Alcatel-Lucent 7705

SERVICE AGGREGATION ROUTER | RELEASE 7.0.R4

SAR-A CHASSIS INSTALLATION GUIDE

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Preface

About This Guide

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

After the hardware installation process is completed, refer to 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 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:

http://support.alcatel-lucent.com

Mandatory Regulations

In This Chapter

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

- List of Terms
- General Requirements
- Canada Regulations
- United States Regulations
- European Union Regulations
- Australia/New Zealand Regulations
- China 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-A. 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-A should be connected to a DC branch circuit with a minimum 5 A and 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

17658

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-A chassis and equipment rack must be properly grounded. A typical grounding point is one of the ground studs on the 7705 SAR-A 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-A or the 100W High Voltage Power Supply.

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-A chassis is properly installed in a grounded equipment rack, the rack provides ESD grounding for the chassis. Before a 7705 SAR-A chassis is installed, connect the ESD wrist strap to a grounded rack or other ground point. After the 7705 SAR-A chassis is installed in a grounded rack or cabinet, connect the anti-static wrist strap to the ESD strap ground point on one of the ground studs identified by the wrist strap label.

Unit Repair

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

- 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-A are defined as the following SELV connectors:

- T1/E1 (variant with T1/E1 ports)
- Ethernet (10/100/1000 Base-T)
- ToD port
- Mgmt port
- Console port
- one external clock input (2.048 MHz G.703, 5 MHz, or 10 MHz)

Interconnection points of the 100W High Voltage Power Supply are defined as the following connections:

- SELV:
  → DC power output
- Hazardous voltage secondary:
  → high-voltage DC power input, above 60 VDC nominal
- Hazardous voltage primary:
  → AC power input

SELV, Hazardous Voltage Secondary and Primary

Only like circuits shall be interconnected. Connect SELV and Hazardous Voltage Secondary and Primary circuits on this equipment only to other circuits that comply with the requirements of SELV and Hazardous Voltage Secondary and Primary circuits respectively 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-A and 100W High Voltage Power Supply 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-A 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 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 ports:

- Management (Ethernet) and console ports
- ToD port
- Synchronization interfaces
- Ethernet interfaces
- T1 and E1 interfaces (variant with T1/E1 ports)

Regulatory Symbols

The 7705 SAR-A 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 2: Protective Earth (ground)

9717

Figure 3: Earth (ground)

9718

Canada Regulations

This section describes the mandatory regulations that govern the installation and operation of the 7705 SAR-A 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-A is:

IC:1737F-0015A

EMC Compliance

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

Safety Approval for DC Systems

When the system is equipped with an AC rectifier, the rectifier must have SCC-accredited lab approval. In addition, low-voltage DC outputs must meet CSA C22.2 No. 60950-1 SELV requirements. High-voltage DC sources must meet CSA C22.2 No. 60950-1 hazardous voltage secondary source requirements.

United States Regulations

This section describes the mandatory regulations that govern the installation and operation of the 7705 SAR-A 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-A 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-A is: GQ6DENAN7705SAR-A.

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:

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

http://www.laserinstitute.org

European Union Regulations

This section describes the mandatory regulations that govern the installation and operation of the 7705 SAR-A 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 1999/05/EC and 2004/108/EC.

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 Directive 1999/05/EC, the Radio and Telecommunications Terminal Equipment Directive (R&TTE), and 2004/108/EC, the Electromagnetic Compatibility (EMC) Directive.

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. High-voltage DC sources must meet EN 60950-1 hazardous voltage secondary source requirements.

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.

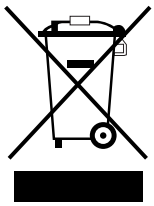
For more information regarding collection and recovery of packaging and packaging waste within specific jurisdictions, please contact the appropriate environmental health and safety organization.

Recycling / Take-back / Disposal of Product

Electronic products bearing or referencing the symbol shown in Figure 4, 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 4: WEEE Symbol for post-August 13, 2005 Product



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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-A in Australia and New Zealand.

ACMA Regulations

The 7705 SAR-A 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-A 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-A 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 5 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 5: Altitude Limit Symbol

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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”

7705 SAR-A Overview

In This Chapter

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

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

Overview of the 7705 SAR-A

The 7705 SAR-A chassis is designed to transport all types of traffic from a mobile cell site to a higher point of presence or to a mobile telephone switching office, over a packet-switched network.

There are two variants of the 7705 SAR-A chassis:

- 12 Ethernet ports and 8 T1/E1 ports (3HE06797AA)
- 12 Ethernet ports and no T1/E1 ports (3HE06796AA)

Note: The `show>chassis` command can be used to display the 7705 SAR-A chassis variant type; the variant type is appended, in brackets, after `7705 SAR-A` in the `Type` field, as shown in the sample outputs below (the first sample shows the variant with Ethernet plus T1/E1 and the second sample shows the variant with Ethernet only).

```
swsim4>#  show>chassis
===============================================================================
Chassis Information
===============================================================================
    Name                            : swsim4
    Type                            : 7705 SAR-A (Eth XOR with T1/E1)
    Location                        :
    Coordinates                     :
    CLLI code                       :
    Number of slots                 : 2
    Number of ports                 : 20
    Critical LED state              : Off
    Major LED state                 : Off
    Minor LED state                 : Off
    Over Temperature state          : OK
    Base MAC address                : a4:9a:ff:00:00:00
Hardware Data
    Part number                     : Sim Part#
    CLEI code                       : Sim CLEI
    Serial number                   : swsim4
    Manufacture date                : 01012003
    Manufacturing variant           : ch1: 1471 ch2: 1491
    Manufacturing string            : Sim MfgString swsim4
    Manufacturing deviations        : Sim MfgDeviation swsim4
    Time of last boot               : 2013/01/22 20:01:05
    Current alarm state             : alarm cleared
-------------------------------------------------------------------------------
```

```
swsim4>#  show>chassis
===============================================================================
Chassis Information
===============================================================================
    Name                          : swsim4
    Type                          : 7705 SAR-A (Eth XOR)
    Location                      :
    Coordinates                   :
    CLLI code                     :
    Number of slots               : 2
    Number of ports               : 12
    Critical LED state            : Off
    Major LED state               : Off
    Minor LED state               : Off
    Over Temperature state        : OK
    Base MAC address              : a4:9a:ff:00:00:00
Hardware Data
    Part number                   : Sim Part#
    CLEI code                     : Sim CLEI
    Serial number                 : swsim4
    Manufacture date              : 01012003
    Manufacturing variant         : ch1: 1471 ch2: 1491
    Manufacturing string          : Sim MfgString swsim4
    Manufacturing deviations      : Sim MfgDeviation swsim4
    Time of last boot             : 2013/01/22 20:04:52
    Current alarm state           : alarm cleared
-------------------------------------------------------------------------------
```

Both variants of the 7705 SAR-A run the same operating system software. The difference between the platforms is their hardware configuration. The term 7705 SAR-A is used in this document as a generic reference to both variants of the chassis. Where hardware differences occur, the chassis variant is specified.

The 7705 SAR-A 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 have been preset. Also, the system hardware is permanently built into the chassis. This preset arrangement of system parameters is considered to be a “fixed” configuration. The fixed configuration of the 7705 SAR-A restricts the router to “port-level provisioning; however, the IOM and MDA numbering must still be specified in CLI commands.

The 7705 SAR-A replaces the CSM module found in the 7705 SAR-8 and 7705 SAR-18 with a control and switching functional block that is integrated into the chassis and does not need to be provisioned. It appears in the CLI as CSM A. The control and switching functions include the console and management interfaces, the synchronization interfaces, and system LEDs.

The CLI syntax follows the structure of IOM number/MDA number/port number. The IOM and MDA do not need to be physically provisioned. When specifying a port, the IOM is always 1 and the MDA must be specified as:

- 1 for Ethernet ports (both variants)
- 2 for T1/E1 ports (only on the variant equipped with T1/E1 ports)

The port number is from 1 to 12 for Ethernet ports and from 1 to 8 for T1/E1 ports.

7705 SAR-A Components

Chassis

The 7705 SAR-A has one circuit board that supports all functions of the router, including control and switching, Ethernet interfaces, T1/E1 interfaces (on the variant equipped with those ports), consolidated power and alarm status LEDs, and connectors for node management and external synchronization. In addition to the circuit board, the chassis has a four-position, single terminal block for redundant DC power inputs. The physical connections are made at the front of the chassis, including the chassis ground connection. There are no back panel connections.

The 7705 SAR-A is a passively cooled chassis that does not use internal fans for forced air cooling; the chassis housing incorporates a built-in heat sink that provides the passive cooling.

Mounting brackets for the 7705 SAR-A chassis are factory-installed and are used to mount the unit in a standard 19-inch rack. The protective earth connection is provided via the chassis grounding stud on the right-hand side mounting bracket.

The 7705 SAR-A chassis can also be mounted vertically.

The following figures show the 7705 SAR-A chassis.

- Figure 6 shows an exploded view of the 7705 SAR-A chassis.
- Figure 7 shows a closeup view of the faceplate of the 7705 SAR-A chassis variant with T1/E1 ports.
- Figure 8 shows a closeup view of the faceplate of the 7705 SAR-A chassis variant with no T1/E1 ports.

Figure 6: Exploded View: 7705 SAR-A Chassis

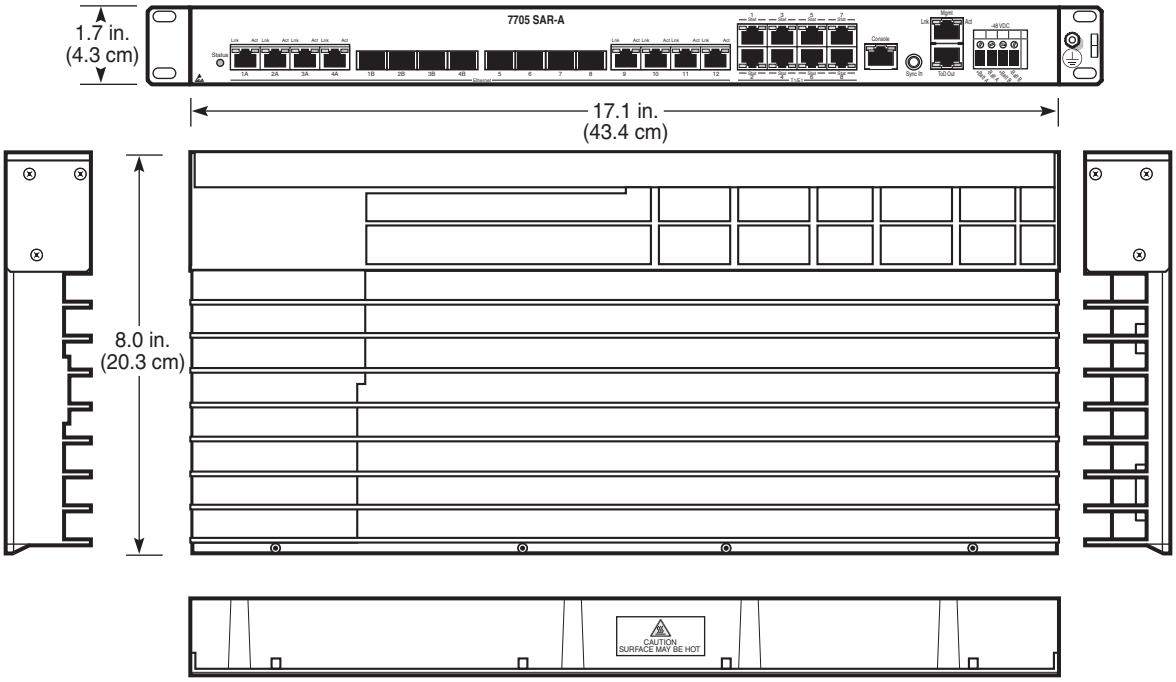
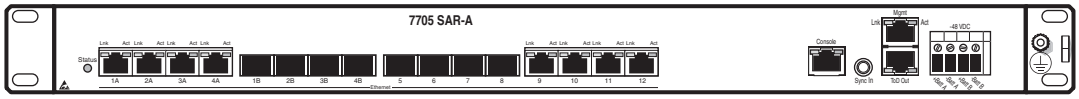


Figure 7: Faceplate: 7705 SAR-A Chassis Variant with T1/E1 Ports

Figure 8: Faceplate: 7705 SAR-A Chassis Variant with No T1/E1 Ports



Control and Switching

Control and switching on the 7705 SAR-A provides the following main functions:

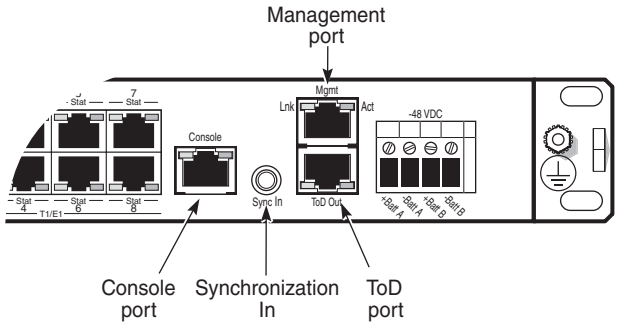
- node management interface to the 7705 SAR-A (Mgmt and Console port); see Figure 9)
- system synchronization input (Sync In port) and Time of Day output (ToD port); see Figure 9)
- routing, switching, and services functions for the entire system

Refer to 7705 SAR-A Connectors and LEDs for a description of these parts

The 7705 SAR-A chassis is shipped with an integrated 256 Mbyte flash memory device (there is no compact flash card) that is used to store system boot software, OS software, and configuration files and logs. The flash memory device cannot be accessed or removed by an operator or installer.

The switching fabric receives and directs traffic to the appropriate interface ports according to the routing information.

Figure 9: 7705 SAR-A Control and Switching Features



T1/E1 and Ethernet Ports

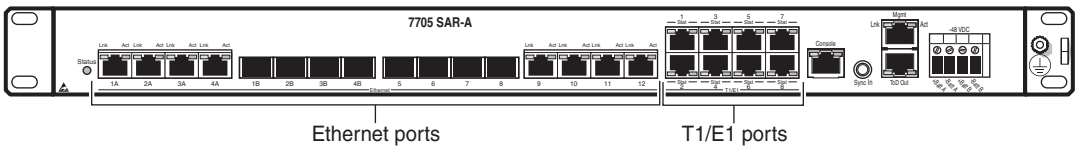
One variant of the 7705 SAR-A chassis is equipped with T1/E1 ports; both variants of the chassis are equipped with Ethernet ports. Figure 10 identifies the T1/E1 and Ethernet interface ports. These ports provide access for a wide variety of interface speeds and types, including T1/E1 with TDM-based services (SAToP, CESoPSN, and CESoETH), PPP/MLPPP in access or network mode, and Ethernet (1000Base-T, 100Base-T, 10Base-T, and optical).

The eight T1/E1 ports use RJ-45 connectors. All eight ports must be configured as either T1 or E1; a mix of T1 and E1 ports is not supported. The T1/E1 ports are on-premises, intra-building SELV ports and require a CSU for off-premises connections. An adapter cable is available that converts RJ-45 connectors to BNC connectors for E1 ports. These ports must be configured for 75 Ω impedance.

Of the 12 Ethernet ports, ports 1 to 4 are exclusive-OR (XOR) ports that can be configured as either 10/100/1000 Base-T electrical RJ-45 ports (ports 1A to 4A) or as 100/1000 SFP ports (ports 1B to 4B). The interface type can be configured on each port independently; the default is RJ-45. Ports 5 to 8 are also Gigabit Ethernet ports and use 100/1000 SFPs. The SFPs are hot-swappable and field-replaceable by qualified personnel. Ports 9 to 12 are Fast Ethernet ports and use an RJ-45 connector.

When making connections to the T1/E1 ports, CAT5e shielded cables must be used to maintain EMC compliance. When making connections to the Ethernet ports, CAT5 shielded cable must be used for Fast Ethernet ports and CAT5e shielded cable must be used for Gigabit Ethernet ports.

Figure 10: T1/E1 and Ethernet Ports



Power Supply Inputs

The 7705 SAR-A supports a –48/–60 VDC power supply through a wire-to-board, modular pluggable terminal block (with four terminals) attached to the front of the chassis. The terminals provide access for two independent power feeds, allowing power redundancy for the system.

DC power can be supplied by a DC circuit or from an AC source using a separately provided external AC-to-DC power converter. When only one power feed is used, the system does not have power supply redundancy. Monitoring and alarms on the unused power feed can be suppressed using the `no power-feed-monitoring` command; refer to the 7705 SAR OS Basic System Configuration Guide, “System Command Reference”, for information. The power system has no field-replaceable parts.

One LED, indicating the DC power supply and alarms, is located on the front of the router. Refer to 7705 SAR-A Connectors and LEDs for a description of the power LED operation.

Refer to DC Power Connections for requirements and information regarding preparing DC power cables. Refer to 100W High Voltage Power Supply Connections for requirements and information regarding AC power cables and AC power converters.

Chassis Cooling

The 7705 SAR-A chassis is equipped with fins for heat dissipation.

Maintain the following clearances around the unit:

- at least 2.5 in. (6.4 cm) at the front of the chassis for cable management
- at least 2 in. (5.1 cm) on each side of the chassis for proper airflow
- at least 1.75 in. (4.4 cm) clearance above and below the chassis for proper airflow

Warning:

- The 7705 SAR-A is designed and built to operate at a local ambient temperature (measured within 1 in. (2.54 cm) around the unit) up to 149°F (65°C) in a vented environment (minimum air movement of 0.5 m/s).
- The 7705 SAR-A can also operate at a local ambient temperature up to 140°F (60°C) in a sealed environment (no air movement).
- An Overheat alarm is raised if the chassis internal temperature exceeds 203°F (95°C). Immediate action should be taken to cool the operating environment if this occurs. If the chassis internal temperature continues to exceed 203°F (95°C), the 7705 SAR-A functionality can be impacted and the unit can shut down. The Overheat alarm is cleared once the chassis internal temperature drops below 203°F (95°C).

7705 SAR-A System Installation Process

To install a 7705 SAR-A 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 DC input power cables to a direct DC circuit, or connect an AC power source to the chassis via an AC power converter.

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 the 7705 SAR-A 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-A needs a disconnect device on each power feed, such as an external 5 A (minimum) and 10 A (maximum) circuit breaker or fuse that meets the requirements for branch circuit protection.
- The 7705 SAR-A 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.
- The power source should be a safety extra-low voltage (SELV) source. Ensure that all power is OFF from the DC circuit or AC power source before installing or servicing the unit, before making the ground connection, and before installing or removing power cables or cords. To switch the DC power OFF, locate the circuit breaker on the panel board that services the DC circuit and switch the circuit breaker to the OFF position. For extra safety, tape the handle of the circuit breaker in the OFF position. To switch the AC power off, unplug the AC cord from the AC outlet.
- Be aware of all operating equipment in the area of the 7705 SAR-A 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.
- 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.
- The 7705 SAR-A 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 in this system.

Warning:

- To properly transport and relocate a 7705 SAR-A chassis, do the following:
  - → disconnect power to the chassis by opening the disconnect devices
  - → detach all cables from the chassis; remove the protective ground connection last
  - → if the chassis is installed in a rack, carefully remove it from the rack
  - → repackage the chassis in its original packaging or an appropriately sized shipping container for relocation
- The 7705 SAR-A 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-A chassis for cable management.
- Maintain a clearance of at least 2 in. (5.1 cm) on each side of the 7705 SAR-A chassis to ensure adequate airflow.
- Maintain a clearance of at least 1.75 in. (4.4 cm) above and below the 7705 SAR-A chassis to ensure adequate airflow.
- The 7705 SAR-A includes a chassis ground stud on the mounting bracket attached to the right-hand side of the chassis (when viewed from the front). The 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-A 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-A. 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-A 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 will cause thermal failure.

Caution: On the variant equipped with T1/E1 ports, 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:

- Prepare the equipment rack and site before installing the 7705 SAR-A chassis. Plan the chassis placement near the power sources and network interface connections.
- The 7705 SAR-A chassis weighs approximately 6.8 lbs (3.1 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-A chassis includes factory-installed, rack-mounting brackets for mounting in a 19-inch equipment rack.

System Specifications

Chassis Specifications

Table 3: 7705 SAR-A Chassis Specifications

Parameter	Description
Dimensions (without mounting brackets)	1.7 x 17.5 x 8.0 in. (H x W x D) (4.3 x 44.4 x 20.3 cm)
Chassis weight (unpacked)	6.8 lbs (3.1 kg)
Mounting	Horizontal or vertical Mount in a standard 19-inch equipment rack or cabinet Rack-mount brackets are factory-installed for 19-inch NEBS mounting; ETSI rack-mount brackets are also available

Environmental Specifications

Table 4: 7705 SAR-A Environmental Specifications

Parameter	Description
Normal operating temperature	–40 to 149ºF (–40 to 65ºC) (vented environment, minimum air movement of 0.5 m/s) –40 to 140ºF (–40 to 60ºC) (sealed environment)
Cold start temperature	–40ºF (–40ºC)
Relative humidity	5 to 95% (non-condensing)
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

Table 4: 7705 SAR-A Environmental Specifications (Continued)

Parameter	Description
Earthquake	Suitable for high-risk areas (Zone 4/California, for short-duration disturbance)
Pollution degree [1]	2
Rated voltage (DC)	–48/–60 VDC (–60 VDC is for various European countries)
Operating voltage range (DC)	–40 to –75 VDC
Rated voltage (AC)	120/240 VAC
Operating voltage range (AC) [2]	90 to 264 VAC
Acoustic noise level	7705 SAR-A is silent

Notes:

1. Pollution degree is as defined in IEC 60950. Pollution Degree 2 applies where there is only non-conductive pollution that might temporarily become conductive due to occasional condensation.
2. The AC operating voltage range applies only to the external AC power supply.

7705 SAR-A Power Consumption

Table 5: Chassis Power Consumption

Description [1]	Typical Power (W)	Maximum Power (W)
7705 SAR-A chassis with Ethernet and T1/E1	45 W	52 W
7705 SAR-A chassis with Ethernet only	43 W	50 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]
45 W	154 BTU/hr

Note:

1. BTU/hr = watts × 3.41214

CBN and IBN Grounding Requirements

The 7705 SAR-A supports both Common Bonding Networks (CBN) and Isolated Bonding Networks (IBN) for systems using a DC power source. The battery terminals (labeled +Batt A, –Batt A, +Batt B, and –Batt B 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 and battery terminals labeled +Batt A and +Batt B on the chassis must always tie to the earth ground.

Warning:

- In a CBN installation, if you use the 7705 SAR-A chassis ground stud (located on the right-hand side mounting bracket) to connect the chassis ground terminal(s) to the frame ground on the rack, then you must use a second nut on the stud to secure the attachment. The first nut is used to secure the building ground point wire to the chassis ground stud.

For information on grounding the chassis and connecting the AC or DC supply, refer to Chassis Ground Wiring, Wiring and Connecting AC Power via the 100W High Voltage Power Supply, and Wiring and Connecting DC Power.

Power and Cabling Requirements

Danger:

- Only electrical service personnel should perform wiring and cabling to the system.
- Power cable(s) must meet local electrical code requirements.
- All power to the equipment rack or cabinet should be disconnected before the installation.
- An external circuit breaker or fuse must be located conveniently close to the equipment. This is intended as the disconnect device.
- When removing DC power cables from the system, first disconnect the power from the source and then disconnect the cables from the 7705 SAR-A.

DC Power Requirements

- A means of disconnect must be provided within 10 ft (3 m) of the 7705 SAR-A.
- A circuit breaker or fuse with recommended current rating 5 A (minimum) to 10 A (maximum) must be provided.
- 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.
- All power cables used on the 7705 SAR-A chassis must meet local safety codes.

AC Power Requirements

- A standard 120 or 240 VAC outlet is required for the 100W High Voltage Power Supply.
- All power cords used on the 7705 SAR-A chassis must meet local safety codes.

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 port(s) of the equipment or sub-assembly is suitable for connection to intra-building or unexposed wiring or cabling only. The intra-building port(s) 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-A is suitable for use in DC-I, DC-C, or AC powered installations. There are no connections between battery return and the chassis ground within the 7705 SAR-A.
- The Ethernet and T1/E1 electrical ports on the 7705 SAR-A are SELV ports and have not been designed or tested to comply with the AC power cross-requirements of Telcordia GR-1089-CORE, Type 4 ports. If a 7705 SAR-A is deployed in Type 4 installations, the Ethernet and T1/E1 shielded electrical cables must be routed to avoid parallel runs and any possible contact with AC power conductors.

Storage

To store an uninstalled 7705 SAR-A, repackage it in its original packaging or an appropriately sized container and keep it in a dry, dust-free, temperature-controlled environment. Table 8 lists the storage specifications.

Table 8: Storage Specifications

Parameter	Description
Storage and shipping temperature	From –40° to 158°F (–40° to 70°C)
Relative humidity	Within 5 to 95% (non-condensing)

Compliance

Refer to Standards and Protocol Support for compliance information.

Installation Locations

Warning: The 7705 SAR-A chassis must not be installed in the same compartment as the batteries, which can give off gas. Out-gassing from batteries could not only 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.

The 7705 SAR-A chassis is intended to be installed at cell site huts or other facilities that provide weather protection in an extended temperature-controlled environment. The 7705 SAR-A chassis is not intended for an outdoor installation. The chassis is designed to work in an environment where protection is provided from ingress of contaminants, including conductive pollution, mold growth, precipitation, volatile or corrosive chemicals (for example, salt-laden air), hygroscopic dust, insects, pests, or vermin entering the product. When installed in an outside plant, such as a hut, cabinet, or outside plant enclosure, it must be installed in an environment where, except during installation and servicing, the compartment is sealed and properly filtered.

The 7705 SAR-A chassis must be installed in a restricted access area, 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.

The humidity level 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. Typically, cabinets that comply with Telcordia GR-487, Generic Requirements for Electronic Equipment Cabinets, provide this level of protection. These cabinets are sealed and are 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. Dust caps are provided and must remain in place for unused ports.

The 7705 SAR-A chassis supports an extended temperature operation from –40° to 149°F (–40 to 65°C) and a cold start from –40°F (–40°C). A minimum air movement of 0.5 m/s is required (equivalent to a Harsh Protected Environment as per ATIS-6000010.01.2008 Class 2). The 7705 SAR-A can also operate in temperatures up to 140°F (60°C) in a sealed environment (no air movement).

If the 7705 SAR-A chassis is powered by an Alcatel-Lucent external AC power supply (100W High Voltage Power Supply), the AC power supply has an operating temperature from –40° to 149°F (–40 to 65°C).

The following rack requirements must be met:

- The rack must be constructed using channel or angle rack uprights that are at least 1.25 in. (3.2 cm) deep and 5 in. (12.7 cm) wide (maximum) (see Figure 11).
- For seismic applications, the rack must be an approved Seismic Frame.
- The rail mounting holes in the equipment rack must align with the mounting holes on the chassis mounting brackets. The 7705 SAR-A mounting brackets are factory-installed for a NEBS mount in a 19-inch rack.
- When installed in the rack, the 7705 SAR-A chassis requires a minimum air movement of 0.5 m/s in order to maintain proper thermal performance up to 149°F (65°C).

Chassis Location Requirements

Warning: 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.

Allow at least 1.75 in. (4.4 cm) clearance above and below and at least 2 in. (5.1 cm) clearance on the sides of the chassis for proper airflow. Allow at least 2.5 in. (6.4 cm) at the front of the chassis for cable management. The clearances are shown in Figure 11 and described in Table 9.

Figure 11: Chassis Clearance Specifications

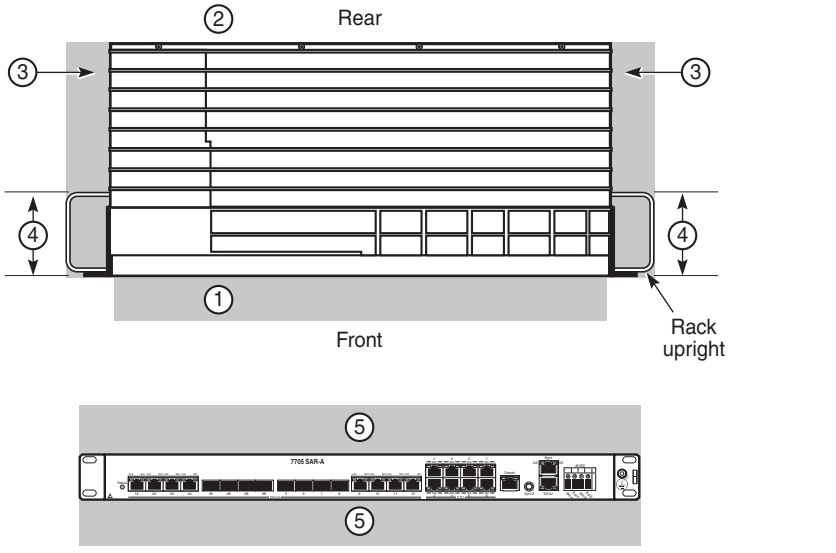


Table 9: Chassis Clearance Specifications

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 upright: a channel enclosure of 5 in. (12.7 cm) maximum is required for airflow
5	Top and bottom: 1.75 in. (4.4 cm) required for airflow

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?		

Table 12: Specific Characteristics of the Installation Site (Continued)

Characteristic	Yes	No
• 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 a 7705 SAR-A chassis:

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

Unpacking the Chassis

The 7705 SAR-A chassis has no field-replaceable parts. The chassis is the only piece of hardware packed in its shipping container.

Note: If the 7705 SAR-A is to be relocated at a later time, observe the warnings that are described in Site Preparation that pertain to relocating the chassis.

Unpacking Precautions

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

- The shipping weight of the chassis is approximately 9.5 lbs (4.3 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.

Note: 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-A to a Repair Center or for future relocation.

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

Figure 12 displays the components of a packed 7705 SAR-A chassis. Table 13 lists the 7705 SAR-A packing components.

Figure 12: Unpacking the 7705 SAR-A Chassis

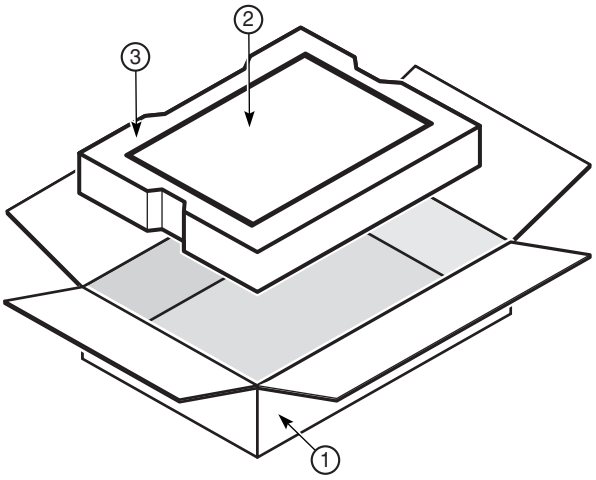


Table 13: 7705 SAR-A Packing Components

Key	Description
1	Shipping container
2	7705 SAR-A 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. Carefully lift the router out of the carton and place it 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 router.

Installing the Chassis in a Rack

Note: Ensure that you observe the Dangers and Warnings that are described in Site Preparation that pertain to grounding and installation before you install this equipment.

Rack-Mounting the Chassis

The 7705 SAR-A chassis is designed for installation in a 19-inch rack. The rack-mount brackets are factory-installed. Figure 13 illustrates the installation of the chassis in a rack. Table 14 lists the rack-mounting components.

Warning:

- 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-A chassis or any other equipment directly on top of another 7705 SAR-A chassis, such that the bottom chassis is supporting other devices. Each chassis must be secured in the rack with the appropriate mounting apparatus.

Figure 13: Installing the 7705 SAR-A Chassis in a Rack

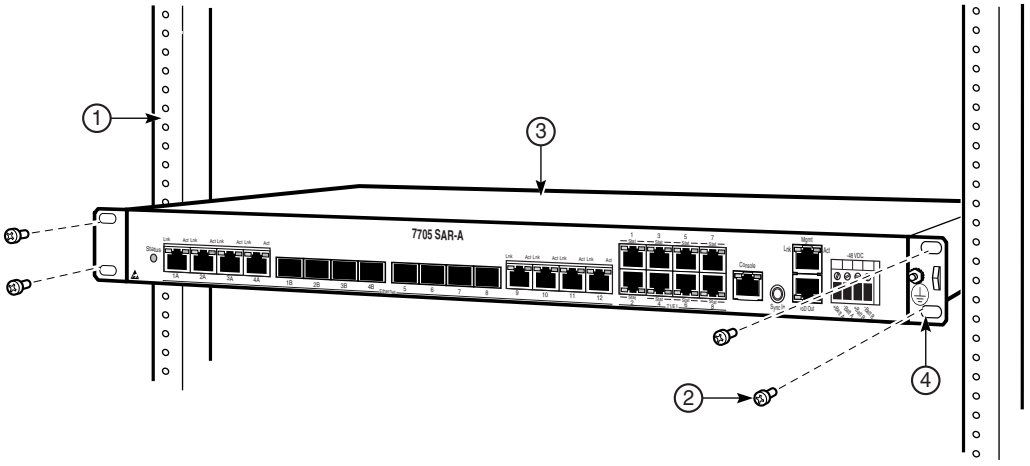


Table 14: Rack-Mounting Components

Key	Description
1	Equipment rack
2	Rack-mounting screws
3	7705 SAR-A 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:

- a screwdriver appropriate for the rack-mount screws

To install the chassis in the rack:

Step 1. Lift the 7705 SAR-A 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.

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 router and proximity to the proper grounding facilities.

Caution: The 7705 SAR-A chassis ground stud located on the right-hand side mounting bracket must be a permanent connection to the earth (building) ground point. Therefore, the connection requires its own nut and washer.

Note:

- When wiring the unit, 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-A must be brought to a bright finish, and an antioxidant solution must be applied to the surfaces being joined.

Making the Ground Connection

Tools and hardware required:

- wire stripper
- wire cutter
- crimping tool
- torque driver for hex nut
- M4 ring lug
- minimum #18 AWG wire (green, or green/yellow)

Figure 14 illustrates how to prepare the ground wire. Table 15 describes the ground wire components.

Figure 14: Preparing the Ground Wire

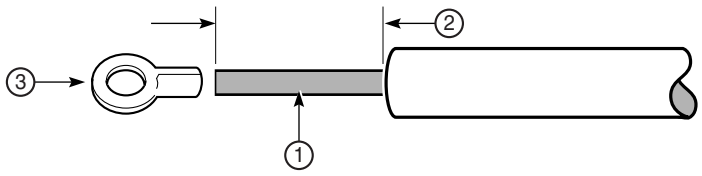


Table 15: Ground Wire Descriptions

Key	Description
1	Copper ground wire with green, or green/yellow shield (minimum #18 AWG)
2	Insulation stripped according to local safety code
3	Ring lug

Figure 15 and Figure 16 show the chassis ground connector when the cable is routed down and when it is routed up. Table 16 describes the chassis ground connection components.

Figure 15: Attaching the Chassis Ground Connector (Cable Routed Down)

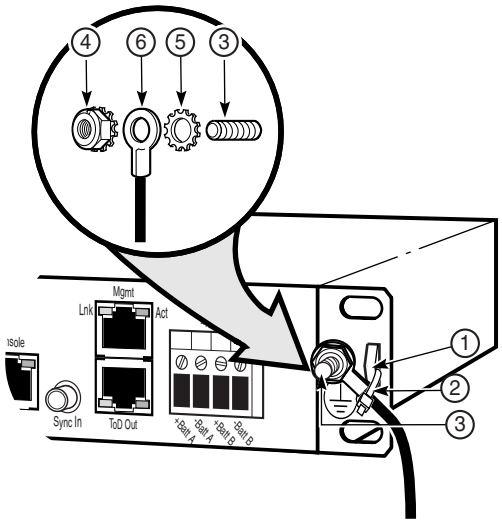


Figure 16: Attaching the Chassis Ground Connector (Cable Routed Up)

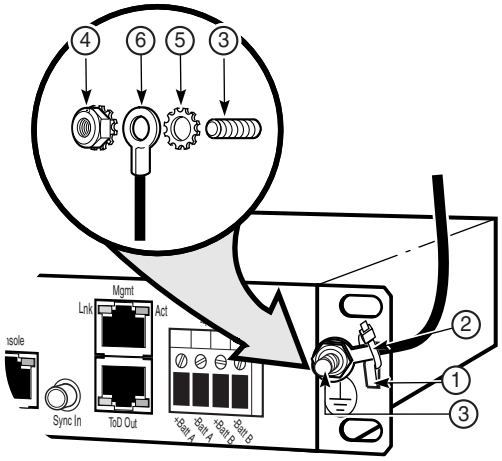


Table 16: Chassis Ground Connection Components

Key	Description
1	Lance
2	Cable tie
3	Chassis ground stud (4 mm diameter, nominal)
4	Keps nut
5	Star washer
6	Ring lug and chassis ground wire (green/yellow)

To make the chassis ground connection:

Step 1. Run a single length of #18 AWG wire (minimum) from the ground point (building ground or equipment ground bus) to the chassis ground stud.

Step 2. Using a wire-stripping tool, strip the insulation from the wire according to local safety codes and crimp the ring lug to the wire (Figure 14).

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 such that the wire is angled slightly as it runs down the rack upright (Figure 15) or up the rack upright (Figure 16). Secure the lug with the Keps nut that was removed in step 3. Tighten the nut to a torque of 8 to 10 lbf-in (0.9 to 1.13 N·m) maximum. Do not over-tighten.

Step 5. Use a cable tie to secure the ground wire to the lance on the mounting bracket. The lug will be below the lance if the ground cable is routed downward. The lug will be above the lance if the ground cable is routed upward.

Step 6. Connect the opposite 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 7. Connect the 7705 SAR-A to the DC or AC power source. See DC Power Connections or 100W High Voltage Power Supply Connections.

DC Power Connections

In This Chapter

This chapter provides information about wiring and connecting the DC power source to the 7705 SAR-A:

- Wiring and Connecting DC Power

Wiring and Connecting DC Power

Note:

- Ensure that you read and observe all the dangers and warnings described in the Site Preparation chapter before wiring and connecting power to the 7705 SAR-A.
- The 7705 SAR-A requires a minimum of one DC power source to operate, but using two DC power sources is recommended for redundancy.
- The 7705 SAR-A is suitable for both DC-I and DC-C power configurations.
- All 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 connecting them.

Wiring and Connecting the DC Inputs

The 7705 SAR-A has a dual-feed, wire-to-board, pluggable terminal block attached to the front of the chassis. The terminals are the DC power feed points for source voltage from the DC circuit.

For redundant power configurations, you must use both DC power feeds (one for each pair of power terminals).

To connect the power cables to the terminal block, remove 0.35 in. (9 mm) of outer shielding from each power cable at the router end, as shown in Figure 17. Table 17 identifies the key items in the figure.

Figure 17: DC Power Cable

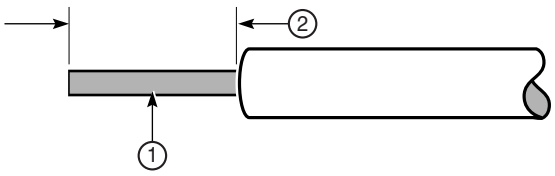


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Table 17: DC Power Cable Descriptions

Key	Description
1	Copper wire

Table 17: DC Power Cable Descriptions (Continued)

Key	Description
2	0.35 in. (9 mm) of outer shielding removed

Figure 18 shows the terminal connections for -48 VDC installations. Table 18 identifies the key items in the figure.

Figure 18: Wiring the -48 VDC Power Supplies

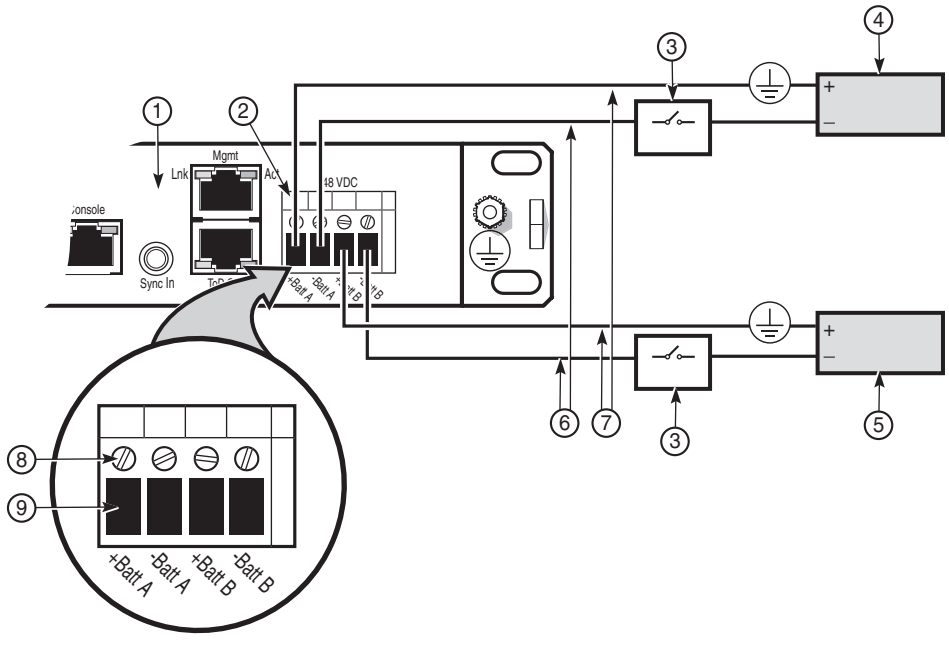


Table 18: Wiring the DC Power Supplies Descriptions

Key	Description
1	7705 SAR-A chassis
2	Wire-to-board, pluggable terminal block
3	Disconnect device (minimum 5 A and maximum 10 A circuit breaker or fuse)
4	DC source A
5	DC source B

Table 18: Wiring the DC Power Supplies Descriptions (Continued)

Key	Description
6	Battery wire
7	Battery return wire
8	Tightening screw
9	Wire receptacle

Required tools and hardware:

- two or four lengths of wire (two lengths per supply)
- wire cutter
- wire stripper
- torque driver for slot screws; No. 2 slotted blade width, 0.125 in (3.2 mm)

Note: 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.

Follow these steps to wire and connect –48 VDC power feeds (see Figure 18):

Step 1. For CBN installations only, ensure that the positive terminal on the DC power source is connected to ground.

Step 2. Make the battery return ground connection(s) (Figure 18, key item 7):

i. Run a length of wire from the power source positive terminal to the terminal on the router.

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

iii. Prepare the end of the wire at the router (see Figure 17).

iv. Attach the battery return wire to the +Batt return terminal on the router. Tighten to a torque of 3.54 to 4.42 lbf-in (0.4 to 0.5 N·m) maximum.

v. For redundant power supply configurations, repeat substeps i to iv for the other battery return wire.

Step 3. Make the battery connection(s) to the disconnect device (Figure 18, key item 3):

i. Run a length of wire from the disconnect device to the router. Prepare the router end of the wire (see Figure 17). Prepare the wire at the disconnect device according to local safety practices.

ii. Attach the battery wire to the –Batt battery terminal on the router. Tighten to a torque of 3.54 to 4.42 lbf-in (0.4 to 0.5 N·m) maximum.

iii. Attach the battery wire to the disconnect device.

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

Step 4. Check that the DC supply wiring is correct.

100W High Voltage Power Supply Connections

In This Chapter

This chapter provides information about wiring and connecting an AC or DC power source to the 7705 SAR-A via the 100W High Voltage Power Supply:

- 100W High Voltage Power Supply System Specifications
- Wiring and Connecting the 100W High Voltage Power Supply to the 7705 SAR-A

100W High Voltage Power Supply System Specifications

Physical Specifications

Table 19: 100W High Voltage Power Supply Physical Specifications

Parameter	Description
Dimensions (without mounting brackets)	8.9 x 2.7 x 1.57 in. (22.6 x 6.8 x 4.0 cm)
Chassis weight	2.9 lbs (1.3 kg)
Mounting	Mount using one of the following methods: • mount on a 35-mm horizontal DIN rail using the attached DIN clip • wall-mount • panel-mount

Environmental Specifications

Table 20: 100W High Voltage Power Supply Environmental Specifications

Parameter	Description
Normal operating temperature	–40 to 149ºF (–40 to 65ºC)
Cold start temperature	–40ºF (–40ºC)
Relative humidity	5 to 95% (non-condensing)
Cooling	Convection
Altitude range	Between 1033 ft (315 m) below sea level and 6562 ft (2000 m) above sea level
Earthquake	Suitable for high-risk areas (Zone 4/California, for short-duration disturbance) [1]
Enclosure classification [2]	IP67
Operating voltage range (DC)	88 VDC to 300 VDC
Operating voltage range (AC)	85 VAC to 264 VAC
Input current	1.5 A maximum at 95 VAC 0.7 A maximum at 220 VAC 1.65 A maximum at 88 VDC
Input frequency	47 Hz to 63 Hz
Rated output voltage (DC)	54 VDC
Maximum output current	2.1 A

Notes:

1. Not applicable to DIN rail-mounted hardware.
2. Enclosure classification is as defined in IEC 60529.

Storage

To store an uninstalled 100W High Voltage Power Supply, repackage it in its original packaging or an appropriately sized container and keep it in a dry, dust-free, temperature-controlled environment.

Table 21: 100W High Voltage Power Supply Storage Specifications

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

100W High Voltage Power Supply Power Consumption

Table 22 lists the power consumption for the 100W High Voltage Power Supply.

Table 22: 100W High Voltage Power Supply Power Consumption

Description	Rated Output Power	Typical Power Efficiency (%)
100W High Voltage Power Supply	100 W [1]	90%

Note:

1. The 100W High Voltage Power Supply can provide a maximum output power of 115 W.

Power and Cabling Requirements

Danger:

- Power cable(s) must meet local electrical code requirements.
- All power to the equipment rack or cabinet should be disconnected before the installation.
- For DC power supplies, an external 20 A (maximum) DC-rated circuit breaker or fuse must be located conveniently close to the equipment. This is intended as the disconnect device.
- When removing DC power cables from the system, first disconnect the power from the source and then disconnect the cables from the 100W High Voltage Power Supply.

Warning: 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.

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.

High-Voltage DC Power Requirements

- For the 100W High Voltage Power Supply, the means of disconnect is the IEC inlet on the unit.
- A DC-rated circuit breaker or fuse with recommended current rating of 20 A (maximum) must be provided in the hot side of the supply line. A ganged breaker that simultaneously disconnects both sides of the supply line is also acceptable.
- The minimum size/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.
- All power cables used on the 100W High Voltage Power Supply must meet local safety codes.

AC Power Requirements

- A standard 120 or 240 VAC outlet is required.
- All power cords used on the 100W High Voltage Power Supply must meet local safety codes.

Compliance

See Standards and Protocol Support for compliance information.

Wiring and Connecting the 100W High Voltage Power Supply to the 7705 SAR-A

Danger:

- For high-voltage DC installations, fuses or breakers must be approved for the applicable DC voltage.
- 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:

- The 100W High Voltage Power Supply must not be installed in the same compartment as the batteries, which can give off gas. Out-gassing from batteries could not only 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.
- Do not install equipment that appears to be damaged.
- The router and equipment rack must be properly grounded. Electrostatic discharge (ESD) damage can occur if 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-A.

Note:

- Ensure that you read and observe all the dangers and warnings described in this chapter and the Site Preparation chapter before wiring and connecting power to the 7705 SAR-A.
- The 7705 SAR-A requires a minimum of one power source to operate, but using two power sources is recommended for redundancy. For AC installations, ideally the power sources should be connected to separate breakers or to a split receptacle.
- For the 100W High Voltage Power Supply, the means of disconnect is the IEC inlet on the unit.

The 7705 SAR-A has a dual-feed, wire-to-board, pluggable terminal block attached to the front of the chassis. The terminals are the DC power feed points for DC voltage from the 100W High Voltage Power Supply.

Use the 100W High Voltage Power Supply (part number 3HE06972AA) from Alcatel-Lucent for AC or DC source-to-router connections. The 100W High Voltage Power Supply shipping container contains:

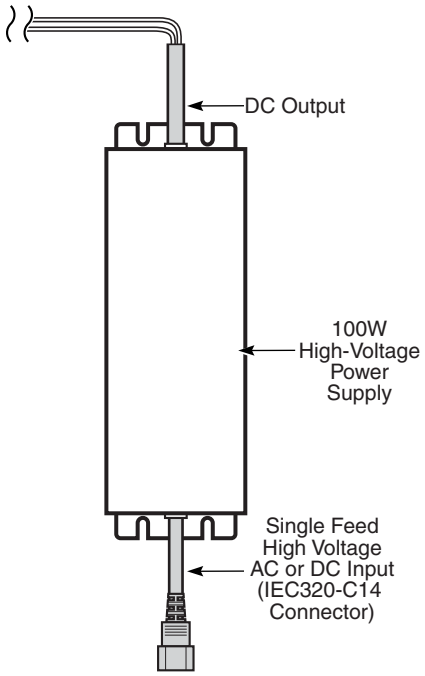
- a 100W High Voltage Power Supply
- a DIN rail bracket and clip attached to the Power Supply, for DIN rail-mount installations
- instructions detailing how to remove the DIN rail bracket and clip from the unit
- one North American AC power cord with auto-lock feature
- one 240V European AC power cord with auto-lock feature
- two O-ring lugs for a #6-32 screw size

Note:

- Although the 100W High Voltage Power Supply is shipped with O-ring lugs, the ring lugs are not used for wiring the 7705 SAR-A.
- The 100W High Voltage Power Supply can be installed on a DIN rail, wall, or panel.
- The 100W High Voltage Power Supply input AC interface uses a standard IEC 320-C14 connector; therefore, other AC cords types can be used.
- The minimum size of the power conductor for the AC or DC input connections must be based on the application, and on the local codes, practices, and regulations applicable for the region.

Figure 19 shows the 100W High Voltage Power Supply. The 100W High Voltage Power Supply has a standard IEC 320-C14 connector on 1 ft (0.3 m) of cable at the power input end, and red and black open-ended wire on 6 ft (1.8 m) of cable at the power output end. The output feed supplies 54 VDC to the 7705 SAR-A chassis.

Figure 19: 100W High Voltage Power Supply



For redundant power configurations, you must use two power feeds (one for each power connector on the 7705 SAR-A).

Figure 20 shows the 100W High Voltage Power Supply wired to the 7705 SAR-A; Table 23 identifies the key items in the figure.

Figure 20: Wiring the 100W High Voltage Power Supply

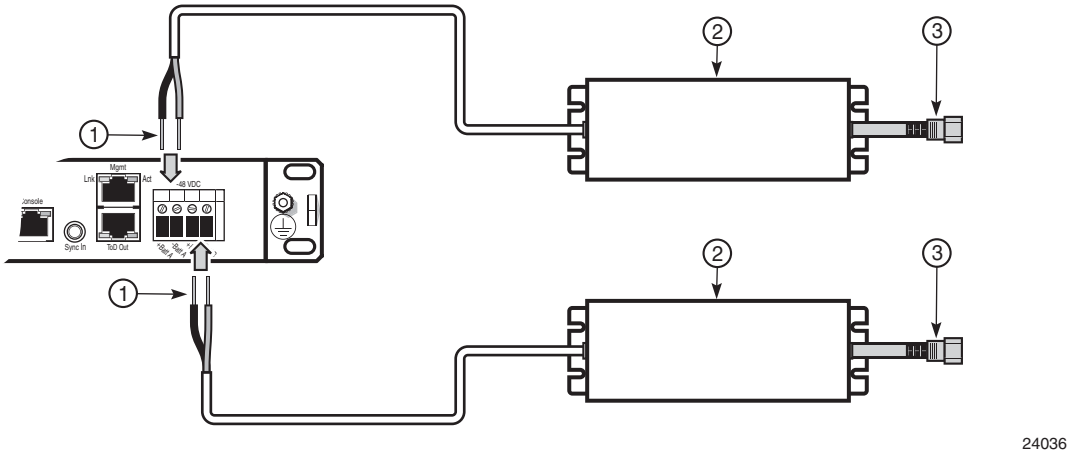


Table 23: Connecting the 100W High Voltage Power Supply to the 7705 SAR-A

Key	Description
1	0.35 in. (9 mm) of outer shielding removed from each wire to expose the conductor
2	100W High Voltage Power Supply
3	Single-feed high voltage AC or DC input (IEC 320-C14 connector) [1]

Note:

1. Two AC cord sets are supplied with the 100W High Voltage Power Supply to match North American and European style AC outlets. Both cord sets have an IEC 320 C13 female connector (plug) at one end.

Wiring and Connecting AC Power via the 100W High Voltage Power Supply

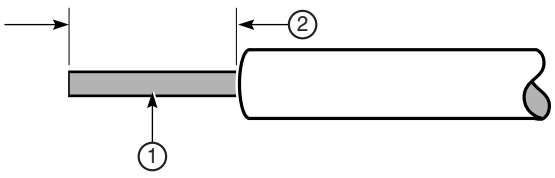
Required tools and hardware:

- one 100W High Voltage Power Supply (two are required for redundant power configurations)
- wire stripper
- torque driver for slot screws; No. 2 slotted blade width, 0.125 in (3.2 mm)

Follow these steps to wire and connect an AC power supply to the –48 VDC power feed inputs on the 7705 SAR-A terminal block via the 100W High Voltage Power Supply. Figure 20 shows the terminal connections; Table 23 identifies the key items in the figure.

Step 1. Prepare the open-ended DC output wire from the 100W High Voltage Power Supply by stripping 0.35 in. (9 mm) of insulation from each power cable at the router end, as shown in Figure 21. Table 24 identifies the key items in the figure.

Figure 21: DC Power Cable



23318

Table 24: DC Power Cable Descriptions

Key	Description
1	Copper wire
2	0.35 in. (9 mm) of outer shielding removed

Step 2. Insert the –VDC black wire from the 100W High Voltage Power Supply into the –Batt wire receptacle on the router. Tighten the screw to a torque of 3.54 to 4.42 lbf-in (0.4 to 0.5 N·m) maximum.

Step 3. Insert the +VDC red wire from the 100W High Voltage Power Supply into the +Batt wire receptacle on the router. Tighten the screw to a torque of 3.54 to 4.42 lbf-in (0.4 to 0.5 N·m) maximum.

Step 4. For redundant power supply configurations, repeat steps 1 to 3.

Step 5. Remove the protective plastic cap from the NEMA 5-15P plug connector on the power supply.

Step 6. Attach the appropriate power cord to the AC power input end of the power supply:

a. For North American power outlets, use the North American AC power cord.

b. For European power outlets, use the 240V European AC power cord.

Step 7. Plug the AC power cord into the grounded AC power outlet.

Wiring and Connecting DC Power via the 100W High Voltage Power Supply

Required tools and hardware:

- one 100W High Voltage Power Supply (two are required for redundant power configurations)
- wire stripper
- torque driver for slot screws; No. 2 slotted blade width, 0.125 in (3.2 mm)

Follow these steps to wire and connect a DC power supply to the –48 VDC power feed inputs on the 7705 SAR-A terminal block via the 100W High Voltage Power Supply. Figure 20 shows the terminal connections; Table 23 identifies the key items in the figure.

Step 1. Prepare the open-ended DC output wire from the 100W High Voltage Power Supply by stripping 0.35 in. (9 mm) of insulation from each power cable at the router end, as shown in Figure 21. Table 24 identifies the key items in the figure.

Step 2. Insert the –VDC black wire from the 100W High Voltage Power Supply into the –Batt wire receptacle on the 7705 SAR-A. Tighten the screw to a torque of 3.54 to 4.42 lbf-in (0.4 to 0.5 N·m) maximum.

Step 3. Insert the +VDC red wire from the 100W High Voltage Power Supply into the +Batt wire receptacle on the 7705 SAR-A. Tighten the screw to a torque of 3.54 to 4.42 lbf-in (0.4 to 0.5 N·m) maximum.

Step 4. For redundant power supply configurations, repeat steps 1 to 3.

Step 5. Prepare the power input end of the power supply cord set by cutting off the AC connector (male plug) from the North American or 240V European power cord.

Step 6. Expose and strip an appropriate length of the insulated outer jacket from the wires in the cut end of the power cord.

Step 7. Connect the wires:

i. Attach the green or green/yellow wire to the building earth.

ii. Attach the black or brown wire to one DC terminal on the power source.

iii. Attach the white or blue wire to the other DC terminal on the power source.

Step 8. Connect the IEC connector on the modified North American or 240V European power cord to the IEC connector on the 100W High Voltage Power Supply.

Wiring and Connecting the 100W High Voltage Power Supply to the 7705 SAR-A

SFPs

In This Chapter

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

- Installing and Removing SFPs

Installing and Removing SFPs

The 7705 SAR-A has eight ports that support small form-factor pluggable (SFP) devices for Ethernet connections, ports 1B to 4B and ports 5 to 8.

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-A. Typical ground points include the grounding stud on the 7705 SAR-A right-hand side mounting bracket, 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-A.
- Before using the optics on the 7705 SAR-A, 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.

SFPs

A small form-factor pluggable (SFP) device can be installed in Ethernet ports 1B to 4B and ports 5 to 8. Figure 22 illustrates the installation of an SFP. Table 25 describes the components.

Figure 22: Installing an SFP

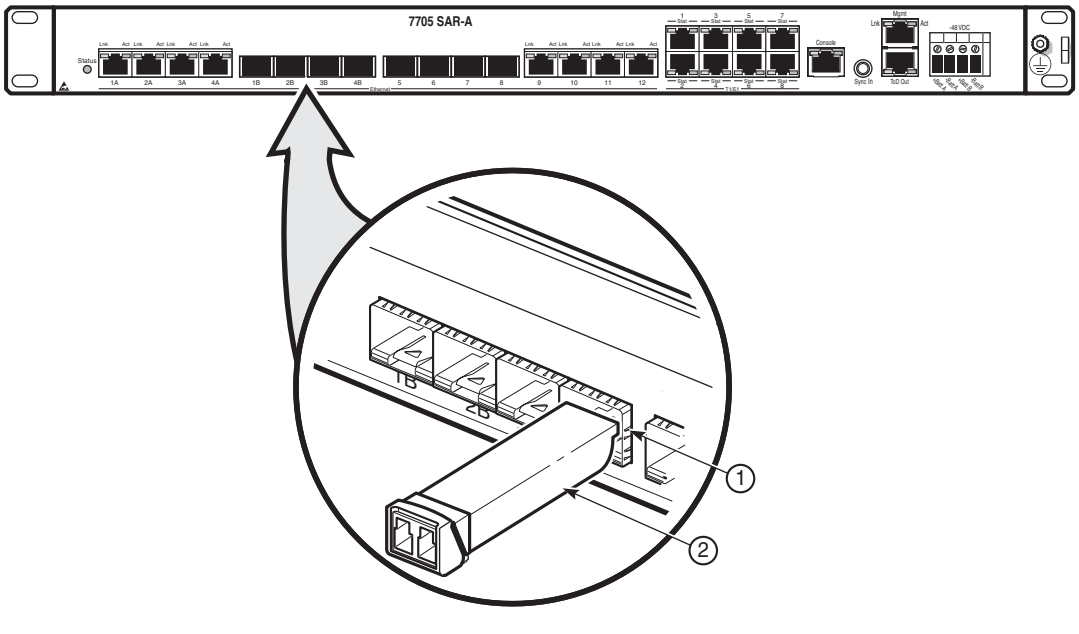


Table 25: SFP Installation Components

Key	Description
1	SFP receptacle
2	SFP

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

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-A.

Connecting Cables

In This Chapter

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

- Cable Connections
- Making External Synchronization Connections
- Making Router Management Connections

Cable Connections

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

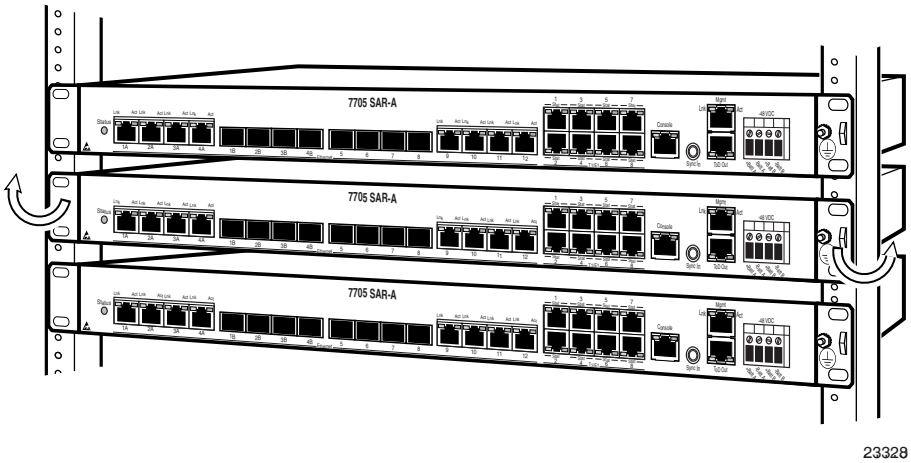
Note:

- Ensure that you read and observe all the dangers and warnings described in the Site Preparation chapter before connecting cables to the 7705 SAR-A.
- 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.

Ethernet and Copper Cables

Figure 23 illustrates how Ethernet and copper wire cables are routed on the 7705 SAR-A. Cables can be routed to the left or the right of the chassis. Shielded cable must be used to maintain EMC compliance.

Figure 23: Managing Cable Connections



Hardware required:

- cable ties (optional)

To attach Ethernet and copper wire cables:

Step 1. Attach the cable to the port connector or SFP connector on the front of the 7705 SAR-A.

Step 2. Route the cables to the left or the right of the chassis. If desired, loosely bundle the cables together using a cable tie. Do not over-tighten the cable tie.

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

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

Fiber Cables

Warning:

- Fiber cables are sensitive to bending, twisting, and general over-exertion. Extreme caution is recommended when handling fiber 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 90º 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 (see Figure 23). Cables are routed to the left or the right of the chassis.

Hardware required:

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

To attach fiber 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 cables to the left or the right of the chassis. If desired, loosely bundle the cables together using a cable tie. Do not over-tighten the cable tie.

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

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 router.

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.

Hardware required:

- 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.

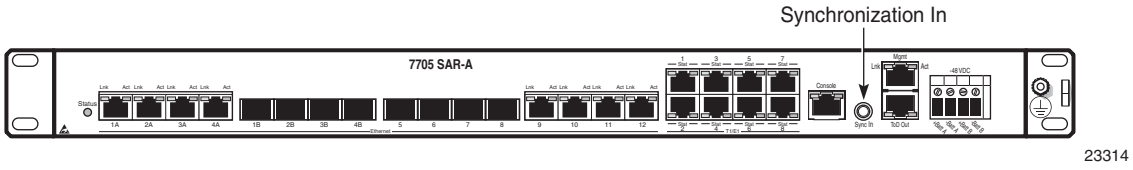
Making External Synchronization Connections

The 7705 SAR-A provides one 1.0/2.3 DIN connector for external synchronization input. It supports the following synchronization input signals with the following impedance:

- 2.048 MHz at 75 Ω
- 5 MHz at 50 Ω
- 10 MHz at 50 Ω

Figure 24 shows the location of the Sync In connector.

Figure 24: External Synchronization Input Connector



Hardware required:

- shielded DIN cable with 1.0/2.3 coaxial connector

Shielded cable must be used to maintain EMC compliance.

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-A.

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

Making Router Management Connections

Refer to Establishing Router Management Connections for information.

Initializing and Provisioning

In This Chapter

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

- Powering Up the Router
- Automatic Discovery Protocol
- Establishing Router Management Connections
- Provisioning the 7705 SAR-A

Powering Up the Router

Complete the steps in Wiring and Connecting the DC Inputs (or Wiring and Connecting AC Power via the 100W High Voltage Power Supply for systems using an AC power source) and SFPs before proceeding with the power-up and initialization instructions. The primary copy of the 7705 SAR-A TiMOS software is located on the internal flash memory device.

Note:

- The 7705 SAR-A does not have a power switch or circuit breaker. The system is powered on by applying power from the AC or DC power source. For AC power supplies, unplug the cord(s) to disconnect the system from the power supply. For DC power supplies, use a circuit breaker or a disconnect device to disconnect the system from the power supply.
- Configurations and executable software can be stored on the internal 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-A. See Establishing Router Management Connections.

Power-Up and Initialization

To power up the router, follow these steps:

Step 1. Turn ON the power to the router at the remote DC power source(s) to initiate the boot process. For systems using AC power, plug the AC power converter into an AC power source to initiate the boot process.

Step 2. Verify that the system is initializing.

The system searches the internal flash memory device for the `boot.ldr` file (also known as the bootstrap or boot loader file). The Status (combined power and alarm status LED) blinks green and the Ethernet Act (activity) LED blinks amber during initialization. After initialization (approximately 30 s), the Status LED turns solid green and the Ethernet Act LED turns solid amber.

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

Step 3. Verify the operational status of the ports by checking the LEDs on the front of the router. Refer to 7705 SAR-A Connectors and LEDs.

Step 4. After verifying the LEDs, establish communication with the router via the Console port. Refer to Console Connection.

Step 5. (Optional at this time) Assign an IP address to the router. 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 6. (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 7. (Optional at this time) Run automatic discovery protocol (ADP).

ADP is a factory-installed boot option that automates the initial commissioning of 7705 SAR-A nodes. ADP runs automatically the first time the system is powered up. The Power/Alarm Status LED blinks green and amber while ADP is running. See Automatic Discovery Protocol for more information.

Troubleshooting Initial Startup

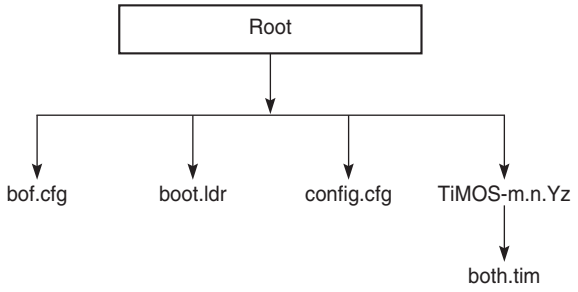
If the system cannot load or cannot find the `boot.ldr` file on the integrated flash memory device (cf3), the system will reboot continuously in an attempt to successfully find and load the file. If this happens, the faulty chassis must be returned to Alcatel-Lucent for replacement.

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 25 displays the directory structure and file names on the integrated flash memory device.

Figure 25: Files on the Integrated Flash Memory Device



Files on the integrated flash memory device 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

Automatic Discovery Protocol

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

Caution: Automatic discovery will not run successfully on the 7705 SAR-A if the only connection to the network is made from ports 1A to 1A and 1B to 4B.

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”. While it is running, ADP can be controlled through the CLI.

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. 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.

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 router 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-A:

- console connection
- SSH connection
- Telnet connection

Console Connection

The Console port on the front of the 7705 SAR-A is a female RJ-45 connector (see Figure 26). To establish a console connection, you need the following:

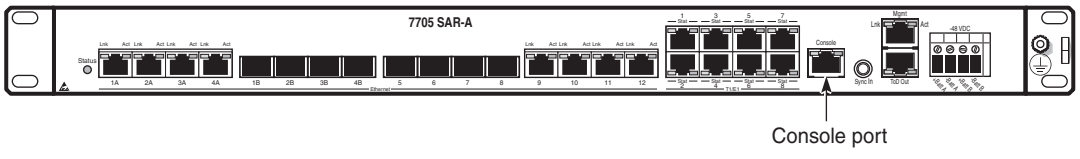
- an ASCII terminal or a PC running terminal emulation software set to the parameters shown in Table 26
- a shielded RJ-45 CAT5e cable

Shielded cable must be used to maintain EMC compliance.

Table 26: Console Port Default Settings

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

Figure 26: Console Port Connection



To establish a console connection:

Step 1. Connect the terminal to the Console port on the front panel (Figure 26) using an RJ-45 CAT5e cable.

Step 2. Power on the terminal.

Step 3. Establish the connection by pressing the <Enter> key a few times on your terminal 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 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 router with an SSH connection from a PC or workstation connected to the network once the following conditions are met:

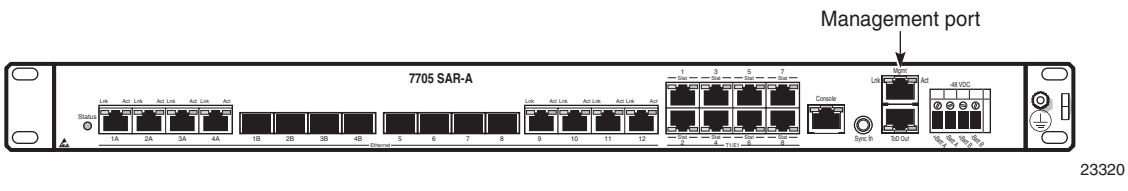
- the router has successfully initialized
- the Management port (Figure 27) has been configured using the `bof>address` command (see **CLI Syntax**)

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.

Figure 27: Management Port Connection



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:

```
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: ########

ALU-1#
```

The default password is `admin`.

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 Management Port Pinouts.

Telnet Connection

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

- the router has successfully initialized
- Telnet connections have been enabled using the `config>system>security>telnet-server` (or `telnet6-server`) command
- the Mgmt port (see Figure 27) has been configured using the `bof>address` command (see **CLI Syntax** below)

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

where:
`address` is an IPv4 or IPv6 address

Running Telnet

After the Ethernet management port IP address is configured, the 7705 SAR-A 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 management 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 Management Port Pinouts.

Provisioning the 7705 SAR-A

The 7705 SAR-A does not require provisioning above port level because it is provisioned at the factory with the following permanent configuration:

- card type in slot 1 is `iom-sar`
- mda type in slot 1/1 is `i12-eth-xor` (for Ethernet ports)
- mda type in slot 1/2 is `i8-chds1` (for T1/E1 ports)

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

```
*A:custDoc_sar-A# show card
===============================================================================
Card State
===============================================================================
Slot/  Provisioned      Equipped         Admin Operational   Num   Num Comments
Id     Type             Type             State State         Ports MDA
-------------------------------------------------------------------------------
1      iom-sar          iom-sar          up    up                  2
1/1    i12-eth-xor      i12-eth-xor      up    up            12
1/2    i8-chds1         i8-chds1         up    up            8
A      csm-2.5g         csm-2.5g         up    up                       Active
===============================================================================
*A:custDoc_sar-A# 2.5
```

Example

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

```
*A:custDoc_sar-A# show card
#--------------------------------------------------
echo "Card Configuration"
#--------------------------------------------------
    card 1
        card-type iom-sar
        mda 1
            mda-type i12-eth-xor
        exit
        mda 2
            mda-type i8-chds1
        exit
    exit
#--------------------------------------------------
```

T1/E1 and Ethernet Port Identifiers

Table 27 shows the CLI identifiers for the interface ports.

Table 27: CLI Port Identifiers

Port Type	CLI Identifier	Variable Definition
T1/E1	`1/2/`*`port-id`*	*`port-id`* is the port number, from 1 to 8
Ethernet	`1/1/`*`port-id`*	*`port-id`* is the port number, from 1 to 12

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

7705 SAR-A Connectors and LEDs

In This Chapter

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

- 7705 SAR-A Connectors and LEDs

7705 SAR-A Connectors and LEDs

Figure 28 identifies the connectors and LEDs on the front of the router. The variant shown is equipped with T1/E1 ports.

Figure 28: 7705 SAR-A Connectors and LEDs (Variant with T1/E1 Ports)

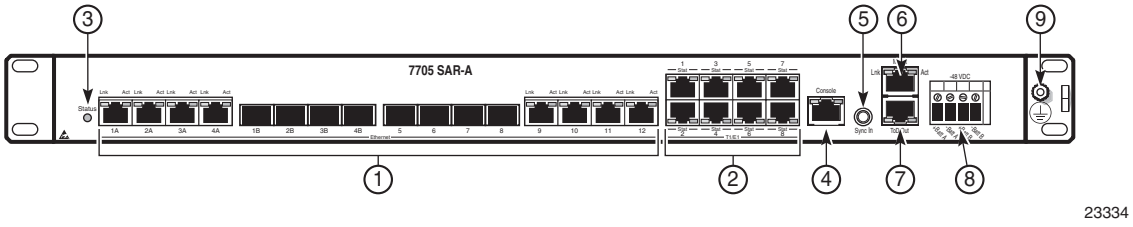


Table 28 describes the connectors and LEDs on the 7705 SAR-A.

Table 28: 7705 SAR-A Connector and LED Descriptions

Key	Label/Part	Sub-category	Description
1	Ethernet Ports	SFP ports	Ports 1B to 4B and ports 5 to 8 are SFP ports. The SFP port number is displayed below each port.
		RJ-45 connectors	Four Gigabit Ethernet ports have RJ-45 connectors that are numbered 1A to 4A. The RJ-45 ports numbered 9 to 12 support Fast Ethernet. The port numbers are displayed below each port. The associated Lnk (link) LED is located at the top-left corner of the port, and the associated Act (activity) LED is located at the top-right corner of the port.
		Lnk LED	**Green**: Indicates that the link is up **Unlit**: Indicates that there is no link, or that the link is operationally down, disabled or shut down
		Act LED	**Amber (blinking)**: Indicates that the port is active (receiving or transmitting) **Unlit**: Indicates that the port is down or disabled

Table 28: 7705 SAR-A Connector and LED Descriptions (Continued)

Key	Label/Part	Sub-category	Description
2	T1/E1 Ports (only for chassis variant with T1/E1 ports)	RJ-45 connectors	Two rows of T1/E1 ports provide eight RJ-45 connectors (2x4); the ports on the top row are numbered 1, 3, 5, 7 and the ports on the bottom row are numbered 2, 4, 6, 8. There are two LEDs for each R-J-45 connector, a green LED on the left and an amber LED on the right; together they are labeled as “Stat”.
		Stat LED	**Green**: Indicates that a valid communication link has been established **Amber (blinking)**: Indicates that a loopback is in progress **Amber (solid)**: Indicates that there is no link present (administratively up and operationally down) **Unlit**: Indicates that the port is disabled or shut down
3	Status (Power Status and Alarm) LED	—	The combined power status and alarm LED indicates: • the combined status of the router’s three main functional blocks (the control and switching functional block, the T1/E1 ports functional block (for the variant with T1/E1 ports), and the Ethernet ports functional block). Blocks that are administratively shut down are not included in the combined status indicated by this LED. • the alarm status **Green (solid)**: Indicates that valid power is available and that the system is operationally up, which means that all functional blocks configured to be administratively up are operationally up If the chassis is operating without redundant power feeds and the `no-power-feed-monitoring` command has been issued on the unused power feed, the LED is green if no other alarm condition exists. **Green (blinking)**: Indicates that one or more functional blocks is initializing **Amber**: Indicates that an alarm condition exists **Unlit**: Indicates that the DC power supply is not installed, the DC power feed is not connected, or the DC voltage level is out of range
4	Console	Connector	The Console port uses an RJ-45 connector and is used for the initial system startup as well as system configuration and monitoring. The Console port is a Universal Asynchronous Receiver/Transmitter (UART) port. Refer to Console Port for pinout assignments.
5	Sync In	In	The Sync In port has a 1.0/2.3 coaxial connector that can be used to receive an external synchronization input signal.

Table 28: 7705 SAR-A Connector and LED Descriptions (Continued)

Key	Label/Part	Sub-category	Description
6	Mgmt Port	Connector	The Ethernet Management port has an RJ-45 connector and is used for the initial system startup as well as system configuration and monitoring. It supports both half-duplex and full-duplex modes and 10M/100M or autonegotiated communication. Refer to Management Port for pinout assignments.
		Lnk LED	The Lnk LED is located at the top left corner of the port **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 LED	Act LED is located at the top right corner of the port. **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
7	ToD Out		The ToD port uses an RJ-45 connector to send Time of Day and phase synchronization from the 7705 SAR-A. Only output signals are supported. The port includes an RS-422 1 pulse per second signal and an RS-422 serial time of day signal. Refer to ToD Out Port for pinout assignments.
8	+BattA/ –BattA +BattB/-BattB		The power connector is a standard terminal block with dual power feeds for redundant DC supplies. For redundant AC power configurations, two AC power converters must be connected to the DC power feeds.
9	Chassis Ground and Anti-static Wrist-strap Stud	Threaded stud	The chassis ground stud allows a direct connection to the building ground for the chassis ground point. The chassis ground stud provides a grounding point for personnel working on the 7705 SAR-A. The wrist strap requires an alligator clip to connect to the stud.

Pinout Assignments

In This Chapter

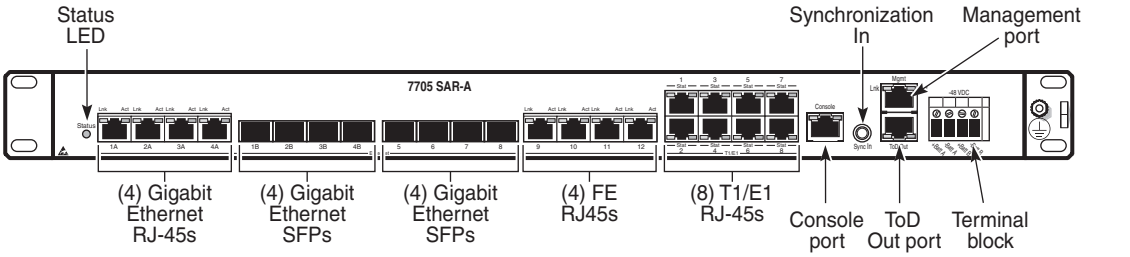
This chapter provides information about the pinout assignments for the port connectors on the 7705 SAR-A:

- 7705 SAR-A Ports

7705 SAR-A Ports

Figure 29 identifies the port connectors that are accessible on the 7705 SAR-A. The chassis variant shown has T1/E1 ports.

Figure 29: 7705 SAR-A Port Connectors (Variant with T1/E1 Ports)

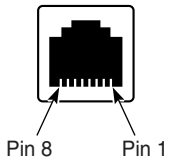


Management Port

The Mgmt (management) port supports 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. This port has an RJ-45 connector on the front panel. You must provide a shielded CAT5e Ethernet cable to connect to the port. Shielded cable must be used to maintain EMC compliance.

Figure 30 shows the Management port pin numbers.

Figure 30: Management Port Pin Numbers



Management Port Pinouts

Table 29 specifies the Management port pinout assignments.

Table 29: Ethernet Management Port Pinouts—RJ-45 Female

Pin	Signal	Direction	Description
1	TX+	Output	Differential transmit data – positive
2	TX-	Output	Differential transmit data – negative
3	RX+	Input	Differential receive data – positive
4	NC	—	Not connected
5	NC	—	Not connected
6	RX-	Input	Differential receive data – negative
7	NC	—	Not connected
8	NC	—	Not connected

Console Port

The Console port uses an RJ-45 connector to provide serial console access for the 7705 SAR-A. 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 connectivity for the RS-232 CLI. Connect the Console port to a terminal using a shielded RJ-45 CAT5e cable. Shielded cable must be used to maintain EMC compliance.

Console Port Pinouts

Table 30 specifies the Console port pinout assignments.

Table 30: Console Port Pinouts—RJ-45 Female

Pin	Signal	Direction	Description
1	NC	—	Not connected
2	NC	—	Not connected

Table 30: Console Port Pinouts—RJ-45 Female (Continued)

Pin	Signal	Direction	Description
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 (Do not connect)

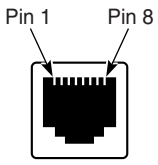
ToD Out Port

The ToD port uses an RJ-45 connector to send Time of Day and phase synchronization from the 7705 SAR-A. Only output signals are supported. The port includes an RS-422 1 pulse per second signal and an RS-422 serial time of day signal.

Shielded cable must be used to maintain EMC compliance.

Figure 31 shows the ToD Out port connector pin numbers.

Figure 31: ToD Out Port Pin Numbers



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ToD Out Port Pinouts

Table 31 specifies the ToD port pinout assignments.

Table 31: ToD Port Pinouts—RJ-45 Female

Pin	Signal	Direction	Description
1	NC	—	Not connected

Table 31: ToD Port Pinouts—RJ-45 Female (Continued)

Pin	Signal	Direction	Description
2	NC	—	Not connected
3	PPS_OUT_N	Output	1 Pulse per Second Out – negative
4	NC	—	Not connected
5	NC	—	Not connected
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

Ethernet Ports

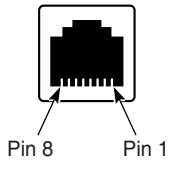
The 7705 SAR-A supports 12 data plane Ethernet ports:

- Ports 1 to 8 are Gigabit Ethernet with the following connectors:
  - → ports 1 to 4 can use either an RJ-45 connector or an SFP connector (RJ-45 for ports 1A to 4A and SFPs for ports 1B to 4B; the connector type for each port can be configured independently using the CLI but you actually have to physically connect to either the RJ-45 port or the SFP port)
  - → ports 5 to 8 are SFP ports
- Ports 9 to 12 are Fast Ethernet (10/100 speed) and use an RJ-45 connector

Use CAT5e (Gigabit Ethernet) shielded cables to attach customer equipment to the 7705 SAR-A RJ-45 Ethernet ports. Shielded cable must be used to maintain EMC compliance.

Figure 32 shows the pin numbering for the Ethernet ports that use an RJ-45 connector.

Figure 32: Ethernet Port RJ-45 Connector Pin Numbers



Ethernet Port Pinouts

Table 32 specifies the Gigabit Ethernet port pinouts assignments.

Table 32: Gigabit Ethernet Port Pinouts—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
7	TRD3+	bidirectional pair 3 – positive
8	TRD3-	bidirectional pair 3 – negative

Table 33 specifies the Fast Ethernet port pinout assignments.

Table 33: Fast Ethernet Port Pinouts—RJ-45 Female

Pin	Signal	Description
1	TD+	transmit – positive
2	TD-	transmit – negative
3	RD+	receive – positive
4	NC	not connected
5	NC	not connected
6	RD-	receive – negative
7	NC	not connected
8	NC	not connected

Custom Alarms on Ethernet Ports

The 7705 SAR-A supports custom alarms on Ethernet ports without the need to deploy a dry-contact alarm aggregator. Custom alarms can be created and assigned to any RJ-45 port; the port must be configured for 100 Base-Tx operation with autonegotiation disabled. One alarm input can be configured for each port with the following:

- name
- description
- association with a user-defined alarm

Alarm inputs must be associated with an alarm in order for them to be triggered. Alarm inputs consist of an Ethernet LOS event caused by breaking contact loops between pins 1 and 3 or 2 and 6 on the Ethernet port. Breaking either loop will trigger the port alarm, and reconnecting the loops will clear the alarm.

Refer to the 7705 SAR OS Interface Configuration Guide, “Configuring Auxiliary Alarm Card, Chassis, and Ethernet Port 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.

Figure 32 shows the pin numbering for the Ethernet ports that use an RJ-45 connector. Table 34 specifies the RJ-45 Ethernet port alarm loop pinout assignments.

Table 34: Ethernet Port Alarm Loop Pinouts—RJ-45 Female

Pin	Loop Pair	Wire Colors
1	3	White-Orange
2	6	Orange-White
3	1	White-Green
4	—	Blue-White
5	—	White-Blue
6	2	Green-White
7	—	White-Brown
8	—	Brown-White

T1/E1 Ports

On the 7705 SAR-A variant equipped with T1/E1 ports, there are eight RJ-45 connectors on the front of the chassis that provide 100 Ω T1 or 120 Ω E1 access to the T1/E1 ports. The T1/E1 ports can be used only for access connectivity.

Use shielded RJ-45 cables to attach customer equipment to the 7705 SAR-A T1/E1 ports. Shielded cable must be used to maintain EMC compliance. The T1/E1 ports are on-premises ports and require an external CSU to connect off premises. An adapter cable (3HE04990AA) is available to convert an RJ-45 connector to BNC for E1 ports; these ports must be configured for 75 Ω impedance.

Figure 33 shows the pin numbering for the top row (odd-numbered) T1/E1 ports. Figure 34 shows the pin numbering for the bottom row (even-numbered) T1/E1 ports.

Figure 33: Top Row T1/E1 Port RJ-45 Connector Pin Numbers

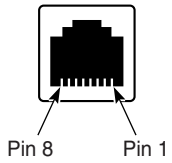


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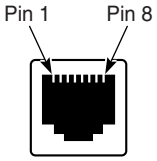
Figure 34: Bottom Row T1/E1 Port RJ-45 Connector Pin Numbers



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T1/E1 Port Pinouts

Table 35 specifies the T1/E1 port pinout assignments.

Table 35: T1/E1 Port Pinouts—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

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 36: 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 37: 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 37: 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 38: 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 38: 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 39: 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 39: 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 40: 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 40: 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 41: 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

Protocol Support

ATM

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

af-tm-0121.000—Traffic Management Specification Version 4.1, March 1999

GR-1113-CORE—Bellcore, Asynchronous Transfer Mode (ATM) and ATM Adaptation Layer (AAL) Protocols Generic Requirements, Issue 1, July 1994

GR-1248-CORE—Generic Requirements for Operations of ATM Network Elements (NEs). Issue 3 June 1996

ITU-T Recommendation I.432.1—B-ISDN user-network interface - Physical layer specification: General characteristics

ITU-T Recommendation I.610—B-ISDN Operation and Maintenance Principles and Functions version 11/95

RFC 2514—Definitions of Textual Conventions and OBJECT_IDENTITIES for ATM Management, February 1999

RFC 2515—Definition of Managed Objects for ATM Management, February 1999

RFC 2684—Multiprotocol Encapsulation over ATM Adaptation Layer 5

BFD

draft-ietf-bfd-mib-00.txt—Bidirectional Forwarding Detection Management Information Base

draft-ietf-bfd-base-o5.txt—Bidirectional Forwarding Detection

draft-ietf-bfd-v4v6-1hop-06.txt—BFD IPv4 and IPv6 (Single Hop)

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

draft-ietf-idr-add-paths-04.txt—Advertisement of Multiple Paths in BGP

draft-ietf-idr-add-paths-guidelines-00.txt—Best Practices for Advertisement of Multiple Paths in BGP

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

RFC 2598—An Expedited Forwarding PHB

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

ITU-T G.992.3 Annex K.2 (ADSL2)

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

ITU-T G.992.5 Annex K (ADSL2+)

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

ITU-T G.993.2 Annex A and Annex B—xDSL Standards Compliance (ADSL2/2+ and VDSL2)

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

ITU G.994.1 (2/07) Amendment 1 and 2—G.hs Handshake

ITU-T G.998.2—SHDSL 4-pair EFM bonding

ITU-T G.998.4 G.inp—Physical layer retransmission

ITU-T Y.1564 Ethernet service activation test methodology

RFC 2684—IEEE 802.2 LLC/SNAP bridged encapsulation while operating in ATM bonded mode

TR-060—SHDSL rate and reach

TR112 (U-R2 Deutsche Telekom AG) Version 7.0 and report of Self-Test-Result (ATU-T Register#3)

ECMP

RFC 2992—Analysis of an Equal-Cost Multi-Path Algorithm

Frame Relay

ANSI T1.617 Annex D—Signalling Specification For Frame Relay Bearer Service

ITU-T Q.922 Annex A—Digital Subscriber Signalling System No. 1 (DSS1) data link layer - ISDN data link layer specification for frame mode bearer services

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

FRF.12—Frame Relay Fragmentation Implementation Agreement

RFC 2427—Multiprotocol Interconnect over Frame Relay

GRE

RFC 2784—Generic Routing Encapsulation (GRE)

IPSec

IETF draft-nourse-scep-21.txt—Cisco Systems' Simple Certificate Enrollment Protocol

ITU-T X.690 (2002)—ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)

PKCS #12 Personal Information Exchange Syntax Standard

RFC 2315—PKCS #7: Cryptographic Message Syntax

RFC 2401—Security Architecture for the Internet Protocol

RFC 2986—PKCS #10: Certification Request Syntax Specification

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

RFC 4291—IPv6 Addressing Architecture

RFC 4443—Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 Specification

RFC 4649—DHCPv6 Relay Agent Remote-ID Option

RFC 4861—Neighbor Discovery for IP version 6 (IPv6)

RFC 5095—Deprecation of Type 0 Routing Headers in IPv6

RFC 5952—A Recommendation for IPv6 Address Text Representation

IS-IS

RFC 1142—OSI IS-IS Intra-domain Routing Protocol (ISO 10589)

RFC 1195—Use of OSI IS-IS for routing in TCP/IP & dual environments

RFC 2763—Dynamic Hostname Exchange for IS-IS

RFC 2966—Domain-wide Prefix Distribution with Two-Level IS-IS

RFC 2973—IS-IS Mesh Groups

RFC 3373—Three-Way Handshake for Intermediate System to Intermediate System (IS-IS) Point-to-Point Adjacencies

RFC 3567—Intermediate System to Intermediate System (IS-IS) Cryptographic Authentication

RFC 3719—Recommendations for Interoperable Networks using IS-IS

RFC 3784—Intermediate System to Intermediate System (IS-IS) Extensions for Traffic Engineering (TE)

RFC 3787—Recommendations for Interoperable IP Networks

RFC 4205 for Shared Risk Link Group (SRLG) TLV

RFC 5309—Point-to-Point Operation over LAN in Link State Routing Protocols

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LDP

RFC 5036—LDP Specification

RFC 5283—LDP Extension for Inter-Area Label Switched Paths

LDP and IP FRR

RFC 5286—Basic Specification for IP Fast Reroute: Loop-Free Alternates

MPLS

RFC 3031—MPLS Architecture

RFC 3032—MPLS Label Stack Encoding

RFC 3815—Definitions of Managed Objects for the Multiprotocol Label Switching (MPLS), Label Distribution Protocol (LDP)

MPLS – OAM

RFC 4379—Detecting Multi-Protocol Label Switched (MPLS) Data Plane Failures

RFC 6424— Mechanism for Performing Label Switched Path Ping (LSP Ping) over MPLS Tunnels

Network Management

IANA-IFType-MIB

ITU-T X.721—Information technology- OSI-Structure of Management Information

ITU-T X.734—Information technology- OSI-Systems Management: Event Report Management Function

M.3100/3120—Equipment and Connection Models

RFC 1157—SNMPv1

RFC 1850—OSPF-MIB

RFC 1907—SNMPv2-MIB

RFC 2011—IP-MIB

RFC 2012—TCP-MIB

RFC 2013—UDP-MIB

RFC 2030—Simple Network Time Protocol (SNTP) Version 4 for IPv4, IPv6 and OSI

RFC 2096—IP-FORWARD-MIB

RFC 2138—RADIUS

RFC 2206—RSVP-MIB

RFC 2571—SNMP-FRAMEWORKMIB

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)

RFC 3418—SNMP MIB

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TMF 509/613—Network Connectivity Model

OSPF

RFC 1765—OSPF Database Overflow

RFC 2328—OSPF Version 2

RFC 2370—Opaque LSA Support

RFC 2740—OSPF for IPv6

RFC 3101—OSPF NSSA Option

RFC 3137—OSPF Stub Router Advertisement

RFC 3509—Alternative Implementations of OSPF Area Border Routers

RFC 3630—Traffic Engineering (TE) Extensions to OSPF

RFC 4203 for Shared Risk Link Group (SRLG) sub-TLV

PPP

RFC 1332—PPP Internet Protocol Control Protocol (IPCP)

RFC 1570—PPP LCP Extensions

RFC 1619—PPP over SONET/SDH

RFC 1661—The Point-to-Point Protocol (PPP)

RFC 1662—PPP in HDLC-like Framing

RFC 1989—PPP Link Quality Monitoring

RFC 1990—The PPP Multilink Protocol (MP)

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Pseudowires

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