be used, whichever is more convenient based on user site and maintenance needs.

Note:

- When wiring the chassis, the chassis ground connection must always be made first and disconnected last.
- All bare conductors must be coated with an appropriate antioxidant compound before crimp connections are made. All unplated connectors, braided strap, and bus bars must be brought to a bright finish and then coated with an antioxidant before connecting them.
- All surfaces that are used for intentionally grounding the 7705 SAR-X must be brought to a bright finish, and an antioxidant solution must be applied to the surfaces being joined.

Making the Ground Connection Using the Ground Point on the Rear of the Chassis

Required hardware and tools:

- copper ground wire with a green or green/yellow colored insulation jacket (minimum #16 AWG)
- Panduit two-hole ground lug
- wire stripper
- wire cutter
- crimping tool
- torque driver for the M10-32 screws

To make a ground connection using the double-hole ground point on the rear of the chassis:

Step 1. Run a single length of #16 AWG wire (minimum) from the ground point (building ground or equipment ground bus) to the ground point on the chassis.

Step 2. Using a wire-stripping tool, strip the insulation from the wire according to local safety codes and crimp the ground lug to the wire.

Step 3. Remove the screws from the ground holes.

Step 4. Place the ground lug over the ground holes and insert the screws that were removed in Step 3 through the ground lug holes and into the ground holes; see Figure 17 and Table 15. Tighten the screws to a torque of 2 to 3 lbf-in (0.23 to 0.34 N·m) maximum. Do not over-tighten.

Figure 17: Connecting the Ground Lug to the Ground Holes
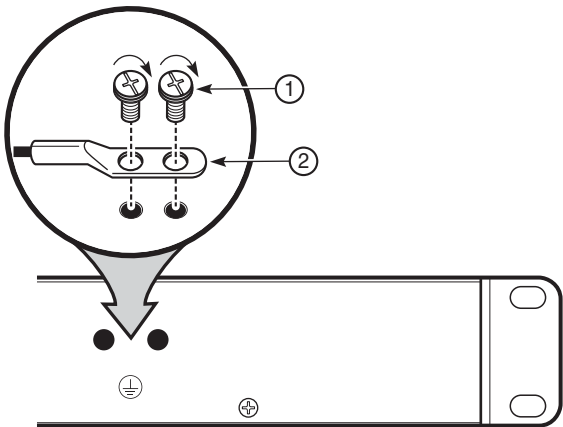
25055

Table 15: Rear Chassis Grounding Components

Key	Component
1	M10-32 screws
2	Panduit two-hole ground lug with ground wire

Step 5. Connect the other end of the ground wire to the appropriate ground point at your installation site. Ensure that the chassis ground connection is made according to local safety codes.

Step 6. Connect the chassis to the DC or AC power source. See Connecting to an AC or DC Power Source.

Making the Ground Connection Using the Ground Point on the Front of the Chassis

Required hardware and tools:

- copper ground wire with a green or green/yellow colored insulation jacket (minimum #16 AWG)
- Panduit single-hole ground lug
- wire stripper
- wire cutter
- crimping tool
- torque driver for Keps hex nut

To make a ground connection using the ground point on the front of the chassis:

Step 1. Run a single length of #16 AWG wire (minimum) from the ground point (building ground or equipment ground bus) to the ground point on the chassis.

Step 2. Using a wire-stripping tool, strip the insulation from the wire according to local safety codes and crimp the ground lug to the wire.

Step 3. Remove the Keps nut and star washer from the ground stud on the mounting bracket.

Step 4. Place the star washer that was removed in Step 3 and the ring lug on the ground stud; see Figure 18 and Table 16. Secure the lug with the Keps nut. Tighten the nut to a torque of 8 to 10 lbf-in (0.9 to 1.13 N·m) maximum. Do not over-tighten.

Figure 18: Connecting the Ground Lug to the Ground Stud
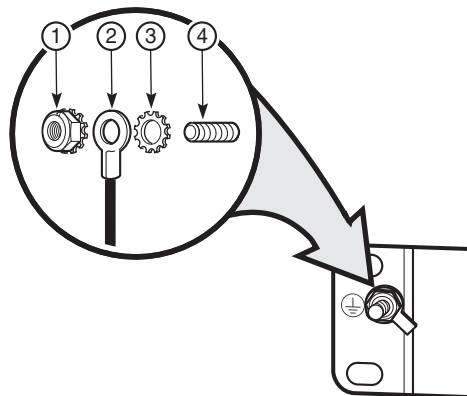
25059

Table 16: Front Chassis Grounding Components

Key	Description
1	Keps hex nut
2	Panduit single-hole ground lug with ground wire
3	Star washer
4	Chassis ground stud

Step 5. Connect the other end of the ground wire to the appropriate ground point at your installation site. Ensure that the chassis ground connection is made according to local safety codes.

Step 6. Connect the chassis to the DC or AC power source. See Connecting to an AC or DC Power Source.

Connecting to an AC or DC Power Source

In This Chapter

This chapter provides information about connecting the 7705 SAR-X to an AC or DC power source:

- Warnings and Notes
- Connecting to AC Power
- Connecting to DC Power

Warnings and Notes

Danger:

- Only qualified personnel should install or replace this equipment.
- Turn OFF power at the power source before you install or remove power cables or cords.
- Before working on equipment that is connected to power, remove jewelry, such as rings, necklaces, and watches. When metal objects are in contact with power and ground, serious burns can occur or the objects can be welded to the terminals.
- You must use cables that meet local electrical code requirements.

Warning:

- Do not install equipment that appears to be damaged.
- The chassis and equipment rack must be properly grounded. Electrostatic discharge (ESD) damage can occur if components are mishandled.
- Electrostatic discharge (ESD) damage can occur if electronic components are mishandled. Always wear an ESD-preventive wrist or ankle strap and always connect an ESD strap to a nearby ground point that is connected to the site grounding point when working on the 7705 SAR-X. Typical ground points include the front and rear ground connection points on the 7705 SAR-X (but only after the 7705 SAR-X is installed and the chassis ground wire has been connected), or a properly grounded rack or work bench.

Connecting to AC Power

The AC variant of the 7705 SAR-X has a standard IEC 320 AC power inlet (see Figure 25). It is equipped with an on/off switch that must be kept in the off position until the AC power connection is made. The AC inlet is used to connect an AC power cord to an AC power outlet. The AC power cord has a male AC plug at one end and a standard IEC 320 female AC receptacle at the other end.

Danger: An AC-powered chassis may have fuses in both Line and Neutral; that is, it may have double pole/neutral fusing. Caution must be taken if the symbol shown in Figure 19 is displayed on the chassis.

Figure 19: Double Pole/Neutral Fusing

24999

Note:

• In order to comply with the GR-1089 Lightning Criteria for Equipment interfacing with AC Power Ports, an external Surge Protective Device is intended to be used at the AC input of the router or building power service entrance as per the NEC.

• The AC power cord is not supplied with the 7705 SAR-X chassis; it must be ordered separately from Alcatel-Lucent.

→ 3HE10040AA (for North America)

→ 3HE10041AA (for Europe)

Follow these steps to connect an AC power cord to the AC variant of the 7705 SAR-X:

Step 1. Plug the female end of the AC power cord into the AC inlet on the chassis.

Step 2. Plug the male end of the AC power cord into the AC power outlet.

Step 3. Turn the AC inlet on/off switch to the on position.

Step 4. Check the AC In LED on the front of the chassis; a solid green color indicates that AC input power is present and operational.

Connecting to DC Power

The DC variant of the 7705 SAR-X has a dual-feed, wire-to-board, pluggable terminal block that is attached to the front of the chassis (see Figure 26). The terminals are the DC power feed points for source voltage from a –48 VDC, –60 VDC, or +24 VDC power source.

Danger: Ensure that the disconnect device is in the OFF (or open) position before making the DC power connection.

Caution: The 7705 SAR-X should be connected to a DC branch circuit with a maximum 10 A circuit breaker or fuse that meets the requirements for branch circuit protection. In order to function, the circuit breaker or fuse must be in the "hot" (ungrounded) side of the connection. That is, if the power source provides +24 VDC power, then the circuit breaker or fuse must be on the positive (ungrounded) side of the connection (see Figure 20 and Figure 21). If the power source provides –48 VDC or –60 VDC power, then the circuit breaker or fuse must be on the negative (ungrounded) side of the connection (see Figure 22 and Figure 23).

Note:

- The 7705 SAR-X requires a minimum of one DC power source to operate, but using two is recommended for redundancy.
- For redundant power configurations, use both DC power feeds (one for each pair of power terminals).
- The 7705 SAR-X is suitable for both DC-I and DC-C power configurations.
- The wiring between the DC power supply and the 7705 SAR-X must be stranded copper wire within the range of 12 to 16 AWG in accordance with local electrical codes.
- The 7705 SAR-X provides reverse polarity protection, which permits normal functioning of DC-powered equipment when the power leads (wires) from a DC power source have been reversed, and protects the equipment from potential damage caused by reverse polarity.
- In order to facilitate the installation, you can first detach the terminal block from the faceplate before performing the wiring, and reattach it after the wiring has been completed. Figure 20 and Figure 22 show the wiring with the terminal block attached to the faceplate; Figure 21 and Figure 23 and show the wiring with the terminal block detached from the faceplate. Table 17 describes the wiring features.

Figure 20: Connecting to a +24 VDC Power Source with the Terminal Block Attached to the Faceplate
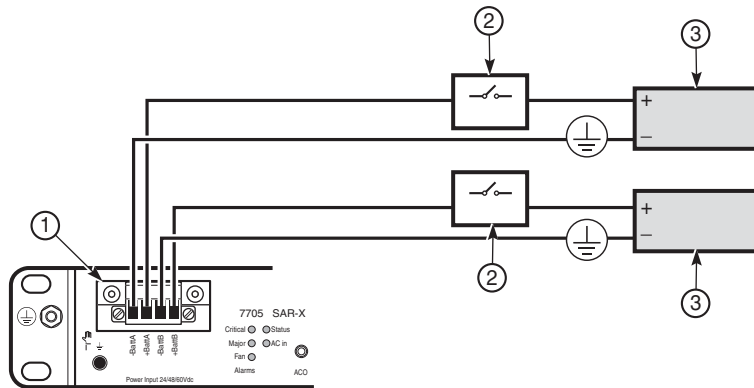
25058

Figure 21: Connecting to a +24 VDC Power Source with the Terminal Block Detached from the Faceplate
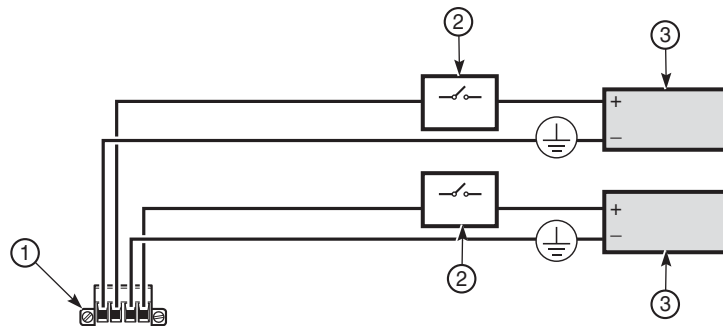
25057

Figure 22: Connecting to a –48 VDC or –60 VDC Power Source with the Terminal Block Attached to the Faceplate
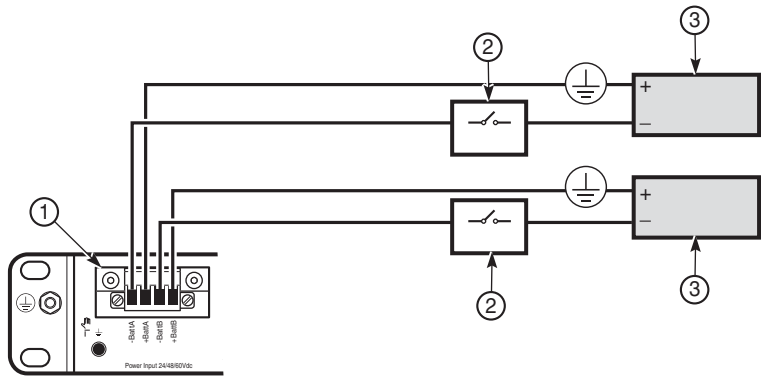
25032

Figure 23: Connecting to a –48 VDC or –60 VDC Power Source with the Terminal Block Detached from the Faceplate
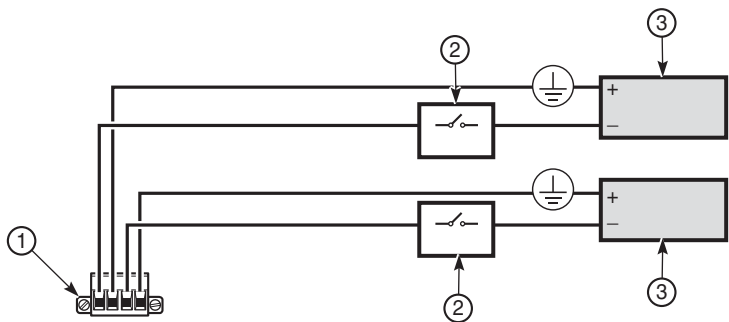
25033

Table 17: DC Power Components

Key	Description
1	Wire-to-board, pluggable terminal block
2	Disconnect device (maximum 10 A circuit breaker or fuse)
3	DC power source

Required hardware and tools:

- two stranded 12 to 16 AWG copper wires, one for each feed (for a redundant configuration)
- wire stripper
- small flat-tip screwdriver

Connecting to a +24 VDC Power Source

Follow these steps to connect to a +24 VDC power source (see Figure 20 and Figure 21):

Step 1. Make the battery return wire ground connections:

    i.   Run a length of wire from the DC power source negative terminal to the terminal block.

    ii.   Prepare the end of the wire at the DC power source according to local safety practices and attach it to the power source negative terminal.

    iii.   Strip 0.35 in. (9 mm) of outer shielding from the end of the wire at the terminal block and insert the wire into the –BattA return terminal plug using a small flat-tip screwdriver. Color-code the wiring according to local standards to ensure that the input power and ground lines can be easily distinguished.

    iv.   For redundant DC power supply configurations, repeat substeps i to iii for the –BattB return wire.

Step 2. Make the battery connections to the disconnect device:

    i.   Run a length of wire from the disconnect device to the terminal block.

    ii.   Strip 0.35 in. (9 mm) of outer shielding from the end of the wire at the terminal block and insert the wire into the +BattA battery plug using a small flat-tip screwdriver.

    iii.   Prepare the wire at the disconnect device according to local safety practices and attach it to the disconnect device.

    iv.   For redundant power supply configurations, repeat substeps i to iii for the +BattB battery wire.

Step 3. Turn the power on at the DC power supply and check the BattA and BattB LEDs on the front of the chassis; a solid green color indicates that the DC supply wiring is correct and that DC input power is present for both power feeds.

Connecting to a –48 VDC or –60 VDC Power Source

Follow these steps to connect to a –48 VDC or –60 VDC power source (see Figure 22 and Figure 23):

Step 1. Make the battery return wire ground connections:

 i. Run a length of wire from the DC power source positive terminal to the terminal block.

 ii. Prepare the end of the wire at the DC power source according to local safety practices and attach it to the power source positive terminal.

 iii. Strip 0.35 in. (9 mm) of outer shielding from the end of the wire at the terminal block and insert the wire into the +BattA return terminal plug using a small flat-tip screwdriver. Color-code the wiring according to local standards to ensure that the input power and ground lines can be easily distinguished.

 iv. For redundant DC power supply configurations, repeat substeps i to iii for the +BattB return wire.

Step 2. Make the battery connections to the disconnect device:

 i. Run a length of wire from the disconnect device to the terminal block.

 ii. Strip 0.35 in. (9 mm) of outer shielding from the end of the wire at the terminal block and insert the wire into the –BattA battery plug using a small flat-tip screwdriver.

 iii. Prepare the wire at the disconnect device according to local safety practices and attach it to the disconnect device.

 iv. For redundant power supply configurations, repeat substeps i to iii for the –BattB battery wire.

Step 3. Turn the power on at the DC power supply and check the BattA and BattB LEDs on the front of the chassis; a solid green color indicates that the DC supply wiring is correct and that DC input power is present for both power feeds.

SFPs

In This Chapter

This chapter provides information about installing and removing SFPs in the 7705 SAR-X:

- Installing and Removing SFPs

Installing and Removing SFPs

The 7705 SAR-X provides the following small form-factor pluggable (SFP) or extended SFP (SFP+) ports (see Figure 25 or Figure 26 for the location of these ports):

- 4 x 10/100/Gigabit Ethernet combination (XOR) ports that can be individually configured for either RJ-45 or SFP. The SFP ports are numbered 2/1B, 2/2B (top row), 3/1B, 3/2B (bottom row).
- 8 x 10/100/Gigabit Ethernet SFP ports. The ports are numbered 2/3 to 2/6 (top row) and 3/3 to 3/6 (bottom row).
- 2 x 10GigE SFP+ ports. The ports are numbered 2/7 and 3/7.

Warnings and Notes

Danger:

- Invisible laser radiation can be emitted from the aperture of an installed, uncapped SFP when no cable is connected. Avoid exposure and do not stare into open, uncabled apertures.
- Always assume that fiber-optic cables are connected to a light source.
- Only trained and qualified personnel should install or replace this equipment.

Warning:

- Electrostatic discharge (ESD) damage can occur if electronic components are mishandled. Always wear an ESD-preventive wrist or ankle strap and always connect an ESD strap to a nearby ground point that is connected to the site grounding point when working on the 7705 SAR-X. Typical ground points include the front and rear ground connection points on the 7705 SAR-X (but only after the 7705 SAR-X is installed and the chassis ground wire has been connected), or a properly grounded rack or work bench.
- Always place components on an anti-static surface.
- Use only approved small form-factor pluggable (SFP) fiber-optic devices in a 7705 SAR-X.
- Before using the optics on the 7705 SAR-X, verify that the optical path is in compliance with the parameters of the optical components. In particular, pay close attention to any minimum attenuation requirements for the optics. If minimum attenuation requirements are not met, the optical receiver components may be permanently damaged. Contact the appropriate technical support center for assistance and further information about your Alcatel-Lucent products.
- Ensure that the ports on an SFP are protected by an SFP protective plug when you install or remove an optical SFP. Only remove the plug when you are ready to install an optical cable.
- Ensure that the connector on the fiber cable is protected by a dust cover until you are ready to attach the cable to an SFP.
- Always replace the dust cover on the connector of a fiber cable when the cable is disconnected from an SFP.
- Avoid bending fiber-optic cable beyond its minimum bend radius. Do not exceed the recommended 1.2 in. (3.0 cm) for fiber-optic cables.

Note:

- Discard SFPs according to all local laws and regulations.
- SFPs can be installed and replaced without disabling the Ethernet interfaces.
- SFPs are keyed to prevent incorrect insertion. If an SFP is not seated properly, remove it and confirm that the orientation is correct before reinserting it.

Fiber Cable Preparation

Clean the connector on the fiber cable before inserting it into the SFP to prevent transferring small particles and contaminating the transceiver.

If you switch SFPs from one port to another, ensure that you clean the fiber connectors before reinserting them.

Apply high standards when inspecting and cleaning fiber connectors. Use a "dry" cleaning method to clean fiber connectors.

Caution: Improper handling, cleaning, and inspection techniques can compromise the fiber connection, resulting in data transmission errors. Refer to the Optical Handling Reference Guide (part number 95-5795-01-00), available by logging on to Alcatel-Lucent Online Customer Support (OLCS) (http://www.alcatel-lucent.com/myaccess). From the "Technical Content for" drop-down menu, choose 7705 SAR, and click on "Manuals and Guides" to access the documentation.

Locking and Release Mechanisms

SFPs approved by Alcatel-Lucent can use different lock and release methods. Possible lock and release mechanisms include:

- locking handle—a locking handle or lever on the front of the SFP that you gently raise or lower to insert or remove the SFP from the port
- bail—a bar or latch in the front of the SFP that you pull down and outward to release the module
- tabs—tabs on the sides or bottom of the SFP that you press inward to release the module

SFP Support

See Table 6 for maximum power consumption values for the supported SFPs. Contact your Alcatel-Lucent representative for information on SFP, SFP+, and XFP module availability and applicability.

⚠ **Warning:** Use non-ETR SFP+s only in non-ETR deployment conditions.

Bidirectional SFPs

Alcatel-Lucent supports several bidirectional SFPs. The optical interface provides single-fiber, bidirectional connectivity operating at 1310 nm and 1490 nm wavelengths. One SFP must be installed at the near end and the other SFP must be installed at the far end of the link. To achieve connectivity, if the far-end SFP transmits at 1310 nm and receives at 1490 nm, the near-end SFP must transmit at 1490 nm and receive at 1310 nm.

Installing SFPs

⚠ **Warning:** The orientation of the SFP cages on the top row is the reverse of that on the bottom row (see Figure 7 or Figure 8). Damage may occur to SFPs if you try to force them into the cages incorrectly.

To install an SFP:

Step 1. Remove the SFP from the packaging and place it on an anti-static work surface.

Step 2. Hold the SFP by its sides and insert it into the appropriate port until it clicks into place.

Step 3. For optical SFPs, remove the protective plug from the SFP port when you are ready to attach the fiber cable.

Removing and Replacing SFPs

When you are replacing an SFP, have the following parts ready:

- a replacement SFP
- protective plugs for the SFP and a dust cover for the fiber cable connector
- an anti-static mat or electrostatic bag

To replace an SFP:

Step 1. Disconnect the cable from the SFP connector.

Step 2. Place a protective plug in the SFP that is being removed.

Step 3. Release the locking mechanism on the SFP with your thumb and forefinger. See Locking and Release Mechanisms for descriptions of the different SFP lock and release methods. Slide the SFP out of the port.

Step 4. Place the SFP on an anti-static mat or in an electrostatic bag.

Step 5. Install a replacement SFP into the Ethernet port.

Step 6. Connect the fiber or copper cable, or if you are not immediately connecting a fiber cable, insert a protective plug into the SFP optical port and place a dust cover on the fiber cable connector.

➡️ **Note:** If you are not immediately replacing the SFP, leave the Ethernet port empty. It is not necessary to install protective plugs in the ports on the 7705 SAR-X.

Connecting Cables

In This Chapter

This chapter provides information about connecting cables to the 7705 SAR-X:

- Warnings and Notes
- Cable Connections
- Making an External Synchronization Connection
- Making an External Alarms Connection
- Making an Optical Management Console Connection
- Making Router Management Connections

Warnings and Notes

Danger:

- Only trained and qualified personnel should install or replace this equipment.
- Invisible laser radiation can be emitted from the aperture of an installed, uncapped SFP when no cable is connected. Avoid exposure and do not stare into open, uncabled apertures.

Warning:

- Electrostatic discharge (ESD) damage can occur if electronic components are mishandled. Always wear an ESD-preventive wrist or ankle strap and always connect an ESD strap to a nearby ground point that is connected to the site grounding point when working on the 7705 SAR-X. Typical ground points include the front and rear ground connection points on the 7705 SAR-X (but only after the 7705 SAR-X is installed and the chassis ground wire has been connected), or a properly grounded rack or work bench.
- Always place components on an anti-static surface.
- Use only approved small form-factor pluggable (SFP) fiber-optic devices in a 7705 SAR-X.

Caution: When a T1/E1 port that is configured for T1 is connected to external equipment or is in physical loopback, ensure that the external equipment's transmit signal is attenuated according to the distance of the T1/E1 port receiver. Adjust LBO settings such that the T1/E1 port receiver's nominal input voltage level is < 3Vp. Refer to "Configuring T1 Line Buildout" in the 7705 SAR OS Interface Configuration Guide for detailed information on attenuating transmit signals.

Note:

- Ensure that cables are dressed such that they do not impede the insertion or removal of other equipment in the rack.
- To maintain EMC compliance, cables that are shielded and grounded at both ends must be used with interface connectors.
- To meet surge protection requirements, the cable shield for any open-ended cables must be grounded by attaching the shield to a convenient chassis ground point, using hardware suitable to provide a solid electrical and mechanical connection. In addition, ensure that there is sufficient strain relief to remove any mechanical strain on the ground connection due to cable movement.

Cable Connections

All port cable connections are made from the front of the 7705 SAR-X. Ports can be connected using copper or fiber-optic cables.

Ethernet and Copper Cables

Ethernet and copper wire cables can be routed to the left or the right of the 7705 SAR-X chassis.

> **Note:**
> • When making connections to the T1/E1 and Ethernet ports, shielded cable must be used to maintain EMC compliance. For vertical markets, double-shielded cables are required for Ethernet XOR copper interfaces and Ethernet SFP copper interfaces
> • Arrange the cables such that they do not impede the insertion or removal of other equipment mounted in the rack.

Required hardware:

• CAT5e shielded cable
• cable ties (optional)

To attach Ethernet and copper wire cables:

Step 1. Attach the cable to the RJ-45 port connector or SFP connector on the front of the chassis.

Step 2. Route the cable to the left or the right of the chassis. If more than one cable is connected, you can loosely bundle the cables together using a cable tie. Do not over-tighten the cable tie.

Step 3. Attach the other end of the cable to the equipment.

Fiber-Optic Cables

⚠ **Warning:**

- Fiber-optic cables are sensitive to bending, twisting, and general over-exertion. Extreme caution is recommended when handling fiber-optic cable.
- In order to ensure that the minimum fiber bend radius of 1.2 in. (3.0 cm) is maintained within the allowable space, an open-angled 90⁰ boot such as TYCO 1374737-x or equivalent is recommended. The boots must be installed and oriented during fiber termination.
- Observe proper fiber connector handling with respect to the use of dust covers and cleaning.

Fiber-optic cables are routed in a similar fashion to Ethernet and copper wire cables. Cables are routed to the left or the right of the chassis.

➡ **Note:** Arrange the cables such that they do not impede the insertion or removal of other equipment in the rack.

Required hardware:

- fiber-optic cable
- fiber cable boot (optional)
- cable ties (optional)

To attach fiber-optic cables:

Step 1. Attach the cable to the SFP port connector on the front of the router. If necessary, attach the fiber cable boot according to the manufacturer's instructions.

Step 2. Route the cable to the left or the right of the chassis. If more than one cable is connected, you can loosely bundle the cables together using a cable tie. Do not over-tighten the cable tie.

Step 3. Attach the other end of the fiber cable to the equipment.

Shield Ground Connections

To maintain EMC compliance, cables that are shielded and grounded at both ends must be used with all the electrical interfaces on the 7705 SAR-X chassis.

To meet surge protection requirements, the shield of any open-ended cable (at the far end) must be grounded to a convenient chassis ground point, such as the equipment rack.

Required hardware:

- wire stripper
- hardware for making the connection (such as a screw, star washer, and cable ties)

To make a shield ground connection:

Step 1. Locate a convenient chassis ground point, such as the equipment rack.

Step 2. Carefully strip enough insulation (outer jacket) from the cable such that the exposed grounding wire can reach the chassis ground point. Ensure that there is enough stripped insulation to provide strain relief for the ground connection.

Caution: When stripping the cable insulation, avoid nicking the ground conductors or the insulation on the signal conductor. Nicks can weaken or break a conductor or expose a wire to a potential short circuit.

Step 3. Separate the ground shield (braid, foil, and drain wire) from the signal conductors.

Step 4. Securely attach the shield to the chassis ground point. Use a screw and star washer large enough to make a proper ground connection. Use proper cable dressing and strain relief techniques.

Making an External Synchronization Connection

The 7705 SAR-X provides a 1.0/2.3 DIN connector for an external synchronization input.

Required hardware:

- shielded DIN cable with 1.0/2.3 coaxial connector

Connecting an External Synchronization Input

To connect an external synchronization source input to the router:

Step 1. Attach one end of the synchronization cable to the Sync In connector on the 7705 SAR-X.

Step 2. Attach the other end of the synchronization cable to the external synchronization source.

Making an External Alarms Connection

The 7705 SAR-X is equipped with a DB-15 female External Alarms connector that provides dry contacts for three alarm outputs and four inputs.

Required hardware:

- appropriate shielded cable with a DB-15 male connector at the chassis end and a customized connector at the external device end. A shielded cable must be used to maintain EMC compliance.

Connecting an External Alarm Device to the Chassis

To connect an external alarm device to the External Alarms connector:

Step 1. Design the external alarm circuitry using the input and output pin assignments provided in External Alarms Connector.

Step 2. Attach the alarm device to the customized end of the external alarm cable (either directly or through a distribution device).

Step 3. Attach the DB-15 male connector end of the cable to the External Alarms connector.

Making an Optical Management Console Connection

The 7705 SAR-X is equipped with an Optical Management Console (OMC) port that provides an interface that is used to connect to managed platforms, such as the Alcatel-Lucent 1830 Versatile WDM Module (VWM) passive shelf.

Required hardware:

- shielded single OMC cable, 3.3 ft (1 m) (part number 3HE10283AA) or
- shielded OMC Y-cable 3.3 ft (1 m) (part number 3HE10284AA)

Connecting a Managed Optical Console to the Chassis

To connect a managed optical console to the OMC port:

Step 1. See OMC Port Pinout Assignments for the OMC port pinout assignments and the OMC cable wire colors.

Step 2. Attach the managed console device to the device end of the OMC cable.

Step 3. Attach the chassis end of the cable to the OMC port.

Making Router Management Connections

Refer to Establishing Router Management Connections for information.

7705 SAR-X Chassis Installation Guide

Initializing and Provisioning

In This Chapter

This chapter provides information about initializing and provisioning the 7705 SAR-X:

- Powering Up and Initializing the 7705 SAR-X
- Automatic Discovery Protocol
- Establishing Router Management Connections
- Provisioning the 7705 SAR-X

Powering Up and Initializing the 7705 SAR-X

Complete the procedures in Connecting to an AC or DC Power Source and Installing SFPs before proceeding with the power-up and initialization instructions.

The primary copy of the 7705 SAR-X TiMOS software is located on the compact flash memory devices that are factory-installed. The compact flash devices are installed pre-programmed with the desired software and configuration files.

Note:

- The 7705 SAR-X does not have a power switch or an internal circuit breaker. For AC-powered variants, the system is powered on by setting the on/off switch on the AC power inlet to the on position. For DC-powered variants, the system is powered on by turning the power on at the DC power supply.
- Configurations and executable software can be stored on the compact flash memory device or at an FTP file location.
- You must have a console or Telnet connection to communicate with and provision the 7705 SAR-X. See Establishing Router Management Connections.

Power-Up and Initialization

To power up the chassis, follow these steps:

Step 1. Turn on the power to the chassis to initiate the boot process.

Step 2. For AC-powered variants, check the AC In LED on the front of the chassis; a solid green color indicates that AC input power is present and operational.

For DC-powered variants, check the BattA and BattB LEDs on the front of the chassis; a solid green color indicates that DC input power is present for both power feeds. If only one DC power feed is used, either the BattA or BattB LED should be lit.

Step 3. Verify that the system is initializing.

The system searches the compact flash device for the `boot.ldr` file (also known as the bootstrap or boot loader file). The Status LED blinks green and the Activity LEDs blink amber during initialization. After initialization (approximately 30 s), the Status and Activity LEDs turn solid green and amber, respectively.

If the LEDs do not operate as described above, or if they blink and turn off, refer to Troubleshooting Initial Startup.

Step 4. Verify the operational status of the ports by checking the LEDs on the front of the chassis. Refer to 7705 SAR-X Connectors and LEDs.

Step 5.   After verifying the LEDs, establish communication with the chassis via the Console port. Refer to Console Connection.

Step 6.   (Optional at this time) Assign an IP address to the chassis. Refer to Telnet Connection for quick reference information and to "Initial System Startup Process Overview" in the 7705 SAR OS Basic System Configuration Guide for detailed information.

Step 7.   (Optional at this time) Configure or modify the primary, secondary, or tertiary BOF file locations. Refer to Telnet Connection for quick reference information and to "Initial System Startup Process Overview" in the 7705 SAR OS Basic System Configuration Guide for detailed information.

Step 8.   (Optional at this time) Run automatic discovery protocol (ADP).

ADP is a factory-installed boot option that automates the initial commissioning of 7705 SAR-X systems. ADP runs automatically the first time the system is powered up. The Status LED blinks green and amber while ADP is running. You can terminate ADP while it is running by pressing the ACO button or via the CLI. See Automatic Discovery Protocol for more information.

Troubleshooting Initial Startup

If the system cannot load or cannot find the `boot.ldr` file on the integrated flash memory device (cf3), the system continuously boots in an attempt to successfully find and load the file. If this happens, the faulty chassis must be returned to Alcatel-Lucent for replacement.

If the system finds the `boot.ldr` file, the system processes the initialization parameters from the BOF. The BOF should be on the same drive as the `boot.ldr` file. If the BOF cannot be found or loaded, then the system prompts the user for alternate software and configuration file locations.

When the software is successfully loaded, control is passed from the boot loader file to the software. The runtime software attempts to locate the configuration file as configured in the BOF. The file includes configurations for the chassis, control and switching functions, and ports, as well as system, routing, and service configurations.

Figure 24 displays the compact flash directory structure and file names.

Figure 24: Files on the Compact Flash Device
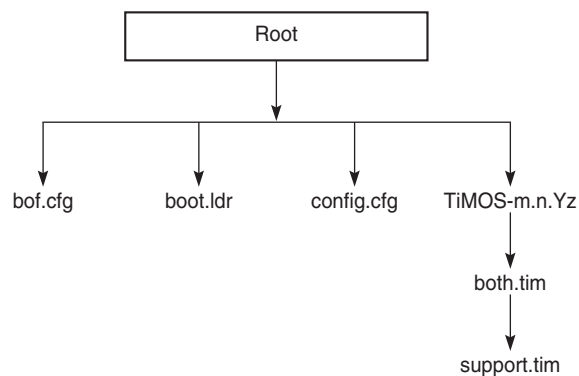
```
                        ┌─────────────────────┐
                        │        Root         │
                        └─────────────────────┘
                                   │
        ┌────────────┬─────────────┼─────────────┐
        ▼            ▼             ▼             ▼
     bof.cfg      boot.ldr     config.cfg    TiMOS-m.n.Yz
                                                  │
                                                  ▼
                                               both.tim
                                                  │
                                                  ▼
                                              support.tim
                                                            19644
```

Files on the compact flash are:

- bof.cfg — boot option file
- boot.ldr — bootstrap software
- config.cfg — default configuration file
- TiMOS-m.n.Yz:

    m — major release number

    n — minor release number

    Y: type of release

    → A — Alpha release

    → B — Beta release

    → M — maintenance release

    → R — released software

    z — version number
- both.tim — application software file
- support.tim — field-programmable gate array (FPGA) file

Automatic Discovery Protocol

Automatic Discovery Protocol (ADP) is a factory-installed boot option that automates the initial commissioning of 7705 SAR-X nodes. When the 7705 SAR-X is started for the first time, an ADP keyword in the BOF causes automatic discovery to run as part of the TiMOS application image.

In the console session, during the boot-up sequence, you can change the boot options before the application image is loaded. On systems that support ADP, you will be presented with the following additional options:

- enable/disable ADP
- specify an optional identifier and optional VLAN
- modify the location where the newly discovered configuration will be stored

For more information about ADP and the BOF file, refer to the 7705 SAR OS Basic System Configuration Guide, "Automatic Discovery Protocol".

ADP can be controlled via the CLI while it is running or by the ACO button on the 7705 SAR-X chassis. You can use the ACO button to terminate or retry ADP or to reboot the chassis. For ADP CLI commands, refer to the 7705 SAR OS OAM and Diagnostics Guide, "Tools Commands".

Table 18 lists the ADP commands you can perform with the ACO button.

Table 18: ADP Front Panel Interface Commands

Command	Instructions	Notes
Enter front panel interface mode	Hold down the ACO button for at least 3 s	Once the user interface mode is activated, you have 5 s to enter the commands. The user interface mode is also activated when ADP is halted, or whenever it enters a new stage of discovery.
Terminate ADP	Enter the front panel interface, then press the ACO button quickly two times	Wait 5 s for the command to take effect
Retry ADP	Press the ACO button quickly once	Wait 5 s for the command to take effect
Reboot the chassis	Enter the front panel interface, then hold down the ACO button for at least 3 s	Wait 5 s for the command to take effect

When run on the system, ADP goes through four basic stages:

- Self-discovery
- Network discovery
- Configuration discovery
- Test and commit

If ADP encounters errors during one of the discovery stages, it enters a halted state until the errors are cleared. ADP can detect some cleared errors and will continue processing. For other cleared errors, you must give ADP a command to retry through the CLI or with the ACO/LT button. This causes ADP to clear the rejected DHCP server list for all ports and retry any processing that failed. If still in a halted state after 15 min, ADP times out and reboots the system. During the reboot, ADP will attempt to run again.

If ADP is halted, the major and minor alarm LEDs on the 7705 SAR-X chassis indicate the ADP stage. Table 19 describes the LED combinations and corresponding ADP stage.

Table 19: ADP Stage LED Indicators

ADP Stage	Major Alarm LED	Minor Alarm LED
Self-discovery	Off	Off
Network discovery	Off	On
Configuration discovery	On	Off
Test and commit	On	On

ADP runs in the background to allow continued CLI access for status queries and troubleshooting. Periodic progress updates are sent to the console and can be viewed through a connected PC. Additionally, dump commands are available to display information and detailed logs about ADP during and after running on the system. The logs are not retained over a chassis reboot.

After ADP successfully completes, or if it is manually terminated, the system sends a command to the BOF to remove the ADP keyword. Any temporary configuration done by the ADP is removed; however, network configuration and remote access remain enabled to allow the chassis to be manually provisioned remotely. ADP does not run again on future system reboots unless it is re-enabled via the CLI.

Establishing Router Management Connections

There are three ways to access management of the 7705 SAR-X:

- Console connection
- SSH connection
- Telnet connection

Console Connection

The Console port on the front of the 7705 SAR-X is a female RJ-45 connector that provides serial console access for the SAR-X (see Figure 25 or Figure 26). To establish a console connection, you need the following:

- an ASCII terminal or a PC running terminal emulation software set to the parameters shown in Table 20
- a shielded RJ-45 CAT5e cable

Table 20: Console Port Default Settings

Parameter	Value
Gender	DCE
Baud Rate	115 200
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

To establish a console connection:

Step 1. Connect the terminal to the Console port using an RJ-45 CAT5e cable. See Console Port Pinout Assignments for the pinout assignments.

Step 2. Power on the terminal.

Step 3. Establish the connection by pressing the <Enter> key a few times on your keyboard.

Step 4. At the router prompt, enter the login and password.

The default login is `admin`.

The default password is `admin`.

SSH Connection

SSH access via a connection to the Mgmt (Management) port provides the same options for user and administrator access as those available through the console port or Telnet; however, SSH is more secure than Telnet. You can access the chassis with an SSH connection from a PC or workstation connected to the network once the following conditions are met:

- the chassis has successfully initialized
- the Mgmt port (see Figure 25 or Figure 26) has been configured using the `bof>address` command as shown below:

CLI Syntax: `bof`
`address ip-prefix/ip-prefix-length [primary | secondary]`

where:
`address` is an IPv4 or IPv6 address

➡ **Note:** SSH connection attempts after a reboot may generate key warnings as the node generates new SSH keys on each reboot. To avoid these key warnings, enable key preservation using the `config>system>security>ssh>preserve-key` command.

Running SSH

After the IP parameters are configured, the CLI can be accessed with an SSH connection. To establish an SSH connection, run an SSH program and issue the SSH command, followed by -l and the user name (optional), followed by the IP address.

The following displays an example of an SSH connection with the default admin user (the default password is `admin`).

```
C:\>ssh -l admin 192.168.1.xx1
TiMOS-B-0.0.I2263 both/hops ALCATEL-LUCENT SAR 7705
Copyright (c) 2000-2014 Alcatel-Lucent.
All rights reserved. All use subject to applicable license agreements.
Built on Wed Jul 30 00:11:49 EDT 2014 by csabuild in /rel0.0/I2263/panos/main

admin@192.168.1.xx1's password: ########
```

For more information about SSH, refer to the 7705 SAR OS System Management Guide, "Secure Shell (SSH)", and the 7705 SAR OS Basic System Configuration Guide. For pinout information, see Mgmt Port Pinout Assignments.

Telnet Connection

Telnet access via a connection to the Mgmt port provides the same options for user and administrator access as those available through the Console port or SSH. You can access the chassis with a Telnet connection from a PC or workstation connected to the network once the following conditions are met:

- the chassis has successfully initialized
- Telnet connections have been enabled using the `config>system>security>telnet-server` (or `telnet6-server`) command
- the Mgmt port (see Figure 25 or Figure 26) has been configured using the `bof>address` command as shown below.

CLI Syntax: `bof`
                  `address ip-prefix/ip-prefix-length [primary | secondary]`

where:
`address` is an IPv4 or IPv6 address

Running Telnet

After the Mgmt port IP address is configured, the 7705 SAR-X CLI can be accessed with a Telnet connection. To establish a Telnet connection, run a Telnet program and issue the `telnet` command, followed by the Mgmt port IP address.

The following displays an example of a Telnet login:

```
C:\>telnet 192.168.1.xx1
Login: admin
Password: ########
ALU-1#
```

The default login is `admin`.

The default password is `admin`.

For more information about Telnet, refer to the 7705 SAR OS System Management Guide and the 7705 SAR OS Basic System Configuration Guide. For pinout information, refer to Mgmt Port Pinout Assignments.

Provisioning the 7705 SAR-X

The 7705 SAR-X does not require provisioning above port level because it is provisioned at the factory with the following permanent configuration (Table 21 shows how the ports are grouped across three MDAs):

- card type in slot 1 is `iom-sar`
- mda type in slot 1/1 is `i8-chds1-x` (T1/E1 ports)
- mda type in slot 1/2 is `i7-mix-eth` (Ethernet XOR, SFP, SFP+ ports)
- mda type in slot 1/3 is `i7-mix-eth` (Ethernet XOR, SFP, SFP+ ports)

The following CLI display shows the factory-provisioned settings when a `show card state` command is issued.

```
*A:SARX:Dut-A# show card state
===============================================================================
Card State
===============================================================================
Slot/  Provisioned Type                 Admin Operational   Num   Num Comments
Id         Equipped Type (if different) State State         Ports MDA
-------------------------------------------------------------------------------
1      iom-sar                          up    up                  3
1/1    i8-chds1-x                       up    up            8
1/2    i7-mix-eth                       up    up            7
1/3    i7-mix-eth                       up    up            7
A      csm-2.5g                         up    up                      Active
===============================================================================
A:SARX:Dut-A#
```

Example

The CLI display for the example above when the `info` command is issued looks similar to the following:

```
ALU-1>config# card 1
ALU-1>config>card# info
. . .
----------------------------------------------
echo "Card Configuration"
#---------------------------------------------
    card 1
        card-type iom-sar
        mda 1
            mda-type i8-chds1-x
            no shutdown
        exit
        mda 2
            mda-type i7-mix-eth
            no shutdown
        exit
```

```
              mda 3
                   mda-type i7-mix-eth
                   no shutdown
              exit
              no shutdown
         exit
    ---------------------------------------------
    ALU-1>config#
```

Interface Port Groupings

Table 21 identifies how the interface ports are grouped across MDA 1, MDA2, and MDA3, and lists the port number variable definitions.

Table 21: Port Groupings

Port Type	MDA Number	Faceplate Port Number	Connector Type	Port Number CLI Identifier	Variable Definition
8 x T1/E1	1	1/1 to 1/8	RJ-45	`1/1/port-id`	1 to 8
4 x 10/100/GigE XOR	2	2/1A	RJ-45	`1/2/port-id`	1
		2/2A	RJ-45	`1/2/port-id`	2
	2	2/1B	SFP	`1/2/port-id`	1
		2/2B	SFP	`1/2/port-id`	2
	3	3/1A	RJ-45	`1/3/port-id`	1
		3/2A	RJ-45	`1/3/port-id`	2
	3	3/1B	SFP	`1/3/port-id`	1
		3/2B	SFP	`1/3/port-id`	2
8 x 10/100/GigE SFP	2	2/3 to 2/6	SFP	`1/2/port-id`	3 to 6
	3	3/3 to 3/6	SFP	`1/3/port-id`	3 to 6
2 x 10GigE SFP+	2	2/7	SFP+	`1/2/port-id`	7
	3	3/7	SFP+	`1/3/port-id`	7

To configure ports, refer to the card and port configuration sections in the 7705 SAR OS Interface Configuration Guide.

7705 SAR-X Connectors and LEDs

In This Chapter

This chapter provides information on the connectors and LEDs on the front of the 7705 SAR-X. There are no connectors or LEDs on the back of the router:

- 7705 SAR-X Connectors and LEDs

7705 SAR-X Connectors and LEDs

Figure 25 identifies the connectors and LEDs on the front of an AC-powered chassis. Figure 26 identifies the connectors and LEDs on the front of a DC-powered chassis. Table 22 describes the connectors and LEDs on the chassis.

Figure 25: 7705 SAR-X Connectors and LEDs, AC-Powered Variant
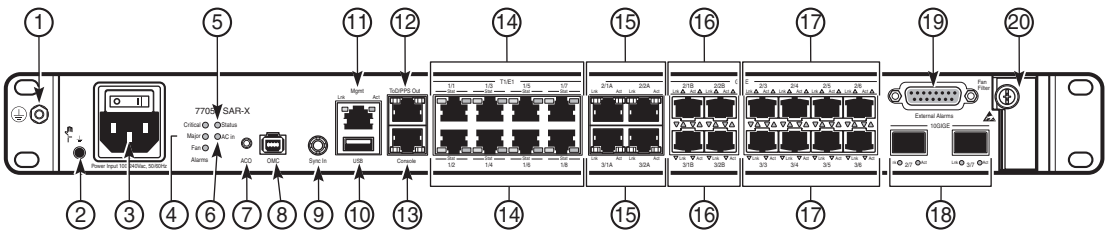
24996

Figure 26: 7705 SAR-X Connectors and LEDs, DC-Powered Variant
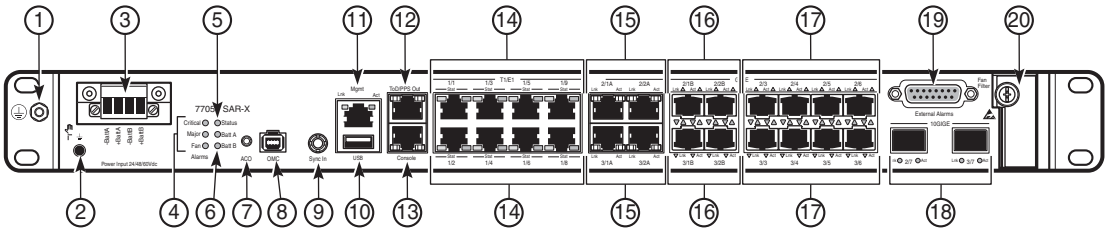
24998

Table 22: 7705 SAR-X Connector and LED Descriptions

Key	Label/Part	Sub-category	Description
1	Chassis ground stud	—	Ground stud that allows a direct connection to the building ground for the chassis ground point
2	Anti-static wrist-strap connector	—	Banana jack receptacle that provides a grounding point for personnel working on the 7705 SAR-X
3	Input power connector	AC-powered variant	Single-source standard IEC 320 AC power inlet
		DC-powered variant	Dual-feed, wire-to-board, pluggable terminal block
4	Alarm LEDs	Critical	**Red**: Indicates that the system has a critical alarm condition **Unlit**: Indicates that there are no critical alarm conditions
		Major	**Amber**: Indicates that the system has a major alarm condition **Unlit**: Indicates that there are no major alarm conditions
		Fan	**Red**: Indicates that the system has a fan failure alarm condition **Unlit**: Indicates that the fans are functioning properly
5	Status LED	—	The system status LED **Green (solid)**: Indicates that the system has initialized and is up and running **Green (blinking)**: Indicates that the system is initializing **Amber**: Indicates that the system has encountered an alarm condition **Unlit**: Indicates that there is no power to the system

Table 22: 7705 SAR-X Connector and LED Descriptions (Continued)

Key	Label/Part	Sub-category	Description
6	AC in LED	AC-powered variant	**Green (solid)**: Indicates that the system is receiving power **Unlit**: Indicates that the system is not receiving power; check the power supply source
	Batt A LED	DC-powered variant	**Green (solid)**: Indicates that the system is receiving power from power supply #1 **Unlit**: Indicates that the system is not receiving power from power supply #1; check the power supply source
	Batt B LED		**Green (solid)**: Indicates that the system is receiving power from power supply #2 **Unlit**: Indicates that the system is not receiving power from power supply #2; check the power supply source

7	ACO	—	Alarm Cut Off button that, if pressed, releases the relay that is issuing an alarm output (the associated Alarm LED remains lit until the alarm condition is cleared)
			This button may also be used to perform one of the following ADP functions (see Table 18 for more details):
			    • enter the user interface mode
			    • terminate an ADP session
			    • retry an ADP session
			    • reboot the chassis

8	OMC	—	Optical Management Console port that provides an interface that is used to connect to managed passive multiplexing platforms
9	Sync In	—	Synchronization In connector that provides a 1.0/2.3 coaxial connector that can be used to receive an external synchronization input signal
10	USB	—	USB port that provides a USB 2.0 interface for a USB storage device. This device can store an alternate/secondary image of the 7705 SAR-X TiMOS software that can be referenced from the BOF.

Table 22: 7705 SAR-X Connector and LED Descriptions (Continued)

Key	Label/Part	Sub-category	Description
11	Mgmt	—	System management port that provides an RJ-45 connector that is used for half-duplex and full-duplex communication via 10/100 or autonegotiated Ethernet. The port provides a channel to download software and configuration files and to manage the system. See Mgmt Port for pinout assignments
		LEDs	The Lnk (link) and Act (activity) LEDs that are associated with the Mgmt port
		Lnk	**Green**: Indicates that there is a valid communications link **Unlit**: Indicates that there is no communications link, or that the link is operationally down, disabled, or shut down
		Act	**Amber (blinking)**: Indicates that the Ethernet link has Rx/Tx activity **Unlit**: Indicates that the Ethernet link has no activity, or is down or disabled
12	ToD/PPS Out port	—	Time of Day/pulse per second port that provides an RJ-45 connector that is used to send out an RS-422 serial ToD signal and an RS-422 1 PPS signal See ToD/PPS Out Port for pinout assignments
13	Console	—	Console port that provides an RJ-45 connector that is used for the initial system startup as well as system configuration and monitoring See Console Port for pinout assignments
14	T1/E1 ports	—	RJ-45 ports that provide a 100 Ω T1 or 120 Ω E1 interface for connecting to user devices
		Stat LED	The status LED that is associated with the T1/E1 ports **Green**: Indicates that a valid communications link has been established **Amber (blinking)**: Indicates that a loopback is in progress **Amber (solid)**: Indicates that there is no link present (administratively up but there is an alarm) **Unlit**: Indicates that the port is disabled or shut down

Table 22: 7705 SAR-X Connector and LED Descriptions (Continued)

Key	Label/Part	Sub-category	Description
15	Ethernet XOR ports	RJ-45 port	10/100/Gigabit Ethernet combination port that can be configured to operate as an RJ-45 port
		LEDs	The Lnk (link) and Act (activity) LEDs that are associated with the RJ-45 ports
		Lnk	**Amber (blinking)**: Indicates that the Ethernet link has Rx/Tx activity **Unlit**: Indicates that the Ethernet link has no activity, or is down or disabled
		Act	**Green**: Indicates that there is a valid communications link **Unlit**: Indicates that there is no communications link, or that the link is operationally down, disabled, or shut down
16	Ethernet XOR ports	SFP port	10/100/Gigabit Ethernet combination port that can be configured to operate as an SFP port
		LEDs	The Lnk (link) and Act (activity) LEDs that are associated with the SFP ports
		Lnk LED	**Green**: Indicates that a valid communications link has been established **Unlit**: Indicates that the link is disabled or shut down, or that the SFP optics are installed but no link is present, or that there is no SFP installed
		Act LED	**Amber (blinking)**: Indicates that the port is active (receiving or transmitting) **Unlit**: Indicates that there is no port activity

Table 22: 7705 SAR-X Connector and LED Descriptions (Continued)

Key	Label/Part	Sub-category	Description
17	Ethernet SFP ports	—	10/100/Gigabit Ethernet SFP ports
		LEDs	The Lnk (link) and Act (activity) LEDs that are associated with the SFP ports
		Lnk LED	**Green**: Indicates that a valid communications link has been established **Unlit**: Indicates that the link is disabled or shut down, or that the SFP optics are installed but no link is present, or that there is no SFP installed
		Act LED	**Amber (blinking)**: Indicates that the port is active (receiving or transmitting) **Unlit**: Indicates that there is no port activity
18	10GigE ports	—	10GigE SFP+ ports
		LEDs	The Lnk (link) and Act (activity) LEDs that are associated with the SFP+ ports.
		Lnk LED	**Green**: Indicates that a valid communications link has been established **Unlit**: Indicates that the link is disabled or shut down, or that the SFP optics are installed but no link is present, or that there is no SFP installed
		Act LED	**Amber (blinking)**: Indicates that the port is active (receiving or transmitting) **Unlit**: Indicates that there is no port activity
19	External Alarms	—	DB-15 connector that provides relays that support two critical alarm outputs, a major alarm output, and four alarm inputs
20	Fan Filter	—	Replaceable fan filter

Pinout Assignments

In This Chapter

This chapter provides information about the pinout assignments for the ports and connectors on the 7705 SAR-X:

- 7705 SAR-X Pinout Assignments

7705 SAR-X Pinout Assignments

See Figure 25 or Figure 26 for the location of the ports and connectors that are described in this section.

Ethernet Ports

There are four 10/100/Gigabit Ethernet combination (XOR) ports that can be configured to provide an RJ-45 mode of operation.

Figure 27 shows the pin numbers for an Ethernet XOR port that has been configured as an RJ-45 port.

Figure 27: Ethernet XOR RJ-45 Port Pin Numbers

Pin 1   Pin 8
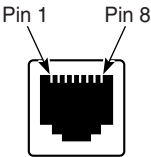
21189

Ethernet Port Pinout Assignments

Table 23 specifies the pinout assignments for an Ethernet XOR port that has been configured as an RJ-45 port.

Table 23: Ethernet XOR RJ-45 Port Pinout Assignments—RJ-45 Female

Pin	Signal	Description
1	TRD0+	bidirectional pair 0 – positive
2	TRD0-	bidirectional pair 0 – negative
3	TRD1+	bidirectional pair 1 – positive
4	TRD2+	bidirectional pair 2 – positive
5	TRD2-	bidirectional pair 2 – negative
6	TRD1-	bidirectional pair 1 – negative

Table 23: Ethernet XOR RJ-45 Port Pinout Assignments—RJ-45 Female (Continued)

Pin	Signal	Description
7	TRD3+	bidirectional pair 3 – positive
8	TRD3-	bidirectional pair 3 – negative

T1/E1 Ports

There are eight RJ-45 connectors that provide a 100 Ω T1 or 120 Ω E1 interface. The T1/E1 ports can be used for either access or network connectivity.

Figure 28 shows the pin numbering for the top row (odd-numbered) T1/E1 ports. Figure 29 shows the pin numbering for the bottom row (even-numbered) T1/E1 ports.

Figure 28: Top Row T1/E1 Port RJ-45 Connector Pin Numbers

Pin 8   Pin 1
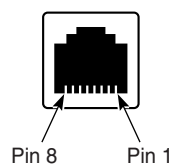
19593

Figure 29: Bottom Row T1/E1 Port RJ-45 Connector Pin Numbers

Pin 1   Pin 8
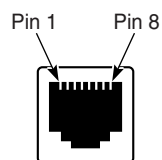
21189

T1/E1 Port Pinout Assignments

Table 24 specifies the T1/E1 port pinout assignments.

Table 24: T1/E1 Port Pinout Assignments— RJ-45 Female

Pin	Signal	Description
1	R	Receive – Ring
2	T	Receive – Tip
3	—	Not connected
4	R1	Transmit – Ring
5	T1	Transmit – Tip
6	—	Not connected
7	—	Not connected
8	—	Not connected

Mgmt Port

The Mgmt port is an RJ-45 connector that provides half-duplex and full-duplex communication via 10/100 or autonegotiated Ethernet. The Mgmt port provides a channel to download software and configuration files and to manage the system.

Figure 30 shows the Mgmt port pin numbers.

Figure 30: Mgmt Port Pin Numbers

Pin 8   Pin 1
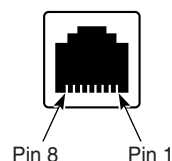
19593

Mgmt Port Pinout Assignments

The Mgmt port supports automatic MDI (straight through) or MDI-X (crossover) operation. Table 25 specifies the management port pinout assignments.

Table 25: Mgmt Port Pinout Assignments—RJ-45 Female

Pin	MDI Signal Function	MDI-X Signal Function
1	Ethernet Transmit Data (TD+)	Ethernet Receive Data (RD+)
2	Ethernet Transmit Data (TD–)	Ethernet Receive Data (RD–)
3	Ethernet Receive Data (RD+)	Ethernet Transmit Data (TD+)
4	Not connected	Not connected
5	Not connected	Not connected
6	Ethernet Receive Data (RD–)	Ethernet Transmit Data (TD-)
7	Not connected	Not connected
8	Not connected	Not connected

Console Port

The Console port is an RJ-45 connector that provides serial console access for the 7705 SAR-X. The Console port is used to configure router and system parameters. It can also be used for monitoring purposes. It supports baud rates of 9600, 19 200, 38 400, 57 600, and 115 200. The port also supports 8 data bits, no parity, and 1 stop bit. The Console port provides a direct connection to a terminal for RS-232 CLI access.

Figure 31 shows the Console port pin numbers.

Figure 31: Console Port Pin Numbers

Pin 8   Pin 1
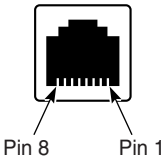
19593

Console Port Pinout Assignments

Table 26 specifies the Console port pinout assignments.

Table 26: Console Port Pinout Assignments—RJ-45 Female

Pin	Signal	Direction	Description
1	NC	—	Not connected
2	NC	—	Not connected
3	TXD	Output	Transmit data
4	GRD	Serial ground	Serial ground
5	GRD	Serial ground	Serial ground
6	RXD	Input	Receive data
7	NC	—	Not connected
8	NC	—	Not connected

ToD/PPS Out Port

The ToD/PPS Out port is an RJ-45 connector that sends an RS-422 serial ToD signal and an RS-422 1 PPS signal.

Figure 32 shows the ToD/PPS Out port connector pin numbers.

Figure 32: ToD/PPS Out Port Pin Numbers

Pin 1   Pin 8
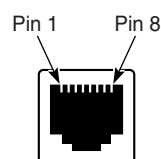
21189

ToD/PPS Out Port Pinout Assignments

Table 27 specifies the ToD/PPS Out port pinout assignments.

Table 27: ToD/PPS Out Port Pinout Assignments—RJ-45 Female

Pin	Signal	Direction	Description
1	N/A	—	—
2	N/A	—	—
3	PPS_OUT_N	Output	1 Pulse per Second Out – negative
4	N/A	—	—
5	N/A	—	—
6	PPS_OUT_P	Output	1 Pulse per Second Out – positive
7	TOD_OUT_N	Output	Time of Day Out – negative
8	TOD_OUT_P	Output	Time of Day Out – positive

External Alarms Connector

The DB-15 External Alarms connector provides relays that support two critical alarm outputs, a major alarm output, and four alarm inputs. When a critical or major alarm condition occurs, the CPU causes the alarm relay to issue the alarm output and turns on the critical or major LED. If you push the alarm cut off (ACO) button, the relay is released but the LED stays on.

The system signals the appropriate alarm output for the following events:

- fan failure — critical alarm is raised
- power supply failure — critical alarm is raised.
- chassis temperature threshold exceeded — major alarm is raised

The input voltage range for the four alarm inputs is from 24 V to 48 V. If an alarm input is active, the CPU processes it, outputs it to the CLI, and issue an SNMP trap. Each alarm input can be configured with the following:

- name
- description
- administrative state (shut down or not shut down)
- detect and clear debounce timers
- normal conditions (normally open or normally closed)
- association with up to four user-defined alarms

The alarm inputs must be associated with an alarm in order for them to be triggered.

Refer to the 7705 SAR OS Interface Configuration Guide, "Configuring Auxiliary Alarm Card and Chassis External Alarm Parameters", for information on configuring the alarm inputs.

You can display the status of the alarm inputs using the `show>external-alarms> input` CLI command. Refer to the 7705 SAR OS Interface Configuration Guide for examples of the alarm inputs display.

As well as configuring alarm inputs for settings such as alarm severity, the pins on the external alarms connector can also be configured to trigger a log event with a configurable severity. For information on configuring the log events on the pins, refer to the 7705 SAR OS System Management Guide, "Event Control." To display the status of the log events, use the `show>chassis>environment` command (refer to the 7705 SAR OS Basic System Configuration Guide).

Figure 33 shows the External Alarms connector pin numbers.

Figure 33: DB-15 External Alarms Connector Pin Numbers
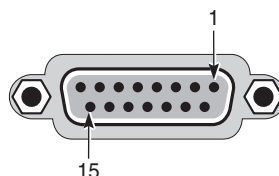
25076

External Alarms Connector Pinout Assignments

Table 28 shows the External Alarms connector pinout assignments.

Table 28: External Alarms Connector Pinout Assignments

Pin	Name	Function
1	CRIT_ALARM_COM	Common contact for critical alarm relay
2	CRIT_ALARM_NO	Normally open contact will be connected to the common contact during a critical alarm state
3	MJR_ALARM_NC	Normally closed contact will be disconnected from the common contact during a major alarm state
4	+24 VDC source 100 mA referenced to chassis ground	Available as a source voltage for use with: ALARM_IN1_EXT_+ ALARM_IN2_EXT_+ ALARM_IN3_EXT_+ ALARM_IN4_EXT_+
5	ALARM_IN4_EXT_+	External alarm input 4 (external relay dry contact closure to pin 12)
6	ALARM_IN3_EXT_+	External alarm input 3 (external relay dry contact closure to pin 13)
7	ALARM_IN2_EXT_+	External alarm input 2 (external relay dry contact closure to pin 14)
8	ALARM_IN1_EXT_+	External alarm input 1 (external relay dry contact closure to pin 15)

Table 28: External Alarms Connector Pinout Assignments (Continued)

Pin	Name	Function
9	CRIT_ALARM_NC	Normally closed contact will be disconnected from the common contact during a critical alarm state
10	MJR_ALARM_COM	Common contact for major alarm relay
11	MJR_ALARM_NO	Normally open contact will be connected to the common contact during a major alarm state
12	ALARM_IN4_EXT_RTN	External alarm input 4 (external relay dry contact closure from pin 5)
13	ALARM_IN3_EXT_RTN	External alarm input 3 (external relay dry contact closure from pin 6)
14	ALARM_IN2_EXT_RTN	External alarm input 2 (external relay dry contact closure from pin 7)
15	ALARM_IN1_EXT_RTN	External alarm input 1 (external relay dry contact closure from pin 8)

Optical Management Console Port

The Optical Management Console (OMC) port provides passive multiplexing shelf management.

Figure 34 shows the OMC port pin numbers.

Figure 34: OMC Port Pin Numbers
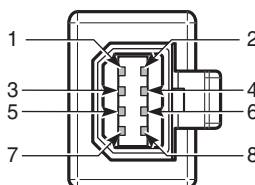
25077

OMC Port Pinout Assignments

Table 29 specifies the OMC port pinout assignments and the OMC cable wire colors.

Table 29: OMC Port Pinout Assignments

Pin	Signal	Cable Wire Color
1	I2C_CK	BRN
2	GND	RED
3	GND	ORG
4	GND	YEL
5	VC5V_IN	GRN
6	VC5V_IN	BLU
7	VC5V_IN	VIO
8	I2C_D	GRY

Standards and Protocol Support

This chapter lists the 7705 SAR compliance with EMC, environmental, and safety standards, telecom standards, and supported protocols:

- EMC Industrial Standards Compliance
- EMC Regulatory and Customer Standards Compliance
- Environmental Standards Compliance
- Safety Standards Compliance
- Telecom Interface Compliance
- Directives, Regional Approvals and Certifications Compliance
- Telecom Standards
- Protocol Support
- Proprietary MIBs

Table 30: EMC Industrial Standards Compliance

Standard	Title	Platform								
		SAR-X	SAR-A	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
IEEE 1613:2009 + A1:2011	IEEE Standard Environmental and Testing Requirements for Communications Networking Devices Installed in Electric Power Substations	✓ [1]			✓ [2]	✓ [1]	✓ [4]	✓ [4]		
IEEE 1613.1-2013	IEEE Standard Environmental and Testing Requirements for Communications Networking Devices Installed in Transmission and Distribution Facilities	✓ [5]			✓ [6]	✓ [3]	✓ [7]	✓ [7]		
IEEE Std C37.90	IEEE Standard for relays and relay systems associated with Electric Power Apparatus	✓			✓	✓	✓	✓		
IEEE Std C37.90.1	Surge Withstand Capability (SWC) Tests	✓			✓	✓	✓	✓		
IEEE Std C37.90.2	Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers	✓			✓	✓	✓	✓		
IEEE Std C37.90.3	IEEE Standard Electrostatic Discharge Tests for Protective Relays	✓			✓	✓	✓	✓		
EN 50121-4: 2006	Electromagnetic Compatibility – Part 4: Emission and Immunity of the Signalling and Telecommunications Apparatus	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 62236-4:2008	Electromagnetic Compatibility – Part 4: Emission and Immunity of the Signalling and Telecommunications Apparatus	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61000-6-2:2005	Generic standards – Immunity for industrial environments	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61000-6-4:2006	Generic standards – Emissions standard for industrial environments	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC TS 61000-6-5	Immunity for power station and substation environments	✓			✓	✓	✓	✓		
IEC 61850-3	Communication networks and systems for power utility automation - Part 3: General requirements	✓			✓	✓	✓	✓		
IEC/AS 60870.2.1	Telecontrol equipment and systems. Operating conditions. Power supply and electromagnetic compatibility	✓			✓	✓	✓	✓		

Notes:

1.   Performance Class 1

2.   Performance Class 1 (Class 2 w/ Optics interfaces only)

3. Zone B; Performance Class 1

4. Performance Class 2

5. Zone A; Performance Class 1

6. Zone A; Performance Class 1 (Class 2 w/Optics interfaces only)

7. Zone A; Performance Class 2

Table 31: EMC Regulatory and Customer Standards Compliance

Standard	Title	Platform								
		SAR-X	SAR-A	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
IEC 61000-4-2	Electrostatic discharge immunity test	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61000-4-3	Radiated electromagnetic field immunity test	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61000-4-4	Electrical fast transient/burst immunity test	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61000-4-5	Surge immunity test	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61000-4-6	Immunity to conducted disturbances	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61000-4-8	Power frequency magnetic field immunity test	✓			✓	✓	✓	✓		
IEC 61000-4-9	Pulse Magnetic field immunity test	✓			✓	✓	✓	✓		
IEC 61000-4-10	Damped Oscillatory Magnetic Field	✓			✓	✓	✓	✓		
IEC 61000-4-11	Voltage dips, short interruptions and voltage variations immunity tests	✓	✓[1]	✓[1]	✓[1]	✓[1]	✓	✓[1]	✓	✓
IEC 61000-4-12	Oscillatory wave immunity test	✓			✓	✓	✓	✓		
IEC 61000-4-16	Conducted immunity 0 Hz - 150 kHz	✓			✓	✓	✓	✓		
IEC 61000-4-17	Ripple on d.c. input power port immunity test	✓			✓	✓	✓	✓		
IEC 61000-4-18	Damped oscillatory wave immunity test	✓			✓	✓	✓	✓		
IEC 61000-4-29	Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests	✓			✓	✓	✓	✓		
IEC 61000-3-2	Limits for harmonic current emissions (equipment input current <16A per phase)	✓	✓[1]	✓[1]	✓[1]	✓[1]	✓	✓[1]	✓	✓
IEC 61000-3-3	Limits for voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current <16A	✓	✓[1]	✓[1]	✓[1]	✓[1]	✓	✓[1]	✓	✓
ITU-T K.20 (DC Ports)	Resistibility of telecommunication equipment installed in a telecommunications centre to overvoltages and overcurrents	✓	✓	✓	✓	✓	✓	✓		

Table 31: EMC Regulatory and Customer Standards Compliance (Continued)

Standard	Title	Platform								
		SAR-X	SAR-A	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
ETSI 300 132-2	Power supply interface at the input to telecommunications and datacom (ICT) equipment; Part 2: Operated by -48 V direct current (dc)	✓	✓	✓	✓	✓	✓	✓	✓	
EN 300 386	Telecommunication network equipment; ElectroMagnetic Compatibility (EMC)	✓	✓	✓	✓	✓	✓	✓	✓	✓
ES 201 468	Electromagnetic compatibility and Radio spectrum Matters (ERM); Additional ElectroMagnetic Compatibility (EMC) requirements and resistibility requirements for telecommunications equipment for enhanced availability of service in specific applications	✓			✓	✓				
EN 55024	Information technology equipment - Immunity characteristics - Limits and methods of measurements	✓	✓	✓	✓	✓	✓	✓	✓	✓
Telcordia GR-1089-CORE	EMC and Electrical Safety - Generic Criteria for Network Telecommunications Equipment	✓	✓	✓	✓	✓	✓	✓	✓	✓
AS/NZS CISPR 22	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[3]	✓[3]
FCC Part 15, Subpart B	Radio Frequency devices- Unintentional Radiators (Radiated & Conducted Emissions)	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[3]	✓[3]
ICES-003	Information Technology Equipment (ITE) — Limits and methods of measurement	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[3]	✓[3]
EN 55022	Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[3]	✓[3]
CISPR 22	Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[3]	✓[3]
KC Notice Emission (KN22) and Immunity (KN24) (South Korea)	EMS standard: NRRA notice	✓	✓	✓	✓	✓	✓	✓		

Notes:

1. With external AC/DC power supply

2. Class A

3. Class B

Table 32: Environmental Standards Compliance

Standard	Title	Platform								
		SAR-X	SAR-A	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
IEEE 1613:2009 + A1:2011	Environmental and Testing Requirements for Communications Networking Devices	✓[1]			✓[1]	✓[1]	✓	✓		
IEC 61850-3	Communication networks and systems for power utility automation - Part 3: General requirements	✓[2]			✓[2]	✓[2]	✓[2]	✓[2]		
IEC 60068-2-1	Environmental testing – Part 2-1: Tests – Test A: Cold	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 60068-2-2	Environmental testing - Part 2-2: Tests - Test B: Dry heat	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 60068-2-30	Environmental testing - Part 2: Tests. Test Db and guidance: Damp heat, cyclic (12 + 12-hour cycle)	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 60255-21-2	Electrical relays - Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment - Section Two: Shock and bump tests	✓			✓	✓	✓	✓		
ETSI 300 753 Class 3.2	Acoustic noise emitted by telecommunications equipment	✓	✓	✓	✓	✓	✓	✓	✓	✓
Telcordia GR-63-CORE	NEBS Requirements: Physical Protection	✓	✓	✓	✓	✓	✓	✓	✓	✓
ETSI EN 300 019-2-1 v2.1.2, Class 1.2	Specification of environmental tests; Storage	✓	✓	✓	✓	✓	✓	✓	✓	✓
ETSI EN 300 019-2-2 V2.1.2, class 2.3	Specification of environmental tests; Transportation	✓	✓	✓	✓	✓	✓	✓	✓	✓
ETSI EN 300 019-2-3 V2.2.2, class 3.2	Specification of environmental tests; Stationary use at weatherprotected locations	✓	✓	✓	✓	✓	✓	✓		
ETSI EN 300 019-2-4 v2.2.2 class T4.1	Specification of environmental tests; Stationary use at non-weatherprotected locations								✓	✓
Telcordia GR-3108-CORE	Generic Requirements for Network Equipment in the Outside Plant (OSP)	✓[3]	✓[3]	✓[3]	✓[3]		✓[3]	✓[3]	✓[4]	✓[4]

Table 32: Environmental Standards Compliance (Continued)

Standard	Title	Platform								
		SAR-X	SAR-A	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
"GR-3108 Class 3 Section 6.2 IEC 60068-2-52 - Severity 3 MIL-STD-810G Method 509.5 EN 60721-3-3 Class 3C4 EN 60068-2-11: Salt Mist EN 50155 Class ST4"	Conformal Coating [5]	✓		✓	✓		✓	✓		
Telcordia GR-950-CORE	Generic Requirements for ONU Closures and ONU Systems								✓	✓

Notes:

1. Forced air system; uses fans
2. Normal environmental conditions as per IEC 61850-3 ed.2
3. Class 2
4. Class 4
5. Conformal coating is available as an orderable option

Table 33: Safety Standards Compliance

Standard	Title	Platform								
		SAR-X	SAR-A	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
UL/CSA 60950-1	Information technology equipment - Safety - Part 1: General requirements	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC/EN 60950-1	Information technology equipment - Safety - Part 1: General requirements	✓	✓	✓	✓	✓	✓	✓	✓	✓
AS/NZS 60950-1	Information technology equipment - Safety - Part 1: General requirements	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC/EN 60825-1 and 2	Safety of laser products - Part 1: Equipment classification and requirements Part 2: Safety of optical fibre communication systems (OFCS)	✓	✓	✓	✓	✓	✓	✓	✓	✓
FDA CDRH 21-CFR 1040	PART 1040 Performance Standards for Light-Emitting Products	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 33: Safety Standards Compliance (Continued)

Standard	Title	Platform								
		SAR-X	SAR-A	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
UL/CSA 60950-22	Information Technology Equipment - Safety - Part 22: Equipment to be Installed Outdoors								✓	✓
CSA–C22.2 No.94	Special Purpose Enclosures								✓	✓
UL50	Enclosures for Electrical Equipment, Non-Environmental Consideration								✓	✓
IEC/EN 60950-22	Information technology equipment. Equipment to be installed Outdoors.								✓	✓
IEC 60529	Degrees of Protection Provided by Enclosures (IP Code)	✓[1]	✓[2]	✓[1]	✓[1]	✓[1]	✓[2]	✓[2]	✓[3]	✓[3]

Notes:

1. IP20
2. IP40
3. IP65

Table 34: Telecom Interface Compliance

Standard	Title	Platform								
		SAR-X	SAR-A	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
IC CS-03 Issue 9	Compliance Specification for Terminal Equipment, Terminal Systems, Network Protection Devices, Connection Arrangements and Hearing Aids Compatibility	✓	✓	✓	✓	✓	✓			
ACTA TIA-968-B	Telecommunications - Telephone Terminal Equipment - Technical Requirements for Connection of Terminal Equipment to the Telephone Network	✓	✓	✓	✓	✓	✓			
AS/ACIF S016 (Australia)	Requirements for Customer Equipment for connection to hierarchical digital interfaces	✓	✓	✓	✓	✓	✓			
ATIS-06000403	Network and Customer Installation Interfaces- DS1 Electrical Interfaces	✓	✓	✓	✓	✓	✓			
ANSI/TIA/EIA-422-B (RS422)	Electrical Characteristics for balanced voltage digital interfaces circuits				✓	✓				

Table 34: Telecom Interface Compliance (Continued)

Standard	Title	Platform								
		SAR-X	SAR-A	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
ITU-T G.825	The control of jitter and wander within digital networks which are based on the synchronous digital hierarchy (SDH)				✓	✓				
ITU-T G.703	Physical/electrical characteristics of hierarchical digital interfaces	✓	✓	✓	✓	✓	✓			
ITU-T G.712 (E&M)	Transmission performance characteristics of pulse code modulation channels				✓	✓				
ITU-T G.957	Optical interfaces for equipments and systems relating to the synchronous digital hierarchy				✓	✓				
ITU-T V.24 (RS232)	List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)				✓	✓	✓	✓		
ITU-T V.28 (V35)	Electrical characteristics for unbalanced double-current interchange circuits				✓	✓				
ITU-T V.36 (V35)	Modems for synchronous data transmission using 60-108 kHz group band circuits				✓	✓				
ITU-T V.11 / X.27 (RS422)	Electrical characteristics for balanced double current interchange circuits operating at data signalling rates up to 10 Mbit/s				✓	✓				
ITU-T X.21 (RS422)	Interface between Data Terminal Equipment and Data Circuit-terminating Equipment for synchronous operation on public data networks				✓	✓				
IEEE 802.3at (POE)	Data Terminal Equipment Power via the Media Dependent Interfaces Enhancements			✓			✓	✓	✓	✓

Table 35: Directives, Regional Approvals and Certifications Compliance

Standard	Title	Platform								
		SAR-X	SAR-A	SAR-M	SAR-8	SAR-18	SAR-H	SAR-Hc	SAR-W	SAR-Wx
EU Directive 2004/108/ EC EMC	Electromagnetic Compatibility (EMC)	✓	✓	✓	✓	✓	✓	✓	✓	✓
EU Directive 2006/95/ EC LVD	Low Voltage Directive (LVD)	✓	✓	✓	✓	✓	✓	✓	✓	✓
EU Directive 2012/19/ EU WEEE	Waste Electrical and Electronic Equipment (WEEE)	✓	✓	✓	✓	✓	✓	✓	✓	✓
EU Directive 2011/65/ EU RoHS2	Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment (RoHS2)	✓	✓	✓	✓	✓	✓	✓	✓	✓
CE Mark		✓	✓	✓	✓	✓	✓	✓	✓	✓
CRoHS Logo; Ministry of Information Industry order No.39		✓	✓	✓	✓	✓	✓	✓	✓	✓
China (MII NAL) Network Access License			✓	✓	✓	✓	✓		✓	
South Korea (KC Mark)		✓	✓	✓	✓	✓	✓	✓		
Australia (RCM Mark)		✓	✓	✓	✓	✓	✓	✓	✓	✓
TL9000 certified		✓	✓	✓	✓	✓	✓	✓	✓	✓
ISO 14001 certified		✓	✓	✓	✓	✓	✓	✓	✓	✓
ISO 9001:2008 certified		✓	✓	✓	✓	✓	✓	✓	✓	✓

Telecom Standards

ANSI/TIA/EIA-232-C—Interface Between Data Terminal Equipment and Data Circuit-
Terminating Equipment Employing Serial Binary Data Interchange

IEEE 802.1ad—IEEE Standard for Local and Metropolitan Area Networks---Virtual Bridged
Local Area Networks

IEEE 802.1ag—Service Layer OAM

IEEE 802.1p/q—VLAN Tagging

IEEE 802.3—10BaseT

IEEE 802.3ab—1000BaseT

IEEE 802.3ah—Ethernet OAM

IEEE 802.3u—100BaseTX

IEEE 802.3x —Flow Control

IEEE 802.3z—1000BaseSX/LX

IEEE 802.3-2008—Revised base standard

IEEE 802.1AX-2008—Link Aggregation Task Force (transferred from IEEE 802.3ad)

IEEE C37.94-2002—N Times 64 Kilobit Per Second Optical Fiber Interfaces Between
Teleprotection and Multiplexer Equipment

ITU-T G.704—Synchronous frame structures used at 1544, 6312, 2048, 8448 and 44 736
kbit/s hierarchical levels

ITU-T G.707—Network node interface for the Synchronous Digital Hierarchy (SDH)

ITU-T G.984.1—Gigabit-capable passive optical networks (GPON): general characteristics

ITU-T Y.1564—Ethernet service activation test methodology

ITU-T Y.1731—OAM functions and mechanisms for Ethernet-based networks

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AF-PHY-0086.001—Inverse Multiplexing for ATM (IMA)

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ITU-T Recommendation I.432.1—B-ISDN user-network interface - Physical layer
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ITU-T Recommendation I.610—B-ISDN Operation and Maintenance Principles and
Functions version 11/95

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RFC 2684—Multiprotocol Encapsulation over ATM Adaptation Layer 5

BFD

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draft-ietf-bfd-multihop-06.txt—BFD for Multi-hop Paths

BGP

RFC 1397—BGP Default Route Advertisement

RFC 1997—BGP Communities Attribute

RFC 2385—Protection of BGP Sessions via MDS

RFC 2439—BGP Route Flap Dampening

RFC 2547bis—BGP/MPLS VPNs

RFC 2918—Route Refresh Capability for BGP-4

RFC 3107—Carrying Label Information in BGP-4

RFC 3392—Capabilities Advertisement with BGP-4

RFC 4271—BGP-4 (previously RFC 1771)

RFC 4360—BGP Extended Communities Attribute

RFC 4364—BGP/MPLS IP Virtual Private Networks (VPNs) (previously RFC 2574bis BGP/MPLS VPNs)

RFC 4456—BGP Route Reflection: Alternative to Full-mesh IBGP (previously RFC 1966 and RFC 2796)

RFC 4486—Subcodes for BGP Cease Notification Message

RFC 4724—Graceful Restart Mechanism for BGP - GR Helper

RFC 4760—Multi-protocol Extensions for BGP (previously RFC 2858)

RFC 4893—BGP Support for Four-octet AS Number Space

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DHCP/DHCPv6

RFC 1534—Interoperation between DHCP and BOOTP

RFC 2131—Dynamic Host Configuration Protocol (REV)

RFC 2132—DHCP Options and BOOTP Vendor Extensions

RFC 3046—DHCP Relay Agent Information Option (Option 82)

RFC 3315—Dynamic Host Configuration Protocol for IPv6

RFC 3736—Stateless Dynamic Host Configuration Protocol (DHCP) Service for IPv6

Differentiated Services

RFC 2474—Definition of the DS Field in the IPv4 and IPv6 Headers

RFC 2597—Assured Forwarding PHB Group

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RFC 3140—Per-Hop Behavior Identification Codes

Digital Data Network Management

V.35

RS-232 (also known as EIA/TIA-232)

X.21

DSL Modules

ITU-T G.991.2 Annex A, B, F and ITU-T G.991.2 Amendment 2 Annex G—SHDSL standards compliance

ITU-T G.991.2 Appendix F and G—Support for up to 5696 Kb/s per pair

ITU-T G.992.1 (ADSL)

ITU-T G.992.3 (G.dmt.bis), Annex A, B, J, M

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ITU-T G.992.5, Annex A, B, J, M

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ITU-T G.993.2 Amendment 1—Seamless Rate Adaptation

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ITU-T G.993.2 Annex K.3—Supported Transport Protocol Specific Transmission Convergence functions

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FRF.1.2—PVC User-to-Network Interface (UNI) Implementation Agreement

FRF.12—Frame Relay Fragmentation Implementation Agreement

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RFC 3706—A Traffic-Based Method of Detecting Dead Internet Key Exchange (IKE) Peers

RFC 3947—Negotiation of NAT-Traversal in the IKE

RFC 3948—UDP Encapsulation of IPsec ESP Packets

RFC 4303—IP Encapsulating Security Payload (ESP)

RFC 4210—Internet X.509 Public Key Infrastructure Certificate Management Protocol (CMP)

RFC 4211—Internet X.509 Public Key Infrastructure Certificate Request Message Format (CRMF)

RFC 4945—The Internet IP Security PKI Profile of IKEv1/ISAKMP, IKEv2, and PKIX

RFC 5280—Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile

RFC 5996—Internet Key Exchange Protocol Version 2 (IKEv2)

IPv6

RFC 2460—Internet Protocol, Version 6 (IPv6) Specification

RFC 2462—IPv6 Stateless Address Autoconfiguration

RFC 2464—Transmission of IPv6 Packets over Ethernet Networks

RFC 3587—IPv6 Global Unicast Address Format

RFC 3595—Textual Conventions for IPv6 Flow Label

RFC 4007—IPv6 Scoped Address Architecture

RFC 4193—Unique Local IPv6 Unicast Addresses

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RFC 2763—Dynamic Hostname Exchange for IS-IS

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RFC 2138—RADIUS

RFC 2206—RSVP-MIB

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RFC 2572—SNMP-MPD-MIB

RFC 2573—SNMP-TARGET-&-NOTIFICATION-MIB

RFC 2574—SNMP-USER-BASED-SMMIB

RFC 2575—SNMP-VIEW-BASED ACM-MIB

RFC 2576—SNMP-COMMUNITY-MIB

RFC 2588—SONET-MIB

RFC 2665—EtherLike-MIB

RFC 2819—RMON-MIB

RFC 2863—IF-MIB

RFC 2864—INVERTED-STACK-MIB

RFC 3014—NOTIFICATION-LOG MIB

RFC 3164—The BSD Syslog Protocol

RFC 3273—HCRMON-MIB

RFC 3411—An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks

RFC 3412—Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)

RFC 3413—Simple Network Management Protocol (SNMP) Applications

RFC 3414—User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)

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RFC 3509—Alternative Implementations of OSPF Area Border Routers

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RFC 3550—RTP: A Transport Protocol for Real-Time Applications

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RFC 4446—IANA Allocation for PWE3

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RFC 5086—Structure-Aware Time Division Multiplexed (TDM) Circuit Emulation Service over Packet Switched Network (CESoPSN)

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RFC 2702—Requirements for Traffic Engineering over MPLS

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RFC 3209—Extensions to RSVP for LSP Tunnels

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RFC 3477—Signalling Unnumbered Links in Resource ReSerVation Protocol - Traffic Engineering (RSVP-TE)

RFC 4090—Fast Reroute Extensions to RSVP-TE for LSP Tunnels

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