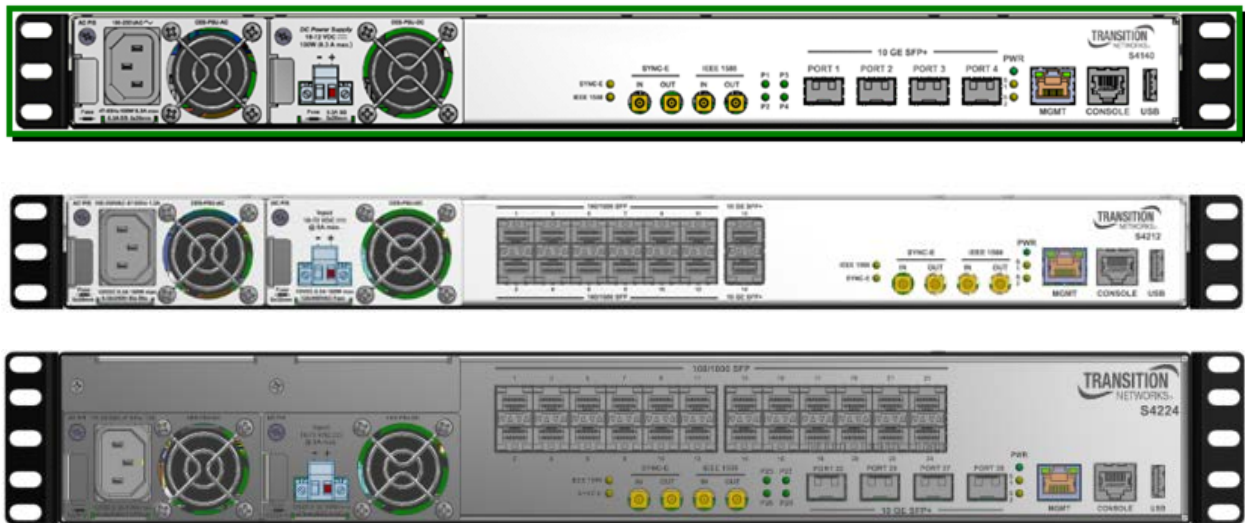




S4140 Carrier Ethernet NID and S4212 & S4224 Ethernet Access / Aggregation Switches



Install Guide

33557 Rev. B

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S4xxx Ethernet Access/Aggregation Switch Install Guide, 33557 Rev. B

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Revision History

| Rev | Date | Description |
|-----|----------|---|
| A | 09/20/13 | Initial release. |
| B | 07/21/15 | Updated to v 2.2 which adds GVRP, Service Activation Tests, DDMI, UDLD, PFC, and Perf- Mon support. |

Cautions and Warnings

Definitions

Cautions indicate that there is the possibility of poor equipment performance or potential damage to the equipment. Warnings indicate that there is the possibility of injury to a person.

Cautions and Warnings appear here and may appear throughout this manual where appropriate. Failure to read and understand the information identified by this symbol could result in poor equipment performance, damage to the equipment, or injury to persons.

Cautions



Do not ship or store devices near strong electrostatic, electromagnetic, magnetic, or radioactive fields.



Caution: When handling chassis Network Interface Devices (NIDs) observe electrostatic discharge precautions. This requires proper grounding (i.e., wear a wrist strap).



Caution: Copper based media ports, e.g., Twisted Pair (TP) Ethernet, USB, RS232, RS422, RS485, DS1, DS3, Video Coax, etc., are intended to be connected to intra-building (*inside plant*) link segments that are not subject to lightning transients or power faults. They are **not** to be connected to inter-building (*outside plant*) link segments that are subject to lightning.



Caution: **Do not** install the NIDs in areas where strong electromagnetic fields (EMF) exist. Failure to observe this caution could result in poor NID performance.



Caution: Read the installation instructions before connecting the chassis to a power source. Failure to observe this caution could result in poor performance or damage to the equipment.



Caution: Only trained and qualified personnel should install or perform maintenance on the S4224. Failure to observe this caution could result in poor performance or damage to the equipment.



Caution: Do not let optical fibers come into physical contact with any bare part of the body since they are fragile, and difficult to detect and remove from the body.



Caution: Do not bend any part of an optical fiber/cable to a diameter that is smaller than the minimum permitted according to the manufacturer's specification (usually about 65 mm or 2.5 in)!

Warnings



Warning: Use of controls, adjustments or the performance of procedures other than those specified herein may result in hazardous radiation exposure.



Warning: Visible and invisible laser radiation when open. **Do not** look into the beam or view the beam directly with optical instruments. Failure to observe this warning could result in an eye injury or blindness.



Warning: DO NOT connect the power supply module to external power before installing it into the chassis. Failure to observe this warning could result in an electrical shock or death.



Warning: Select mounting bracket locations on the chassis that will keep the chassis balanced when mounted in the rack. Failure to observe this warning could allow the chassis to fall, resulting in equipment damage and/or possible injury to persons.



Warning: Do not work on the chassis, connect, or disconnect cables during a storm with lightning. Failure to observe this warning could result in an electrical shock or death.

See "[Electrical Safety Warnings](#)" on page 65 for Electrical Safety Warnings translated into multiple languages.

These products are not intended for use in life support products where failure of a product could reasonably be expected to result in death or personal injury. Anyone using this product in such an application without express written consent of an officer of Transition Networks does so at their own risk, and agrees to fully indemnify Transition Networks for any damages that may result from such use or sale.

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1. Introduction

Transition Networks' S4140, S4212 and S4224 products are designed to support a wide range of MEF-based Carrier Ethernet services for Mobile Backhaul, Business Ethernet, Cloud Assurance and Carrier Exchange E-Access Services.

Transition Networks' Carrier Ethernet portfolio meets the demand for highly scalable, on-demand, dynamic bandwidth, differentiated services (E-Line E-LAN, E-Access), and integration of Cloud services in a fully automated service centric management platform , Converge™ , to ensure robust performance SLA reporting and end-to-end pro-active fault management.

Transition Networks' Carrier Ethernet optimized demarcation devices, access switches, and Converge™ service management platform are designed to automate the entire service lifecycle, accelerate the rollout of MEF CE 2.0 services and support stringent performance SLAs.

Document Overview

The purpose of this manual is to provide the information needed to install the S4140/S4212/S4224 (hereafter "S4xxx") to the point of operation. This manual documents all of these models, and notes differences where they apply. This manual includes four chapters, two appendixes, a table of contents, and an Index.

A printed Product Documentation postcard is shipped with each S4xx device. A substantial set of technical documents, white papers, case studies, etc. are available on the Transition Networks web site at www.transition.com. Note that this manual may provide links to third party web sites for which Transition Networks, Inc. is not responsible.

Related Manuals and Online Help

This manual is one of several S4xxx manuals which include:

- Product Documentation Postcard, 33504
- S4140/S4212/S4224 Install Guide, 33534 (this manual)
- S4140/S4212/S4224 Web User Guide (33535)
- S4140/S4212/S4224 CLI Reference (33536)
- EtherSAT Test User Guide (33540)
- Converge™ EMS Install Guide - Ubuntu Linux (33543), Install Guide - Windows (33548), Admin Procedures (33544)
- Release Notes (version specific)

Context-sensitive Help screens are built into the Web interface (click ) and the CLI (type ? or **Help**).

Check the TN web site at <http://www.transition.com/> for additional white papers, application notes, etc.

For the latest S4xxx datasheet, features, applications, specs, SKUs, etc., check the [S4140 product page](#).

Standards

IEEE Standards

- IEEE 802.3™, IEEE 802.3u
- IEEE 802.3z, IEEE 802.3x
- IEEE 802.3ad, IEEE 802.1D
- IEEE 802.1w, IEEE802.1s
- IEEE 802.1Q, IEEE 802.1p
- IEEE 802.1ad, IEEE 80.1AB
- IEEE 802.3ah, IEEE 802.1ag
- IEEE 1588-2008 (v2) Precision Time Protocol (PTP)
- ITU G.8261 Synchronous Ethernet, ITU Y.1731 PM
- ITU G.8031, ITU G.8032

Optical Module Standards

- SFP MSA, <ftp://ftp.seagate.com/sff/INF-8074.PDF>
- SFP+ MSA, <ftp://ftp.seagate.com/sff/SFF-8431.PDF>

Models

The S4xxx models are defined below.

Table 1: S4xxx Model Numbers

| Model | Description |
|-----------------------------|--|
| S4140 | Four 1Gbps/10GE SFP+ ports; includes IEEE 1588v2, SyncE & Service Activation Test generation (includes 19" Rack Mount ears). Does not include Power Supply; need to order separately (see Table 2 below). |
| S4212 | Twelve 100/1000Mbps SFP ports with two 10G SFP+ ports; includes IEEE 1588v2, SyncE & Service Activation Test generation (includes 19" Rack Mount ears). Does not include Power Supply, need to order separately (see Table 2 below). |
| S4224 | Twenty-four 100/1000Mbps SFP ports with four 10G SFP+ ports; includes IEEE 1588v2, SyncE & Service Activation Test generation (includes 19" Rack Mount ears). Does not include Power Supply, need to order separately (see Table 2 below). |
| Optional Accessories | Power supplies, SFPs, copper Ethernet cables, and fiber patch cables sold separately. |

Power Supply Options

The S4xxx power supply options are defined below.

Table 2: Power Supply Model Numbers

| Model | Description |
|-------------------|--|
| CES-PSU-AC | 100-250VAC; 47-63 Hz, 1.2A. 100W, 8.3A max. Hot Swappable AC Power Supply. Fuse: 6.3A 250V SloBlo 5x20 mm. |
| CES-PSU-DC | Input: 18-72 VDC @ 6A Max. 12 VDC 8.3 A 100W Max. Hot Swappable DC power supply. 12A 250V 5.3 X 32mm Fuse. |

Power supplies do not ship in the chassis, but are ordered separately. Each S4xxx ships with one blank faceplate and one open power supply slot. The power supplies are “hot swappable”.

Physical Specifications

The S4140 meets the following operating specifications.

Table 3a: S4140 Operating Specifications

| Specification | Description |
|------------------------------------|---|
| Switch Specifications | Fully non-blocking wire-speed switching performance for all frame sizes. Maximum frame size = 10,056 bytes Maximum MAC addresses = 32768 Shared buffer memory = 32Mbit |
| Data Rate | IEEE 1588 Input = 1 PPS, 8 KHz, 64 KHz, 1.544 MHz, 2.048 MHz, 10 MHz, 19.44 MHz, and 25 MHz. IEEE 1588 Output = 1 to 25 KHz. Sync-E = 8 KHz, 64 KHz, 1.544 MHz, 2.048 MHz, 10 MHz, 19.44 MHz, and 25 MHz. |
| Regulatory Compliance for Emission | EN55022 Class A |
| Regulatory Compliance for Immunity | EN55024 |
| Safety Compliance | UL listed, CE mark |
| Power Consumption | 24W (no SFP modules) |
| Power Source | See Table 2. |
| Size (Dimensions) | 1.75" h x 17.375" w x 10" d |
| Weight | DC supply: 10 oz. AC supply: 15 oz. Unit without power supplies: 8.5 lbs |
| Operating Temperature | 0 to 50 deg. C |
| Storage Temperature | -40 to +70°C |
| Altitude | 0-10,000 feet (with de-rating) |
| Operating Humidity | 5% to 95% or 10 % to 95 % relative humidity, non condensing |

The S4212 meets the following industry specifications.

Table 3b: S4212 Operating Specifications

| Specification | Description |
|------------------------------------|---|
| Switch Specifications | Fully non-blocking wire-speed switching performance for all frame sizes. Maximum frame size = 10,056 bytes Maximum MAC addresses = 32768 Shared buffer memory = 4Mbit |
| Data Rate | IEEE 1588 Input = 1 PPS, 8 KHz, 64 KHz, 1.544 MHz, 2.048 MHz, 10 MHz, 19.44 MHz, and 25 MHz. IEEE 1588 Output = 1 to 25 KHz. Sync-E = 8 KHz, 64 KHz, 1.544 MHz, 2.048 MHz, 10 MHz, 19.44 MHz, and 25 MHz. |
| Regulatory Compliance for Emission | EN55022 Class A |
| Regulatory Compliance for Immunity | EN55024, CE |
| Safety Compliance | UL listed, CE mark |
| Power Consumption | 24W (no SFP modules) |
| Power Source | See Table 2. |
| Size (Dimensions) | 1.75" h x 17.375" w x 10" d |
| Weight | 2 lb., 14 oz. (46 oz.) 1304.07 Grams (1.30 Kg) |
| Operating Temperature | 0°C to +50°C |
| Storage Temperature | -40°C to +85°C |
| Altitude | 0 to 10,000 feet (with de-rating) |
| Operating Humidity | 5% to 95% (non-condensing) |

Note: Operating temperature is at 900 ft.; therefore product must be de-rated above this. Multiply by 0.57 for maximum temperature at 10,000 ft.

The S4224 meets the following industry specifications.

Table 3c: S4224 Operating Specifications

| Specification | Description |
|------------------------------------|--|
| Switch Specifications | Fully non-blocking wire-speed switching performance for all frame sizes. Maximum frame size = 10,056 bytes Maximum MAC addresses = 32768 Shared buffer memory = 4Mbit |
| Data Rate | IEEE 1588 Input: 1 PPS, 8 KHz, 64 KHz, 1.544 MHz, 2.048 MHz, 10 MHz, 19.44 MHz, and 25 MHz. IEEE 1588 Output: 1 to 25 KHz. Sync-E: 8 KHz, 64 KHz, 1.544 MHz, 2.048 MHz, 10 MHz, 19.44 MHz, and 25 MHz. |
| Regulatory Compliance for Emission | EN55022 Class A |
| Regulatory Compliance for Immunity | EN55024, CE |
| Safety Compliance | UL listed, CE mark |
| Power Consumption | 24W (no SFP modules) |
| Power Source | See Table 2. |
| Size (Dimensions) | 2.625" h x 17.375" w x 10" d |
| Weight | 2 lb., 14 oz. (46 oz.) 1304.07 Grams (1.30 Kg) |
| Operating Temperature | 0°C to +50°C |
| Storage Temperature | -40°C to +85°C |
| Altitude | 0 to 10,000 feet (with de-rating) |
| Operating Humidity | 5% to 95% (non-condensing) |

Note: Operating temperature is at 900 ft.; therefore product must be de-rated above this. Multiply by 0.57 for maximum temperature at 10,000 ft.

Features List

Port Control

- Port speed, duplex mode
- Port frame size (jumbo frames)
- Port state (administrative status)
- Port status (link monitoring)
- Port statistics (MIB counters)
- Port VeriPHY (cable diagnostics for TP ports only)
- On-the-fly SFP detection

QoS

- Traffic classes (8 active priorities)
- Port default priority
- User priority
- Input priority mapping
- Scheduler mode
- QoS control list (QCL mode)
- Storm control for UC, BC, and unknown
- Weighted Random Early Discard (WRED)
- Policers: port, service, queue, and global (ACL)
- Port and queue egress shaper
- DiffServ (RFC 2474) remarking
- Tag remarking

L2 Switching

- IEEE 802.1D Bridge, static auto MAC address learning/aging and MAC addresses
- IEEE 802.1Q static VLAN
- VLAN translation
- Private static VLAN
- Port isolation (static)
- MAC-based and protocol-based VLAN
- Multiple Registration Protocol (MRP)
- Multiple VLAN Registration Protocol (MVRP)
- Multiple VLAN Registration (MVR)
- IEEE 802.10ad Provider Bridge (native or translated VLAN)
- E-LINE (EPL, EVPL)
- E-LAN (EP-LAN, EVP-LAN)
- Multiple spanning tree (MSTP, RSTP, STP)
- Loop guard
- IEEE 802.30ad link aggregation, static and LACP
- BPDU guard and restricted role
- IGMPv2 and IGMPv3 snooping
- MLDv1 and MLDv2 snooping
- IPMC throttling, filtering, and leave proxy
- Voice VLAN
- DHCP client, DHCP snooping
- DNS client, proxy
- Port mirroring
- Protection: 1+1 port protection, 1:1 port protection, 1:N port protection, port protection with services, G.8032 ring protection v.1 and v.2

L3 Switching

- DHCP option 82 relay
- IP MAC binding

Security

- Network Access Server (NAS)
 - Port-based IEEE 802.1X
 - Single and multiple IEEE 802.1X
 - MAC-based authentication
 - VLAN and QoS assignment
 - Guest VLAN
- RADIUS accounting
- MAC address limit
- TACACS+
- Web and CLI Authentication
- Authorization (15 user levels)
- ACLs for filtering, policing, and port copy
- IP source guard

Synchronization

- Synchronous Ethernet with SSM
- 1588v2 PTP with two-step clock
- 1588v2 PTP with one-step clock
- Peer-to-peer and end-to-end-transparent clock
- Boundary clock
- Redundant masters and multiple timing domains
- ITU filtering
- PTP over IPv4
- Unicast/multicast
- NTPv4 client

OAM

- IEEE 802.3ah Ethernet OAM with dying gasp
- IEEE 802.1ag MEP/MP
- MEP Up/Down and MIP Support
- ITU-T Y.1731 Support: LM/DM
- ITU-T Y.1731 PM Time Stamping hardware supported with IEEE 1588 timestamping HW
- Third party Ethernet test- set OAM loop up compatibility
- Manual IP/MAC Swap Loop-up
- RFC 2544 Traffic Generation/Reporting (Throughput Test, Latency Test, Frame Loss Test, and Back-to-back Frames Test)
- In-Service Throughput Testing
- 3rd Party Performance Monitoring Portal Vendor support

Power Savings

- ActiPHY
- Green Ethernet (energy-detect and short-reach) (via CLI only)

Management

- HTTP server
- CLI – console port and Telnet
- Management access filtering
- HTTPS
- SSHv2
- IPv6 Management
- IPv6 Ready Logo Phase 2
- System Syslog
- Software upload through Web
- SNMP v1, v2c, v3 Agent
- RMON Group 1, 2, 3, and 9
- IEEE 802.10AB-2005 Link Layer Discovery (LLDP)
- Cisco Discovery filtering (CDP)
- Loop detection restore to default

Converge EMS Management

Transition Networks Carrier Ethernet products are managed by Converge EMS, a standards-based, fully integrated service and resource manager for MEF CE 2.0 services designed to simplify provisioning and management of your network.

MIBs

- RFC 1213 MIB II
- RFC 1215 TRAPS MIB
- RFC 2613 SMON MIB •
- RFC 2819 RMON (Group 1, 2, 3, and 9) RFC 2863 Interface Group MIB Using SMI v2
- RFC 3411 SNMP Management Frameworks
- RFC 3414 User-based Security Model for SNMPv3
- RFC 3415 View-based Access Control Model for SNMP
- RFC 3621 LLDP-MED Power (POE)
- RFC 3635 Ethernet-like MIB
- RFC 3636 IEEE 802.30 MAU MIB
- RFC 4133 Entity MIB v3
- RFC 4188 Bridge MIB
- RFC 4668 RADIUS Authentication Client MIB
- RFC 4670 RADIUS Accounting MIB
- RFC 5519 Multicast Group Membership Discovery
- IEEE 802.1 MSTP MIB
- IEEE 802.1AB LLDP MIB (LLDP MIB is included in clause of the standard)
- IEEE 802.1X (PAE MIB included in clause of the standard)
- IEEE 802.1Q Bridge MIB 2008
- IEEE 802.30ad (LACP MIB included in clause of the standard)
- Private MIB framework

Feature Descriptions

Key S4xxx features include:

- Up to 4096 Service Classification entries; and up to 4096 service-specific egress tagging and QoS entries.
- **Layer 2 Switching** features (802.1Q VLAN switch with 32k MACs and 4k VLANs, Push/pop/translate up to two VLAN tags on ingress and/or egress; Policing with leaky bucket storm control and protection from broadcast, flooding, and multicast. RSTP, MSTP, IVL and hardware- and software-based Learning. Up to 512 QoS, VLAN, and Security Profile Classification entries.
- **L2 Multicast** features (32k Layer 2 Multicast Groups with up to 1k port masks; IGMP v2 and v3 support, and MLD v1 and v2 support).
- **Quality of Service** (Eight QoS class queues per port with Strict or DWRR scheduling; four DP levels per QoS class queue; WRED operation between DP levels within each QoS class queue for intelligent congestion avoidance per QoS class.
- **Security** (content aware filtering engine using ACLs for frame/packet inspection; generic storm control for flooded broadcast, flooded multicast, and flooded unicast traffic. Eight selectable CPU ports for segregation of CPU redirected traffic. Per-port and per-address registration of snooping of reserved IEEE Mac addresses (BPDU, GARP). Port-based and MAC-based access control (IEEE 802.1X). Per-port CPU-based learning with option for secure CPU-based learning. Per-port ingress and egress monitoring.
- **RMON** statistics group (RFC 2819) support and **SNMP** interface group (RFC 2863).
- **Carrier Ethernet** features (Provider bridge switch for 32K MACs and 4K VLANs).

Timing and testing features

- Service-aware architecture.
- IEEE 1588 and Sync-E network timing.
- Ethernet OAM and protection switching.

IEEE 1588 interfaces

- Input: 1 PPS, 8 KHz, 64 KHz, 1.544 MHz, 2.048 MHz, 10 MHz, 19.44 MHz, and 25 MHz.
- Output: 1 to 25 KHz.
- 1500VAC isolated.
- SMB coaxial INPUT: TTL, minimum 100ns high pulse, 50-75-High-Z termination.
- SMB coaxial OUTPUT: 2.0V into 50 ohm, 4V into High-Z.

Sync-E interfaces (future release)

- 8 KHz, 64 KHz, 1.544 MHz, 2.048 MHz, 10 MHz, 19.44 MHz and 25 MHz.
- 1500VAC isolated.
- SMB coaxial INPUT: 1Vpp to 5Vpp, Sine or square wave, minimum 40/60 duty cycle, 50-75-High-Z termination.
- SMB coaxial OUTPUT: 2.0V into 50 ohm, 4V into High-Z.

Loopbacks

- MAC SA-DA swap, swap the source and destination before sending back out source port.
- Per EVC.
- Per VLAN.

Synchronous Ethernet (Sync-E)

Recommendation ITU-T G.8262/Y.1362 outlines requirements for timing devices used in synchronizing network equipment using synchronous Ethernet. This Recommendation defines the requirements for clocks (e.g., bandwidth, frequency accuracy, pull-in, hold-in, and pull-out ranges, noise generation, noise tolerance, noise transfer, transient response, holdover performance, etc.).

Synchronous Ethernet (Sync-E) as defined by ITU-T G.8261 allows for the transfer of high-quality network timing from a traceable reference, to all network elements. Because this is a physical layer process, the timing quality does not vary due to network load. Sync-E builds on the existing Ethernet standards and is backward compatible with IEEE 802.3. **Note:** Synchronous Ethernet (SyncE) is currently not supported

IEEE 1588 PTP

IEEE 1588 Precision Time Protocol (PTP) support can be used simultaneously with Sync-E in hybrid networks. **Note:** 1588 PTP is not supported when a port is operating in 1000X or SGMII mode.

Loopback Features

These Loopbacks are available:

1. Ethernet port loopback - this would be service impacting
2. Per EVC loopback
3. Per VLAN loopback

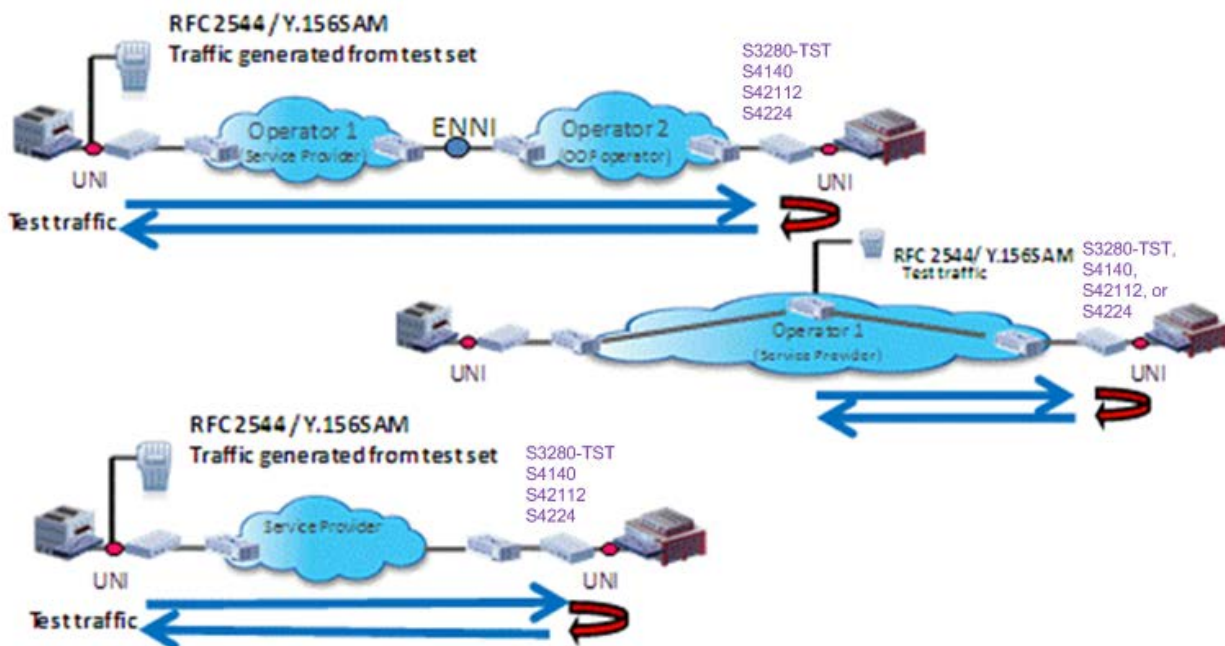


Figure 1: Loopback Types

Packet Generator and Checker

The RFC2544 Packet Generator / Checker provides Throughput, Latency, Back-to-Back and Frame loss tests. RFC 2544 is the de facto methodology that outlines the tests required to measure and to prove performance criteria for carrier Ethernet networks. It provides an out-of-service benchmarking methodology to evaluate the performance of network devices using throughput, back-to-back, frame loss and latency tests. Each standard test validates a specific part of a SLA.

See <http://www.ietf.org/rfc/rfc2544> for specifics.

Ethernet SAT (Service Activation Testing) Loopback

The MEF SAT (Service Activation Testing) is implemented early in the Ethernet Service lifecycle; when a new customer order is received, MEF SAT (along with MEF LLB) can be used to provision and turn up the circuit in order to verify the performance to the SLA (via FM and PM). Ethernet Service Activation Test (EtherSAT) methodology involves:

- Verify a new service after provisioning is complete, but before it is turned over to the customer.
- Check that the configuration is correct.
- Verify performance meets the Service Acceptance Criteria (SAC) to ensure CoS Performance Objectives are attained.

The EtherSAT loopback test can be run via the Web interface or the CLI. See the related manual for detailed information.

Typical Applications

The S4xxx can be used to implement the access and first-level aggregation functions between CPE (Customer Premise Equipment) and PE (Provider Edge) boxes. Environments can include:

- Metro Ethernet transport (MSPP/MSTP)
- Carrier Ethernet switch/router (CESR)
- Mobile wireless backhaul

The figure below shows CPE and PE equipment placed in a 'typical' network.

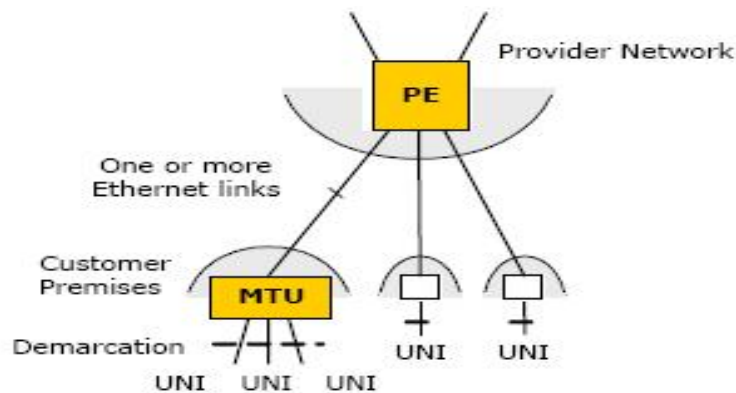


Figure 2: S4140 Deployment

In this application, the S4xxx forms the demarcation between the customer network and the provider network, providing the full set of UNI features in a cost-effective manner.

- Map customer frame formats into provider frame formats. Classify frames and map to appropriate QoS profiles.
- Meter the customer traffic and ensure that the customer SLA is met. Police using MEF-compliant dual leaky-bucket algorithm. Mark frames as either Committed (green) or Discard Eligible (yellow). Provide correct QoS treatment (traffic management). Provide traffic statistics per customer in a manner consistent with the SLA.
- Enable end-to-end SOAM (Service OAM), if allowed.
- Implement the service defined by the SLA (E-LINE for point-to-point or backhaul service; E-LAN for multipoint/bridged services; E-TREE for video distribution or backhaul services).
- Enable management and protection schemes as required by the provider. Link aggregation or other port schemes if used for access. OAM at the operator and service provider level for remote management, fault diagnosis, and protection switching.
- Support network timing and synchronization requirements as required. Synchronous Ethernet (Sync-E) and IEEE 1588 (PTP) functionality.

2. Installation

This section describes how to install the S4xxx hardware and software, and the procedures to access and initially set up the S4xxx through either a local serial interface (USB) or a remote Ethernet connection (Telnet session or Web interface).

Safety

Before installing the S4xxx, read the “[Safety Cautions and Warnings](#)” on pages 3-4 of this manual and ensure that the requirements noted are met. During installation and maintenance, avoid direct exposure to laser beams. Specifically, do not look into laser ports. Ensure that each SFP port at which laser beams are (or will be) present is occupied by an SFP that is locked in position. See the related SFP manual for details. See “[Electrical Safety Warnings](#)” on page 65 for Electrical Safety Warnings translated into multiple languages.

Unpacking

1. Carefully unpack all S4xxx contents.
2. Verify receipt of all S4xxx components; see “[Ship Kit Contents](#)” on page 21.
3. Place the S4xxx and related materials in the desired install location (e.g., Rack-mount, Table top, or Wall mount). See “[Installing S4xxx Hardware](#)” on page 28.



Figure 2: S4224 Unpacking

4. Save the S4xxx shipping carton and packing materials for future use.

Package Contents

The S4xxx is shipped with some standard and some optional components. Make sure you have received the following standard items:

- One S4xxx Carrier Ethernet device with Power Supply Covers installed
- One printed Product Documentation postcard
- Six Rubber Feet
- Dust Caps

Note that one AC Power Supply and/or one DC Power Supply may be shipped separately. See “[Power Supply Options](#)” on page 10.

The S4224 is shipped with Dust Caps for protecting the connectors from intrusions. A Dust Cap is usually made from flexible plastic. When placing a Dust Cap over a connector, avoid pressing it against the fiber ferula surface in the connector so as to prevent contamination. Leave the Dust Cap(s) in place until making the actual fiber connection. Save the Dust caps for future use (reconfiguration, equipment moves, spares, returns, etc.).

A blank faceplate ships installed on each S4xxx ordered. The power supplies are “hot swappable”.

Other / Optional Items

Additional items used during installation may include one or more SFPs, SGMII device(s), an SMB cable, Ethernet CAT 6 cable(s) and/or Fiber cable(s), and wall mount brackets or rack mount brackets.

Tools Required

Installation may require a #4 Phillips screwdriver.

Additional tools and equipment required for cleaning connectors may include dust caps, isopropyl alcohol (solvent for contaminants), and tissues (soft multi-layered fabric made from non-recycled cellulose).

Use industry standard procedures for cleaning connectors. If applicable, follow your organizations process and procedure for copper and fiber cable cleaning and maintenance.

Installation Overview

1. Review the Safety section above (see [Safety](#) on page 20).
2. Unpack the S4224 (see [Unpacking](#) on page 20).
3. Remove the Power Supply covers and install the Power Supply(s). See the related section of this manual.
4. Perform desktop install (see [Desktop / Tabletop Installation](#) on page 28) or perform rack mount install procedure (see [Rack Mount Installation](#) on page 28).
5. Install SFP devices (see [Installing SFPs](#) on page 29).
6. Connect SFP PORT 1 - PORT 24 (see (see ["Front Panel"](#) on page 23).
7. Install SFP+ devices (see [Installing SFPs](#) on page 29).
8. Connect SFP+ PORT 25 - PORT 28 (see (see ["Front Panel"](#) on page 23).
9. Connect the MGMT port to a PC's Ethernet NIC port (see ["Front Panel"](#) on page 23).
10. Connect the CONSOLE PORT (see ["Front Panel"](#) on page 23).
11. Perform grounding (see [Grounding the S4224 \(Rack Mount\)](#) on page 28).
12. Connect Power (see [Installing - Connecting to 18-57 VDC Power](#) on page 31 or see [Installing AC Power](#) on page 29).
13. Monitor the LEDs (see ["Front Panel"](#) on page 23).
14. Install the Software (see [Software Install Process](#) on page 37).
15. If the install was successful, continue with the *S4224 User Guide* or the *S4224 CLI Reference manual*.
If the install was unsuccessful, refer to section [4. Messages and Troubleshooting](#) on page 48.

Front Panel

The S4140 front panel connectors and LEDs are shown and described below.

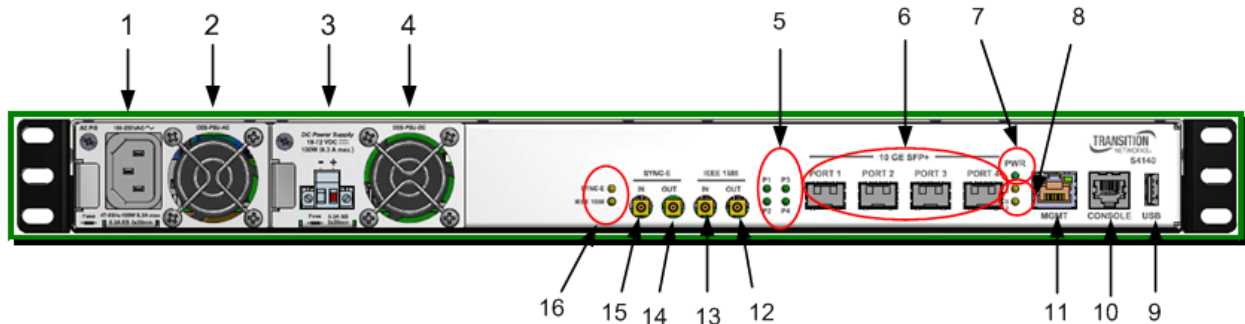


Figure 4a: S4140 Front Panel Connectors and LEDs

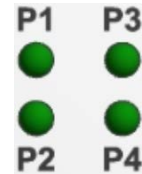
Front Panel

- 1. Power input for Power Supply 1.
- 2. Fan for Power Supply 1.
- 3. Power input for Power Supply 2.
- 4. Fan for Power Supply 2.

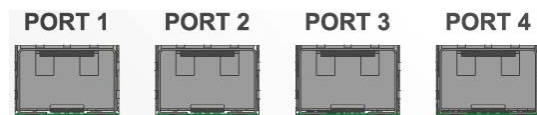
5. LEDs **P1 - P4**: One LED per port, bi-color (Green/Yellow)

Green = ON green when linked at 10GE, OFF when not linked, BLINK when activity.
 Yellow = ON yellow when linked at 1GE, OFF when not linked, BLINK when activity.

When first connected, the Port 1-4 LEDS turn yellow while a link is established. After about 15 seconds, the LED turns green when the S4140 and the target device have established a fiber link. If this LED remains off after cable is connected, check 1) remote power, 2) cabling, and 3) interface modes of both the local and remote devices (speed, duplex, auto negotiation, etc. See the Troubleshooting section of the related online *User Guide* manual for more information.



6. **PORT 1 - PORT 4**: Four Ethernet 10 GE SFP+ ports. The S4140 supports 1Gbps, but the behavior is different than a normal 1G SFP port (no SFP detect).



7. **PWR (Power) LED**:

- Green ON = power on to device;
- Primary Green
- Secondary Green



8. S1 LED (System Status LED) and S2 LED - Power Source LED.

S1 - System Status LED. During normal boot up this LED will be amber. Once the device is fully booted it will turn green. During firmware upgrade this LED will flash green. When a fatal condition is logged, S1 flashes amber.

| S1 LED Color | S1 LED Description |
|----------------|------------------------|
| Yellow | During boot up |
| Green | Normal operation |
| Flashing Green | Firmware upgrade |
| Flashing Amber | Fatal condition logged |

**S2 - Power Source LED.**

Green: Primary power source active. **Amber:** Secondary Power Source active.

There is a primary and secondary power source slot. The left slot is primary and the right is secondary.

If primary is present and powered, all power is supplied by the primary supply; the secondary is in 'standby' mode.

| S2 LED Color | S2 LED Description |
|--------------|-----------------------|
| Green | Primary Power input |
| Yellow | Secondary Power Input |

**9. USB port (not currently programmed to recognize USB devices).**

10. CONSOLE Port: One Ethernet RJ-45 female connector for connection to a computer for console control / administration (shown below). The CONSOLE port can be used for accessing the S4xxx CLI for out-of-band management. The COM port can be connected at 115k baud with 8/N/1/None connection setting. See the "Software Install Process" on page 37 for more information.



11. MGMT 10/100/1000 Port: One Ethernet RJ-45 connection for out-of-band management over the IP network the RJ-45 port is provided to keep management traffic totally isolated from data traffic. Connect the MGMT port to a PC's Ethernet NIC port to use this management function.

11. MGMT port LED:

Left LED: ON=Link, BLINK=Activity, Green=Full duplex, Yellow=Half duplex

Right LED: When linked, Green=1G Yellow=100M OFF=10M



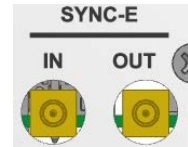
12. IEEE 1588 OUT: SMB connection for Sync-E timing output 1 to 25 KHz (2.0V into 50 ohm, 4V into High-Z).

13. IEEE 1588 IN: SMB connection for Sync-E timing input (TTL, minimum 100ns high pulse, 50-75-High-Z termination). Input: 1 PPS, 8 KHz, 64 KHz, 1.544 MHz, 2.048 MHz, 10 MHz, 19.44 MHz, and 25 MHz.



14. Sync-E Out: SMB connection for PTP timing output. Sync-E interfaces (2 KHz to 25 MHz; 1500VAC isolated). SMB coaxial OUTPUT: 2.0V into 50 ohm, 4V into High-Z.

15. Sync-E In: SMB connection for PTP timing input. SMB coaxial INPUT: 1Vpp to 5Vpp, Sine or square wave, minimum 40/60 duty cycle, 50-75-High-Z termination. IN: 8 KHz, 64 KHz, 1.544 MHz, 2.048 MHz, 10 MHz, 19.44 MHz and 25 MHz. 1500VAC isolated.



16. IEEE 1588 PTP LED:

Off = Input Disabled;
 Flashing Amber = No signal detected;
 Yellow = Signal detected, but incorrect frequency or unstable.
 Flashing Green -- N/A;
 Green = Valid signal detected.



17. SYNC-E LED:

Off = Disabled;
 Flashing Amber = No signal detected;
 Yellow = Signal detected, but incorrect frequency or unstable.
 Flashing Green = Locked;
 Green = Selected, and using as primary clock source.



The **S4212** front panel connectors and LEDs are shown and described below.

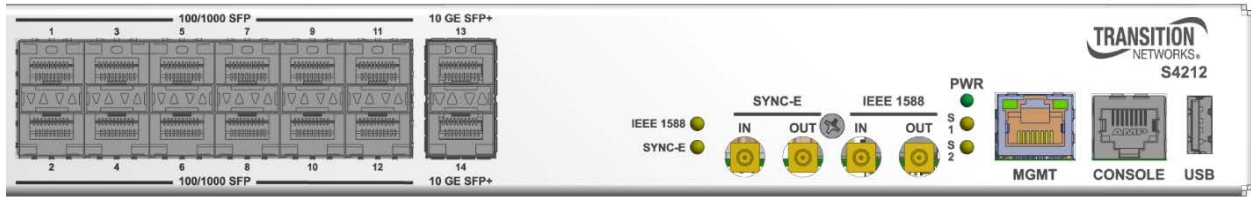
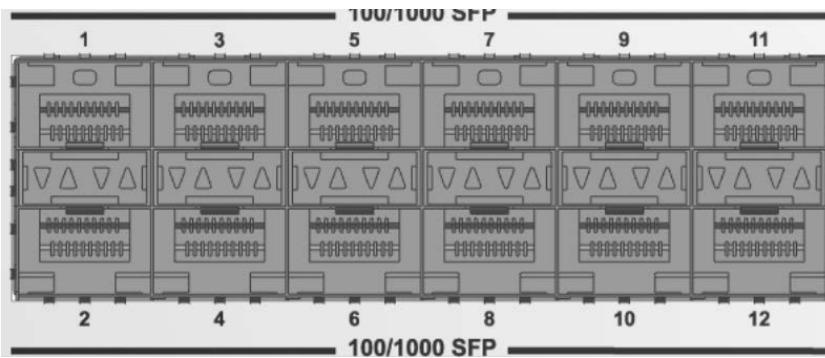


Figure 4b: S4212 Front Panel

S4212:

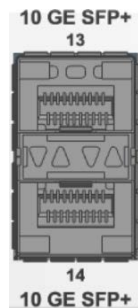
P1-P12 LEDs

Two LEDs for each port, one Green and one Yellow:
 Green LED = ON when linked, OFF when not linked, BLINK when activity.
 Yellow LED = Indicates speed when linked, ON=1GE, OFF=100FX.



P13-P14 LEDs

Two LEDs for each port, one Green and one Yellow:
 Green LED = ON when linked, OFF when not linked, BLINK when activity.
 Yellow LED = Indicates speed when linked, ON=10GE, OFF=1GE.



The **S4224** front panel connectors and LEDs are shown and described below.

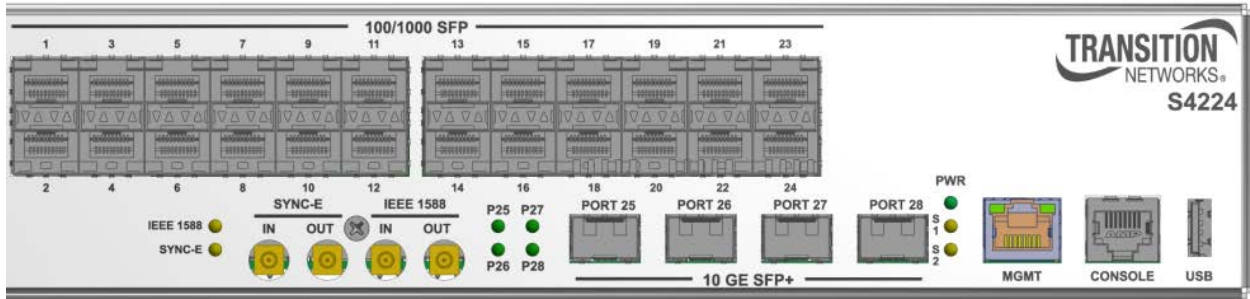
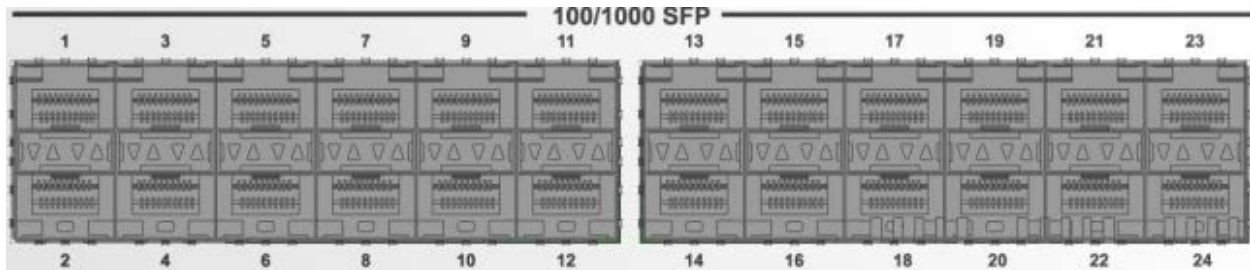


Figure 4c: S4224 Front Panel

S4224:

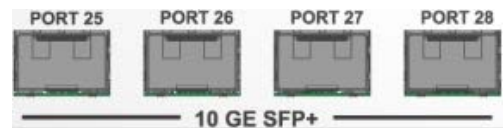
P1-P24 LEDs

Two LEDs for each port, one Green and one Yellow:
 Green LED = ON when linked, OFF when not linked, BLINK when activity.
 Yellow LED = Indicates speed when linked, ON=1GE, OFF=100FX.



P25-P28 LEDs

One LED per port, bi-color (Green/Yellow):
 Green = ON green when linked at 10GE, OFF when not linked, BLINK when activity.
 Yellow = ON yellow when linked at 1GE, OFF when not linked, BLINK when activity.



Installing S4xxx Hardware

The S4xxx can be installed via rack mount or via desktop / table top. Desktop mount is standard.

Rack Mount Installation

The S4xxx enclosure has three holes on each side for rack mounting. Rack mount uses SKU # S4140-19RM - 19" Rack Mount Kit for S4xxx mounted in 1RU of a 19" rack.



Figure 5: Rack Mount Installation

Desktop / Tabletop Installation

The S4xxx is shipped with four rubber feet for optional installation on a table or other flat, stable surface in a well-ventilated area.

1. Remove the rubber feet from the card.
2. On the bottom of the S4xxx, place one foot in each corner of the device.

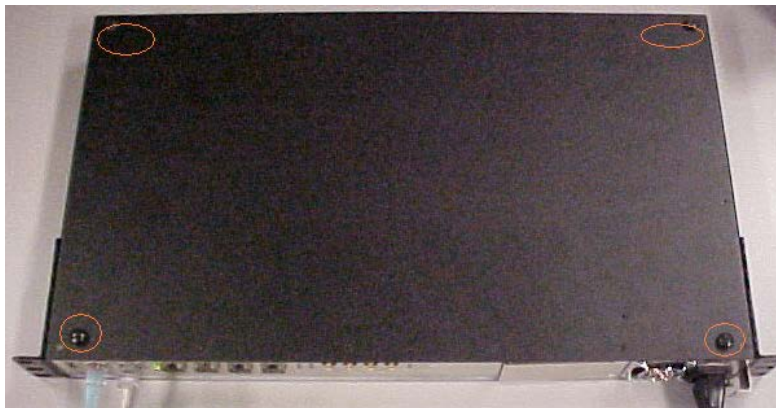


Figure 6: Tabletop Installation

3. Set the NID in place and connect the power adapter (see "[Power Supply Installation](#)" on page 31).

SFP / XFP / GBIC Optical Transceivers

Transition Networks SFPs and XFPs are Small Form-Factor Pluggable (SFP) hot-pluggable transceivers that allow a single network device to be connected to a multitude of interfaces, protocols, and transmission media via the SFP/XFP port. Our SFPs offer a cost effective, flexible way to accommodate network modifications and growth, while still using existing network devices. All TN SFPs and XFPs are compliant with the Multi-Sourcing Agreement (MSA) ensuring interoperability with all other MSA compliant networking devices. **Note:** DMI option support requires an SFP that supports DMI.

Installing SFPs

The S4xxx lets you install one to four SFP devices of your choice in order to make a fiber connection.

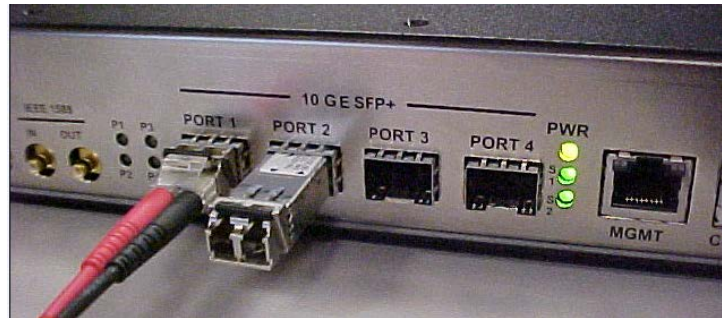
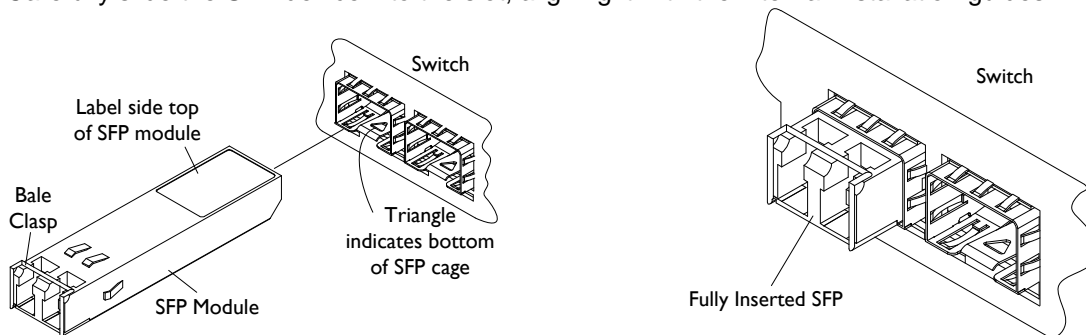


Figure 7a: S4140 SFP Installation

1. Position the SFP device at either installation slot, with the label facing up.
2. Carefully slide the SFP device into the slot, aligning it with the internal installation guides.



3. Ensure that the SFP device is firmly seated against the internal mating connector.
4. Make sure the SFP release latch is in the up (closed) position when you insert the cable connector into the SFP at PORT 1 - PORT 4 (S4140). On the S4212/S4224, rotate the SFP 19- degrees (label facing down) and insert for the lower row of ports.

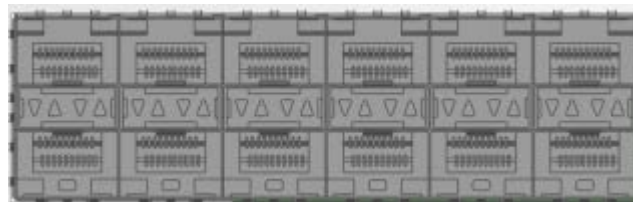


Figure 7b: S4212/S4224 SFP Installation

5. Attach an appropriate cable into the SFP module port.
6. Attach the other end of the cable into the other device.

Note: Do not remove and replace the SFP modules more often than necessary; excessive SFP removing/replacing can shorten the SFPs useful life.

Back Panel

The S4140 back panel is shown and described below.




Figure 8: Back Panel

Connections

The S4140 back panel connectors are described in the table below.

Table 4: S4xxx Back Panel Connector Descriptions

| Connector | Description |
|---|--|
|  | <p>C. GND (Common Ground) screws; two optional threaded common ground connections are provided.</p> |

Power Supply Installation

This section covers installing the power supply options. After the S4xxx has been unpacked, install the AC and/or DC Power Supply. Note that this can be done at initial S4xxx installation or as a field upgrade.

Warning: power supply must not be powered during installation. The unit can be powered while installing or removing a power supply (just the supply being serviced must not be powered).

Table 5: Power Supply Descriptions

| Model | Description |
|-------------------|--|
| CES-PSU-AC | 100-250VAC; 47-63 Hz, 1.2A. 100W, 8.3A max. Hot Swappable AC Power Supply. Fuse: 6.3A 250V SloBlo 5x20 mm. |
| CES-PSU-DC | Input: 21-72 VDC @ 6A Max. Out: 12 VDC 8.3 A 100W Max. Hot Swappable DC Power Supply. Fuse:12A 250VDC Fast 6 X 32mm. |

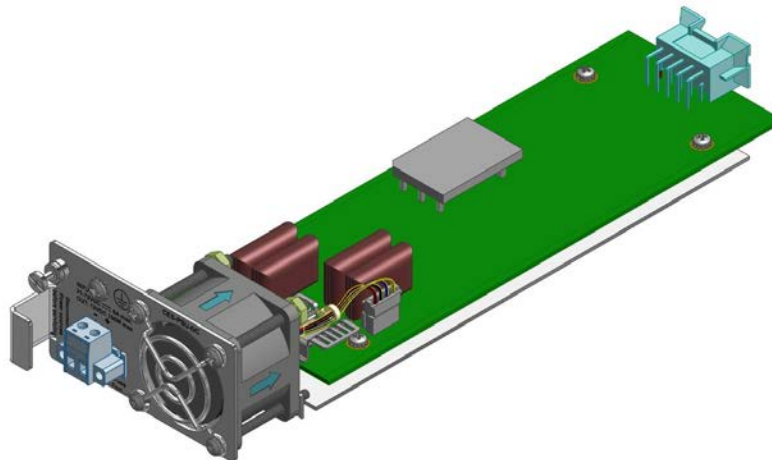


Figure 9: CES-PSU-DC Power Supply

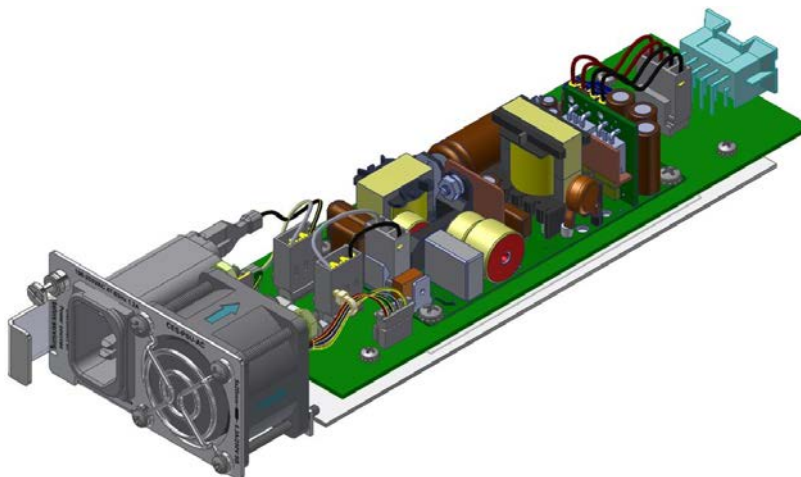


Figure 10: CES-PSU-AC Power Supply

Installing the DC Power Supply

After the S4xxx has been unpacked, install the DC Power Supply.



Warning: Risk of electrical shock. **For multiple power sources:** Energy hazard if both power modules are not disconnected. Disconnect both power sources before servicing.

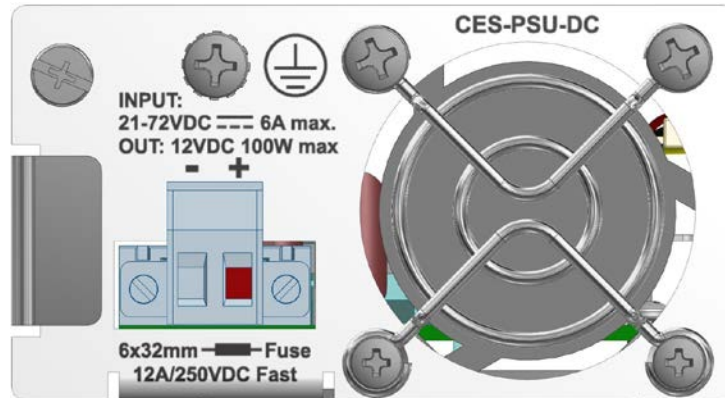
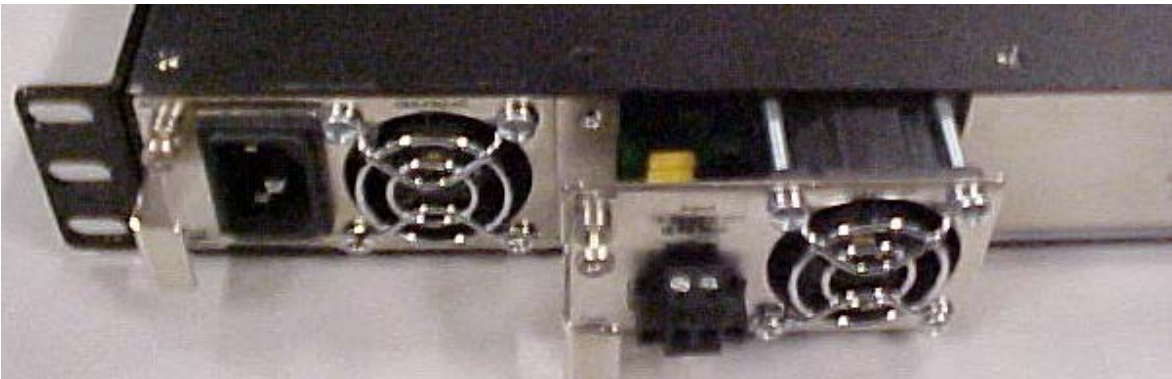


Figure 11: DC Power Connection



Warning: Shock hazard exists if power supply is ejected while powered on.

1. Unplug S4xxx POWER, CONSOLE, and PORT connections if desired.
2. Remove the blank faceplate or use the one open power supply slot.
3. Insert the DC Power Supply into the open S4xxx slot.



4. Fasten the DC Power Supply with the slotted retaining screw.
5. Insert the power plug wires of the DC power adapter into the **-** and **+** power inlets.
6. Refer to the [“Grounding the S4xxx”](#) section below.

Installing the AC Power Supply

After the S4xxx has been unpacked, install the AC Power Supply.



Warning: Risk of electrical shock. **For multiple power sources:** Energy hazard if both power modules are not disconnected. Disconnect both power sources before servicing.

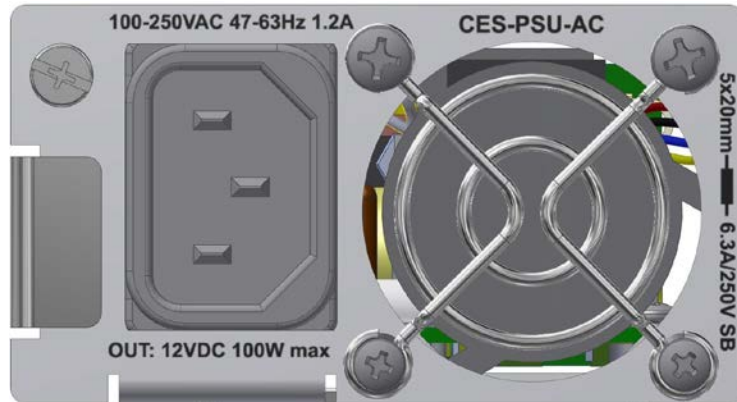


Figure 12: AC Power Connection



Warning: Shock/damage hazard exists if power supply is installed / removed while powered on.

1. Unplug S4xxx POWER, CONSOLE, and PORT connections if desired.
 - a. Remove the blank faceplate or use the one open power supply slot.



2. Fasten the AC Power Supply with the slotted retaining screw.
3. Insert the AC Power plug into the AC Power Block receptacle (power inlet).
4. Refer to the “[Grounding the S4xxx](#)” section below.

Grounding the S4xxx (Rack Mount)

C. GND (Chassis Ground) Note: a device bonded to metallic shelf that houses S4xxx jacks should be bonded directly by either **1)** and independent conductor to the central office ground via rack ground bar, or **2)** connection to the rack itself, or **3)** other metal-to-metal bond to ground. To connect the S4xxx to a ground point on the rack, follow your organization's or IT department's standard procedure or the US NFPA 70®: National Electrical Code.

Connecting to the DC Power Supply

Use the procedure below to connect the S4xxx to the provided DC power supply (see Figure 11 above).



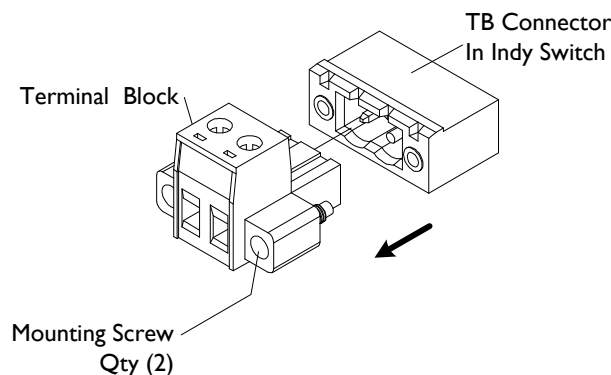
Warning: Risk of electrical shock. **CAUTION:** When connecting DC power wires to the terminal-block plug, pay close attention to the polarity markings shown near the terminal block of the S4xxx. Failure to observe this caution could result in damage to the switch.

Note: It is a good practice to turn OFF input and load power, and unplug the power terminal block before making wire connections. Otherwise, your screwdriver blade can inadvertently short the terminal connections to the grounded enclosure.

- The range of suitable wire for the terminal block is 12 to 26 AWG.
- The power source must be safety certified.

Remove the Terminal Block

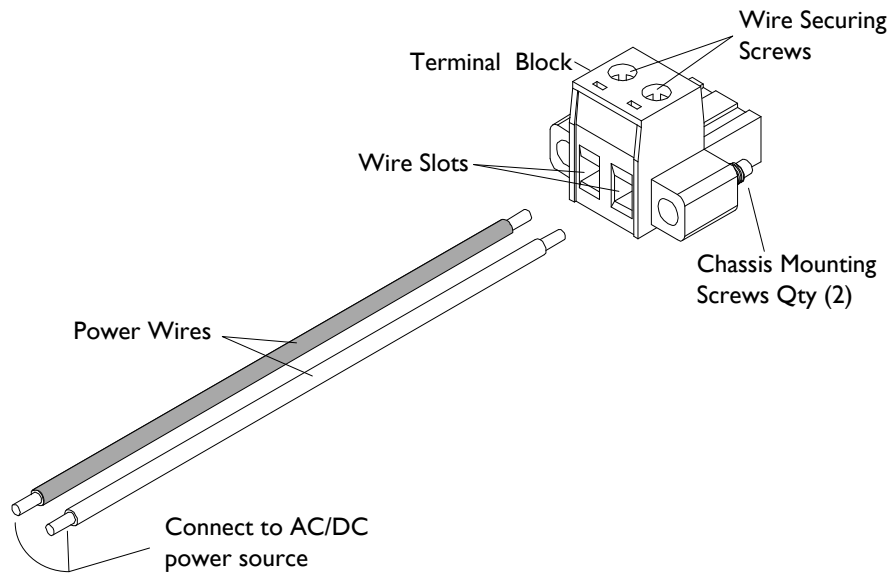
1. Turn the external power source OFF.
2. Loosen the “2” mounting screws, attaching the “primary” Terminal Block to the switch chassis, and then pull it from the chassis connector.



Connect Power Wires to the Terminal Block

3. Strip the wires to the proper length.
4. Insert the positive and negative power wires into V+ and V- contacts respectively of the terminal block (note polarity on the chassis of the switch). Make sure the wires are secure.

5. Insert the positive and negative power wires into V+ and V- contacts respectively into the power source; make sure the wires are secure. Insert the positive and negative power wires into V+ and V- contacts respectively into the power source - make sure the wires are secure.



6. Note that the S4xxx front panel **P** (power) LED lights and a startup sequence of LEDs light momentarily. When the sequence stops, only the **P** Power LED remains lit.
7. Continue with the “[Software Install Process](#)” below.

Connecting to the AC Power Supply

Use the procedure below to connect the S4xxx to the provided AC power supply (see Figure 13 above).



Warning: Risk of electrical shock.

1. Insert the installed Power Supply plug into the S4xxx front panel.
2. Plug the AC power plug into a live AC outlet.
3. Note that the S4xxx front panel **P** (power) LED lights, and a startup sequence of LEDs light momentarily. When the sequence stops, only the **Power** LED remains lit.
4. Continue with the “[Software Install Process](#)” below.

Power Supply “Hot Swap” Feature

After the Power Supply module(s) are installed (previous sections), you can replace a Power Supply module without powering down the S4xxx. This allows you to change the configuration or repair a module without interrupting S4xxx overall operation.

Warning: Shock/damage hazard exists if power supply is installed / removed while powered on.

See the “[Power Supply Options](#)” section on page 10 for PS module model descriptions.

Checking Power Supply Status

After the Power Supply module(s) are installed (previous sections) and the Software Install Process is done (next section) you can use the CLI or web GUI to verify Power Supply module status.

Via the CLI: See the related *CLI Reference* manual for details.

Via the GUI: navigate to the **Monitor > System > Information** page to verify that the PS modules (PS 1 and/or PS 2) are Present, Powered, the Type (AC or DC), whether Active, the current Fan RPM, and the current fan Temperature). See the related *Web User Guide* manual for details.

| Power Supplies | | |
|----------------|------|------|
| | PS 1 | PS 2 |
| Present | Yes | Yes |
| Powered | Yes | No |
| Type | AC | DC |
| Fan RPM | 4421 | 4566 |
| Temperature | 27 C | 27 C |

Software Install Process

The next sections cover the S4224 installation process, which includes:

1. Configure and login in to the S4224 via Telnet , PuTTY, or HyperTerminal.
2. Log in to the S4224 via the Web Interface (page 43).
3. [Register at My TN Access](#) (page 44).
4. Take our [TN Customer Satisfaction Survey](#) (page 44).

Operating System Support

The S4xxx has no OS requirements.

Web Browser Support

The S4xxx is compatible with any browser supporting Java (e.g., Firefox (Mozilla Firefox), Internet Explorer, Google Chrome).

Telnet Client Support

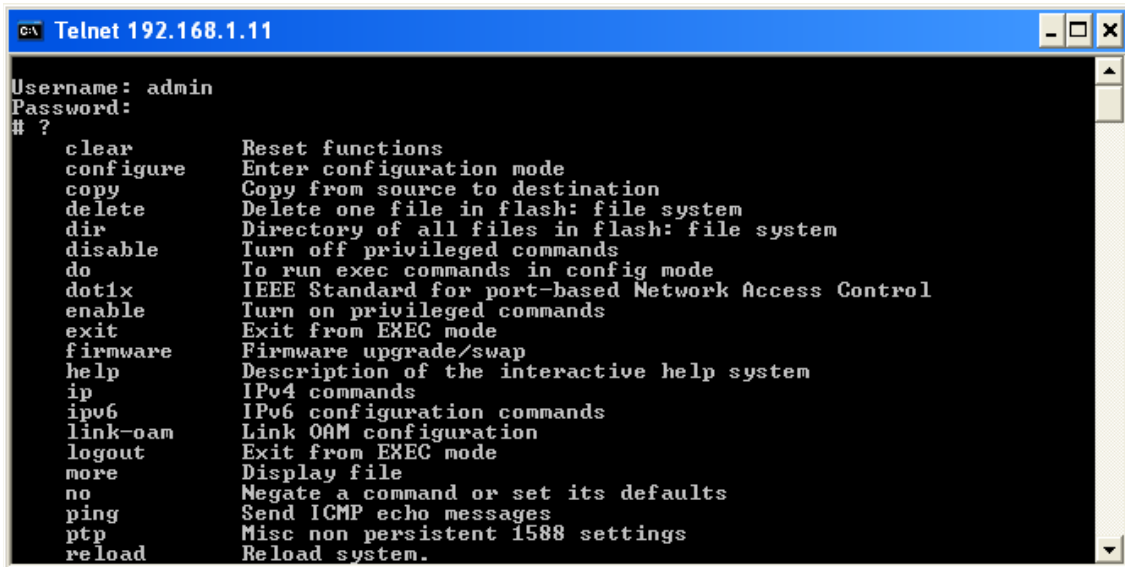
The S4xxx CLI is compatible with any Telnet program supporting SSH.

Terminal Emulation Package Support

The S4xxx CLI is compatible with any terminal program supporting ANSI/VT100 emulation.

Login In to the S4xxx via Telnet

1. Use the Windows Start > Command Prompt menu path to open a command prompt.
2. At the prompt type **telnet 192.168.0.1** and press the **Enter** key.
3. Enter the S4224 Username (the default is **admin** in lowercase letters) and press the **Enter** key.
4. Enter the S4224 Password (no default - just press the **Enter** key).
5. At the command prompt, enter a command and press the Enter key. For example, type Help (or ?) and press Enter to display the S4224 Help screen:

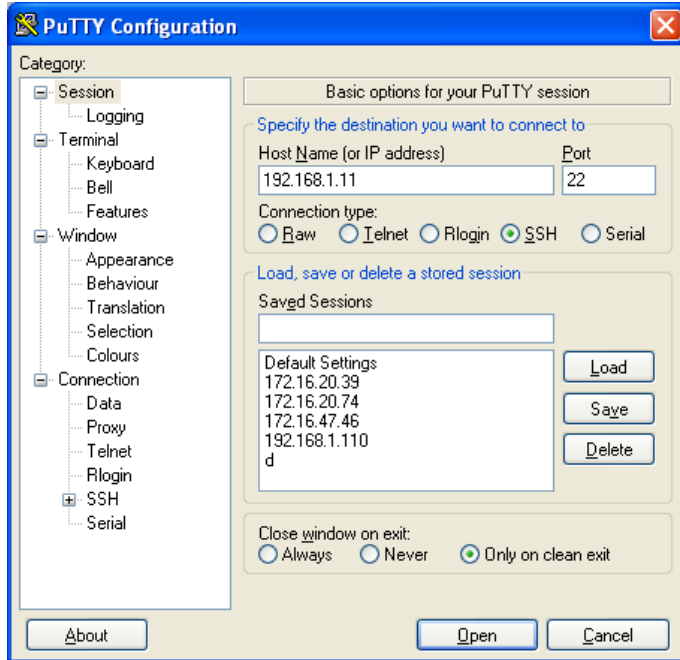
A screenshot of a Windows Command Prompt window titled "Telnet 192.168.1.11". The window shows a Telnet session where the user has entered the username "admin" and a password. The prompt is "# ?". The user has entered a question mark to display the help screen. The help screen lists various commands and their descriptions:

```
clear          Reset functions
configure     Enter configuration mode
copy          Copy from source to destination
delete        Delete one file in flash: file system
dir           Directory of all files in flash: file system
disable       Turn off privileged commands
do            To run exec commands in config mode
dot1x         IEEE Standard for port-based Network Access Control
enable        Turn on privileged commands
exit          Exit from EXEC mode
firmware      Firmware upgrade/swap
help          Description of the interactive help system
ip            IPv4 commands
ipv6          IPv6 configuration commands
link-oam      Link OAM configuration
logout        Exit from EXEC mode
more          Display file
no            Negate a command or set its defaults
ping          Send ICMP echo messages
ptp           Misc non persistent 1588 settings
reload        Reload system.
```

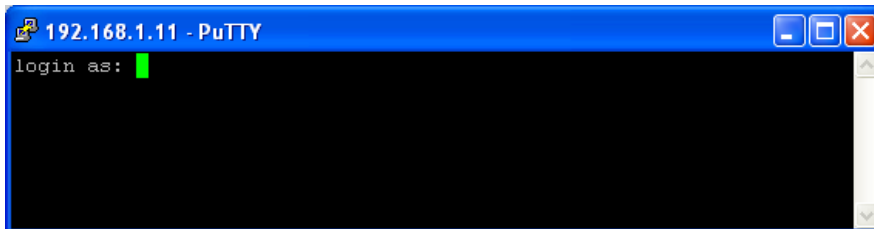
6. Continue to enter S4224 CLI commands. See the *S4224 CLI Reference* manual for more information.

Log In to the S4xxx via PuTTY

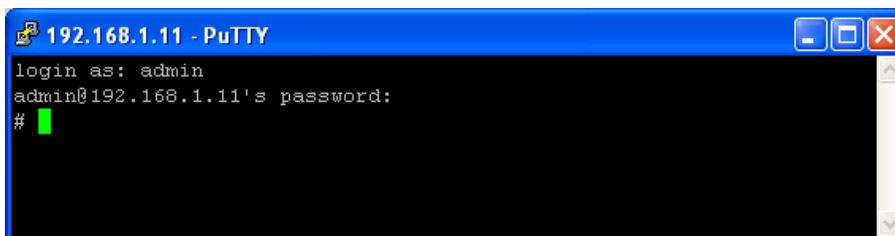
1. Start PuTTY. If the PuTTY "Open File - Security Warning: dialog displays, click the Run button.
2. At the PuTTY Configuration dialog box, in the "Host Name [or IP Address]" field, enter the S4224 IP address (the default is 192.168.0.1).
3. In the Port field, enter 22.



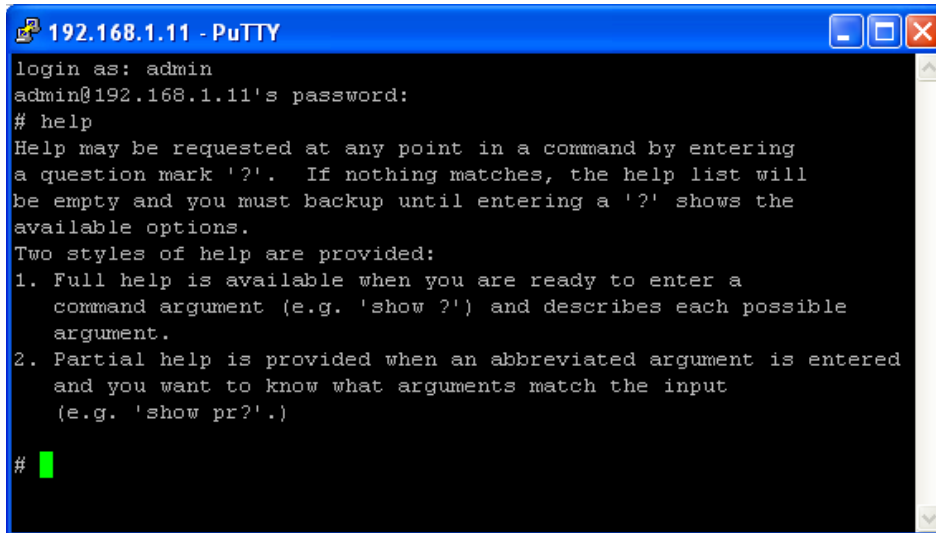
4. Save and Load the saved session as desired.
5. Click the **Open** button. The S4224 PuTTY login screen displays.



6. Enter the S4224 Username (the default is **admin** in lowercase letters) and press the **Enter** key.
7. Enter the S4224 password (no default - just press the **Enter** key). The command prompt (#) displays.



8. At the PuTTY command prompt, enter a command and press the Enter key. For example, type **Help** and press Enter to display the S4224 Help screen:

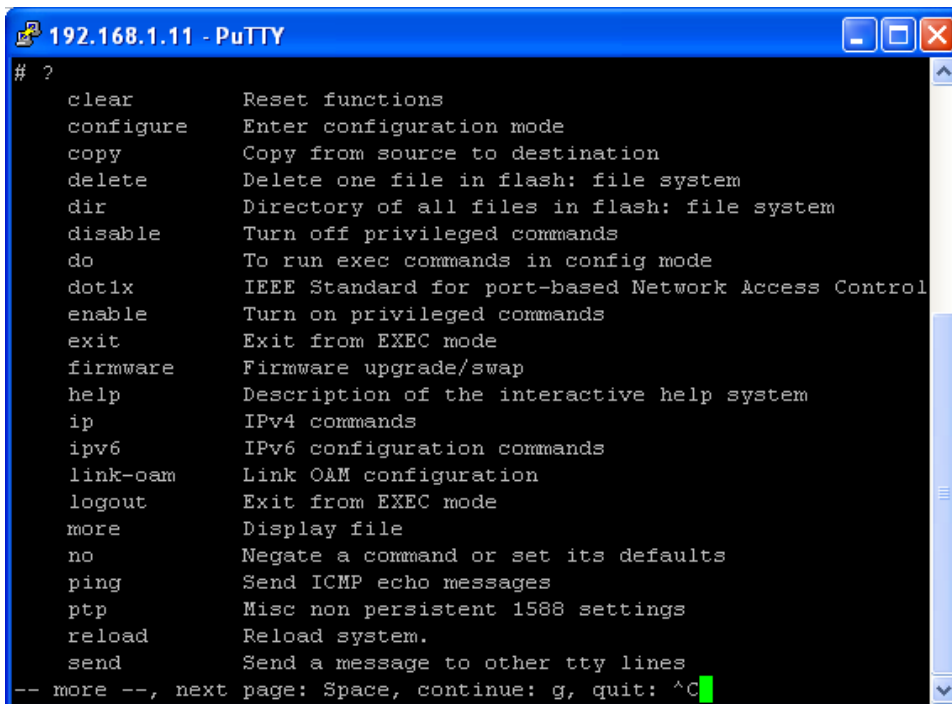


```

192.168.1.11 - PuTTY
login as: admin
admin@192.168.1.11's password:
# help
Help may be requested at any point in a command by entering
a question mark '?'. If nothing matches, the help list will
be empty and you must backup until entering a '?' shows the
available options.
Two styles of help are provided:
1. Full help is available when you are ready to enter a
command argument (e.g. 'show ?') and describes each possible
argument.
2. Partial help is provided when an abbreviated argument is entered
and you want to know what arguments match the input
(e.g. 'show pr?'.)
#

```

9. At the PuTTY command prompt, enter a command and press the Enter key. For example, type **? and a space** and press Enter to display the S4224 Help screen:



```

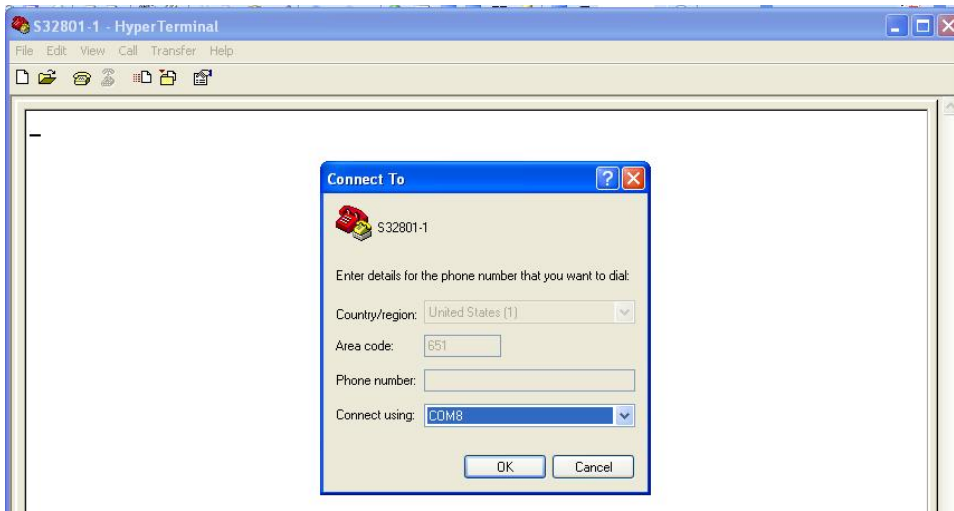
192.168.1.11 - PuTTY
# ?
clear      Reset functions
configure  Enter configuration mode
copy       Copy from source to destination
delete     Delete one file in flash: file system
dir        Directory of all files in flash: file system
disable    Turn off privileged commands
do         To run exec commands in config mode
dot1x      IEEE Standard for port-based Network Access Control
enable     Turn on privileged commands
exit       Exit from EXEC mode
firmware   Firmware upgrade/swap
help       Description of the interactive help system
ip         IPv4 commands
ipv6       IPv6 configuration commands
link-oam   Link OAM configuration
logout     Exit from EXEC mode
more       Display file
no         Negate a command or set its defaults
ping       Send ICMP echo messages
ptp        Misc non persistent 1588 settings
reload     Reload system.
send       Send a message to other tty lines
-- more --, next page: Space, continue: g, quit: ^C

```

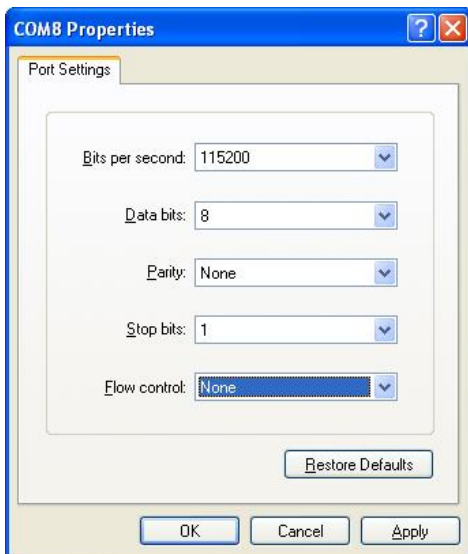
10. Continue to enter S4224 CLI commands. See the *S4224 CLI Reference* manual for more information.

Log In to the S4xxx via HyperTerminal (HT)

1. Open the HyperTerminal (HT) program.
2. Create a new connection by selecting File > New Connection.
3. Enter a name for the session, choose an icon, and click the **OK** button.
4. At the Connect To dropdown select “COM7” and click the **OK** button.



5. At the COM 7 Properties > Port Settings tab, select:
Bits per second: 115,200
Data bits: 8
Parity: None
Stop bits: 1
Flow Control: None



6. Click the **OK** button.
7. Press the Enter key twice.

8. At the Username prompt enter **admin** and press the Enter key. The TN CLI Login screen displays.

```

S4224 - HyperTerminal
File Edit View Call Transfer Help
Username: admin
Password:
Connected 0:04:27  ANSIW  115200 8-N-1  SCROLL  CAPS  NUM  Capture  Print echo

```

9. Enter the Username (**admin**) and press the Enter key.

10. At the HT command prompt, enter a command and press the Enter key. For example, type **Help** and press Enter to display the S4224 Help screen:

```

S4224 - HyperTerminal
File Edit View Call Transfer Help
Username: admin
Password:
# help
Help may be requested at any point in a command by entering
a question mark '?'. If nothing matches, the help list will
be empty and you must backup until entering a '?' shows the
available options.
Two styles of help are provided:
1. Full help is available when you are ready to enter a
   command argument (e.g. 'show ?') and describes each possible
   argument.
2. Partial help is provided when an abbreviated argument is entered
   and you want to know what arguments match the input
   (e.g. 'show pr?'.)
# _
Connected 0:02:47  ANSIW  115200 8-N-1  SCROLL  CAPS  NUM  Capture  Print echo

```

11. Enter the ? command and press Enter to display the available S4224 CLI commands. See the S4224 CLI Reference manual for more information.

```

S4224 - HyperTerminal
File Edit View Call Transfer Help
# ?
clear          Reset functions
configure      Enter configuration mode
copy           Copy from source to destination
delete         Delete one file in flash: file system
dir            Directory of all files in flash: file system
disable        Turn off privileged commands
do             To run exec commands in config mode
dot1x          IEEE Standard for port-based Network Access Control
enable         Turn on privileged commands
exit           Exit from EXEC mode
firmware       Firmware upgrade/swap
help           Description of the interactive help system
ip             IPv4 commands
ipv6           IPv6 configuration commands
link-oam       Link OAM configuration
logout         Exit from EXEC mode
more           Display file
no             Negate a command or set its defaults
ping           Send ICMP echo messages
ptp            Misc non persistent 1588 settings
reload         Reload system.
send           Send a message to other tty lines
-- more --, next page: Space, continue: g, quit: ^C
Connected 0:07:40  ANSIW  115200 8-N-1  SCROLL  CAPS  NUM  Capture  Print echo

```

Log In to the S4xxx via the Web Interface

This procedure assumes that the previous steps are successfully completed.

1. Open a supported web browser.
2. Type in the default URL (e.g., 192.251.144.129) and press the **Enter** key. The 'Connect to' screen displays in IE (or the 'Authentication Required' screen in Google Chrome or Mozilla Firefox).



3. At the User Name field / dropdown enter or select your user name (e.g., admin).
4. In the Password field enter your password or just click **OK**.
5. At the "Remember my password" checkbox, follow your organizations policy on password protection.
6. Click the **OK** button. The S4224 Web interface main screen displays.
7. We recommend registering your S4224 online, and ask you to take the TN customer survey.
8. Continue to Section 3 below for more information on the S4224 Web interface menu system.

When you access the web interface, by default, the DHCP client is enabled and the static IP address is 192.168.0.1.

If a DHCP server is available on the network, the following steps are recommended:

1. Setup the system name using the "system name" command, e.g. "system name my-switch".
2. Delete the static IP address using "ip setup 0.0.0.0".
3. Renew the DHCP address using "ip dhcp enable"

The DHCP client will include the system name as host name in the DHCP request.


Web access to the switch can then be done using the system name, e.g. "my-switch".

If a DHCP server is not available, the following steps are recommended:

1. Disable DHCP using "ip dhcp disable"
2. Setup the IP configuration using the "ip setup" command.

The default web login is "admin" and password is an empty string "".

Log Out of the S4xxx Web Interface

1. Click the logout () button located in the top right corner of each web interface screen. The message "Do you want to logout the web site?" displays.

2. Click the **OK** button to clear the webpage message, or click the **Cancel** button to continue.

3. If you click the **OK** button, the **Connect to ...** dialog displays again to let you log back in if you want. The web interface also displays the message "Authorization required to access this URL." You can either log back in or click the **Cancel** button to clear the **Connect to ...** dialog.



Display S4xxx Web Interface Help

Click the Help (?) button from any web interface menu to display the related online Help.



Register at My TN Access

Register your TN product at <http://www.transition.com/TransitionNetworks/MyTNAccess/>.

Registering for an account is free and will unlock product installation manuals, software upgrades, drivers and various support files related to specific products.

TN Customer Satisfaction Survey

You are invited to participate in our Customer Satisfaction Survey at

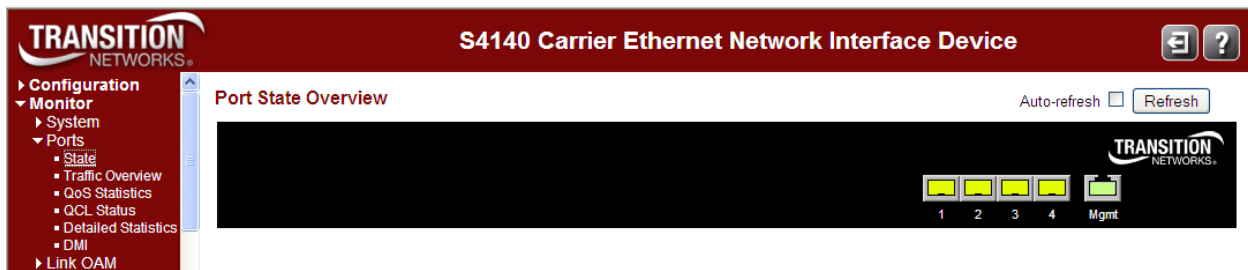
<http://www.transition.com/TransitionNetworks/Landing/customer/customerweb.aspx>.

3. Web Interface and CLI

When the previous steps are successfully completed, you can continue with the S4224 web interface menu system and/or the CLI (Command Line Interface). See these manuals for more information: *S4224 Web Interface User Guide*, 33506 and *S4224 CLI Reference*, 33507.

Web Interface Menu System

The S4xxx web interface is available from a PC connected to a network port or management port. Ensure that the PC and the S4xxx are on the same subnet, start the PC's browser, point the browser at the switch's IP address (default is 192.168.0.1), enter login credentials (default username "**admin**" - no quotes), default password blank (i.e., empty), and the S4xxx startup screen shown below displays.



The default (startup) screen above is at the **Monitor > Ports > State** menu path. Help screens are available via the question mark button in the top right corner.

The S4224 Web interface menu system is shown below in terms of its sub-menus and functions.

| Main Menu | Configuration sub-menu | Monitor sub-menu | Diagnostics sub-menu | Maintenance sub-menu |
|--|---|---|---|---|
| <ul style="list-style-type: none"> ▶ Configuration ▶ Monitor ▶ Diagnostics ▶ Maintenance | <ul style="list-style-type: none"> ▼ Configuration <ul style="list-style-type: none"> ▶ System ▶ Ports ▶ DHCP ▶ Security ▶ Aggregation ▶ Link OAM ▶ Loop Protection ▶ Spanning Tree ▶ IPMC Profile ▪ MVR ▶ IPMC ▪ L2CP ▶ LLDP ▪ EPS ▪ MEP ▪ ERPS ▪ MAC Table ▶ VLAN Translation ▪ VLANs ▶ Private VLANs ▶ VCL ▶ Ethernet Services ▶ Performance Monitor ▶ QoS ▪ Mirroring ▪ PTP ▶ GVRP ▶ Service Activation ▶ DDMI ▪ UDLD | <ul style="list-style-type: none"> ▼ Monitor <ul style="list-style-type: none"> ▶ System ▶ Ports ▶ Link OAM ▶ DHCP ▶ Security ▶ LACP <ul style="list-style-type: none"> ▪ Loop Protection ▶ Spanning Tree ▶ MVR ▶ IPMC ▶ LLDP ▶ Ethernet Services <ul style="list-style-type: none"> ▪ PTP ▪ MAC Table ▶ VLANs ▶ DDMI ▪ UDLD | <ul style="list-style-type: none"> ▼ Diagnostics <ul style="list-style-type: none"> ▪ Ping ▶ Link OAM ▪ Ping6 ▪ VeriPHY ▶ Service Activation | <ul style="list-style-type: none"> ▼ Maintenance <ul style="list-style-type: none"> ▪ Restart Device ▪ Factory Defaults ▼ Software <ul style="list-style-type: none"> ▪ Upload ▪ Image Select ▪ Peripheral Device Upload ▼ Configuration <ul style="list-style-type: none"> ▪ Save startup-config ▪ Download ▪ Upload ▪ Activate ▪ Delete |

The four Main menu selections are:

- **Configuration** - lets you define system operating parameters for the available S4224 features.
- **Monitor** - lets you view and track the S4224 operating functions. See *the S4224 User Guide*.
- **Diagnostics** - provides access to the full set of S4224 tests and verification functions.
- **Maintenance** - supports the S4224 troubleshooting and service functions.

Each of these sub-menus and their functions are described in the S4224 User Guide manual. Note that certain features (e.g., EtherSAT) have separate manuals each with its own Web GUI and CLI descriptions and procedures. See “[Related Manuals and Online Help](#)” on page **Error! Bookmark not defined.** of this manual.

Command Line Interface (CLI)

This S4224 CLI is for experienced network administrators who are responsible for configuring and maintaining the S4224. The CLI offers a comprehensive set of management features for use during initial setup (set IPs, etc.) and troubleshooting, as well as for day-to-day management (device management, firmware upgrades, managing security features, etc.).

The S4224 offers a rich set of commands through its CLI for performing configuration and status monitoring. The CLI is accessible through the RS-232 serial console, telnet and SSH. The CLI incorporates user authentication for security purposes.

The CLI interface can be accessed via Secure Shell (SSH) interface. This provides a more secure interface as SSH uses public-key cryptography for authentication. When the SSH server is enabled, normal telnet access can be enabled or disabled to avoid potential security holes.

All of the CLI commands and their functions are described in the S4224 CLI Reference Guide manual.

4. Messages and Troubleshooting

This section provides general and specific S4224 problem solving suggestions, general error recovery steps, and specific web interface messages, meanings, examples, and possible recovery steps.

S4224 Troubleshooting

1. Check the S4224 [Back Panel Connections](#) (see page 30)
2. Verify the Installation. Check the Operating System, Web Browser, Telnet Client, and/or Terminal Emulation package support (see page 32).
3. Make sure your particular model supports the function attempted.
4. Check the S4224 Front Panel Connectors (see page 24) and LEDs (see page 25).
5. Check the S4224 front panel LEDs. See “[Front Panel](#)” on page 23.
6. Respond to any S4224 error messages (see “S4224 Error Recovery” below).
7. Run the S4224 Diagnostics tests and verification functions (e.g., Ping, Link OAM Mib Retrieve, Ping6, VeriPHY). See the “Diagnostics” section of the S4224 User Guide manual.
8. Perform the S4224 troubleshooting and service functions (e.g., [Restart Device](#), [reset to Factory Defaults](#), [Software Upload](#), [Image Select](#)). See “4. Messages and Troubleshooting” on page 48.
9. Check the S4224 operating parameters (e.g., Information, CPU Load, Log, Detailed Log). See the “[Operation](#)” section of the S4224 User Guide manual.
10. If you can access the S4224 via PuTTY or HyperTerminal but not via the web interface, enter the **restore default keep_ip** CLI command and try accessing the S4224 web interface again.
11. If you have problems displaying the S4224 web interface in IE, try displaying in Compatibility View from the IE **Tools > Compatibility View** menu path.

S4224 Error Recovery

The S4224 displays error and information messages from the CLI and Web interface. This section lists the messages, provides an example, and discusses the message meaning of and possible recovery steps.

As a general troubleshooting step for problems encountered using the S4224 web interface, try the related CLI command. For many messages, recovery involves reviewing the command/function description and verifying the entry selection/syntax. For example, for many CLI messages, the first recovery step would be to refer to the “S4224 CLI Reference Guide” manual.

For any error condition, you can check the [TN Tech Support web](#) site for possible solutions. For any problem that persists, contact TN Tech Support in the US or Canada at 1-800-260-1312, International at 00-1-952-941-7600; via fax at +1 952-941-2322; or via Email at techsupport@transition.com.

Generic Message Recovery (e.g., you tried a function, but the operation failed or is still in process):

1. Wait for a few moments for the operation to complete.
2. Use the **Help** or **?** command to get assistance (help) on a group of commands or on a specific command.
3. Make sure this is the function you want and that the device/port/configuration supports this function.
4. Verify the parameters entered and re-try the function. See the related section of this manual for specifics.
5. Try using the CLI to perform the function. See the “S4224 CLI Reference Guide” manual.
6. If the “*continue y(es) n(o) prompt*” displays, type **y** and press **Enter** to continue.
7. Use the [Monitor](#) sub-menu functions (System, Ports, Link OAM, MAC Table, VLANS) to view related status, statistics, events, etc. related to a specific function.

8. Use the [Diagnostics](#) sub-menu functions (Ping, Link OAM MIB Retrieval, VeriPHY) to test a general functionality.
9. Use the [Maintenance](#) sub-menu functions (Restart the S4224, Reset the S4224 to factory defaults, Upgrade the S4224 firmware).
10. If the problem persists, contact TN Tech Support. US/Canada: 1-800-260-1312, International: 00-1-952-941-7600; [TN Tech Support web](#); fax: +1 952-941-2322; Email: techsupport@transition.com.

Specific Messages Recovery:

1. For messages (e.g., ACL messages) that are the result of a switch memory shortage:
 - a. Reduce other system activity to ease memory demands.
 - b. Use a less complicated configuration that requires less memory.
 - c. Modify the ACL configuration to use fewer resources, or rename the ACL with a name or number that alphanumerically precedes the other ACL names or numbers.
 - d. Reduce the number of IP or MAC access lists to be applied to interfaces.
 - e. Reduce other system activity to ease memory demands (e.g., remove ACLs that are defined but not used; use simpler ACLs with fewer ACEs; use fewer VLANs / remove unneeded VLANs from the VLAN database).
2. For messages that indicate the configuration is too complicated for the ACL code to support, there is likely too many separate access lists in a single VLAN map or policy map. Reduce the number of IP or MAC access lists separately) in any one VLAN or policy map to fewer than the number of levels. Or try to use the same ACLs on multiple interfaces if possible.
3. For messages that indicate an illegal configuration, reconfigure the port / device, removing the illegal configuration.
4. For messages that indicate the temperature is high reduce the temperature in the room.
5. For messages that indicate that the number of MAC address entries for the VLAN exceeds the maximum number allowed, have your system administrator configure an action.
6. For messages that indicate that an unauthorized device attempted to connect on a secure port, identify the device that attempted to connect on the secure port and notify your network system administrator of the condition.
7. For messages that indicate that the amount of traffic detected on the interface has exceeded the configured threshold values, determine and fix the root cause of the excessive traffic on the interface.
8. For messages that indicate an unrecoverable software error has occurred, copy the message exactly as it appears on the console or in the system log and contact TN Support.

See "[S4224 Error Recovery](#)" on page 48 for specific messages and the recommended recovery steps.

For More Error Message Information

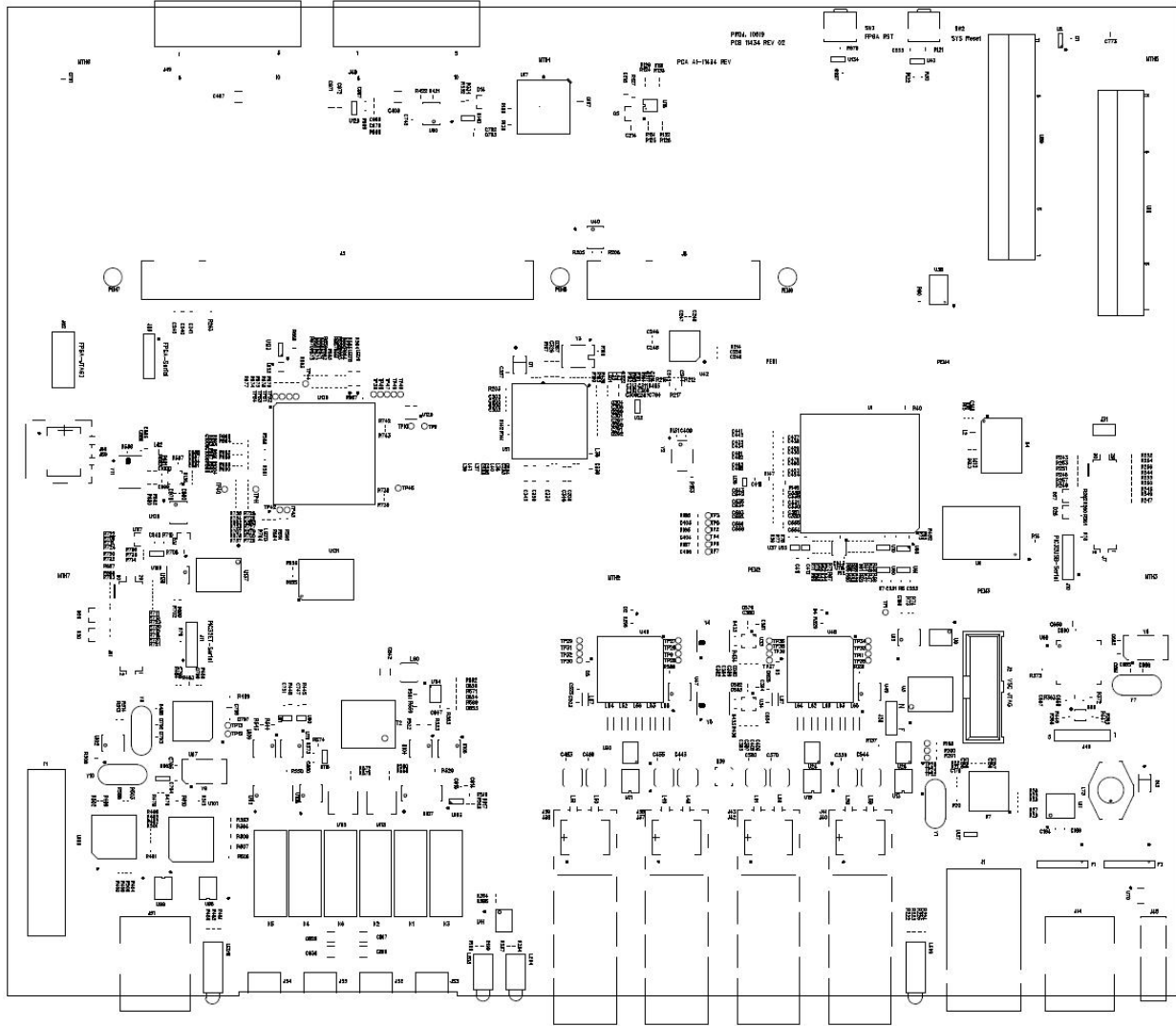
For specific messages resulting from S4224 web interface operation, see the "Web Interface Messages" section of the S4224 Web Interface User Guide, 33506.

For specific messages resulting from S4224 CLI operation, see the "CLI Messages" section of the S4224 CLI Reference Guide, 33507.

For functional level troubleshooting for S4224-TST web interface operation, see the "Web Interface Messages" section of the S4224 Web Interface User Guide, 33506. Topics there include EPS Troubleshooting, ERPS Troubleshooting, IPv6 Troubleshooting, Troubleshooting High CPU Load Conditions, etc.

PCB 11432 Rev. 02

The PCB has configurable components that can only be altered by or at the direction of a TN Tech Support specialist.



J8 (Hardware / Software Jumper)

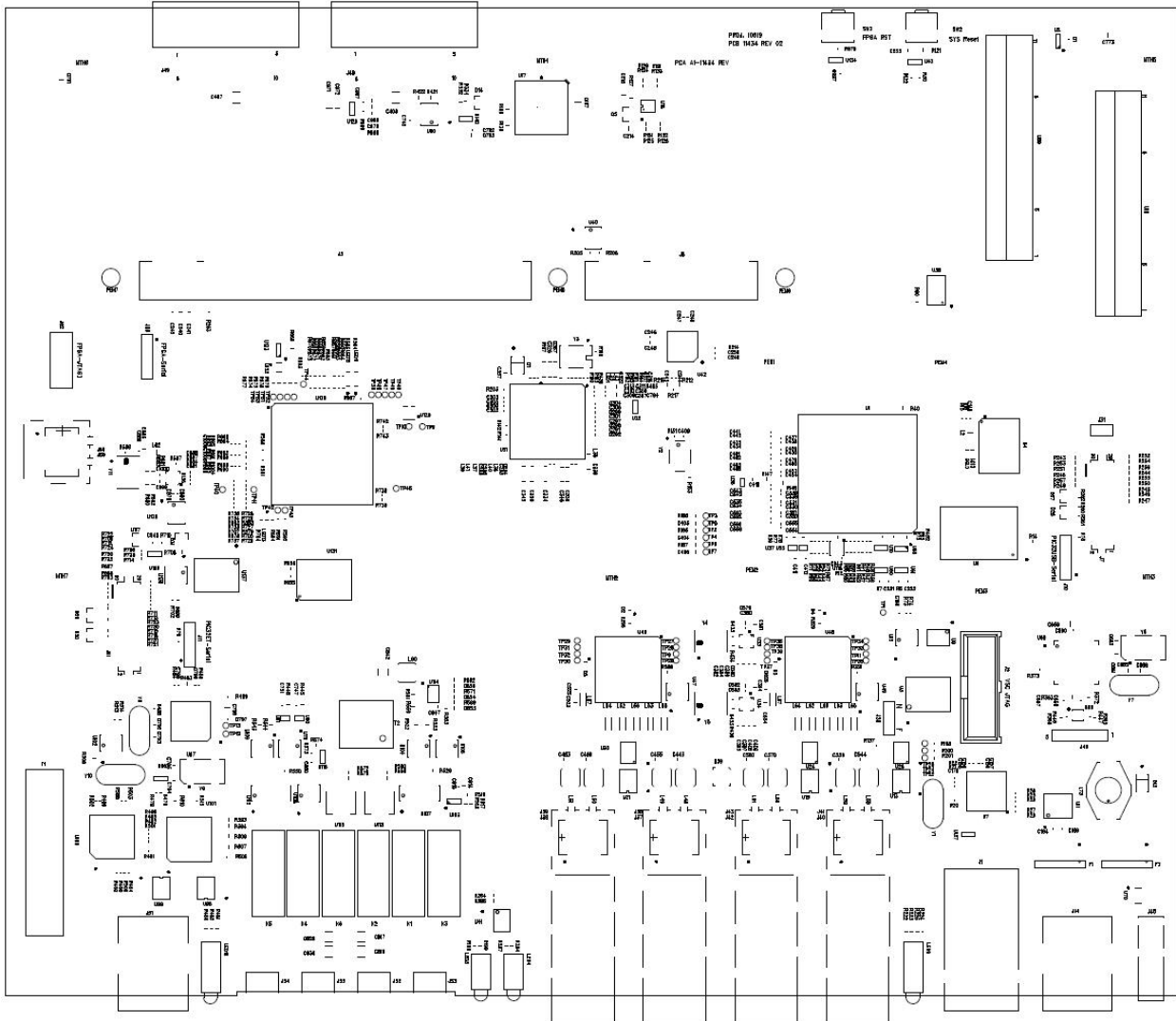
Contact TN Technical Support.

SW1 (x-position DIP Switch)

Contact TN Technical Support.

PCB 11434 Rev. 02

The PCB has configurable components that can only be altered by or at the direction of a TN Tech Support specialist.



SW2 (Factory Reset Jumper)

Contact TN Technical Support.

SW3 (FPGA Reset Jumper)

Contact TN Technical Support.

Appendix A - Cables and Connectors

TN 10GBE Support

The 10G copper and fiber maximum distance is based on cable type for TP. The fiber maximum distance depends on the SFP+ module installed (which just needs to be MSA compliant).

TN products that support 10GBE can use either TN or third party MSA compatible 10G XFP or SFP+ modules including support for these standards:

- 10GBase-SR
- 10GBase-LR
- 10GBase-ER
- 10GBase-LRM
- 10GBase-ZR

Connector Types

The DMI connector type indicates the external optical or electrical cable connector provided as the interface. The information below is from SFF-8472 Rev 11.0. For additional information see the latest SFF-8472 Specification at <ftp://ftp.seagate.com/sff/SFF-8472.PDF>.

Table 5: Connector Descriptions

| Value | Description of connector |
|--------|--|
| 01h | SC |
| 02h | Fibre Channel Style 1 copper connector |
| 03h | Fibre Channel Style 2 copper connector |
| 04h | BNC/TNC |
| 05h | Fibre Channel coaxial headers |
| 06h | FiberJack |
| 07h | LC |
| 08h | MT-RJ |
| 09h | MU |
| 0Ah | SG |
| 0Bh | Optical pigtail |
| 22h | RJ45 |
| 80-FFh | Vendor specific |

The LC and SC connector types (jacks) are shown below.



Figure 11: Connector Types

Cable Types

The cabling specifications are provided for troubleshooting purposes.

RJ-45 to DB-9 Cisco Blue Serial Cable

Use this cable from the PC to the S4xxx.

Table 7: RJ-45 Pinning

| Pin | Signal |
|----------------|---------------|
| P3 | TXD |
| P4, P5 | GND |
| P6 | RXD |
| P1, P2, P7, P8 | No connection |

Copper 10G Ethernet

Copper 10G Ethernet can run over twin-ax cabling, twisted pair cabling, and backplanes. Common forms of 10GbE copper cables include:

10GBASE-CX4 was the first 10G copper standard, published as 802.3ak-2004. It uses the XAU1 4-lane PCS (Clause 48) and copper cabling similar to that used by InfiniBand technology. It is specified to work up to a distance of 15 m (49 ft). Each "lane" carries 3.125 G baud of signaling bandwidth. 10GBASE-CX4 offers the advantages of low power, low cost and low latency, but has a bigger form factor and more bulky cables than the newer single lane SFP+ standard, and a much shorter reach than fiber or 10GBASE-T. This cable is fairly rigid and much more expensive than Category 5 or 6 UTP. Shipments of 10GBASE-CX4 today are very low, although some network vendors offer CX-4 interfaces which can be used for either 10GBase Ethernet or for stacking of switches at (slightly) higher speeds (e.g., Dell PowerConnect PCT6200, PCT7000 and the 1G Powerconnect blade switches PCM6220 and PCM6348).

10GBASE-CR: currently the most common type of copper 10GbE cable is the 10GBase-CR cable that uses an attached SFP+ connector, also known as a Direct Attach Copper (DAC). This fits into the same form factor connector and housing as the fiber-optic cables with SFP+ connectors. Many 10GbE switches accept cables with SFP+ connectors, which support both copper and fiber-optic cables. These cables are available in 1m, 3m, 5m, 7m, 8.5m and longer distances. The most commonly deployed distances are 3m and 5m.

Passive and Active DAC: Passive copper connections are common with many interfaces. The industry is finding that as the transfer rates increase, passive copper does not provide the distance needed and takes up too much physical space. The industry is moving towards an active copper type of interface for higher speed connections. Active copper connections include components that boost the signal, reduce the noise and work with smaller gauge cables, improving signal distance, cable flexibility and airflow.

SFP+ Direct Attach is also known as Direct Attach (DA), 10GSFP+Cu, 10GBase-CR, 10GBase-CX1, SFP+, and 10GbE Cu SFP cabling. Direct Attach uses a passive twin-ax cable assembly and connects directly into an SFP+ housing. SFP+ DA has a fixed-length cable, typically 3, 5, 7 or 10m in length, and is low power, low cost and low latency, with the added advantages of using less bulky cables and of having the (SFP+) small form factor.

Backplane Ethernet (or 802.3ap) is used in backplane applications such as blade servers and routers/switches with upgradable line cards. 802.3ap implementations are required to operate in an environment comprising up to 1 meter (39 in.) of copper PCB with two connectors.

10GBASE-KX4 operates over four backplane "lanes" and uses the same physical layer coding as 10GBASE-CX4 (defined in IEEE 802.3 Clause 48).

10GBASE-KR operates over a single backplane "lane" and uses the same physical layer coding as 10GBASE-LR/ER/SR (defined in IEEE 802.3 Clause 49).

10GBASE-T (or IEEE 802.3an-2006) provides 10 Gbit/s connections over UTP or STP cable, at distances up to 100 metres (330 ft.). Although Category 6a is required to reach the full 100 metres (330 ft.), Category 5e is good for up to 45 metres (148 ft) and Category 6 will reach 55 metres (180 ft). 10GBASE-T cable infrastructure can also be used for 1000BASE-T, allowing a gradual upgrade from 1000BASE-T using auto negotiation to select which speed to use. 10GBASE-T has latency in the range 2 to 4 microseconds, compared with 1 to 12 microseconds on 1000BASE-T. **10GBASE-T** uses the IEC 60603-7 8P8C (RJ45) connectors already widely used with Ethernet. Transmission characteristics are now specified to 500 MHz. To reach this frequency, Category 6A or better balanced twisted pair cables specified in ISO/IEC 11801 amendment 2 or ANSI/TIA-568-C.2 are needed to carry 10GBASE-T up to distances of 100 m. Category 6 cables can carry 10GBASE-T for shorter distances when qualified according to the guidelines in ISO TR 24750 or TIA-155-A. **10GBASE-T** cables and connectors are similar to, but not the same as the cables used for 1000BASE-T. 10GBASE-T cables are Cat6a (Category 6 augmented), also known as Class EA cables. These support the higher frequencies required for 10Gb transmission up to 100 meters (330 feet). Cables must be certified to at least 500MHz to ensure 10GBASE-T compliance. Cat7 (Category 7, Class F) cable is also certified for 10GBASE-T compliance, and is typically deployed in Europe. Cat6 cables may work in 10GBASE-T deployments up to 55m, but should be tested first. Some newer 10GbE switches support 10GBASE-T (RJ45) connectors.

SFP+

10 gigabit Ethernet (10GE or 10GbE or 10 GigE) refers to various technologies for transmitting Ethernet frames at a rate of 10 gigabits per second (10×10⁹ or 10 billion bits per second), first defined by the IEEE 802.3ae-2002 standard. Its adoption has been more gradual than previous revisions of Ethernet: in 2007, one million 10GbE ports were shipped, in 2009 two million ports were shipped, and in 2010 over three million ports were shipped. Like previous versions of Ethernet, 10GbE supports both copper and fiber cabling. However, due to its higher bandwidth requirements, higher-grade copper cables are required: category 6a or Class F/Category 7 cables for links up to 100m. Unlike previous Ethernet standards, 10 gigabit Ethernet defines only full duplex point-to-point links which are generally connected by network switches. Half duplex operation and hubs do not exist in 10GbE.

The 10 gigabit Ethernet standard encompasses a number of different physical layer (PHY) standards. A networking device may support different PHY types through pluggable PHY modules, such as those based on SFP+. At the time that the 10 gigabit Ethernet standard was developed, interest in 10GbE as a wide area network (WAN) transport led to the introduction of a WAN PHY for 10GbE. The WAN PHY encapsulates Ethernet packets in SONET OC-192c frames and operates at a slightly slower data-rate (9.95328 Gbit/s) than the local area network (LAN) PHY. Both share the same physical medium-dependent sublayers so can use the same optics.

The WAN PHY can support maximum link distances up to 80 km depending on the fiber standard employed.

IEEE 10GbE Standards

Table 7: Copper Cable Descriptions

| Standard | Year | Description |
|------------|------|--|
| 802.3ae | 2002 | 10 Gbit/s Ethernet over fiber for LAN (10GBASE-SR, 10GBASE-LR, 10GBASE-ER, 10GBASE-LX4) and WAN (10GBASE-SW, 10GBASE-LW, 10GBASE-EW). |
| 802.3ak | 2004 | 10GBASE-CX4 10 Gbit/s Ethernet over twin-axial (InfiniBand type) cable. |
| 802.3-2005 | 2005 | A revision of base standard incorporating the prior amendments and errata. |
| 802.3an | 2006 | 10GBASE-T 10 Gbit/s Ethernet over copper twisted pair cable. |
| 802.3ap | 2007 | Backplane Ethernet (1 and 10 Gbit/s over printed circuit boards). |
| 802.3aq | 2006 | 10GBASE-LRM 10 Gbit/s Ethernet over multimode fiber with enhanced equalization. |
| 802.3-2008 | 2008 | A revision of base standard incorporating the 802.3an/ap/aq/as amendments, two corrigenda and errata. Link aggregation moved to 802.1AX. |

To support different 10GbE physical layer standards, many interfaces consist of a standard socket into which different PHY modules may be plugged. Physical layer modules are not specified in an official standards body but by multi-source agreements (MSAs) that can be negotiated more quickly. Relevant MSAs for 10GbE include XENPAK (and related X2 and XPAK), XFP and SFP+. When choosing a PHY module, a designer considers cost, reach, media type, power consumption, and size (form factor). A single point-to-point link can have different MSA pluggable formats on either end (e.g. XPAK and SFP+) as long as the 10GbE optical or copper interface (e.g. 10GBASE-SR) inside the pluggable is identical.

The Transition Networks (TN) SFP+ modules are hot-pluggable (allows plugging in or unplugging a module while the host board is powered). **Note:** Transition Networks' SFP+ modules fully comply with the Multi-Sourcing Agreement (MSA). This compliance allows our SFP+ modules to be used in all other MSA compliant SFP+ platforms. In addition, TN SFP modules are also compatible with all Cisco SFP+ based routers and switches, as well as Cisco's IOS software. TN SFP+ modules ARE NOT Cisco OEM brand modules. For more information see

<http://transition.com/TransitionNetworks/Products2/Product.aspx?ID=46893&CategoryName=DAC-10G-SFP-0xM>.

Most of the specifications developed by the SFF Committee have either been incorporated into standards or adopted as standards by EIA (Electronic Industries Association), ANSI (American National Standards Institute) and IEC (International Electrotechnical Commission). The SFF Committee activities support the requirements of the storage industry, and it is involved with several standards. If you are interested in participating or wish to follow the activities of the SFF Committee, the signup for membership and/or documentation can be found at:

www.sffcommittee.com/ie/join.html.

The complete list of SFF Specifications which have been completed or are currently being worked on by the SFF Committee are at <ftp://ftp.seagate.com/sff/SFF-8000.TXT>. See also <ftp://ftp.seagate.com/sff/SFF-8431.PDF>.

Copper (TP / UTP) CAT 1 – CAT 7 Cabling

ANSI/EIA Standard 568 is one of several standards that specify "categories" (each a "CAT") of twisted pair cabling systems. Assigned by the American National Standards Institute/Electronic Industries Association, these standards categories include CAT 1 – CAT 7, as shown below.

Table 8: Copper Cable Descriptions

| Category | Max Data Rate | Typical Application |
|---------------------|---|---|
| CAT 5 | 100 MHz | 100 Mbps TPDDI. 155 Mbps ATM. No longer supported; replaced by 5E. 10/100BASE-T. |
| CAT 5E | 100 MHz | 100 Mbps TPDDI, 155 Mbps ATM, Gigabit Ethernet. Offers better near-end crosstalk than CAT 5. |
| CAT 6 | Up to 250 MHz | Minimum cabling required for data centers in TIA-942. CAT 6 is quickly replacing CAT 5e. |
| CAT 6E | Up to 500 MHz | Field-tested to 500 MHz. Supports 10 Gigabit Ethernet (10GBASE-T). May be either shielded (STP, ScTP, S/FTP) or unshielded (UTP). Standard published in Feb. 2008. The minimum requirement for Data Centers in the ISO Data Center standard. |
| CAT 7 (ISO Class F) | 600 MHz, 1.2 GHz in pairs with Siemon connector | Full-motion video, Teleradiology, Government and manufacturing environments. Fully Shielded (S/FTP) system using non-RJ45 connectors but backwards compatible with hybrid cords. Standard published in 2002. Until Feb. 2008, the only standard to support 10GBASE-T for a full 100m. |

CAT 7A/Class FA and Category 6A/Class EA specifications were published in February, 2008.

Cat 6 (Category 6) Copper Cable

Category 6 cable, commonly referred to as Cat 6, is a standardized cable for Gigabit Ethernet and other network physical layers that is backward compatible with the Category 5/5e and Category 3 cable standards. Compared to Cat 5 and Cat 5e, Cat 6 provides more stringent specifications for crosstalk and system noise. The Cat 6 cable standard provides performance of up to 250 MHz and is suitable for 10BASE-T, 100BASE-TX (Fast Ethernet), 1000BASE-T/1000BASE-TX (Gigabit Ethernet) and 10GBASE-T (10-Gigabit Ethernet).

Category 6 cable has a reduced maximum length when used for 10GBASE-T.

Like most of the earlier twisted-pair cables, Category 6 cable contains four twisted wire pairs. Attenuation, Near End crosstalk (NEXT), and PSNEXT (Power Sum NEXT) in Cat 6 cable and connectors are all much lower than Cat 5 or Cat 5e, which uses 24 AWG wire. The increase in performance with Cat 6 comes mainly from increased (22 AWG) wire size. Because the conductor sizes are generally the same, Cat 6 jacks may also be used with Cat 5e cable.

Category 6 cable can be identified by the printing on the side of the cable sheath. Cat 6 patch cables are normally terminated in 8P8C modular connectors. If Cat 6 rated patch cables, jacks, and connectors are not used with Cat 6 wiring, overall performance is degraded to that of the cable or connector.

Connectors use either T568A or T568B pin assignments; although performance is comparable provided both ends of a cable are the same, T568B is a deprecated standard in the US and no longer supported by TIA.

Category 6a Copper Cable (Augmented Category 6)

Category 6a cable, or Augmented Category 6, is characterized to 500 MHz and has improved alien crosstalk characteristics, allowing 10GBASE-T to be run for the same distance as previous protocols.

The latest standard from the TIA for enhanced performance standards for twisted pair cable systems was defined in February 2008 in ANSI/TIA/EIA-568-B.2-10. Category 6a is defined at frequencies up to 500 MHz—twice that of Cat. 6.

Category 6a performs at improved specifications, in particular in the area of alien crosstalk, as compared to Cat 6 UTP (unshielded twisted pair), which exhibited high alien noise in high frequencies.

The global cabling standard ISO/IEC 11801 has been extended by the addition of amendment 2, which defines new specifications for Cat 6A components and Class EA permanent links. These new global Cat 6A/Class EA specifications require a new generation of connecting hardware, which offer superior performance compared to existing products based on the American TIA standard.

Note the performance difference between ISO/IEC and EIA/TIA component specifications for the NEXT transmission parameter. At a frequency of 500 MHz, an ISO/IEC Cat 6A connector performs 3 dB better than a Cat 6A connector that conforms to the EIA/TIA specification. The 3 dB represents a 100% increase of near-end crosstalk noise reduction when measured in absolute magnitudes.

Maximum Length

When used for 10/100/1000BASE-T, the maximum allowed length of a Cat 6 cable is 100 meters or 328 feet. This consists of 90 meters (300 ft) of solid "horizontal" cabling between the patch panel and the wall jack, plus 10 meters (33 ft) of stranded patch cable between each jack and the attached device. Since stranded cable has higher attenuation than solid cable, exceeding 10 meters of patch cabling will reduce the permissible length of horizontal cable.

When used for 10GBASE-T, Cat 6 cable's maximum length is 55 meters (180 ft) in a favorable alien crosstalk environment, but only 37 meters (121 ft) in a hostile alien crosstalk environment, such as when many cables are bundled together. However, because the effects of alien crosstalk environments on cables are difficult to determine prior to installation, it is highly recommended that all Cat 6 cables being used for 10GBASE-T are electrically tested once installed. With its improved specifications, Cat6 A does not have this limitation and can run 10GBASE-T at 100 meters (330 ft) without electronic testing.

Installation Notes

Category 6 and 6a cable must be properly installed and terminated to meet specifications. The cable must not be kinked or bent too tightly (the bend radius should be at least four times the outer diameter of the cable). The wire pairs must not be untwisted and the outer jacket must not be stripped back more than 1/2 inch (1.27 cm).

All shielded cables must be grounded for safety and effectiveness and a continuous shield connection maintained from end to end. Ground loops develop when there is more than one ground connection and the difference in common mode voltage potential at these ground connections introduces noise into the cabling.

Note that 23 or 24 AWG wire is allowed if the ANSI/TIA-568-B.2-1 performance specifications are met.

The figure below shows the pins on plug face; note that the socket is the reverse of the plug pinout shown below.

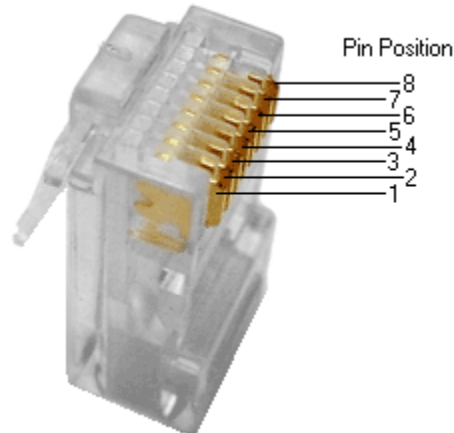


Figure 12: Category 6 Plug Face Pins

For more information, see the TIA web site or the IEEE web site.

Troubleshooting Cat 6 & Cat 6A Structured Copper Cabling Systems

If a Category 6 cabling system does not meet the electrical requirements for supporting 10GBASE-T applications, see the TSB-155 provides guidelines designed to mitigate the alien crosstalk between the target pair and the disturbing pairs of Category 6 channels and permanent links. Annex B of TSB-155 outlines the following mitigation actions most appropriate for individual situations:

- Use Category 6 shielded or Category 6A patch cords;
- Replace Category 6 connectors with Category 6A connectors;
- Use non-adjacent patch panel positions;
- Separate equipment cords and patch cords;
- Unbundle or more loosely bundle the horizontal cabling; and
- Reconfigure the cross-connect as an interconnect.

Fiber (10GbE) Cabling

The two general types of fiber optic cables are SMF (single-mode fiber) and MMF (multi-mode fiber).

SMF has an optical core of approximately 9 μm (microns), and has lower modal dispersion than MMF, and can support distances of at least 10 Km and as high as 80-100 Km (Kilometers) or more, depending on transmission speed, transceivers, etc..

MMF has an optical core of either 50 μm or 62.5 μm , and it supports distances up to 600 meters, depending on transmission speeds and transceivers.

Table 9: Fiber Cable Descriptions

| Standard | Cable Type | Core Diameter | IEEE Standard Distance | Wavelength |
|----------|-------------------|------------------------|------------------------|----------------|
| OM1 | Multi-mode (MMF) | 62.5/125 μm | 33 meters (SR) | 850 / 1300 nm |
| OM2 | Multi-mode (MMF) | 50/125 μm | 82 meters (SR) | 850 / 1300 nm |
| OM3 | Multi-mode (MMF) | 50/125 μm | 300 meters (SR) | 850 / 1300 nm |
| OM4 | Multi-mode (MMF) | 50/125 μm | 550 meters (SR) | 850 / 1300 nm |
| OS1 | Single mode (SMF) | 9 μm | up to 10,000m | 1310 / 1550 nm |

OS1 SMF optics are used for distances up to 10,000m (6.2 miles) with standard transceivers and can work at longer distances with special transceivers and switching infrastructure.

SMB (Sub Miniature version B) Cables

There are several differences between 50 and 75 ohm SMB cables. The ohms refer to the impedance or electrical resistance of the cable type. Typically, **50 ohm** cables are used to transmit information (data) from one piece of equipment to another or, quite often, to an antenna. GPS, wifi, satellite radio, RFID and other applications use 50 ohm cables.



Figure 13: SMB (Sub Miniature version B) Cables

Generally, **75 ohm** cables are used to transmit video signals. Only about 10% of our customers use 75 ohm cables. Chances are if you need 75 ohm cables you will know it but check first if you are unsure.

The 50 ohm low loss cables are older style RG174, RG58, RG8/X and RG8 cables. The available diameters include approx. 1/10th of an inch thick to approx. 4/10th of an inch thick. The thicker the cable, the lower the data loss per foot, but the thicker the cable, the harder it is to bend and the more weight it puts on connections.

- RG174 types have approx. 1/10th inch diameter and are suited for 1-10 ft. applications.
- RG58 types have approx. 2/10th inch diameter, most suitable for 10-25 ft. applications.
- RG8X types are approx. 1/4 inch thick, most suitable for 20-40 ft. applications.
- RG8 types are approx. 4/10ths of an inch thick and are mainly used for 50+ ft. applications.

RJ-45 Serial Port for CLI

The S4224 dedicated RJ-45 serial port for CLI (Command Line Interface) is pinned for Cisco blue RJ-45-to-DB9 cable. A typical Cisco blue RJ-45-to-DB9 cable is shown above.



Figure 14: RJ-45 Serial Port for CLI

Appendix B: Application Notes

S4224 Applications Support

The S4224 targets the CPE (Customer Premise Equipment) or the PE (Provider Edge) equipment and can be used to implement the access functions in these devices. The S4224 provides the required set of UNI features in a cost-effective manner, including:

- Map customer frame formats into Provider frame formats.
 - Classify frames and map to appropriate QoS profiles.
 - Apply Provider Bridge (Q-in-Q) encapsulations.
- Meter the customer traffic and ensure that the customer SLA (Service Level Agreement) is met.
 - Polices using MEF-defined Token Bucket algorithm.
 - Mark frames as Committed (Green) or Discard Eligible (Yellow).
 - Provide correct QoS treatment (traffic management).
 - Provide traffic statistics per Customer in a manner consistent with the SLA.
- Enable end to end Service OAM (SOAM) by the customer, if allowed.
- Implement the Service as defined by the SLA.
 - E-LINE for point-to-point or backhaul services.
 - E-LAN for multi-point/bridged services.
 - E-Tree for video distribution or backhaul services.
- Enable management and protection schemes as required by the Provider.
 - Link Aggregation or other port protection schemes if used for access.
 - OAM at the Operator and Service Provider levels for remote management, fault diagnosis, and protection switching.
- Support network timing and synchronization requirements as required.
- Provide Sync-E (Synchronous Ethernet) and IEEE 1588 functionality.

Available TN S4224 Application Notes

Application notes on certain specific functions / environments are available from your TN Technical Support specialist. See the [Warranty](#) section on page 62 for contact information. Topics include:

1. Service OAM (SOAM)
2. IEEE 1588 Precision Time Protocol (PTP)
3. EVC - MEF Service Configuration (MEF E-Line - E-LAN - E-Tree Services)
4. Ethernet Ring Protection Switching (ERPS)
5. EVC Behavior - ELAN Configuration

Not Intended for Use in Life Support Products: S4224 products are not intended for use in life support products, systems, or environments where failure of an S4224 product could reasonably be expected to result in death or personal injury. Anyone using an S4224 product in such an application without express written consent of an officer of Transition Networks, Inc. does so at their own risk, and agrees to fully indemnify Transition Networks, Inc. for any damages that may result from such use or sale.

Appendix C: Service, Warranty & Compliance Information

Warranty

Five-Year Limited Hardware Warranty

Transition Networks warrants to the original consumer or purchaser that each of its Liberator, PacketBand, DataBand, MILAN brand switch and media converters, S3280 series, S4140, S4212, S4224 products and all components thereof, will be free from defects in material and/or workmanship for a period of five years from the original factory shipment date. Any warranty hereunder is extended to the original consumer or purchaser and is not assignable. Transition Networks makes no express or implied warranties including, but not limited to, any implied warranty of merchantability or fitness for a particular purpose, except as expressly set forth in this warranty. In no event shall Transition Networks be liable for incidental or consequential damages, costs, or expenses arising out of or in connection with the performance of the product delivered hereunder. Transition Networks will in no case cover damages arising out of the product being used in a negligent fashion or manner.

Return Authorization

To return a defective product for warranty coverage, contact Transition Networks's technical support department for a return authorization number. Transition's technical support department can be reached through any of the following means:

Service Hours

USA: 8:00 PM Sunday through 8:00 PM Friday CST. After Hours: Calls will be answered by an on call engineer.

Direct Contact Numbers

Domestic: + 1 800-260-1312

International: + 1 952-358-3601

Fax: +1 952-941-2322

Email: techsupport@transition.com Online Support

Live Help: [Chat live](#) with a Transition Networks representative.

Return Instructions

Send the defective product postage and insurance prepaid to the following address:

Transition Networks, Inc.
10900 Red Circle Drive
Minnetonka, MN 55343 USA
Attn: RETURNS DEPT: CRA/RMA # _____

Failure to properly protect the product during shipping may void this warranty. The return authorization number must be written on the outside of the carton to ensure its acceptance. We cannot accept delivery of any equipment that is sent to us without a CRA or RMA number.

CRA's are valid for 60 days from the date of issuance. An invoice will be generated for payment on any unit(s) not returned within 60 days.

Upon completion of a demo/ evaluation test period, units must be returned or purchased within 30 days. An invoice will be generated for payment on any unit(s) not returned within 30 days after the demo/ evaluation period has expired.

The customer must pay for the non-compliant product(s) return transportation costs to Transition Networks for evaluation of said product(s) for repair or replacement. Transition Networks will pay for the shipping of the repaired or replaced in-warranty product(s) back to the customer (any and all customs charges, tariffs, or/and taxes are the customer's responsibility).

Before making any non-warranty repair, Transition Networks requires a \$200.00 charge plus actual shipping costs to and from the customer. If the repair is greater than \$200.00, an estimate is issued to the customer for authorization of repair. If no authorization is obtained, or the product is deemed 'not repairable', Transition Networks will retain the \$200.00 service charge and return the product to the customer not repaired. Non-warranted products that are repaired by Transition Networks for a fee will carry a 180-day limited warranty. All warranty claims are subject to the restrictions and conventions set forth by this document.

Transition Networks reserves the right to charge for all testing and shipping incurred, if after testing, a return is classified as "No Problem Found."

THIS WARRANTY IS YOUR ONLY REMEDY. NO OTHER WARRANTIES, SUCH AS FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSED OR IMPLIED. TRANSITION NETWORKS IS NOT LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, ARISING FROM ANY CAUSE OR THEORY. AUTHORIZED RESELLERS ARE NOT AUTHORIZED TO EXTEND ANY DIFFERENT WARRANTY ON TRANSITION NETWORKS'S BEHALF.

Compliance Information

Standards: CISPR22/EN55022 Class A, CE Mark

FCC Regulations:

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 his own expense.

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.

CE Marking

This is a Class A product. In a domestic environment, this product could cause radio interference; as a result, the customer may be required to take adequate preventative measures.

UL Recognized

Tested and recognized by the Underwriters Laboratories, Inc.

European Regulations**WARNING:**

This is a Class A product. In a domestic environment, this product could cause radio interference in which case the user may be required to take adequate measures.

Achtung !

Dieses ist ein Gerät der Funkstörgrenzwertklasse A. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkstörungen auftreten. In diesem Fall ist der Benutzer für Gegenmaßnahmen verantwortlich.

Attention !

Ceci est un produit de Classe A. Dans un environnement domestique, ce produit risque de créer des interférences radioélectriques, il appartiendra alors à l'utilisateur de prendre les mesures spécifiques appropriées.



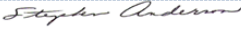
In accordance with European Union Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003, Transition Networks will accept post usage returns of this product for proper disposal. The contact information for this activity can be found in the 'Contact Us' portion of this document.



CAUTION: RJ connectors are NOT INTENDED FOR CONNECTION TO THE PUBLIC TELEPHONE NETWORK. Failure to observe this caution could result in damage to the public telephone network.

Der Anschluss dieses Gerätes an ein öffentliches Telekommunikationsnetz in den EG-Mitgliedstaaten verstösst gegen die jeweiligen einzelstaatlichen Gesetze zur Anwendung der Richtlinie 91/263/EWG zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über Telekommunikationsendeinrichtungen einschliesslich der gegenseitigen Anerkennung ihrer Konformität.

Declaration of Conformity

| | | | |
|--|--|---|------------------------|
| <i>Declaration of Conformity</i> | | | |
| <u>Transition Networks, Inc.</u> <small>Manufacturer's Name</small> | | | |
| <u>10900 Red Circle Drive, Minnetonka, Minnesota 55343 U.S.A.</u> <small>Manufacturer's Address</small> | | | |
| Declares that the products: S4140, S4212, S4224 | | | |
| Conforms to the following Product Regulations: | | | |
| EN 55022:2010/AC:2011, EN 55024:2010, IEC /EN 60950-1 Directive 2004/108/EC FCC Part 15 Subpart B AS/NZS CISPR 22: 2009 + A1:2010, ICES-003, Issue 5:2012, VCCI V-3/2013.04 | | | |
| I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and Standards(s). | | | |
| <u>Minnetonka, Minnesota</u> <small>Place</small> | <u>Dec 23, 2013</u> <small>Date</small> |  <small>Signature</small> | |
| <u>Stephen Anderson</u> <small>Full Name</small> | | <u>Vice President of Engineering</u> <small>Position</small> | <small>28/1418</small> |

Electrical Safety Warnings

Electrical Safety

IMPORTANT: This equipment must be installed in accordance with safety precautions.

Elektrische Sicherheit

WICHTIG: Für die Installation dieses Gerätes ist die Einhaltung von Sicherheitsvorkehrungen erforderlich.

Elektrisk sikkerhed

VIGTIGT: Dette udstyr skal installeres i overensstemmelse med sikkerhedsadvarslerne.

Elektrische veiligheid

BELANGRIJK: Dit apparaat moet in overeenstemming met de veiligheidsvoorschriften worden geïnstalleerd.

Sécurité électrique

IMPORTANT : Cet équipement doit être utilisé conformément aux instructions de sécurité.

Sähköturvallisuus

TÄRKEÄÄ : Tämä laite on asennettava turvaohjeiden mukaisesti.

Sicurezza elettrica

IMPORTANTE: questa apparecchiatura deve essere installata rispettando le norme di sicurezza.

Elektrisk sikkerhet

VIKTIG: Dette utstyret skal installers I samsvar med sikkerhetsregler.

Segurança eléctrica

IMPORTANTE: Este equipamento tem que ser instalado segundo as medidas de precaução de segurança.

Seguridad eléctrica

IMPORTANTE: La instalación de este equipo deberá llevarse a cabo cumpliendo con las precauciones de seguridad.

Elsäkerhet

OBS! Alla nödvändiga försiktighetsåtgärder måste vidtas när denna utrustning används

Safety Instructions for Rack Mount Installations

The instructions below (or similar) are intended for S4224 rackmount installation environments:

1. Elevated Operating Ambient: if installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may exceed room ambient. Install the equipment in an environment compatible with the maximum ambient temperature (T_{ma}) specified.
2. Reduced Air Flow: install the equipment in a rack so that the amount of air flow required for safe operation is not compromised.
3. Mechanical Loading: Mount the equipment in the rack so that a hazardous condition does not occur due to uneven mechanical loading (weight distribution/rack balance).
4. Circuit Overloading: give consideration to the connection of the equipment to the supply circuit and the effect that overloading of the circuits might have on overcurrent protection and supply wiring. Consider all equipment nameplate ratings when addressing this concern.
5. Reliable Earthing: maintain reliable earthing of rack-mounted equipment; pay particular attention to supply connections other than direct connections to the branch circuit (e.g., use of power strips).

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