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<th>Acronym</th>
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</tr>
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<tbody>
<tr>
<td>2G</td>
<td>second generation wireless telephone technology</td>
</tr>
<tr>
<td>3G</td>
<td>third generation mobile telephone technology</td>
</tr>
<tr>
<td>5620 SAM</td>
<td>5620 Service Aware Manager</td>
</tr>
<tr>
<td>7705 SAR</td>
<td>7705 Service Aggregation Router</td>
</tr>
<tr>
<td>ABR</td>
<td>available bit rate</td>
</tr>
<tr>
<td>AC</td>
<td>alternating current</td>
</tr>
<tr>
<td>ACL</td>
<td>attachment circuit</td>
</tr>
<tr>
<td>ACR</td>
<td>adaptive clock recovery</td>
</tr>
<tr>
<td>AIS</td>
<td>alarm indication signal</td>
</tr>
<tr>
<td>ANSI</td>
<td>American National Standards Institute</td>
</tr>
<tr>
<td>Apipe</td>
<td>ATM VLL</td>
</tr>
<tr>
<td>ARP</td>
<td>address resolution protocol</td>
</tr>
<tr>
<td>AS</td>
<td>autonomous system</td>
</tr>
<tr>
<td>ASAP</td>
<td>any service, any port</td>
</tr>
<tr>
<td>ATM</td>
<td>asynchronous transfer mode</td>
</tr>
<tr>
<td>ATM PVC</td>
<td>ATM permanent virtual circuit</td>
</tr>
<tr>
<td>B-bit</td>
<td>beginning bit (first packet of a fragment)</td>
</tr>
<tr>
<td>Batt A</td>
<td>battery A</td>
</tr>
<tr>
<td>Bellcore</td>
<td>Bell Communications Research</td>
</tr>
<tr>
<td>BFD</td>
<td>bidirectional forwarding detection</td>
</tr>
<tr>
<td>BITS</td>
<td>building integrated timing supply</td>
</tr>
<tr>
<td>BOF</td>
<td>boot options file</td>
</tr>
<tr>
<td>Acronym</td>
<td>Expansion</td>
</tr>
<tr>
<td>-----------</td>
<td>------------------------------------------------------------------</td>
</tr>
<tr>
<td>BRAS</td>
<td>Broadband Remote Access Server</td>
</tr>
<tr>
<td>BSC</td>
<td>Base Station Controller</td>
</tr>
<tr>
<td>BSTA</td>
<td>Broadband Service Termination Architecture</td>
</tr>
<tr>
<td>BTS</td>
<td>base transceiver station</td>
</tr>
<tr>
<td>CAS</td>
<td>channel associated signaling</td>
</tr>
<tr>
<td>CBN</td>
<td>common bonding networks</td>
</tr>
<tr>
<td>CBS</td>
<td>committed buffer space</td>
</tr>
<tr>
<td>CC</td>
<td>control channel</td>
</tr>
<tr>
<td>CE</td>
<td>customer edge</td>
</tr>
<tr>
<td></td>
<td>circuit emulation</td>
</tr>
<tr>
<td>CEM</td>
<td>circuit emulation</td>
</tr>
<tr>
<td>CES</td>
<td>circuit emulation services</td>
</tr>
<tr>
<td>CESoPSN</td>
<td>circuit emulation services over packet switched network</td>
</tr>
<tr>
<td>CIDR</td>
<td>classless inter-domain routing</td>
</tr>
<tr>
<td>CIR</td>
<td>committed information rate</td>
</tr>
<tr>
<td>CLI</td>
<td>command line interface</td>
</tr>
<tr>
<td>CLP</td>
<td>cell loss priority</td>
</tr>
<tr>
<td>CoS</td>
<td>class of service</td>
</tr>
<tr>
<td>CPE</td>
<td>customer premises equipment</td>
</tr>
<tr>
<td>Cpipe</td>
<td>circuit emulation (or TDM) VLL</td>
</tr>
<tr>
<td>CPU</td>
<td>central processing unit</td>
</tr>
<tr>
<td>CRC</td>
<td>cyclic redundancy check</td>
</tr>
<tr>
<td>CRON</td>
<td>a time-based scheduling service (from chronos = time)</td>
</tr>
<tr>
<td>CSM</td>
<td>Control and Switching Module</td>
</tr>
<tr>
<td>CSPF</td>
<td>constrained shortest path first</td>
</tr>
<tr>
<td>Acronym</td>
<td>Expansion</td>
</tr>
<tr>
<td>---------</td>
<td>-----------</td>
</tr>
</tbody>
</table>
| CV      | connection verification  
customer VLAN (tag) |
<p>| CW      | control word |
| DC      | direct current |
| DC-C    | DC return - common |
| DC-I    | DC return - isolated |
| DCO     | digitally controlled oscillator |
| DDoS    | distributed DoS |
| DHCP    | dynamic host configuration protocol |
| DNS     | domain name server |
| DoS     | denial of service |
| dot1q   | IEEE 802.1q encapsulation for Ethernet interfaces |
| DPLL    | digital phase locked loop |
| DSCP    | differentiated services code point |
| DSL     | digital subscriber line |
| DSLAM   | digital subscriber line access multiplexer |
| DTE     | data termination equipment |
| DU      | downstream unsolicited |
| e911    | enhanced 911 service |
| E-bit   | ending bit (last packet of a fragment) |
| ECMP    | equal cost multi-path |
| EFM     | Ethernet in the first mile |
| ELER    | egress label edge router |
| Epipe   | Ethernet VLL |
| ESD     | electrostatic discharge |
| ETE     | end-to-end |</p>
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Expansion</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVDO</td>
<td>evolution - data optimized</td>
</tr>
<tr>
<td>EXP bits</td>
<td>experimental bits</td>
</tr>
<tr>
<td>FC</td>
<td>forwarding class</td>
</tr>
<tr>
<td>FCS</td>
<td>frame check sequence</td>
</tr>
<tr>
<td>FDB</td>
<td>forwarding database</td>
</tr>
<tr>
<td>FDL</td>
<td>facilities data link</td>
</tr>
<tr>
<td>FEC</td>
<td>forwarding equivalence class</td>
</tr>
<tr>
<td>FIB</td>
<td>forwarding information base</td>
</tr>
<tr>
<td>FTN</td>
<td>FEC-to-NHLFE</td>
</tr>
<tr>
<td>FTP</td>
<td>file transfer protocol</td>
</tr>
<tr>
<td>GigE</td>
<td>Gigabit Ethernet</td>
</tr>
<tr>
<td>GRE</td>
<td>generic routing encapsulation</td>
</tr>
<tr>
<td>GSM</td>
<td>Global System for Mobile Communications (2G)</td>
</tr>
<tr>
<td>HEC</td>
<td>header error control</td>
</tr>
<tr>
<td>HSDPA</td>
<td>high-speed downlink packet access</td>
</tr>
<tr>
<td>HSPA</td>
<td>high-speed packet access</td>
</tr>
<tr>
<td>IBN</td>
<td>isolated bonding networks</td>
</tr>
<tr>
<td>ICMP</td>
<td>Internet control message protocol</td>
</tr>
<tr>
<td>ICP</td>
<td>IMA control protocol cells</td>
</tr>
<tr>
<td>IEEE</td>
<td>Institute of Electrical and Electronics Engineers</td>
</tr>
<tr>
<td>IES</td>
<td>Internet Enhanced Service</td>
</tr>
<tr>
<td>IETF</td>
<td>Internet Engineering Task Force</td>
</tr>
<tr>
<td>ILER</td>
<td>ingress label edge router</td>
</tr>
<tr>
<td>ILM</td>
<td>incoming label map</td>
</tr>
<tr>
<td>IMA</td>
<td>inverse multiplexing over ATM</td>
</tr>
<tr>
<td>IOM</td>
<td>input/output module</td>
</tr>
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<td>Acronym</td>
<td>Expansion</td>
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<td>-----------</td>
</tr>
<tr>
<td>IP</td>
<td>Internet Protocol</td>
</tr>
<tr>
<td>LCP</td>
<td>link control protocol</td>
</tr>
<tr>
<td>LDP</td>
<td>label distribution protocol</td>
</tr>
<tr>
<td>LER</td>
<td>label edge router</td>
</tr>
<tr>
<td>LLID</td>
<td>loopback location ID</td>
</tr>
<tr>
<td>LSP</td>
<td>label switched path</td>
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<td>LSR</td>
<td>label switch router</td>
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<td>LTN</td>
<td>LSP ID to NHLFE</td>
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<td>MAC</td>
<td>media access control</td>
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<td>MBB</td>
<td>make-before-break</td>
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<td>MBS</td>
<td>maximum buffer space</td>
</tr>
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<td>maximum burst size</td>
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<td>media buffer space</td>
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<td>MD5</td>
<td>message digest version 5 algorithm</td>
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<td>media dependent adapter</td>
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<td>Metro Ethernet Forum</td>
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<td>MFC</td>
<td>multi-field classification</td>
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<td>MIB</td>
<td>management information base</td>
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<tr>
<td>MIR</td>
<td>minimum information rate</td>
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<td>MLPPP</td>
<td>multilink point-to-point protocol</td>
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<tr>
<td>MP</td>
<td>multilink protocol</td>
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<tr>
<td>MPLS</td>
<td>multiprotocol label switching</td>
</tr>
<tr>
<td>MRRU</td>
<td>maximum received reconstructed unit</td>
</tr>
<tr>
<td>MRU</td>
<td>maximum receive unit</td>
</tr>
<tr>
<td>MTSO</td>
<td>mobile trunk switching office</td>
</tr>
<tr>
<td>MTU</td>
<td>maximum transmission unit</td>
</tr>
<tr>
<td></td>
<td>multi-tenant unit</td>
</tr>
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<td>Acronym</td>
<td>Expansion</td>
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<td>-----------</td>
</tr>
<tr>
<td>NHLFE</td>
<td>next hop label forwarding entry</td>
</tr>
<tr>
<td>NNI</td>
<td>network-to-network interface</td>
</tr>
<tr>
<td>Node B</td>
<td>similar to BTS but used in 3G networks — term is used in UMTS (3G systems) while BTS is used in GSM (2G systems)</td>
</tr>
<tr>
<td>OAM</td>
<td>operations, administration, and maintenance</td>
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<td>OAMPDU</td>
<td>OAM protocol data units</td>
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<td>OS</td>
<td>operating system</td>
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<td>OSS</td>
<td>operations support system</td>
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<td>PDU</td>
<td>protocol data units</td>
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<td>PE</td>
<td>provider edge router</td>
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<td>PHB</td>
<td>per-hop behavior</td>
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<td>physical layer</td>
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<td>peak information rate</td>
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<td>point of presence</td>
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<td>pseudowire emulation edge-to-edge</td>
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<td>QoS</td>
<td>quality of service</td>
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<td>RAN</td>
<td>Radio Access Network</td>
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<td>RDI</td>
<td>remote defect indication</td>
</tr>
<tr>
<td>Acronym</td>
<td>Expansion</td>
</tr>
<tr>
<td>---------</td>
<td>-----------</td>
</tr>
<tr>
<td>RED</td>
<td>random early discard</td>
</tr>
<tr>
<td>RNC</td>
<td>Radio Network Controller</td>
</tr>
<tr>
<td>RSVP-TE</td>
<td>resource reservation protocol - traffic engineering</td>
</tr>
<tr>
<td>R&amp;TTE</td>
<td>Radio and Telecommunications Terminal Equipment</td>
</tr>
<tr>
<td>RT</td>
<td>receive/transmit</td>
</tr>
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<td>RTM</td>
<td>route table manager</td>
</tr>
<tr>
<td>RTN</td>
<td>battery return</td>
</tr>
<tr>
<td>RTP</td>
<td>real-time protocol</td>
</tr>
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<td>SAA</td>
<td>service assurance agent</td>
</tr>
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<td>SAP</td>
<td>service access point</td>
</tr>
<tr>
<td>SAR-8</td>
<td>7705 Service Aggregation Router - 8-slot chassis</td>
</tr>
<tr>
<td>SAR-F</td>
<td>7705 Service Aggregation Router - fixed form-factor chassis</td>
</tr>
<tr>
<td>SAToP</td>
<td>structure-agnostic TDM over packet</td>
</tr>
<tr>
<td>SDP</td>
<td>service destination point</td>
</tr>
<tr>
<td>SIR</td>
<td>sustained information rate</td>
</tr>
<tr>
<td>SLA</td>
<td>Service Level Agreement</td>
</tr>
<tr>
<td>SNMP</td>
<td>Simple Network Management Protocol</td>
</tr>
<tr>
<td>SNTP</td>
<td>simple network time protocol</td>
</tr>
<tr>
<td>SPE</td>
<td>source provider edge router</td>
</tr>
<tr>
<td>SPF</td>
<td>shortest path first</td>
</tr>
<tr>
<td>SR</td>
<td>service router (includes 7710 SR, 7750 SR)</td>
</tr>
<tr>
<td>SSH</td>
<td>secure shell</td>
</tr>
<tr>
<td>SSU</td>
<td>system synchronization unit</td>
</tr>
<tr>
<td>SVC</td>
<td>switched virtual circuit</td>
</tr>
<tr>
<td>TCP</td>
<td>transmission control protocol</td>
</tr>
<tr>
<td>TDM</td>
<td>time division multiplexing</td>
</tr>
<tr>
<td><strong>Acronym</strong></td>
<td><strong>Expansion</strong></td>
</tr>
<tr>
<td>------------</td>
<td>--------------</td>
</tr>
<tr>
<td>TLDP</td>
<td>targeted LDP</td>
</tr>
<tr>
<td>TLV</td>
<td>type length value</td>
</tr>
<tr>
<td>ToS</td>
<td>type of service</td>
</tr>
<tr>
<td>TPE</td>
<td>target provider edge router</td>
</tr>
<tr>
<td>TPID</td>
<td>tag protocol identifier</td>
</tr>
<tr>
<td>TTL</td>
<td>time to live</td>
</tr>
<tr>
<td>TTM</td>
<td>tunnel table manager</td>
</tr>
<tr>
<td>UBR</td>
<td>unspecified bit rate</td>
</tr>
<tr>
<td>UDP</td>
<td>user datagram protocol</td>
</tr>
<tr>
<td>UMTS</td>
<td>Universal Mobile Telecommunications System (3G)</td>
</tr>
<tr>
<td>UNI</td>
<td>user-to-network interface</td>
</tr>
<tr>
<td>VC</td>
<td>virtual circuit</td>
</tr>
<tr>
<td>VCC</td>
<td>virtual channel connection</td>
</tr>
<tr>
<td>VCCV</td>
<td>virtual circuit connectivity verification</td>
</tr>
<tr>
<td>VCI</td>
<td>virtual circuit identifier</td>
</tr>
<tr>
<td>VLAN</td>
<td>virtual LAN</td>
</tr>
<tr>
<td>VLL</td>
<td>virtual leased line</td>
</tr>
<tr>
<td>VoIP</td>
<td>voice over IP</td>
</tr>
<tr>
<td>VP</td>
<td>virtual path</td>
</tr>
<tr>
<td>VPC</td>
<td>virtual path connection</td>
</tr>
<tr>
<td>VPI</td>
<td>virtual path identifier</td>
</tr>
<tr>
<td>VPN</td>
<td>virtual private network</td>
</tr>
<tr>
<td>VPRN</td>
<td>virtual private routed network</td>
</tr>
<tr>
<td>WCDMA</td>
<td>wideband code division multiple access (transmission protocol used in UMTS networks)</td>
</tr>
<tr>
<td>WRED</td>
<td>weighted random early discard</td>
</tr>
</tbody>
</table>
About This Guide

This guide provides an overview of the Alcatel-Lucent 7705 Service Aggregation Router (SAR-F 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 7705 SAR OS documentation set (listed below) for details on the boot process, software configuration, and Command Line Interface (CLI) information to configure system and network parameters.

List of Technical Publications

The 7705 SAR-series 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, IP-based filtering, and routing policies.
- 7705 SAR OS MPLS Guide
  This guide describes how to configure Multiprotocol Label Switching (MPLS) 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, user services, and Operations, Administration and Management (OAM) tools.
• 7705 SAR OS Quality of Service Guide
This guide describes how to configure Quality of Service (QoS) policy management.

Warnings and Notes

Observe the warnings and notes in this guide to avoid injury or router damage during installation and maintenance. Follow the 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 technologies.

Information Symbols

Table 1 describes symbols contained in this guide.

Table 1: Information Symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>⚠️</td>
<td>Danger</td>
<td>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 instigate accident prevention procedures.</td>
</tr>
<tr>
<td>⚠️</td>
<td>Warning</td>
<td>This symbol warns that improper handling and installation could result in equipment damage or loss of data.</td>
</tr>
<tr>
<td>🚫</td>
<td>Caution</td>
<td>This symbol warns that improper handling may reduce your component or system performance.</td>
</tr>
</tbody>
</table>
If you purchased a service agreement for your 7705 SAR-F 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, contact technical assistance at:

Web: http://www1.alcatel-lucent.com/comps/pages/carrier_support.jhtml

Class 1 laser products are identified in the adapter card installation guides. Only approved Class 1 replaceable laser transceivers should be used with this product.
Mandatory Regulations

In This Chapter

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

- List of Terms on page 24
- General Requirements on page 25
- Canada Regulations on page 28
- United States Regulations on page 29
- European Union Regulations on page 31
- Australia/New Zealand Regulations on page 35
- China Regulations on page 36
**List of Terms**

Table 2 lists the terms used in this chapter.

<table>
<thead>
<tr>
<th>Term</th>
<th>Expansion</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACMA</td>
<td>Australian Communications and Media Authority</td>
</tr>
<tr>
<td>ACTA</td>
<td>Administrative Council for Terminal Attachments</td>
</tr>
<tr>
<td>ANSI</td>
<td>American National Standards Institute</td>
</tr>
<tr>
<td>AS/NZ</td>
<td>Australian/New Zealand standard</td>
</tr>
<tr>
<td>CE</td>
<td>Conformité Européene</td>
</tr>
<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
</tr>
<tr>
<td>CSA</td>
<td>Canadian Standards Association International</td>
</tr>
<tr>
<td>EEC</td>
<td>European Economic Community</td>
</tr>
<tr>
<td>EMC</td>
<td>Electromagnetic Compatibility</td>
</tr>
<tr>
<td>EMI</td>
<td>Electromagnetic Interference</td>
</tr>
<tr>
<td>EN</td>
<td>European Standards</td>
</tr>
<tr>
<td>ETSI</td>
<td>European Telecommunications Standards Institute</td>
</tr>
<tr>
<td>FCC</td>
<td>Federal Communications Commission</td>
</tr>
<tr>
<td>ICES</td>
<td>Interference Causing Equipment Standard</td>
</tr>
<tr>
<td>IEC</td>
<td>International Electrotechnical Commission</td>
</tr>
<tr>
<td>IEE</td>
<td>Institute of Electrical Engineers (UK)</td>
</tr>
<tr>
<td>LVD</td>
<td>Low Voltage Directive</td>
</tr>
<tr>
<td>NRTL</td>
<td>Nationally Recognized Testing Laboratory</td>
</tr>
<tr>
<td>OSHA (USA)</td>
<td>Occupational Safety and Health Administration (USA)</td>
</tr>
<tr>
<td>RoHS</td>
<td>Restriction of the use of certain Hazardous Substances</td>
</tr>
<tr>
<td>SELV</td>
<td>Safety Extra Low Voltage</td>
</tr>
<tr>
<td>UL</td>
<td>Underwriters Laboratories</td>
</tr>
<tr>
<td>WEEE</td>
<td>Waste Electrical and Electronic Equipment</td>
</tr>
</tbody>
</table>
General Requirements

The sections that follow outline the mandatory regulations that govern the installation and operation of the 7705 SAR-F. 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.

Warning: The unit 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.

Equipment Interconnection Points

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

- T1/E1
- Ethernet (10/100/1000 Base-T)
- alarms
- management ports
- external clock inputs and clock outputs (2 MHz, 5 MHz, 10 MHz)

SELV

Connect SELV circuits on this equipment only to other circuits that comply with the requirements of SELV circuits as defined in CSA C22.2 No. 60950-1, UL 60950-1, EN 60950-1, AS/NZS 60950-1, and IEC60950-1.

Prevention of Access

The 7705 SAR-F must be accessible only to authorized personnel. Install this apparatus in a restricted access location or similar environment to prevent unauthorized access.
**Laser Interface**

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

**Protective Safety Ground (Earth)**

The cable used for safety ground should be at least the same gauge as the supply conductors, green and yellow in color, and of sufficient length to connect the building earth point to the chassis ground connection (refer to Chassis Ground Wiring on page 65 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 DB9 console ports
- DB15 Alarm port
- Synchronization interfaces
- Ethernet interfaces
  - Fast Ethernet (CAT5 shielded cable)
  - Gigabit Ethernet (CAT5E shielded cable)
- T1 and E1 interfaces
Regulatory Symbols

The 7705 SAR-F uses various regulatory approvals symbols. They may be used on product markings such as approvals labels. These symbols are described in IEC 417.

Figure 1 and Figure 2 show symbols of a terminal that you must connect to earth ground before you make any other connections to the equipment.

Figure 1: Protective Earth (ground)

![Protective Earth (ground)](image)

Figure 2: Earth (ground)

![Earth (ground)](image)
Canada Regulations

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

Industry Canada Regulations

ICES-003: Interference-Causing Equipment Standard Digital Apparatus

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.

Registration number: IC: 1737F-0011

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.

Safety Approval for DC Systems

The DC source for the system must meet the requirements of a SELV source to comply with CSA standard C22.2 No. 60950-1. Use the system with a SELV secondary source that is electrically isolated from the AC source and that is grounded reliably.

The 7705 SAR-F is safety certified according to CSA standard C22.2 No. 60950-1 by CSA.
United States Regulations

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

Federal Communications Commission

FCC Part 15

Important! Changes or modifications not expressly approved by Alcatel-Lucent could void the user’s authority 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 this equipment meets the FCC specifications.

This equipment complies with Part 68 of the FCC rules and the requirements adopted by the ACTA. On the equipment is a label that contains, among other information, a product identifier in the format of AAAEQ##TXXXX.

Identification Number: GQ6DENAN7705SAR-F

In the event that repairs to this equipment are needed, contact:

Technical Support Services
Alcatel-Lucent
Within the United States: 1-866-582-3688, prompt 1
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, the DC outputs must meet UL 60950-1 SELV requirements.

Safety Approval for DC Systems

The DC source for the system must meet the requirements of a SELV source in accordance with UL 60950-1. You must use the system with a SELV secondary source that is electrically isolated from the AC source and that is grounded reliably.

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
12424 Research Parkway, Suite 125
Orlando, FL 32826-3274
European Union Regulations

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 1999/5/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 99/05/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 system 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 system must meet the requirements of a SELV source as defined in EN 60950-1. For 60V station battery systems, the source is considered TNV-2 as per IEC/EN 60950-1 and must have reinforced insulation from the AC mains.

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

Protective Earth

Protective earth is referred to as chassis ground in this document. A green and yellow colored earth wire must be connected from the site equivalent of the AC earth 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 on page 65 for specific instructions on connecting the protective earth). The protective earth is also carried by the mains plug and socket (for AC systems only).

Approval for External AC Rectifiers

When the system is equipped with an external AC rectifier, the rectifier must meet EN 60950-1 SELV DC output requirements. Make sure that the rectifier is rated and adjusted for the appropriate AC input voltage and frequency for the country where it is installed. Set the output of the rectifier according to the installation and operating instructions of the manufacturer, to provide output levels that coincide with the nominal DC input ratings of the system.

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 Environmental Health and Safety organization.
For installations not performed by Alcatel-Lucent, please contact the Alcatel-Lucent Customer Support Center at:

Technical Support Services  
+1 630 224 4672, prompt 2

**Recycling / Take-back / Disposal of Product**

Electronic products bearing or referencing the symbol shown in Figure 3, 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 3: WEEE Symbol for post-August 13, 2005 Product**

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 2002/95/EC, “Restriction of the use of certain Hazardous Substances” (RoHS), 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 1 July 2006, with various exemptions, including an exemption for lead solder in network infrastructure equipment. Alcatel-Lucent products shipped to the EU after 1 July 2006 comply with the EU RoHS Directive.
Australia/New Zealand Regulations

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

ACMA Regulations

The 7705 SAR-F complies with the ACMA requirements and the product is marked with the 'A Tick' under the Supplier Code N594.

EMC

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

Telecom

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

Safety

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

The 7705 SAR-F complies with the AS/NZS 60950 – Business Equipment, Computers, Telecommunications requirements.
China Regulations

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

Safety

The equipment complies with the Product Safety specification of IEC 60950-1.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 Alcatel-Lucent Environmental Health and Safety organization. For installations not performed by Alcatel-Lucent, please contact the Alcatel-Lucent Customer Support Center at:

Technical Support Services
+1 630 224 4672, prompt 2

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). Currently, 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 Product” (SJ/T11364-2006), customers may access Alcatel-Lucent’s Hazardous Substances Table information at either of the following two URLs:

- Access via the Alcatel-Lucent Corporate website at:
  http://www.alcatel-lucent.com/cn
- Access via the Alcatel Shanghai Bell website at:
  http://www.alcatel-sbell.com.cn/
In This Chapter

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

- 7705 SAR-F Components on page 40
  - Control and Switching on page 41
  - T1/E1 and Ethernet Ports on page 42
  - Power Supply Inputs on page 42
  - Fan Operation on page 43
- Notes on 7705 SAR-F and 7705 SAR-8 on page 44
- SAR System Installation Process on page 46
7705 SAR-F Components

The 7705 SAR-F is a service access router that has a fixed hardware configuration. The 7705 SAR-F has one circuit board that supports all functions of the router, including control and switching, T1/E1 interfaces, Ethernet interfaces, as well as indicator LEDs and connectors for node management, external synchronization, and external alarms.

Figure 4 shows the front view of the 7705 SAR-F. All physical connections are made at the front of the chassis, including the chassis ground connection. There are no back panel connections.

There are two variants of the 7705 SAR-F: a -48VDC variant and a +24VDC variant. They are functionally identical—only the power supply ratings differ. The variant type is printed on the front of router, below the DC terminal strip.

In addition to containing the circuit board, the chassis includes fans for cooling the router and a dual terminal block for redundant DC power inputs.

Mounting brackets for the 7705 SAR-F chassis are factory-installed and are used to mount the unit in a recommended 19-inch rack. The chassis grounding stud is on the right-hand side bracket.

Note: The 7705 SAR-F and the 7705 SAR-8 are products in the SAR product line. The main difference between these products is their hardware configuration. The 7705 SAR-F has a fixed, single circuit board configuration while the 7705 SAR-8 is an 8-slot modular configuration. Refer to Notes on 7705 SAR-F and 7705 SAR-8 on page 44 for more information.
Control and Switching

Control and switching on the 7705 SAR-F provide the following main functions:

- node management interfaces to the 7705 SAR-F (Management (Ethernet) and Console; see Figure 5)
- system synchronization and alarm interfaces for external inputs and outputs (see Figure 5)
- routing, switching, and services functions for the entire system

The 7705 SAR-F has a compact flash memory device that stores system boot software, OS software, and configuration files and logs. The compact flash 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 5 identifies the connectors and LEDs that are part of the control and switching function. Refer to 7705 SAR-F Connectors and LEDs on page 102 for a description of these parts.
T1/E1 and Ethernet Ports

Figure 6 identifies the T1/E1 and Ethernet interface ports. These ports provide access for a wide variety of interface speeds and types, including Ethernet (10/100/1000 Base-T and optical), T1/E1 with ATM and IMA, and TDM (channelized and unchannelized).

There are 16 T1/E1 ports that support T1/E1 connections via connection to RJ-45 connectors. All ports must be configured as either T1 or E1 ports; a mix of T1 and E1 ports is not allowed.

There are 8 Ethernet ports: 6 ports to support 10/100 Base-T Ethernet interfaces via Ethernet connectors, and 2 ports to support 10/100/1000 Base-T and optical 100/1000 Ethernet interfaces via SFP modules.

The SFP modules are hot-swappable and field-replaceable by qualified personnel. Refer to Table 16 on page 79 for a list of supported SFP modules.

Power Supply Inputs

The 7705 SAR-F has a standard, dual terminal block (four terminals) attached to the front of the chassis. The terminals provide access for two independent power feeds, allowing power redundancy for the system. When only one power feed is used, the system does not have power supply redundancy. The power system has no field-replaceable parts.

The DC power LEDs are located on the front of the router (see Figure 7). Refer to 7705 SAR-F Connectors and LEDs on page 102 for a description of the power LED operation.

Refer to DC Power Connections on page 69 for requirements and information regarding preparing DC power cables.
Fan Operation

The 7705 SAR-F has five internal fans that provide cooling for the components. All five fans are either on or off, depending on control signals from sensors monitoring the router’s internal temperature. Air enters from the intake vent on the right side of the chassis and exits through the exhaust vent on the left side.

Individual fans are not user-replaceable; however, there is sufficient cooling even if one of the fans fails. A minor alarm is raised when one fan fails. If two or more fans fail, a critical alarm is raised and the 7705 SAR-F must be serviced.

Monitoring Temperature

By default, all the fans are turned off until they are turned on by system software. The software controls the fans by monitoring temperature sensors, based on the following criteria.

- Starting early in the system boot-up cycle, the internal system temperature sensor is monitored continually. Fans are turned on when the internal system temperature exceeds +104°F (40°C) and are turned off when the internal temperature drops below +59°F (15°C). These thresholds correspond to an average external air ambient temperature of +68°F (20°C) and +50°F (10°C), respectively.

- During normal operation, three sensors monitor the temperatures of critical internal areas. The fans are turned on if any of these sensors indicate that the internal temperature exceeds +131°F (55°C). Fans remain on until all of the internal sensors indicate that the temperature is equal to or below +86°F (30°C). Also, an overheat alarm is raised if any sensor temperature exceeds +183°F (84°C).
The `show chassis` CLI command displays the fan status as one of the following:

- **up** – all fans are operating
- **minor failure** – one fan has failed
- **critical failure** – two or more fans have failed

The fan speed can be one of the following:

- **full speed** – all fans are on
- **off** – all fans are off

An example of the Fan Information portion of the `show chassis` display is shown below:

<table>
<thead>
<tr>
<th>Fan Information</th>
</tr>
</thead>
<tbody>
<tr>
<td># of on-board fans</td>
</tr>
<tr>
<td>Status</td>
</tr>
<tr>
<td>Speed</td>
</tr>
</tbody>
</table>

### Notes on 7705 SAR-F and 7705 SAR-8

The 7705 SAR-F and the 7705 SAR-8 run the same operating system software. The main difference between the products is their hardware configuration. The 7705 SAR-8 has an 8-slot chassis that supports two CSMs, six adapter cards, and a Fan module. The 7705 SAR-F chassis has a fixed hardware configuration, replacing the 7705 SAR-8 physical components (the CSM, Fan module, and adapter cards) with an all-in-one unit that provides comparable functional blocks, as detailed in Table 3.

The fixed configuration of the 7705 SAR-F means that provisioning the router at the “card slot” and “type” levels is preset and is not user-configurable. Operators begin configurations at the port level.

**Note:** Unless stated otherwise, references to the terms “Adapter card” and “CSM” throughout the 7705 SAR OS documentation set include the equivalent functional blocks on the 7705 SAR-F.
Table 3: 7705 SAR-8 and 7705 SAR-F Comparison

<table>
<thead>
<tr>
<th>Feature</th>
<th>7705 SAR-8</th>
<th>7705 SAR-F</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSM</td>
<td>Control and switching</td>
<td>Control and switching</td>
<td>The control and switching functions include the console and management interfaces, the alarm and fan functions, the synchronization interfaces, system LEDs, and so on.</td>
</tr>
<tr>
<td>Fan module</td>
<td>Integrated with the</td>
<td>Integrated with the</td>
<td></td>
</tr>
<tr>
<td></td>
<td>control and switching</td>
<td>control and switching</td>
<td></td>
</tr>
<tr>
<td>16-port T1/E1 ASAP Adapter card</td>
<td>16 individual T1/E1</td>
<td>16 individual T1/E1</td>
<td>The T1/E1 ports on the 7705 SAR-F are equivalent to a 16-port T1/E1 ASAP Adapter card on the 7705 SAR-8 with additional support for multiple synchronization sources. The 7705 SAR-8 CLI indicates that the MDA type for the T1/E1 ASAP Adapter card is a16-chds1. The 7705 SAR-F supports MDA type a16-chds1v2.</td>
</tr>
<tr>
<td></td>
<td>ports on the faceplate</td>
<td>ports on the faceplate</td>
<td></td>
</tr>
<tr>
<td>8-port Ethernet Adapter card</td>
<td>8 individual Ethernet</td>
<td>8 individual Ethernet</td>
<td>The Ethernet ports on the 7705 SAR-F are equivalent to one 8-port Ethernet Adapter card (version 2) on the 7705 SAR-8 with additional support for multiple synchronization sources. The 7705 SAR-8 CLI indicates that the MDA type for the Ethernet Adapter card is a8-eth or a8-ethv2. The 7705 SAR-F supports MDA type a8-ethv3. Versions 2 and 3 support Synchronous Ethernet timing.</td>
</tr>
<tr>
<td></td>
<td>ports on the faceplate</td>
<td>ports on the faceplate</td>
<td></td>
</tr>
<tr>
<td>Requires user configuration at</td>
<td>Configuration at card</td>
<td>Configuration at card</td>
<td></td>
</tr>
<tr>
<td>card (IOM) and MDA (adapter card)</td>
<td>(IOM) and MDA (adapter card)</td>
<td>(IOM) and MDA (adapter card)</td>
<td>levels is preset and users cannot change these types</td>
</tr>
</tbody>
</table>
SAR System Installation Process

To install the 7705 SAR-F system, perform the installation procedures in the following order:

Step 1. Prepare the site.
Step 2. Unpack the chassis.
Step 3. Rack mount and ground the chassis.
Step 4. Prepare and connect the DC input power cables.
Step 5. Install the SFPs.
Step 6. Power up the system.
Step 7. Connect the network cables.
Step 8. Provision (preconfigure) the system.
Site Preparation

In This Chapter

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

- **Warnings and Notes** on page 48
- **System Specifications** on page 50
  - Chassis Specifications on page 50
  - Environmental Specifications on page 50
  - 7705 SAR-F Power Consumption on page 51
- **Installation Locations** on page 52
  - Chassis Location Requirements on page 52
- **Safety Considerations** on page 54
  - Placement on page 54
  - Grounding on page 54
  - Cabling on page 56
  - Power on page 56
  - Fans on page 57
  - Storage on page 57
  - Compliance on page 57
**Warnings and Notes**

**Dangers:**
- The 7705 SAR-F needs a disconnect device on each power feed (such as an external circuit breaker, switch, or fuse) to disconnect DC power from the router. Disconnect both A and B feeds before servicing.
- Do not assume that power has been disconnected from a circuit. Be sure to disconnect power to the equipment rack and external cables before installing or removing the 7705 SAR-F.
- The 7705 SAR-F uses a fiber-optic communications method and is a Class 1 laser product. Only trained service personnel familiar with laser radiation hazards should install or remove fiber-optic cables and cards in this system.

**Warnings:**
- To properly transport and relocate a 7705 SAR-F chassis, do the following:
  → disconnect power to the chassis by opening the disconnect devices
  → detach all cables from the router
  → if the router is installed in a rack, carefully remove it from the rack
  → repack the router in its original shipping container for relocation
- Do not install equipment that appears to be damaged.
- 7705 SAR-F systems 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.
- This product complies with, and has been CE marked in accordance with, the European Directive 99/05/EC (R&TTE) and 2004/108/EC (EMC).
- Failure to comply with the equipment rack and chassis instructions as outlined in Installation Locations on page 52 and Chassis Location Requirements on page 52 will cause thermal failure.

**Notes:**
- Prepare the equipment rack and site before installing the router. Plan the router placement near the power sources and network interface connections.
- A 7705 SAR-F chassis weighs approximately 7.25 lbs (3.3 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.
Notes: (continued)

- To provide necessary stability, ensure that the equipment rack is bolted to the floor. Ceiling brackets are useful to provide additional stability.
- The equipment rack must be properly grounded.
- Install the chassis in the equipment rack before installing SFPs.
- Maintain a clearance of at least 2.5 in. (6.4 cm) at the front of the router for cable management.
- Maintain a clearance of at least 3 in. (7.6 cm) on each side of the router to ensure adequate air intake and exhaust. When mounting the router in a rack, ensure that the rack complies with all requirements outlined in Chassis Location Requirements on page 52.
- The 7705 SAR-F includes factory-installed, rack-mounting brackets to mount the router in a 19-inch equipment rack.
System Specifications

Chassis Specifications

Table 4: 7705 SAR-F Chassis Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>(1.75 x 17.5 x 9.5 in.) (H x W x D)</td>
</tr>
<tr>
<td>(without mounting brackets)</td>
<td>(4.45 x 44.4 x 25.0 cm)</td>
</tr>
<tr>
<td>Chassis weight</td>
<td>7.25 lbs (3.3 kg)</td>
</tr>
<tr>
<td>Mounting</td>
<td>Mount in a recommended 19-inch equipment rack</td>
</tr>
<tr>
<td></td>
<td>Rack-mount brackets are factory-installed for 19-inch NEBS mounting</td>
</tr>
</tbody>
</table>

Environmental Specifications

Table 5: Environmental Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal operating temperature</td>
<td>-40 to 149°F (-40 to +65°C)</td>
</tr>
<tr>
<td>Cold start temperature</td>
<td>-40°F (-40°C)</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>5 to 85% (non-condensing)</td>
</tr>
<tr>
<td>Normal relative humidity</td>
<td>Not to exceed 29 g of water per cubic meter of air</td>
</tr>
<tr>
<td>Altitude range</td>
<td>Between 197 ft (60 m) below sea level and 5906 ft (1800 m) above sea level</td>
</tr>
<tr>
<td></td>
<td>(70kPa to 106kPa)</td>
</tr>
<tr>
<td>Shock and vibration</td>
<td>Very low levels for continuous duration (similar to modern office building, for example)</td>
</tr>
<tr>
<td>Earthquake</td>
<td>Suitable for high risk areas (Zone 4/California, for short duration)</td>
</tr>
<tr>
<td>Pollution degree (1)</td>
<td>2</td>
</tr>
</tbody>
</table>
Table 5: Environmental Specifications (Continued)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage (DC)</td>
<td>-48/-60 VDC (-60 VDC is for various European countries)</td>
</tr>
<tr>
<td></td>
<td>+24 VDC</td>
</tr>
<tr>
<td>Operating voltage range (DC)</td>
<td>-40 to -75 VDC</td>
</tr>
<tr>
<td></td>
<td>+18 to +28 VDC</td>
</tr>
<tr>
<td>Heat dissipation (worst case configuration)</td>
<td>60 W</td>
</tr>
</tbody>
</table>

Note:
1. Pollution degree is as defined in IEC 60950.

7705 SAR-F Power Consumption

Table 6: Component Power Consumption

<table>
<thead>
<tr>
<th>Component</th>
<th>Power (Watts) (conservative estimate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chassis (full load)</td>
<td>60 W</td>
</tr>
</tbody>
</table>
Installation Locations

The 7705 SAR-F is intended to be installed in cell site or other facilities that provide weather protection and an extended temperature-controlled environment. The facilities provide protection from mold growth, pest incursion, and precipitation. The 7705 SAR-F is not intended for installation in outdoor facilities.

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

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

- The rack must be constructed using channel or angle rack uprights that are at least 1.25 in. (3.2 cm) deep, 5 in. (12.7 cm) wide (maximum) (see Figure 8).
- For seismic applications, the rack must be an approved Seismic Frame.
- 7705 SAR-F deployments in closed cabinets are not recommended. If closed cabinets must be used, they must not restrict shelf airflow in any way. Furthermore, they must not cause the shelf inlet bulk air temperatures to rise above those defined in Chassis Location Requirements under worst-case environmental conditions, including any preheating of the cabinet air by other equipment.
- The rail mounting holes in the equipment rack must align with the mounting holes on the chassis mounting brackets. The 7705 SAR-F mounting brackets are factory-installed for a NEBS mount in a 19-inch rack.

Follow the equipment rack manufacturer’s instructions for proper rack installation.

Chassis Location Requirements

Allow at least 3 in. (7.6 cm) clearance on the sides of the chassis for proper airflow and at least 2.5 in. (6.4 cm) in front of the chassis for cable management. See Figure 8.

Warning: Failure to comply with the location requirements outlined in Installation Locations and Chassis Location Requirements will impede proper airflow and will result in thermal failure.
Observe the following requirements when installing the system.

- Ensure that the chassis is located in an area that can provide an average inlet air temperature (bulk air temperature averaged over 1 year) no greater than 104°F (40°C) under full system power loading combined with worst-case environmental deployment conditions.
- Ensure that the 7705 SAR-F system intake is not located immediately adjacent to the exhaust of another chassis such that preheated air above 104°F (40°C) is drawn into the system.
- Ensure that the 7705 SAR-F system intake is not located immediately adjacent to the intake of another chassis such that 7705 SAR-F airflow is restricted in any way.
- Ensure that the inlet and exhaust of the chassis is free of obstructions from cabling, mounting hardware, or other electronic equipment in the areas shown in Figure 8.

**Figure 8: Chassis Clearance Requirements (View from Top)**

![Figure 8: Chassis Clearance Requirements (View from Top)](image)

**Table 7: Chassis Clearance Specifications**

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Front</strong>: 2.5 in. (6.4 cm) required for cable management</td>
</tr>
<tr>
<td>2</td>
<td><strong>Rear</strong>: No clearance required</td>
</tr>
<tr>
<td>3</td>
<td><strong>Side</strong>: 3 in. (7.6 cm) minimum required for airflow</td>
</tr>
<tr>
<td>4</td>
<td><strong>Rack upright</strong>: 5 in. (12.7 cm) maximum required for airflow (solid metal not touching the chassis)</td>
</tr>
</tbody>
</table>
Safety Considerations

Placement

Warnings:
• Install the 7705 SAR-F in recommended equipment racks.
• Install in clean, dry, ventilated, and temperature-controlled rooms.
• Verify that the rack is properly bolted and braced and is properly grounded to a grounding electrode.
• Install the chassis in the equipment rack before installing SFPs.

Grounding

Dangers:
• The router and equipment rack must be properly grounded. Chassis ground cables are not included. Lack of proper grounding (earthing) of the equipment may result in a safety hazard and excessive electromagnetic emissions.
• Before making the chassis ground connection, ensure that all power is OFF from the DC circuit. To switch the power OFF, locate the circuit breaker on the panel board that services the DC circuit and switch the circuit breaker to the OFF position.
  Tip: For extra safety, tape the handle of the circuit breaker in the OFF position.

Warnings:
• Electrostatic discharge (ESD) damage can occur if the router 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-F. Typical ground points include the ground connection point on the front of the 7705 SAR-F, the grounding stud on the 7705 SAR-F mounting bracket, or a properly grounded rack or work bench.
• The 7705 SAR-F includes a chassis ground stud on the mounting bracket attached to the right-hand side of the router (when viewed from the front). The chassis ground must be connected to the building ground, using either a direct connection or a ground bus.
• Do not use the chassis ground wire connection on the chassis ground stud for any other purpose. That is, the washers and nut used to secure the chassis ground wire on the ground stud must only be used for that purpose.
• When wiring the unit, the chassis ground connection must always be made first and disconnected last.
CBN and IBN support

The 7705 SAR-F supports both Common Bonding Networks (CBN) and Isolated Bonding Networks (IBN). 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.

Warnings:

- In an IBN installation, the chassis ground terminal must be connected to ground at the building ground point.
- In a CBN installation, if you use the 7705 SAR-F 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, and that connection must be a single-purpose permanent connection.

For information on grounding the chassis and connecting the DC supply, refer to Chassis Ground Wiring on page 65 and Wiring and Connecting DC Power on page 70.
Cabling

Warnings:

- 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 or Type 4 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 strap, and bus bars must be brought to a bright finish and then coated with an antioxidant before they are connected.
- The 7705 SAR-F is suitable for both DC-I and DC-C power configurations. However, when used in a DC-I configuration, the battery returns must remain isolated until they reach the main power bus.

Power

Dangers:

- Only electrical service personnel should perform wiring and cabling to the system.
- Power cable(s) must meet local electric code requirements.
- All power to the equipment rack or cabinet should be disconnected before the installation.
- An external circuit breaker or fuse with a minimum 5 A and maximum 10 A rating must be located within a readily accessible distance from 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-F.
**DC Power Requirements**

- A means of disconnect must be provided within 10 ft (3 m) of the 7705 SAR-F.
- A circuit breaker or fuse with recommended current rating 5 A (minimum) to 10 A (maximum) must be provided.
- A minimum #18 AWG power conductor must be used for each DC input connection.
- All power cables used on the 7705 SAR-F chassis must meet local safety codes.

**Fans**

The 7705 SAR-F has five fans integrated into the chassis. The fans are not field-replaceable.

The 7705 SAR-F cooling system requires a minimum of 3 in. (7.6 cm) of unrestricted, unobstructed airflow on each side of the chassis to function properly.

**Warning:** Failure to comply with the location requirements outlined in Installation Locations on page 52 and in this section will impede proper airflow and will result in thermal failure.

**Storage**

To store an uninstalled 7705 SAR-F, rewrap the router in its original packaging and keep it in a dry, dust-free, temperature-controlled environment.

**Table 8: Storage Specifications**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage and shipping temperature</td>
<td>From -40° to 158°F (-40° to 70°C)</td>
</tr>
<tr>
<td>Non-condensing relative humidity</td>
<td>Within 5 to 95%</td>
</tr>
</tbody>
</table>

**Compliance**

Refer to Standards and Protocol Support on page 115 for compliance information.
Installing the Chassis

In This Chapter

This chapter provides information on installing a 7705 SAR-F chassis:

- Unpacking the Chassis on page 60
  → Unpacking Precautions on page 60
- Installing the Chassis in a Rack on page 62
  → Rack-Mounting the Chassis on page 62
- Chassis Ground Wiring on page 65
  → Making the Ground Connection on page 65
Unpacking the Chassis

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

Warning: If the 7705 SAR-F is to be relocated at a later time, observe the following warning:

• To properly transport and relocate a 7705 SAR-F chassis, do the following:
  → disconnect power to the chassis by opening the disconnect devices
  → detach all cables from the router
  → if the router is installed in a rack, carefully remove it from the rack
  → repack the router in its original shipping container for relocation

Unpacking Precautions

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

• The shipping weight of the chassis is approximately 7.25 lbs (3.3 kg).
• The chassis is shipped in a heavy corrugated cardboard container protected by foam end caps. Do not discard the packaging container and materials used in shipping. The packing materials should be reused if it is necessary to reship the router.
• Keep the chassis wrapped in the anti-static packaging until you are ready to install the router.
Figure 9 displays the components of a packed 7705 SAR-F chassis.

**Figure 9: Unpacking the 7705 SAR-F Chassis**

![Figure 9: Unpacking the 7705 SAR-F Chassis](image)

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shipping container</td>
</tr>
<tr>
<td>2</td>
<td>7705 SAR-F chassis (wrapped in an anti-static bag)</td>
</tr>
<tr>
<td>3</td>
<td>Foam end caps</td>
</tr>
</tbody>
</table>

**Table 9: Unpacking the 7705 SAR-F Chassis**

*Note:* Wear an anti-static wrist strap 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 foam end caps on the sides of the router.

**Step 3.** Remove the protective anti-static wrapping when you are ready to install the router.
Installing the Chassis in a Rack

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

Warnings:

• 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-F. Typical ground points include the ground connection point on the front of the 7705 SAR-F, the grounding stud on the 7705 SAR-F mounting bracket, or a properly grounded rack or work bench.

• Failure to comply with the location requirements outlined in Installation Locations on page 52 and Chassis Location Requirements on page 52 will impede proper airflow and will result in thermal failure.

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

Rack-Mounting the Chassis

The 7705 SAR-F chassis is designed for installation in a 19-inch rack. The rack-mount brackets are factory-installed. Figure 10 illustrates the installation of the chassis in a rack.
Figure 10: Installing the 7705 SAR-F Chassis in a Rack

Table 10: Rack-Mounting the 7705 SAR-F Chassis

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Equipment rack</td>
</tr>
<tr>
<td>2</td>
<td>Rack-mounting screws</td>
</tr>
<tr>
<td>3</td>
<td>7705 SAR-F chassis</td>
</tr>
<tr>
<td>4</td>
<td>Rack-mounting bracket</td>
</tr>
</tbody>
</table>
Before you begin, verify that:

- the equipment rack is securely installed, anchored, and grounded. Refer to the rack manufacturer’s documentation for instructions.
- the power to the rack is **OFF**

Required tools:

- a Phillips screwdriver

To install the chassis in the rack:

**Step 1.** Lift the 7705 SAR-F 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 on page 65.
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-F chassis ground stud located on the right-hand side mounting bracket must be a single-purpose permanent connection to the earth (building) ground point. Therefore, the connection requires its own nut and washer.

Notes:

- 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-F 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/yellow)

Figure 11: Preparing the Ground Wire
Table 11: Ground Wire Descriptions

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Copper ground wire with green/yellow shield (minimum #18 AWG)</td>
</tr>
<tr>
<td>2</td>
<td>Insulation stripped according to local safety code</td>
</tr>
<tr>
<td>3</td>
<td>Ring lug</td>
</tr>
</tbody>
</table>

Figure 12: Attaching the Chassis Ground Connector

Table 12: Chassis Ground Connection

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lance</td>
</tr>
<tr>
<td>2</td>
<td>Cable tie</td>
</tr>
<tr>
<td>3</td>
<td>Chassis ground stud</td>
</tr>
<tr>
<td>4</td>
<td>Keps nut</td>
</tr>
<tr>
<td>5</td>
<td>Star washer</td>
</tr>
<tr>
<td>6</td>
<td>Ring lug and chassis ground wire (green/yellow)</td>
</tr>
</tbody>
</table>
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. When routing the cable, ensure that there is enough extra wire to form a service loop at the chassis end in order to facilitate maintenance.

**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 11).

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

**Step 4.** Place a star washer and the ring lug on the ground stud such that the wire is angled slightly as it runs down the rack upright (Figure 12). Secure the lug with the Keps nut. Tighten the nut to a torque of 8-10 lbf-in maximum. Do not over-tighten.

**Step 5.** Use a cable tie to secure the ground wire to the lance on the mounting bracket.

**Step 6.** Form a service loop with the extra wire and secure it to a convenient place (for example, a rack upright).

**Step 7.** 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 8.** Connect the 7705 SAR-F to the DC power source. See [DC Power Connections on page 69](#).
Installing the Chassis
In This Chapter

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

- Wiring and Connecting DC Power on page 70
  → Warnings and Notes on page 70
- DC-Input Power Connections on page 71
  → Wiring the DC Inputs on page 71
Wiring and Connecting DC Power

Warnings and Notes

Dangers:

- Only qualified personnel should install or replace this equipment.
- Confirm that the DC power source is OFF during installation. The power source should be a safety extra-low voltage (SELV) source.
- Turn OFF power at the power source before you install or remove power cables or cords.
- The unit 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 must be provided in the DC branch, either a circuit breaker or switch that can be employed to disconnect power to the system during servicing.
- 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.

Warnings:

- 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-F. Typical ground points include the ground connection point on the front of the 7705 SAR-F, the grounding stud on the 7705 SAR-F mounting bracket, or a properly grounded rack or work bench.
- For IBN installations, the battery return terminal(s) on the SAR-F must always be connected to the building ground at the power source. For redundant supply configurations, separate battery return wires must be used.
- For CBN installations, the battery return terminal should be connected to chassis ground at the chassis or frame.

Notes:

- The 7705 SAR-F requires a minimum of one DC power source to operate, but using two DC power sources is recommended for redundancy.
- The 7705 SAR-F 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 strap, and bus bars must be brought to a bright finish and then coated with an antioxidant before connecting them.
DC-Input Power Connections

Dangers:

- Ensure that all power is OFF from the DC circuit. 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, you can tape the handle of the circuit breaker in the OFF position.
- When wiring the unit, the chassis ground connection must always be made first and disconnected last.

Wiring the DC Inputs

The 7705 SAR-F has a standard, dual-feed, 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 power cables to the terminal block, attach a ring lug to each power cable at the router end, as shown in Figure 13.

Figure 13: Attaching a Ring Lug to a Power Cable

Table 13: Ring Lug to Power Cable Descriptions

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Copper wire (minimum #18 AWG)</td>
</tr>
<tr>
<td>2</td>
<td>Insulation stripped according to local safety code</td>
</tr>
<tr>
<td>3</td>
<td>Ring lug</td>
</tr>
</tbody>
</table>
Figure 14 and Figure 15 show the terminal connections for -48 VDC and +24 VDC installations.

Figure 14: Wiring the -48 VDC Power Supplies

Figure 15: Wiring the +24 VDC Power Supplies
Required tools and hardware:

- two or four lengths of wire (#18 AWG minimum) (two lengths per supply)
- torque driver for slot screws

### For -48 VDC installations

Follow these steps to wire and connect -48 VDC power feeds (see Figure 14):

**Step 1.** Make the battery return ground connection(s) (Figure 14, key item 7). To make the connection:

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

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

c) Prepare the end of the wire at the router by attaching a ring lug (see Figure 13).

d) Attach the battery return wire to the correct battery return terminal on the router. For -48 VDC systems, use the +Batt terminal. Tighten to a torque of 8-10 lbf-in maximum.

e) For redundant supply configurations, repeat this step for the other battery return wire.

**Step 2.** Make the battery connection(s) to the disconnect device (Figure 14, key item 3). To make the connection:

a) Run a length of wire from the disconnect device to the router. Prepare the router end of the wire by attaching a ring lug (see Figure 13). Prepare the wire at the disconnect device according to local safety practices.

---

Table 14: Wiring the DC Power Supplies Descriptions

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7705 SAR-F chassis</td>
</tr>
<tr>
<td>2</td>
<td>Terminal strip with protective cover</td>
</tr>
<tr>
<td>3</td>
<td>Disconnect device</td>
</tr>
<tr>
<td>4</td>
<td>DC source A</td>
</tr>
<tr>
<td>5</td>
<td>DC source B</td>
</tr>
<tr>
<td>6</td>
<td>Battery wire</td>
</tr>
<tr>
<td>7</td>
<td>Battery return wire</td>
</tr>
</tbody>
</table>

---
b) Attach the battery wire to the correct battery terminal on the router. For -48 VDC systems, use the -Batt terminal. Tighten to a torque of 8-10 lbf-in maximum.

c) Attach the battery wire to the disconnect device.

d) For redundant supply configurations, repeat this step for the other battery wire.

**Step 3.** Check that the DC supply wiring is correct.

**Step 4.** Install the SFPs. See SFPs on page 75.

---

**For +24 VDC installations**

Follow these steps to wire and connect +24 VDC power feeds (see Figure 15):

**Step 1.** Make the battery return ground connection(s) (Figure 15, key item 7). To make the connection:

a) Run a length of wire from the power source negative terminal to the terminal strip on the router.

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

c) Prepare the end of the wire at the router by attaching a ring lug (see Figure 13).

d) Attach the battery return wire to the correct battery return terminal on the router. For +24 VDC systems, use the -Batt terminal. Tighten to a torque of 8-10 lbf-in maximum.

e) For redundant supply configurations, repeat this step for the other battery return wire.

**Step 2.** Make the battery connection(s) to the disconnect device (Figure 15, key item 3). To make the connection:

a) Run a length of wire from the disconnect device to the router. Prepare the router end of the wire by attaching a ring lug (see Figure 13). Prepare the wire at the disconnect device according to local safety practices.

b)Attach the battery wire to the correct battery terminal on the router. For +24 VDC systems, use the +Batt terminal. Tighten to a torque of 8-10 lb-in maximum.

c) Attach the battery wire to the disconnect device.

d) For redundant supply configurations, repeat this step for the other battery wire.

**Step 3.** Check that the DC supply wiring is correct.

**Step 4.** Install the SFPs. See SFPs on page 75.
In This Chapter

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

- Installing and Removing SFPs on page 76
  → Warnings and Notes on page 76
  → SFPs on page 77
  → Fiber Cable Preparation on page 78
  → Locking and Release Mechanisms on page 78
  → SFP Support on page 79
  → Installing SFPs on page 80
  → Removing SFPs on page 80
Installing and Removing SFPs

The 7705 SAR-F supports two small form-factor pluggable (SFP) modules for Ethernet connections.

Warnings and Notes

Dangers:

- Invisible laser radiation can be emitted from the aperture of Ethernet port 7 or 8 or from an installed SFP module when no cable is connected. Avoid exposure and do not stare into open apertures.
- Always assume that fiber-optic cables are connected to a light source.
- Only trained and qualified personnel should install or replace this equipment.
- Use of procedures other than those specified in this Installation Guide can result in hazardous radiation exposure.

Warnings:

- 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-F. Typical ground points include the ground connection point on the front of the 7705 SAR-F, the grounding stud on the 7705 SAR-F 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-F.
- Before using the optics on the 7705 SAR-F, 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.
- Make sure optical ports on the 7705 SAR-F are protected by a protective plug when there is no SFP installed in the port. Only remove the plug when you are ready to install an SFP.
- Make sure 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.
- Avoid bending fiber-optic cable beyond its minimum bend radius. Do not exceed the recommended 1.2 inches (3.0 cm) for fiber-optic cables.
SFPs

A small form-factor pluggable (SFP) module can be installed in Ethernet ports 7 and 8. Figure 16 illustrates the installation of an SFP.

Refer to SFP Support on page 79 for a list of SFPs supported by the router.

Figure 16: Installing an SFP

Cautions:

• Make sure 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.

Notes:

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


## Fiber Cable Preparation

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

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

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

**Caution:** Improper handling, cleaning, and inspection techniques can compromise the fiber connection, resulting in data transmission errors. Refer to Alcatel-Lucent’s Online Support Documentation Service (OSDS) (http://www.alcatel-lucent.com/support) for the Optical Handling Reference Guide.

### 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 of the SFP that you press inward to release the module

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SFP receptacle</td>
</tr>
<tr>
<td>2</td>
<td>SFP</td>
</tr>
</tbody>
</table>
SFP Support

Table 16 lists the Alcatel-Lucent approved SFPs for the 7705 SAR-F.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Short Description</th>
<th>Ports</th>
<th>Media</th>
<th>Wavelength</th>
<th>Connector Type</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>3HE00062AA</td>
<td>PBA GigE TX SFP Copper Module (1000BASE-T, Category 5, 10/100/1000 Mbps)</td>
<td>1</td>
<td>Copper</td>
<td>N/A</td>
<td>RJ-45</td>
<td>100 m</td>
</tr>
<tr>
<td>3HE00027AA</td>
<td>PBA GigE SX SFP Optics Module - LC (1000BASE-SX)</td>
<td>1</td>
<td>Fiber</td>
<td>850 nm</td>
<td>LC</td>
<td>220 m</td>
</tr>
<tr>
<td>3HE00028AA</td>
<td>PBA GigE LX SFP Optics Module - LC (1000BASE-LX)</td>
<td>1</td>
<td>Fiber</td>
<td>1310 nm</td>
<td>LC</td>
<td>10 km</td>
</tr>
<tr>
<td>3HE00867AA</td>
<td>KIT GigE EX SFP Optics Module - LC (1000BASE-EX)</td>
<td>1</td>
<td>Fiber</td>
<td>1310 nm</td>
<td>LC</td>
<td>40 km</td>
</tr>
<tr>
<td>3HE00029AA</td>
<td>PBA GigE ZX SFP Optics Module - LC (1000BASE-ZX)</td>
<td>1</td>
<td>Fiber</td>
<td>1550 nm</td>
<td>LC</td>
<td>70 km</td>
</tr>
<tr>
<td>3HE01389AA</td>
<td>GigE EZX SFP Optics Module - LC (1000BASE-EZX)</td>
<td>1</td>
<td>Fiber</td>
<td>1550 nm</td>
<td>LC</td>
<td>120 km</td>
</tr>
<tr>
<td>3HE00024AA</td>
<td>PBA 100FX SFP Optics Module - LC</td>
<td>1</td>
<td>Fiber</td>
<td>1310 nm</td>
<td>LC</td>
<td>400 m(1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 km (2)</td>
</tr>
<tr>
<td>3HE01454AA</td>
<td>100FX SFP Optics Module - SM - LC 100BASE-FX Single Mode</td>
<td>1</td>
<td>Fiber</td>
<td>1310 nm</td>
<td>LC</td>
<td>40 km</td>
</tr>
</tbody>
</table>

Notes:
1. Half duplex, multimode fiber.
2. Full duplex, multimode fiber.
Installing SFPs

To install an SFP:

Step 1. Remove the SFP from the packaging and place it on a flat 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 SFPs

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

• a replacement SFP or protective plug for the empty Ethernet port
• a protective plug for the SFP
• a dust cover for the fiber cable connector
• an anti-static mat or electrostatic bag

To remove an SFP:

Step 1. Disconnect the cable from the SFP connector.
Step 2. Release the locking mechanism on the SFP with your thumb and forefinger. See Locking and Release Mechanisms on page 78 for descriptions of the different SFP lock and release methods. Slide the SFP out of the port.
Step 3. Place the SFP on an anti-static mat or in an electrostatic bag.
Step 4. Install a replacement SFP or insert a protective plug into the Ethernet port.
Step 5. Connect the fiber or copper cable, or insert a protective plug into the optical port and place a dust cover on the fiber cable connector.
Connecting Cables

In This Chapter

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

- Warnings and Notes on page 82
- Making Cable Connections to Ports on page 83
  → Warnings and Notes on page 83
- Cable Connections on page 84
  → Ethernet and Copper Cables on page 84
  → Fiber Cables on page 85
  → Shield Ground Connections on page 86
- Making External Synchronization Connections on page 87
  → Connecting an External Synchronization Input on page 87
  → Providing an External Synchronization Output on page 87
- Making External Alarm Connections on page 88
  → Connecting an External Alarm on page 89
- Making Router Management Connections on page 90
Warnings and Notes

Dangers:

• Only trained and qualified personnel should install or replace this equipment.
• Use of procedures other than those specified in this Installation Guide can result in hazardous radiation exposure.
• Invisible laser radiation can be emitted from an optical port aperture when no cable is connected. Avoid exposure and do not stare into open apertures.

Warnings:

• 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-F. Typical ground points include the ground connection point on the front of the 7705 SAR-F, the grounding stud on the 7705 SAR-F 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-F.

Note: Services cannot be configured until the ports are configured.
Making Cable Connections to Ports

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

Notes:

- Ensure 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.

Warnings and Notes

Dangers:

- Only trained and qualified personnel should install or replace this equipment.
- Invisible laser radiation can be emitted from an optical port aperture when no cable is connected. Avoid exposure and do not stare into open apertures.

Warnings:

- Electrostatic discharge (ESD) damage can occur if the 7705 SAR-F 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-F. Typical ground points include the ground connection point on the front of the 7705 SAR-F, the grounding stud on the 7705 SAR-F mounting bracket, or a properly grounded rack or work bench.
- Do not power up a 7705 SAR-F until all SFPs are installed and verified as having been installed correctly.
- Use only approved small form-factor pluggable (SFP) fiber-optic devices.
Cable Connections

Ethernet and Copper Cables

Figure 17 illustrates how Ethernet and copper wire cables are routed on the 7705 SAR-F. Cables can be routed to the left or the right of the chassis.

Figure 17: Managing Cable Connections

Hardware required:

- cable ties (optional)

To attach Ethernet and copper wire cables:

**Step 1.** Attach the cable to the port connector on the front of the 7705 SAR-F.

**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 attached equipment.
Fiber Cables

Warnings:

- 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 90° 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 17). 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.

![Warning: Fiber cables are sensitive to bending, twisting and general over-exertion. Extreme caution is recommended when handling fiber cable.]

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 attached 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 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-F provides 1.0/2.3 coaxial connectors for external synchronization input and output. Figure 18 shows the location of the Sync In and Sync Out connectors.

Figure 18: External Synchronization Input and Output Connectors

Table 17: External Synchronization Input and Output Features

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sync In Connector</td>
</tr>
<tr>
<td>2</td>
<td>Sync Out Connector</td>
</tr>
</tbody>
</table>

Hardware required:

- coaxial cable with 1.0/2.3 coaxial connector

Connecting an External Synchronization Input

To connect an external synchronization source input to the router:

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

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

Providing an External Synchronization Output

To provide an external synchronization source output from the router:

**Step 1.** Attach one end of the synchronization cable to the Sync Out connector on the 7705 SAR-F.
Step 2. Attach the other end of the synchronization cable to the device requiring a synchronization source.

Making External Alarm Connections

The 7705 SAR-F provides a DB15 female connector for external alarm connections. The input and output ratings are 5 VDC and 100 mA (source or sink).

The External Alarms interfaces are equipped with relays that can be used to trigger external alarm indicators. They also provide inputs that can be used to trigger the generation of alarms on the 7705 SAR-F that indicate environmental or external alarm conditions. Refer to External Alarms Port Pinouts on page 111 for pinout definitions.

Figure 19 shows the location of the External Alarms connector. Figure 20 shows the pin numbers. See External Alarms Port on page 110 for pinout designations.

Hardware required:

- appropriate cable with DB15 male connector at the router end and customized connector at external device(s) end
Connecting an External Alarm

To connect an external alarm to the router:

**Step 1.** Design the external alarm circuitry using the input and output pin assignments provided in External Alarms Port on page 110.

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

**Step 3.** Attach the DB15 male connector end of the cable to the router.
Making Router Management Connections

Refer to Establishing Router Management Connections on page 95 for detailed information.
Initializing and Provisioning

In This Chapter

This chapter provides information about initializing and provisioning the router:

- Powering Up the Router on page 92
  → Power-Up and Initialization on page 92
  → Troubleshooting Initial Startup on page 93
- Establishing Router Management Connections on page 95
  → Console Connection on page 95
  → Telnet Connection on page 96
  → Running Telnet on page 97
- Provisioning the 7705 SAR-F on page 98
Powering Up the Router

Complete the steps in Wiring the DC Inputs on page 71 and SFPs on page 75 before proceeding with the following instructions. Then power up the system and verify the LED activity of all components.

The primary copy of the 7705 SAR-F TiMOS software is located on the compact flash memory device that is factory-installed. The compact flash device is not user-accessible or field-replaceable.

Notes:

• The DC-powered 7705 SAR-F does not have a power switch or circuit breaker. The system is powered on by applying power from the DC power source. Typically, this is done via a circuit breaker or a disconnect device.
• Configurations and executable software can be stored on the compact flash memory device or at an FTP file location.
• You must have a console or Telnet connection to communicate with and provision the 7705 SAR-F. See Establishing Router Management Connections on page 95.

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.

The Power LED should be blue, and the Bat A and Bat B LEDs should be green. If only one DC power source is used, only one Bat LED should be lit.

Step 2. Verify that the system is initializing.

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

If the LEDs do not operate as described above, or if they blink and turn off, refer to Troubleshooting Initial Startup on page 93.
Step 3. Verify the operational status of the ports by checking the LEDs on the front of the router. Refer to 7705 SAR-F Connectors and LEDs on page 102.

Step 4. After verifying the LEDs, establish communication with the router via the Console port. Refer to Console Connection on page 95.

Step 5. (Optional at this time) Assign an IP address to the router. Refer to Telnet Connection on page 96 for quick reference information and to 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 on page 96 for quick reference information and to the 7705 SAR OS Basic System Configuration Guide for detailed information.

Troubleshooting Initial Startup

If the system cannot load or cannot find the boot.ldr file on the compact flash memory device (cf3), the system will reboot continuously in an attempt to successfully find and load the boot.ldr file. If this happens, the 7705 SAR-F should be replaced and the faulty router returned to Alcatel-Lucent. The example below displays the output when the boot.ldr file cannot be found.

Example: Rebooting display

Rebooting...
Alcatel-Lucent 7705 Boot ROM. Copyright 2007 Alcatel-Lucent.
All rights reserved. All use is subject to applicable license agreements.
Version: 0x20
Performing Data Bus Test... Passed.
Performing Local RAM Test (1st 2MB)... Passed.
COLD boot on processor #1
CPLD revision is 0x0C
?Preparing for jump to RAM...
Starting bootrom RAM code...
Bootrom version is v32 (0x20)
CPU BIST check passed.
Validating SDRAM from 0x41f00000 to 0x42000000
Testing SDRAM from 0x02200000 to 0x41f00000
Testing Compact Flash ... OK (SMART CF)
CPLD revision is v12 (0x0c)
Board Serial Number is 'NS083140278'
Chassis Serial Number is 'NS083140278'
Searching for boot.ldr on local drives:
Searching cf3 for boot.ldr...
Error - file boot.ldr not found on any drive
Please insert CF containing boot.ldr. Rebooting in 5 seconds.
When the system finds the `boot.ldr` file, the system processes the initialization parameters from the BOF (boot option file). 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 21 displays the compact flash directory structure and file names.

**Figure 21: Files on the Compact Flash**

Files on the compact flash are:

- `bof.cfg` — Boot option file
- `boot.ldr` — Bootstrap software
- `config.cfg` — Default configuration file
- `TiMOS-m.n.Yz`:
  - `m` — Major release number
  - `n` — minor release number
  - `Y`:  
    - `A` — Alpha release
    - `B` — Beta release
    - `M` — Maintenance release
    - `R` — Released software
  - `z` — Version number
- `both.tim` — Application software file
Establishing Router Management Connections

There are two ways to access management of the 7705 SAR-F:

- Console connection
- Telnet connection

Console Connection

The console connector on the front of the 7705 SAR-F is a male DB9 connector (see Figure 22). 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 18
- a standard serial cable with a female DB9 connector

For pinout information, refer to Console Port Pinouts on page 110.

Table 18: Console Port Default Settings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baud Rate</td>
<td>115 200</td>
</tr>
<tr>
<td>Data Bits</td>
<td>8</td>
</tr>
<tr>
<td>Parity</td>
<td>None</td>
</tr>
<tr>
<td>Stop Bits</td>
<td>1</td>
</tr>
<tr>
<td>Flow Control</td>
<td>None</td>
</tr>
</tbody>
</table>

Figure 22: Console Port Connection
To establish a console connection:

**Step 1.** Connect the terminal to the Console port on the front panel (Figure 22) using a serial 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`.

---

**Telnet Connection**

Telnet access via a connection to the Management port provides the same options for user and administrator access as those available through the console port. 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
- the Management port (see Figure 23) has been configured using the `bof>address` command (see **CLI Syntax** below)

**CLI Syntax:**

```
bof
address ip-prefix/ip-prefix-length
```

where:

- `ip-prefix` is of the form `a.b.c.d`
- `ip-prefix-length` is 0 to 32

For more information about configuring router parameters, refer to the 7705 SAR OS Router Configuration Guide. For pinout information, refer to Management Port Pinouts on page 109.

---

**Figure 23: Management Port Connection**
Running Telnet

After the Ethernet Management port IP address is configured, the 7705 SAR-F 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.
Provisioning the 7705 SAR-F

The 7705 SAR-F does not require provisioning at the card or MDA levels because it is provisioned at the factory with the following permanent configuration:

- card type in slot 1 is csm-1g with iom-1g
- mda type in slot 1/1 is a16-chds1v2 (for T1/E1 ports)
- mda type in slot 1/2 is a8-ethv3 (for Ethernet ports)

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

```
ALA-12#show card
===============================================================================
Card State
===============================================================================
<table>
<thead>
<tr>
<th>Slot/</th>
<th>Provisioned</th>
<th>Equipped</th>
<th>Admin</th>
<th>Operational</th>
<th>Num</th>
<th>Num Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Id</td>
<td>Type</td>
<td>Type</td>
<td>State</td>
<td>State</td>
<td>Ports</td>
<td>MDA</td>
</tr>
</tbody>
</table>
---------------------------------------------------------------------
| 1     | iom-1g      | iom-1g   | up    | up          | 2   |              |
| 1/1   | a16-chds1v2 | a16-chds1v2 | up    | up          | 16  |              |
| 1/2   | a8-ethv3    | a8-ethv3 | up    | up          | 8   |              |
| A     | csm-1g      | csm-1g   | up    | up          |     | Active       |
---------------------------------------------------------------------
ALA-12#
```

Example

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

```
ALU-1>config# info
----------------------------------------------
echo "Card Configuration"
#---------------------------------------------
  card 1
    card-type iom-1g
    mda 1
      mda-type a16-chds1v2
    exit
  mda 2
    mda-type a8-ethv3
  exit
exit
----------------------------------------------
ALU-1>config#
```
T1/E1 and Ethernet Port Identifiers

Table 19 shows the CLI identifiers for the interface ports.

<table>
<thead>
<tr>
<th>Port Type</th>
<th>CLI Identifier</th>
<th>Variable Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1/E1</td>
<td>1/1/\textit{port_id}</td>
<td>$\textit{port_id}$ is the port number, from 1 to 16</td>
</tr>
<tr>
<td>Ethernet</td>
<td>1/2/\textit{port_id}</td>
<td>$\textit{port_id}$ is the port number, from 1 to 8</td>
</tr>
</tbody>
</table>

To configure ports, refer to the Card and Port Configuration section of the 7705 SAR OS Interface Configuration Guide.
Appendix A: 7705 SAR-F
Connectors and LEDs

In This Chapter

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

- 7705 SAR-F Connectors and LEDs on page 102
7705 SAR-F Connectors and LEDs

Figure 24 identifies the connectors and LEDs on the front of the router.

Table 20 describes the connectors and LEDs on the 7705 SAR-F.

<table>
<thead>
<tr>
<th>Key</th>
<th>Label/Part</th>
<th>Subcategory</th>
<th>Description</th>
</tr>
</thead>
</table>
| 1   | Alarm LEDs | Critical    | **Red:** Indicates that a critical condition exists, such as the failure of two or more fans or a power feed  
*Unlit:* Indicates that there are no critical alarm conditions  
Major | **Red:** Indicates that a serious condition exists, such as an over-temperature condition or a full compact flash device  
*Unlit:* Indicates that there are no major alarm conditions  
Minor | **Amber:** Indicates that a minor condition exists, such as the failure of a single fan  
*Unlit:* Indicates that there are no minor alarm conditions  |
| 2   | Pwr LED    |             | **Blue:** Indicates that power to the router is on and the system is receiving the DC power feed from source A or source B, and the power rails are at their proper levels  
*Unlit:* Indicates that there is no power to the router, or the power is faulty |
Appendix A: 7705 SAR-F Connectors and LEDs

### Table 20: 7705 SAR-F Connector and LED Descriptions (Continued)

<table>
<thead>
<tr>
<th>Key</th>
<th>Label/Part</th>
<th>Sub category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Stat (Status) LED</td>
<td>—</td>
<td>The system status 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, and the Ethernet ports functional block). Blocks that are administratively shut down are not included in the combined status indicated by this LED. <strong>Green (solid):</strong> Indicates that the system is operationally up, which means that all functional blocks configured to be administratively up are operationally up <strong>Green (blinking):</strong> Indicates that one or more functional blocks is initializing <strong>Amber:</strong> Indicates that one or more functional blocks is operationally down but administratively up, or that hardware is booting up <strong>Unlit:</strong> Indicates that there is no power getting to the system</td>
</tr>
</tbody>
</table>
| 4   | ACO/LT Push Button | — | The Audible Alarm Cutoff/Lamp Test button verifies LED operation and turns off the external alarm control bits. **When pressed:** The Lamp Test is enabled and the following LED activity occurs:  
  • the status LED on the chassis glows green  
  • all T1/E1 port LEDs glow green  
  • critical and major Alarm LEDs glow red and the minor Alarm LED glows amber  
  Note: The following LEDs are not affected by the Lamp Test: Management port LEDs, Battery A/B LEDs, and all Ethernet port LEDs. **When released:** All LEDs except the Alarm LEDs return to their pre-Lamp Test state. The Alarm LEDs turn off and stay unlit until the next new alarm condition. |
| 5   | External Alarms Connector | | The External Alarms port is a serial port that uses a DB15 female connector. It can receive input signals from four external alarm devices and provide output signals through three sets of contacts. Refer to External Alarms Port on page 110 for pinout assignments. |
Appendix A: 7705 SAR-F Connectors and LEDs

Table 20: 7705 SAR-F Connector and LED Descriptions (Continued)

<table>
<thead>
<tr>
<th>Key</th>
<th>Label/Part</th>
<th>Subcategory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Mgmt Port</td>
<td>Connector</td>
<td>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 and full duplex modes and 10M/100M or autonegotiated communication. Refer to Management Port on page 108 for pinout assignments.</td>
</tr>
<tr>
<td></td>
<td>LEDs</td>
<td></td>
<td>The Link LED is located in the top left corner of the port and the Activity LED is located in the top right corner.</td>
</tr>
</tbody>
</table>
|     | Link       |             | **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(ivity) |             | **Green:** Indicates that there is a valid communications link  
|     |            |             | **Unlit:** Indicates that there is no communications link, or that the link is operationally down or disabled or shut down  
|     |            |             | Note: The Activity LED is not affected by a Lamp Test |
| 7   | Console    | Connector   | The console port has a DB9 male 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 on page 109 for pinout assignments. Use an EIA/TIA-232 DTE console cable to connect a terminal to the console port. The factory default baud rate is 115.2 KBAud and can be reconfigured for 9.6, 19.2, 38.4, or 57.6 KBAud. |
| 8   | Sync       | In          | The “In” synchronization port has a 1.0/2.3 coaxial connector that can be used to receive an external synchronization input signal. |
|     |            | Out         | The “Out” synchronization port has a 1.0/2.3 coaxial connector that can be used to provide an external synchronization output signal. |
| 9   | T1/E1 Ports| RJ-45 connectors | Each T1/E1 port has an RJ-45 connector for attaching user devices. Note: the yellow LED in the top right corner of the connector is not used and is always off. |
|     | 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 but there is an alarm)  
|     |            |             | **Unlit:** Indicates that the port is disabled or shut down |
**Table 20: 7705 SAR-F Connector and LED Descriptions (Continued)**

<table>
<thead>
<tr>
<th>Key</th>
<th>Label/Part</th>
<th>Subcategory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Ethernet Ports</td>
<td>RJ-45 connectors</td>
<td>Six Ethernet ports have an RJ-45 connector for attaching user devices. The RJ-45 port number (1 through 6) is displayed below the port, between the Link and the Act(ivity) silkscreen labels.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Link LED</td>
<td><strong>Green:</strong> Indicates that the link is up</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Unlit:</strong> Indicates that there is no link, or that the link is operationally down, disabled or shut down</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Act LED</td>
<td><strong>Amber (blinking):</strong> Indicates that the port is active (receiving or transmitting)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Unlit:</strong> Indicates that the port is down or disabled</td>
</tr>
<tr>
<td></td>
<td>SFP connectors</td>
<td>Link LED</td>
<td><strong>Green:</strong> Indicates that a valid communication link has been established</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Unlit:</strong> Indicates that the link is disabled or shut down, or that the SFP optics are installed but no link is present, or that there is no SFP installed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Act LED</td>
<td><strong>Amber (blinking):</strong> Indicates that the port is active (receiving or transmitting)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Unlit:</strong> Indicates that there is no port activity</td>
</tr>
<tr>
<td>11</td>
<td>+BattA/-BattA</td>
<td>Connector</td>
<td>The power connector is a standard terminal block with dual power feeds for redundant DC supplies.</td>
</tr>
<tr>
<td></td>
<td>+BattB/-BattB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Batt A</td>
<td>LEDs</td>
<td><strong>Green:</strong> Indicates that DC input power is present and operational.</td>
</tr>
<tr>
<td></td>
<td>Batt B</td>
<td></td>
<td><strong>Unlit:</strong> Indicates that the DC power supply is not installed or the DC power feed is not connected</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Note: The Batt A and Batt B LEDs are not affected by a Lamp Test</td>
</tr>
<tr>
<td>13</td>
<td>Anti-static Wrist Strap Connector</td>
<td>Connector</td>
<td>The wrist-strap connector is a banana jack that provides a grounding point for personnel working on the 7705 SAR-F.</td>
</tr>
<tr>
<td>14</td>
<td>Chassis Ground Stud</td>
<td>Threaded stud</td>
<td>The chassis ground stud allows a direct connection to the building ground for the chassis ground point.</td>
</tr>
</tbody>
</table>
Appendix B: Pinout Assignments

In This Chapter

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

- 7705 SAR-F Ports on page 108
- Management Port on page 108
  → Management Port Pinouts on page 109
- Console Port on page 109
  → Console Port Pinouts on page 110
- External Alarms Port on page 110
  → External Alarms Port Pinouts on page 111
  → Alarm Examples on page 112
- Ethernet Port on page 112
  → Ethernet Port Pinouts on page 113
- T1/E1 Port on page 113
  → T1/E1 Port Pinouts on page 114
Appendix B: Pinout Assignments

7705 SAR-F Ports

Figure 25 identifies the port connectors that are accessible on the 7705 SAR-F.

![Figure 25: 7705 SAR-F Port Connectors]

Management Port

The Management port supports half and full duplex communication via 10/100 or autonegotiated Ethernet. The Management 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 CAT5 Ethernet cable to connect to the port.

Figure 26 shows the Management port pin numbers.

![Figure 26: Management Port Pin Numbers]
Management Port Pinouts

Table 21 displays the Management port pin assignments

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Direction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TX+</td>
<td>Output</td>
<td>Differential transmit data – positive</td>
</tr>
<tr>
<td>2</td>
<td>TX-</td>
<td>Output</td>
<td>Differential transmit data – negative</td>
</tr>
<tr>
<td>3</td>
<td>RX+</td>
<td>Input</td>
<td>Differential receive data – positive</td>
</tr>
<tr>
<td>4</td>
<td>NC</td>
<td>—</td>
<td>Not connected</td>
</tr>
<tr>
<td>5</td>
<td>NC</td>
<td>—</td>
<td>Not connected</td>
</tr>
<tr>
<td>6</td>
<td>RX-</td>
<td>Input</td>
<td>Differential receive data – negative</td>
</tr>
<tr>
<td>7</td>
<td>NC</td>
<td>—</td>
<td>Not connected</td>
</tr>
<tr>
<td>8</td>
<td>NC</td>
<td>—</td>
<td>Not connected</td>
</tr>
</tbody>
</table>

Console Port

The Console port is a Universal Asynchronous Receiver/Transmitter (UART) port used to configure router and system parameters. It can also be used for monitoring purposes. The Console port is enabled by default and is configured as DTE. The default baud rate is 115 200. This port has a DB9 male connector. Connect the Console port to a terminal using an EIA/TIA-232 serial cable.

Figure 27 shows the Console port pin numbers.
**Console Port Pinouts**

Table 22 displays the Console port pin assignments. The Console port is configured for DTE mode.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Direction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DCD</td>
<td>Input</td>
<td>Data carrier detect</td>
</tr>
<tr>
<td>2</td>
<td>RXD</td>
<td>Input</td>
<td>Receive data</td>
</tr>
<tr>
<td>3</td>
<td>TXD</td>
<td>Output</td>
<td>Transmit data</td>
</tr>
<tr>
<td>4</td>
<td>DTR</td>
<td>Output</td>
<td>Data terminal ready</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>Signal ground</td>
<td>Signal ground</td>
</tr>
<tr>
<td>6</td>
<td>DSR</td>
<td>Input</td>
<td>Data set ready</td>
</tr>
<tr>
<td>7</td>
<td>RTS</td>
<td>Output</td>
<td>Request to send</td>
</tr>
<tr>
<td>8</td>
<td>CTS</td>
<td>Input</td>
<td>Clear to send</td>
</tr>
<tr>
<td>9</td>
<td>RI</td>
<td>Input</td>
<td>Ring indicator</td>
</tr>
</tbody>
</table>

**External Alarms Port**

The External Alarms port provides access to three pairs of alarm output contacts and four alarm inputs. All alarm interfaces are rated for 5 VDC and 100 mA (source or sink). Each alarm input has a fixed severity associated with it—there is one Critical alarm input, two Major alarm inputs, and one Minor alarm input (see Table 23). State transitions on the inputs are debounced for 2 seconds.

The port uses a DB15 female connector. You must provide an appropriate cable configured according to your alarm panel.

You can display the status of the alarm inputs using the `show>chassis>environment` CLI command.
Figure 28 shows the External Alarms port pin numbers.

Figure 28: External Alarms Port Pin Numbers

External Alarms Port Pinouts

Table 23 specifies the External Alarms port connector pinouts.

Table 23: External Alarms Port Pinouts – DB15 Female

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Direction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alarm 1</td>
<td>Input</td>
<td>Critical alarm severity (fixed)</td>
</tr>
<tr>
<td>2</td>
<td>Alarm 2</td>
<td>Input</td>
<td>Major alarm severity (fixed)</td>
</tr>
<tr>
<td>3</td>
<td>nc</td>
<td>—</td>
<td>Not connected</td>
</tr>
<tr>
<td>4</td>
<td>Alarm output 3, pin 2</td>
<td>Output</td>
<td>Contact opens on minor alarm</td>
</tr>
<tr>
<td>5</td>
<td>Alarm output 3, pin 1</td>
<td>Output</td>
<td>Contact opens on minor alarm</td>
</tr>
<tr>
<td>6</td>
<td>nc</td>
<td>—</td>
<td>Not connected</td>
</tr>
<tr>
<td>7</td>
<td>Ground</td>
<td>Reference</td>
<td>Reference output for alarm inputs</td>
</tr>
<tr>
<td>8</td>
<td>nc</td>
<td>—</td>
<td>Not connected</td>
</tr>
<tr>
<td>9</td>
<td>Alarm output 2, pin 2</td>
<td>Output</td>
<td>Contact opens on major alarm</td>
</tr>
<tr>
<td>10</td>
<td>Alarm output 2, pin 1</td>
<td>Output</td>
<td>Contact opens on major alarm</td>
</tr>
<tr>
<td>11</td>
<td>Alarm 3</td>
<td>Input</td>
<td>Major alarm severity (fixed)</td>
</tr>
<tr>
<td>12</td>
<td>Alarm 4</td>
<td>Input</td>
<td>Minor alarm severity (fixed)</td>
</tr>
<tr>
<td>13</td>
<td>nc</td>
<td>—</td>
<td>Not connected</td>
</tr>
</tbody>
</table>
Table 23: External Alarms Port Pinouts—DB15 Female (Continued)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Direction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Alarm output 1, pin 2</td>
<td>Output</td>
<td>Contact closes on critical alarm</td>
</tr>
<tr>
<td>15</td>
<td>Alarm output 1, pin 1</td>
<td>Output</td>
<td>Contact closes on critical alarm</td>
</tr>
</tbody>
</table>

**Alarm Examples**

Table 24 lists critical, major, and minor alarm examples.

Table 24: Alarm Examples

<table>
<thead>
<tr>
<th>Alarm Severity</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical</td>
<td>• two or more fans have failed</td>
</tr>
<tr>
<td></td>
<td>• a power feed has failed</td>
</tr>
<tr>
<td></td>
<td>• a critical external alarm has been detected</td>
</tr>
<tr>
<td>Major</td>
<td>• an over-temperature condition has been detected</td>
</tr>
<tr>
<td></td>
<td>• a major external alarm has been detected</td>
</tr>
<tr>
<td>Minor</td>
<td>• one fan has failed</td>
</tr>
<tr>
<td></td>
<td>• a minor external alarm has been detected</td>
</tr>
</tbody>
</table>

**Ethernet Port**

There are 6 RJ-45 and 2 SFP connectors on the front of the 7705 SAR-F that provide Ethernet access to 8 Ethernet ports.

Use CAT5 (Fast Ethernet) or CAT5E (Gigabit Ethernet) shielded cables to attach customer equipment to the 7705 SAR-F Ethernet ports.

Figure 29 shows the pin numbering.
Ethernet Port Pinouts

Table 25 indicates the pinout assignments.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Direction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TX+</td>
<td>Output</td>
<td>Differential transmit data – positive</td>
</tr>
<tr>
<td>2</td>
<td>TX-</td>
<td>Output</td>
<td>Differential transmit data – negative</td>
</tr>
<tr>
<td>3</td>
<td>RX+</td>
<td>Input</td>
<td>Differential receive data – positive</td>
</tr>
<tr>
<td>4</td>
<td>NC</td>
<td>—</td>
<td>Not connected</td>
</tr>
<tr>
<td>5</td>
<td>NC</td>
<td>—</td>
<td>Not connected</td>
</tr>
<tr>
<td>6</td>
<td>RX-</td>
<td>Input</td>
<td>Differential receive data – negative</td>
</tr>
<tr>
<td>7</td>
<td>NC</td>
<td>—</td>
<td>Not connected</td>
</tr>
<tr>
<td>8</td>
<td>NC</td>
<td>—</td>
<td>Not connected</td>
</tr>
</tbody>
</table>

T1/E1 Port

There are 16 RJ-45 connectors on the front of the 7705 SAR-F that provide 100-ohm T1 or 120-ohm E1 access to 16 ASAP ports.

Use standard RJ-45 cables to attach customer equipment to the 7705 SAR-F T1/E1 ports.
Figure 30 shows the pin numbering.

Figure 30: T1/E1 Port RJ-45 Connector Pin Numbers

T1/E1 Port Pinouts

Table 26 indicates the pinout assignments.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Pair</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>R</td>
<td>Rx Ring</td>
</tr>
<tr>
<td>2</td>
<td>T</td>
<td>Rx Tip</td>
</tr>
<tr>
<td>3</td>
<td>—</td>
<td>Reserved</td>
</tr>
<tr>
<td>4</td>
<td>R1</td>
<td>Tx Ring</td>
</tr>
<tr>
<td>5</td>
<td>T1</td>
<td>Tx Tip</td>
</tr>
<tr>
<td>6</td>
<td>—</td>
<td>Reserved</td>
</tr>
<tr>
<td>7</td>
<td>—</td>
<td>Shield</td>
</tr>
<tr>
<td>8</td>
<td>—</td>
<td>Shield</td>
</tr>
</tbody>
</table>
Standards and Protocol Support

Standards Compliance

IEEE 802.1p/q VLAN Tagging
IEEE 802.3 10BaseT
IEEE 802.3u 100BaseTX
IEEE 802.3x Flow Control
IEEE 802.3z 1000BaseSX/LX

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LDP
RFC 5036 LDP Specification

MPLS
RFC 3031 MPLS Architecture
RFC 3032 MPLS Label Stack Encoding
RFC 4379 Detecting Multi-Protocol Label Switched (MPLS) Data Plane Failures

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

TCP/IP
RFC 768 UDP
RFC 791 IP
RFC 792 ICMP
RFC 793 TCP
RFC 826 ARP
RFC 854 Telnet
RFC 1350 The TFTP Protocol (Rev. 2)
RFC 1812 Requirements for IPv4 Routers

PPP
RFC 1332 PPP IPCP
RFC 1661 PPP
RFC 1662 PPP in HDLC-like Framing
RFC 1989 PPP Link Quality Monitoring
RFC 1990 The PPP Multilink Protocol (MP)

ATM
RFC 2514 Definitions of Textual Conventions and OBJECT_IDENTITIES for ATM Management, February 1999
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**PSEUDOWIRES**
- RFC 4385  Pseudowire Emulation Edge-to-Edge (PWE3) Control Word for Use over an MPLS PSN
- RFC 4446  IANA Allocation for PWE3
- RFC 4447  Pseudowire Setup and Maintenance Using the Label Distribution Protocol (LDP)
- RFC 4448  Encapsulation Methods for Transport of Ethernet over MPLS Networks
- RFC 4553  Structure-Agnostic Time Division Multiplexing (TDM) over Packet (SAToP)
- RFC 4717  Encapsulation Methods for Transport of Asynchronous Transfer Mode (ATM) over MPLS Networks
- RFC 5086  Structure-Aware Time Division Multiplexed (TDM) Circuit Emulation Service over Packet Switched Network (CESoPSN)
- RFC 5085  Pseudowire Virtual Circuit Connectivity Verification (VCCV): A Control Channel for Pseudowires

**RADIUS**
- RFC 2865  Remote Authentication Dial In User Service
- RFC 2866  RADIUS Accounting

**SSH**
- draft-ietf-secsh-architecture.txt  SSH Protocol Architecture
- draft-ietf-secsh-userauth.txt  SSH Authentication Protocol
- draft-ietf-secsh-transport.txt  SSH Transport Layer Protocol
- draft-ietf-secsh-connection.txt  SSH Connection Protocol
- draft-ietf-secsh-newmodes.txt  SSH Transport Layer Encryption Modes

**TACACS+**
- draft-grant-tacacs-02.txt  The TACACS+ Protocol

**SYNCHRONIZATION**
- G.813 Timing characteristics of SDH equipment slave clocks (SEC)
- G.8261 Timing and synchronization aspects in packet networks
- G.8262 Timing characteristics of synchronous Ethernet equipment slave clock
- GR 1244 CORE Clocks for the Synchronized Network: Common Generic Criteria

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- ITU-T X.721: Information technology- OSI-Structure of Management Information
- M.3100/3120  Equipment and Connection Models
- TMF 509/613  Network Connectivity Model
- RFC 1157  SNMPv1
- RFC 1305  Network Time Protocol (Version 3) Specification, Implementation and Analysis
- RFC 1907  SNMPv2-MIB
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- RFC 2572  SNMP-MPD-MIB
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- RFC 2576  SNMP-COMMUNITY-MIB
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- RFC 2819  RMON-MIB
- RFC 2863  IF-MIB
- RFC 2864  INVERTED-STACK-MIB
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- RFC 3273  HCRMON-MIB
- 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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TIMETRA-TC-MIB.mib
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Customer documentation and product support

Customer documentation

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