Edge-corE ®

ECS4510-28T/P/F
ECS4510-52T/P
28/52-Port Layer 2+
Stackable GE Switch

Installation Guide

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INSTALLATION GUIDE

ECS4510-28T GIGABIT ETHERNET SWITCH

*Layer 2+ Stackable Gigabit Ethernet Switch
with 24 10/100/1000BASE-T (RJ-45) Ports,
2 10 Gigabit SFP+ Ports,
and 1 10-Gigabit SFP+ Extender Module Slot*

ECS4510-28P GIGABIT ETHERNET SWITCH

*Layer 2+ Stackable Gigabit Ethernet Switch
with 24 10/100/1000BASE-T (RJ-45) PoE Ports,
2 10 Gigabit SFP+ Ports,
and 1 10-Gigabit SFP+ Extender Module Slot*

ECS4510-28F GIGABIT ETHERNET SWITCH

*Layer 2+ Stackable Gigabit Ethernet Switch
with 22 100/1000BASE-X SFP Ports,
2 Combination Gigabit (RJ-45/SFP) Ports,
2 10 Gigabit SFP+ Ports,
and 1 10-Gigabit SFP+ Extender Module Slot*

ECS4510-52T GIGABIT ETHERNET SWITCH

*Layer 2+ Stackable Gigabit Ethernet Switch
with 48 10/100/1000BASE-T (RJ-45) Ports,
2 10 Gigabit SFP+ Ports,
and 1 10-Gigabit SFP+ Extender Module Slot*

ECS4510-52P GIGABIT ETHERNET SWITCH

*Layer 2+ Stackable Gigabit Ethernet Switch
with 48 10/100/1000BASE-T (RJ-45) PoE Ports,
2 10 Gigabit SFP+ Ports,
and 1 10-Gigabit SFP+ Extender Module Slot*

COMPLIANCES AND SAFETY STATEMENTS

FCC - CLASS A

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.

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

You may use unshielded twisted-pair (UTP) for RJ-45 connections - Category 3 or better for 10 Mbps connections, Category 5 or better for 100 Mbps connections, Category 5, 5e, or 6 for 1000 Mbps connections. For fiber optic connections, you may use 50/125 or 62.5/125 micron multimode fiber or 9/125 micron single-mode fiber.

INDUSTRY CANADA - CLASS A

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled "Digital Apparatus," ICES-003 of the Department of Communications.

Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Classe A prescrites dans la norme sur le matériel brouilleur: "Appareils Numériques," NMB-003 édictée par le ministère des Communications.

JAPAN VCCI CLASS A

この装置は，クラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。　　　　　　　　VCCI-A

CE MARK DECLARATION OF CONFORMANCE FOR EMI AND SAFETY (EEC)

This information technology equipment complies with the requirements of the Council Directive 89/336/EEC on the Approximation of the laws of the Member States relating to Electromagnetic Compatibility and 73/23/EEC for electrical equipment used within certain voltage limits and the Amendment Directive 93/68/EEC. For the evaluation of the compliance with these Directives, the following standards were applied:

RFI Emission:	◆ Limit class A according to EN 55022: 2010, Class A/B
	◆ Limit class A for harmonic current emission according to EN 61000-3-2: 2009, Class A
	◆ Limitation of voltage fluctuation and flicker in low-voltage supply system according to EN 61000-3-3: 2008
Immunity:	◆ Product family standard according to EN 55024: 2010
	◆ Electrostatic Discharge according to IEC 61000-4-2: 2008
	◆ Radio-frequency electromagnetic field according to IEC 61000-4-3: 2010
	◆ Electrical fast transient/burst according to IEC 61000-4-4: 2011
	◆ Surge immunity test according to IEC 61000-4-5: 2005
	◆ Immunity to conducted disturbances, Induced by radio-frequency fields: IEC 61000-4-6: 2008
	◆ Power frequency magnetic field immunity test according to IEC 61000-4-8: 2009
	◆ Voltage dips, short interruptions and voltage variations immunity test according to IEC 61000-4-11: 2004
LVD:	◆ EN 60950-1: 2011

SAFETY COMPLIANCE

Warning: Fiber Optic Port Safety

| CLASS I
LASER DEVICE |

When using a fiber optic port, never look at the transmit laser while it is powered on. Also, never look directly at the fiber TX port and fiber cable ends when they are powered on.

Avertissment: Ports pour fibres optiques - sécurité sur le plan optique

| DISPOSITIF LASER
DE CLASSE I |

Ne regardez jamais le laser tant qu'il est sous tension. Ne regardez jamais directement le port TX (Transmission) à fibres optiques et les embouts de câbles à fibres optiques tant qu'ils sont sous tension.

Warnhinweis: Faseroptikanschlüsse - Optische Sicherheit

| LASERGERÄT
DER KLASSE I |

Niemals ein Übertragungslaser betrachten, während dieses eingeschaltet ist. Niemals direkt auf den Faser-TX-Anschluß und auf die Faserkabelenden schauen, während diese eingeschaltet sind.

PSE ALARM

本製品に同梱いたしております電源コードセットは、
本製品専用です。本電源コードセットは、本製品以外の
製品並びに他の用途でご使用いただくことは出来ません。
製品本体に同梱された電源コードセットを利用し、他製品
の電源コードセットを使用しないで下さい。

Power Cord Set	
U.S.A. and Canada	The cord set must be UL-approved and CSA certified.
	The minimum specifications for the flexible cord are: - No. 18 AWG - not longer than 2 meters, or 16 AWG. - Type SV or SJ - 3-conductor
	The cord set must have a rated current capacity of at least 12 A
	The attachment plug must be an earth-grounding type with NEMA 5-15P (15 A, 125 V) configuration.
Denmark	The supply plug must comply with Section 107-2-D1, Standard DK2-1a or DK2-5a.
Switzerland	The supply plug must comply with SEV/ASE 1011.
U.K.	The supply plug must comply with BS1363 (3-pin 13 A) and be fitted with a 5 A fuse which complies with BS1362.
	The mains cord must be <HAR> or <BASEC> marked and be of type HO3VVF3GO.75 (minimum).
Europe	The supply plug must comply with CEE7/7 ("SCHUKO").
	The mains cord must be <HAR> or <BASEC> marked and be of type HO3VVF3GO.75 (minimum).
	IEC-320 receptacle.

Veuillez lire à fond l'information de la sécurité suivante avant d'installer le Switch:

AVERTISSEMENT: L'installation et la dépose de ce groupe doivent être confiés à un personnel qualifié.

◆ Ne branchez pas votre appareil sur une prise secteur (alimentation électrique) lorsqu'il n'y a pas de connexion de mise à la terre (mise à la masse).

◆ Vous devez raccorder ce groupe à une sortie mise à la terre (mise à la masse) afin de respecter les normes internationales de sécurité.

◆ Le coupleur d'appareil (le connecteur du groupe et non pas la prise murale) doit respecter une configuration qui permet un branchement sur une entrée d'appareil EN 60320/IEC 320.

◆ La prise secteur doit se trouver à proximité de l'appareil et son accès doit être facile. Vous ne pouvez mettre l'appareil hors circuit qu'en débranchant son cordon électrique au niveau de cette prise.

◆ L'appareil fonctionne à une tension extrêmement basse de sécurité qui est conforme à la norme IEC 60950. Ces conditions ne sont maintenues que si l'équipement auquel il est raccordé fonctionne dans les mêmes conditions.

France et Pérou uniquement:
Ce groupe ne peut pas être alimenté par un dispositif à impédance à la terre. Si vos alimentations sont du type impédance à la terre, ce groupe doit être alimenté par une tension de 230 V (2 P+T) par le biais d'un transformateur d'isolement à rapport 1:1, avec un point secondaire de connexion portant l'appellation Neutre et avec raccordement direct à la terre (masse).

Cordon électrique - Il doit être agréé dans le pays d'utilisation	
Etats-Unis et Canada:	Le cordon doit avoir reçu l'homologation des UL et un certificat de la CSA.
	Les spécifications minimales pour un cable flexible sont AWG No. 18, ouAWG No. 16 pour un cable de longueur inférieure à 2 mètres. - type SV ou SJ - 3 conducteurs
	Le cordon doit être en mesure d'acheminer un courant nominal d'au moins 12 A.
	La prise femelle de branchement doit être du type à mise à la terre (mise à la masse) et respecter la configuration NEMA 5-15P (15 A, 125 V).
Danemark:	La prise mâle d'alimentation doit respecter la section 107-2 D1 de la norme DK2 1a ou DK2 5a.
Suisse:	La prise mâle d'alimentation doit respecter la norme SEV/ASE 1011.
Europe	La prise secteur doit être conforme aux normes CEE 7/7 ("SCHUKO") LE cordon secteur doit porter la mention <HAR> ou <BASEC> et doit être de type HO3VVF3GO.75 (minimum).

Bitte unbedingt vor dem Einbauen des Switches die folgenden Sicherheitsanweisungen durchlesen:

WARNUNG: Die Installation und der Ausbau des Geräts darf nur durch Fachpersonal erfolgen.

◆ Das Gerät sollte nicht an eine ungeerdete Wechselstromsteckdose angeschlossen werden.

◆ Das Gerät muß an eine geerdete Steckdose angeschlossen werden, welche die internationalen Sicherheitsnormen erfüllt.

◆ Der Gerätestecker (der Anschluß an das Gerät, nicht der Wandsteckdosenstecker) muß einen gemäß EN 60320/IEC 320 konfigurierten Geräteeingang haben.

◆ Die Netzsteckdose muß in der Nähe des Geräts und leicht zugänglich sein. Die Stromversorgung des Geräts kann nur durch Herausziehen des Gerätenetzkabels aus der Netzsteckdose unterbrochen werden.

◆ Der Betrieb dieses Geräts erfolgt unter den SELV-Bedingungen (Sicherheitskleinstspannung) gemäß IEC 60950. Diese Bedingungen sind nur gegeben, wenn auch die an das Gerät angeschlossenen Geräte unter SELV-Bedingungen betrieben werden.

Stromkabel. Dies muss von dem Land, in dem es benutzt wird geprüft werden:	
Schweiz	Dieser Stromstecker muß die SEV/ASE 1011Bestimmungen einhalten.
Europe	Das Netzkabel muß vom Typ HO3VVF3GO.75 (Mindestanforderung) sein und die Aufschrift <HAR> oder <BASEC> tragen. Der Netzstecker muß die Norm CEE 7/7 erfüllen (”SCHUKO”).

WARNINGS AND CAUTIONARY MESSAGES

WARNING: This product does not contain any serviceable user parts.

WARNING: Installation and removal of the unit must be carried out by qualified personnel only.

WARNING: When connecting this device to a power outlet, connect the field ground lead on the tri-pole power plug to a valid earth ground line to prevent electrical hazards.

WARNING: This switch uses lasers to transmit signals over fiber optic cable. The lasers are compliant with the requirements of a Class 1 Laser Product and are inherently eye safe in normal operation. However, you should never look directly at a transmit port when it is powered on.

CAUTION: Wear an anti-static wrist strap or take other suitable measures to prevent electrostatic discharge when handling this equipment.

CAUTION: Do not plug a phone jack connector in the RJ-45 port. This may damage this device.

CAUTION: Use only twisted-pair cables with RJ-45 connectors that conform to FCC standards.

ENVIRONMENTAL STATEMENTS

The manufacturer of this product endeavours to sustain an environmentally-friendly policy throughout the entire production process. This is achieved though the following means:

◆ Adherence to national legislation and regulations on environmental production standards.

◆ Conservation of operational resources.

◆ Waste reduction and safe disposal of all harmful un-recyclable by-products.

◆ Recycling of all reusable waste content.

◆ Design of products to maximize recyclables at the end of the product's life span.

◆ Continual monitoring of safety standards.

END OF PRODUCT LIFE SPAN

This product is manufactured in such a way as to allow for the recovery and disposal of all included electrical components once the product has reached the end of its life.

MANUFACTURING MATERIALS

There are no hazardous nor ozone-depleting materials in this product.

DOCUMENTATION

All printed documentation for this product uses biodegradable paper that originates from sustained and managed forests. The inks used in the printing process are non-toxic.

COMPLIANCES AND SAFETY STATEMENTS

ABOUT THIS GUIDE

PURPOSE

This guide details the hardware features of the switch, including the physical and performance-related characteristics, and how to install the switch.

AUDIENCE

The guide is intended for use by network administrators who are responsible for installing and setting up network equipment; consequently, it assumes a basic working knowledge of LANs (Local Area Networks).

CONVENTIONS

The following conventions are used throughout this guide to show information:

NOTE: Emphasizes important information or calls your attention to related features or instructions.

CAUTION: Alerts you to a potential hazard that could cause loss of data, or damage the system or equipment.

WARNING: Alerts you to a potential hazard that could cause personal injury.

RELATED PUBLICATIONS

The following publication gives specific information on how to operate and use the management functions of the switch:

The *Management Guide*

Also, as part of the switch's software, there is an online web-based help that describes all management related features.

REVISION HISTORY

This section summarizes the changes in each revision of this guide.

MAY 2014 REVISION

This is the third revision of this guide. It includes the following change:

◆   Added information for stacking support.

AUGUST 2013 REVISION

This is the second revision of this guide. It includes the following change:

◆   Added redundant power supply specifications for ECS4510-52P.

JUNE 2013 REVISION

This is the first revision of this guide.

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1 INTRODUCTION

OVERVIEW

The ECS4510-28T, ECS4510-28P, ECS4510-52T, and ECS4510-52P are intelligent Layer 2+ stackable switches with 24 or 48 10/100/1000BASE-T ports, and 2 10G SFP+ slots. The ECS4510-28P and ECS4510-52P front-panel ports all support Power-over-Ethernet Plus (PoE+).

The ECS4510-28F provides 24 100/1000BASE-X SFP transceiver slots, two combination ports, comprised of two RJ-45 ports and two SFP+ transceiver slots, and two 10G SFP+ slots.

All switches provide one rear-panel slot for a dual-port 10 Gigabit Ethernet hot-swappable expansion module.

The switches include an SNMP-based management agent embedded on the main board, which supports both in-band and out-of-band access for managing the switch.

Figure 1: 28-Port Switch Front Panels

ECS4510-28T

ECS4510-28P

ECS4510-28F

Figure 2: 52-Port Switch Front Panels

ECS4510-52T

ECS4510-52P

Figure 3: Rear Panel

SWITCH ARCHITECTURE

This Gigabit Ethernet switch employs a wire-speed, non-blocking switching fabric. This permits simultaneous wire-speed transport of multiple packets at low latency on all ports. The switch also features full-duplex capability on all ports, which effectively doubles the bandwidth of each connection.

This switch uses uses store-and-forward switching to ensure maximum data integrity. With store-and-forward switching, the entire packet must be received into a buffer and checked for validity before being forwarded. This prevents errors from being propagated throughout the network.

These switches include built-in stacking ports that enable up to eight units to be connected together through a 40 Gbps stack backplane. The switch stack can be managed from a master unit using a single IP address.

This switch also includes one slot on the rear panel for a slide-in dual-port SFP+ 10GBASE module.

POWER-OVER-ETHERNET CAPABILITY

The ECS4510-28P and ECS4510-52P 10/100/1000 Mbps RJ-45 ports support the IEEE 802.3at Power-over-Ethernet Plus (PoE+) standard that enables DC power to be supplied to attached devices using wires in the connecting Ethernet cable. Any 802.3at compliant device attached to a port can directly draw power from the switch over the Ethernet cable without requiring its own separate power source. This capability gives network administrators centralized power control for devices such as IP phones and wireless access points, which translates into greater network availability.

For each attached 802.3at-compliant device, the switch automatically senses the load and dynamically supplies the required power. The switch delivers power to a device using the two data wire pairs in UTP or STP. Each port can provide up to 30 W of power at the standard -48 VDC voltage. Independent overload and short-circuit protection for each port allows the switch to automatically shut down a port's power when limits are exceeded.

Network devices such as IP phones, wireless access points, and network cameras, typically consume less than 10 W of power, so they are ideal for PoE aplications.

NETWORK MANAGEMENT OPTIONS

This switch contains a comprehensive array of LEDs for "at-a-glance" monitoring of network and port status. It also includes a management agent that allows you to configure or monitor the switch using its embedded management software, or via SNMP applications. To manage the switch, you can make a direct connection to the console port (out-of-band), or you can manage the switch through a network connection (in-band) using Telnet, the on-board web agent, or SNMP-based network management software.

For a detailed description of the management features, refer to the *Management Guide*.

DESCRIPTION OF HARDWARE

10/100/1000BASE-T RJ-45 PORTS

The switch contains 24/48 RJ-45 ports that operate at 10 Mbps or 100 Mbps, half or full duplex, or at 1000 Mbps, full duplex. Because all ports on the switch support automatic MDI/MDI-X operation, you can use straight-through cables for all network connections to PCs or servers, or to other switches or hubs. (See "1000BASE-T Pin Assignments" on page 72.)

Each of these ports support auto-negotiation, so the optimum transmission mode (half or full duplex), and data rate (10, 100, or 1000 Mbps) can be selected automatically. If a device connected to one of these ports does not support auto-negotiation, the communication mode of that port can be configured manually.

SFP TRANSCEIVER SLOTS

The ECS4510-28F switch contains 24 Small Form Factor Pluggable (SFP) transceiver slots that operate at 1000 Mbps full duplex. These slots support 1000 Mbps SFP Gigabit Ethernet transceivers and 100 Mbps Fast Ethernet trasceivers.

For information on the recommended standards for fiber optic cabling, see "1000 Mbps Gigabit Ethernet Collision Domain" on page 61 and "100 Mbps Fast Ethernet Collision Domain" on page 62.

COMBINATION RJ-45/SFP PORTS

The ECS4510-28F switch contains two combination RJ-45 ports that operate at 10 Mbps or 100 Mbps, half or full duplex, or at 1000 Mbps, full duplex. They are shared with SFP ports 23~24. In its default configuration, if an SFP transceiver (purchased separately) is installed in a slot and has a valid link on its port, the associated RJ-45 port is disabled and cannot be used. The switch can also be configured to force the use of an RJ-45 port or SFP slot, as required.

SFP+ TRANSCEIVER SLOTS

The Small Form Factor Pluggable Plus (SFP+) transceiver slots are 10G capable slots that support both SFP and SFP+ modules (purchased seperately.)

STACKING PORTS

The 10G SFP+ ports on the front panel can also be used as stacking ports to provide a 40 Gbps stack backplane connection. Up to eight 24-port or 48-port switches can be connected together using SFP+ transceivers and cables. One unit in the stack acts as the Master for configuration tasks, all of the other units function in Slave mode, but can automatically take over management of the stack if the Master unit fails. For more information on stacking, see "Connecting Switches in a Stack" on page 47.

10 GIGABIT ETHERNET EXPANSION MODULE

The switch includes one slot on the rear panel for a hot-swappable dual-port 10GBASE module. Refer to "Optional Media Extender Modules" on page 29 for more information on the supported modules.

PORT AND SYSTEM STATUS LEDS

The switch includes a display panel for key system and port indications that simplify installation and network troubleshooting. The LEDs, which are located on the front panel for easy viewing, are shown below and described in the following tables.

Figure 4: Port LEDs

Table 1: Port Status LEDs

LED	Condition	Status
Link/Activity	On/Flashing Green	Port has a valid link. Flashing indicates activity.
	On/Flashing Amber	Port has a valid link and is supplying PoE power. Flashing indicates activity.
	Off	The link is down.

Figure 5: System LEDs
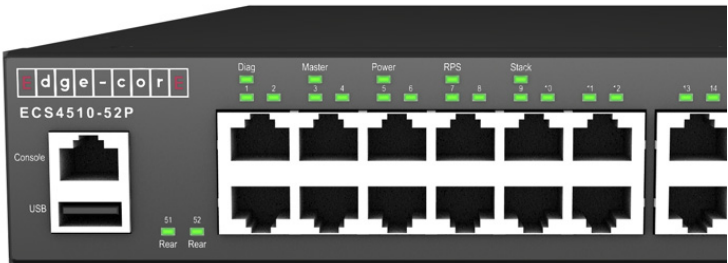
Table 2: System Status LEDs

LED	Condition	Status
Power	On Green	Internal power is operating normally.
	On Amber	Internal power supply failure.
	Off	Power off.
Diag	Flashing Green	System self-diagnostic test in progress.
	On Green	System self-diagnostic test successfully completed.
	On Amber	System self-diagnostic test has detected a fault.
	Flashing Amber	A system fan has failed.
RPS	On Green	Redundant power supply is receiving power.
	On Amber	Fault in redundant power supply, including thermal or fan failure.
	Off	Redundant power supply is not plugged in.
Stack	On Green	The SFP+ ports are operating in stacking mode.
	Off	The SFP+ ports are in uplink mode or there is no link.
Master	On Green	The switch is the Master unit in the stack.
	On Amber	The switch is operating as a Slave unit in the stack.
	Off	The switch is operating in stand-alone mode.

OPTIONAL REDUNDANT POWER SUPPLY

The switch supports an optional Redundant Power Supply (RPS), that can supply power to the switch in the event the internal power supply fails.

POWER SUPPLY SOCKETS

There are two power sockets on the rear panel of the switch. The standard power socket is for the AC power cord. The socket labeled "RPS" is for the optional Redundant Power Supply (RPS).

Figure 6: Power Supply Sockets
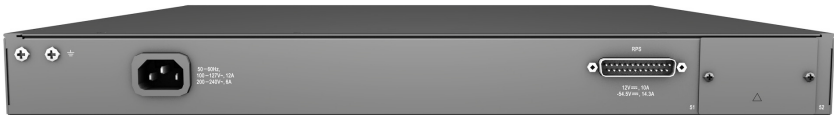
OPTIONAL MEDIA EXTENDER MODULES

10GBASE SFP+ MODULE

Figure 7: Dual-Port 10GBASE Module (SFP+)

The module's SFP+ slots support standard 10 Gigabit Ethernet (10G) SFP+ transceivers. The 10GBASE transceivers operate at 10 Gbps full duplex with support for flow control.

2 NETWORK PLANNING

INTRODUCTION TO SWITCHING

A network switch allows simultaneous transmission of multiple packets via non-crossbar switching. This means that it can partition a network more efficiently than bridges or routers. Switches have, therefore, been recognized as one of the most important building blocks for today's networking technology.

When performance bottlenecks are caused by congestion at the network access point (such as the network card for a high-volume file server), the device experiencing congestion (server, power user or hub) can be attached directly to a switched port. And, by using full-duplex mode, the bandwidth of the dedicated segment can be doubled to maximize throughput.

When networks are based on repeater (hub) technology, the distance between end stations is limited by a maximum hop count. However, a switch turns the hop count back to zero. So subdividing the network into smaller and more manageable segments, and linking them to the larger network by means of a switch, removes this limitation.

A switch can be easily configured in any Ethernet, Fast Ethernet, Gigabit Ethernet, or 10G Ethernet network to significantly boost bandwidth while using conventional cabling and network cards.

APPLICATION EXAMPLES

The Gigabit Ethernet Switch is not only designed to segment your network, but also to provide a wide range of options in setting up network connections. Some typical applications are described below.

SUPPLYING POE

The switch is an excellent choice for supplying power to connected PoE devices such as web cameras, IP telephones or access points. You can easily connect a PoE device to a switch port and allow power to be supplied over the connecting cable. Each of the 24/48 ports on the switch can provide power to a connected device.

In the figure below, the switch is supplying power to three PoE devices. It is also providing dedicated 100 Mbps full-duplex data connections to the devices. In addition, other non-PoE devices can be connected to the switch.

Figure 8: PoE Connections

Power-over-Ethernet Devices

Web Camera   IP Telephone   Access Point
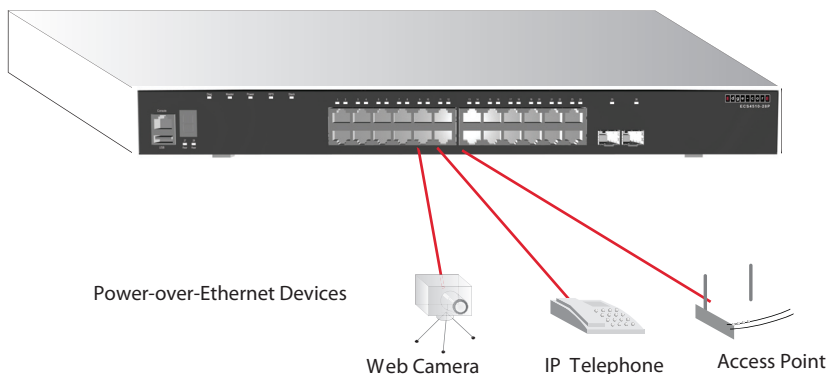
COLLAPSED BACKBONE

The Gigabit Ethernet Switch is an excellent choice for mixed Ethernet, Fast Ethernet, and Gigabit Ethernet installations where significant growth is expected in the near future. In a basic stand-alone configuration, it can provide direct full-duplex connections for up to 28/52 workstations or servers. You can easily build on this basic configuration, adding direct full-duplex connections to workstations or servers. When the time comes for further expansion, just connect to another switch using one of the Gigabit Ethernet ports built into the front panel, a Gigabit Ethernet port on a plug-in SFP transceiver, or a 10G transceiver on an optional module.

In the figure below, the 28-port Gigabit Ethernet Switch is operating as a collapsed backbone for a small LAN. It is providing dedicated 10 Mbps full-duplex connections to workstations and 100 Mbps full-duplex connections to power users, and 1 Gbps full-duplex connections to servers.

Figure 9: Collapsed Backbone
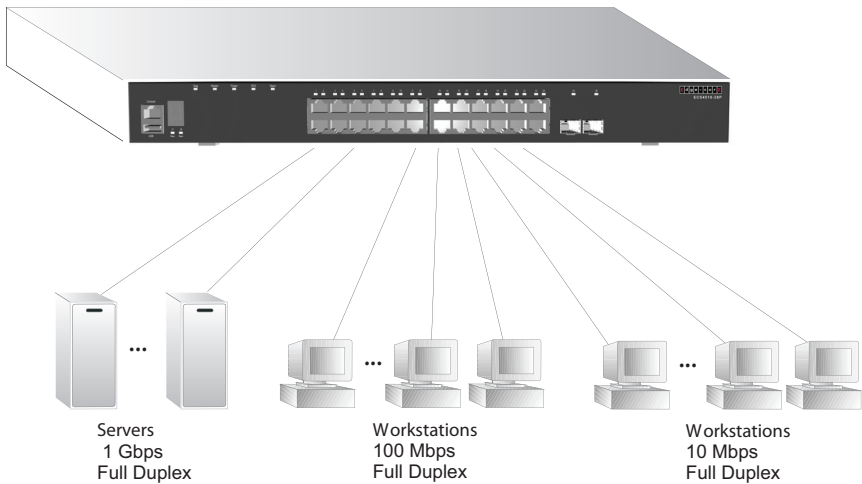
NETWORK AGGREGATION PLAN

With 28/52 parallel bridging ports (i.e., 28/52 distinct collision domains), a Gigabit switch can collapse a complex network down into a single efficient bridged node, increasing overall bandwidth and throughput.

In the figure below, the 10/100/1000BASE-T ports of a 28-port Gigabit Ethernet switch are providing 1000 Mbps connectivity through other switches. In addition, the switch is also connecting servers at 10 Gbps.

Figure 10: Network Aggregation Plan

Server Farm

10/100/1000 Mbps Segments
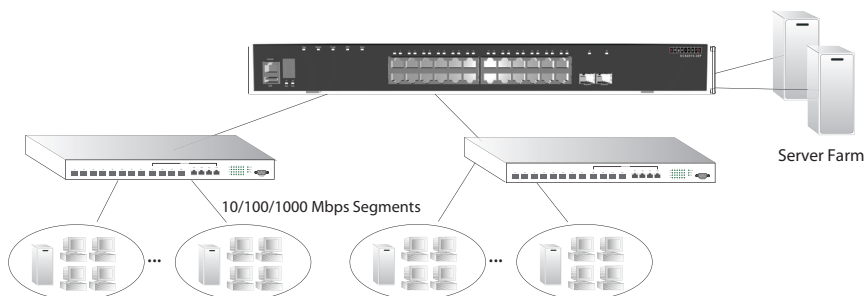
REMOTE CONNECTIONS WITH FIBER CABLE

Fiber optic technology allows for longer cabling than any other media type. A 1000BASE-SX (MMF) link can connect to a site up to 550 meters away, a 1000BASE-LX (SMF) link up to 10 km, and a 1000BASE-ZX link up to 100 km. This allows a switch to serve as a collapsed backbone, providing direct connectivity for a widespread LAN.

A 1000BASE-SX SFP transceiver can be used for a high-speed connection between floors in the same building and a 10GBASE-LR module can be used for high-bandwidth core connections between buildings in a campus setting. For long-haul connections, a 1000BASE-ZX SFP transceiver can be used to reach another site up to 100 kilometers away.

The figure below illustrates three Gigabit Ethernet switches interconnecting multiple segments with fiber cable.

Figure 11: Remote Connections with Fiber Cable
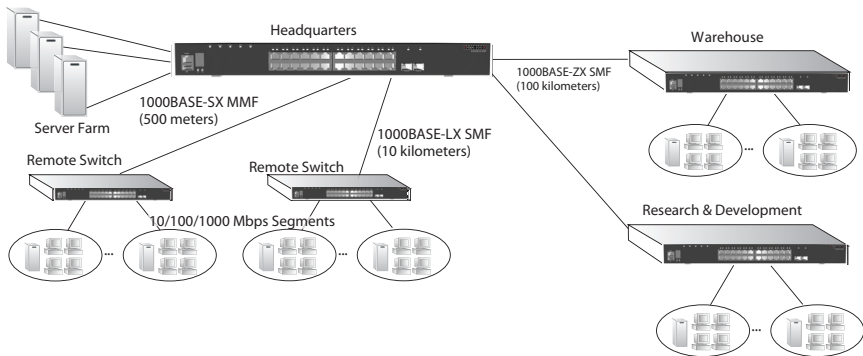
MAKING VLAN CONNECTIONS

This switch supports VLANs which can be used to organize any group of network nodes into separate broadcast domains. VLANs confine broadcast traffic to the originating group, and can eliminate broadcast storms in large networks. This provides a more secure and cleaner network environment.

VLANs can be based on untagged port groups, or traffic can be explicitly tagged to identify the VLAN group to which it belongs. Untagged VLANs can be used for small networks attached to a single switch. However, tagged VLANs should be used for larger networks, and all the VLANs assigned to the inter-switch links.

This switch also supports multiple spanning trees which allow VLAN groups to maintain a more stable path between all VLAN members. This can reduce the overall amount of protocol traffic crossing the network, and provide a shorter reconfiguration time if any link in the spanning tree fails.

Figure 12: Making VLAN Connections
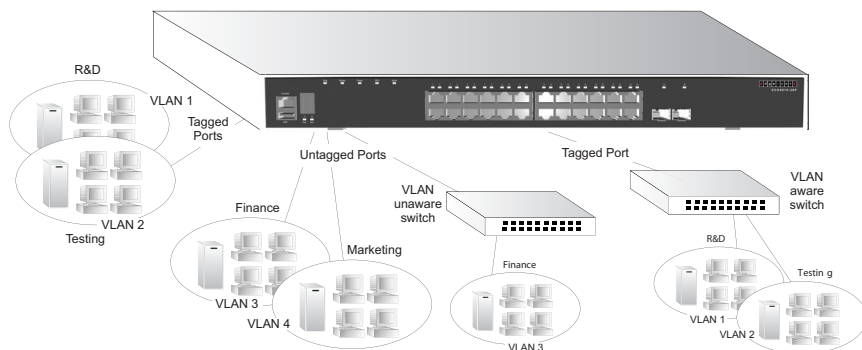
NOTE: When connecting to a switch that does not support IEEE 802.1Q VLAN tags, use untagged ports.

APPLICATION NOTES

1. Full-duplex operation only applies to point-to-point access (such as when a switch is attached to a workstation, server or another switch). When the switch is connected to a hub, both devices must operate in half-duplex mode.

2. For network applications that require routing between dissimilar network types, you can attach this switch directly to a multi-protocol router.

3. As a general rule, the length of fiber optic cable for a single switched link should not exceed:

- 1000BASE-SX: 550 m (1805 ft) for multimode fiber

- 1000BASE-LX: 10 km (6.2 miles) for single-mode fiber

- 1000BASE-ZX: 100 km (62 miles) for single-mode fiber

- 10GBASE-SR: 300 m (984 ft) for multimode fiber

- 10GBASE-LR: 10 km (6.2 miles) for single-mode fiber

- 10GBASE-ER: 40 km (24.8 miles) for single-mode fiber

However, power budget constraints must also be considered when calculating the maximum cable length for your specific environment.

3 INSTALLING THE SWITCH

SELECTING A SITE

Switch units can be mounted in a standard 19-inch equipment rack or on a flat surface. Be sure to follow the guidelines below when choosing a location.

◆ The site should:

- be at the center of all the devices you want to link and near a power outlet.

- be able to maintain its temperature within 0 to 45 °C (32 to 113 °F) and its humidity within 5% to 95%, non-condensing

- provide adequate space (approximately five centimeters or two inches) on all sides for proper air flow

- be accessible for installing, cabling and maintaining the devices

- allow the status LEDs to be clearly visible

◆ Make sure twisted-pair cable is always routed away from power lines, fluorescent lighting fixtures and other sources of electrical interference, such as radios and transmitters.

◆ Make sure that the unit is connected to a separate grounded power outlet that provides 100 to 240 VAC, 50 to 60 Hz, is within 2 m (6.6 feet) of each device and is powered from an independent circuit breaker. As with any equipment, using a filter or surge suppressor is recommended.

ETHERNET CABLING

To ensure proper operation when installing the switch into a network, make sure that the current cables are suitable for 10BASE-T, 100BASE-TX or 1000BASE-T operation. Check the following criteria against the current installation of your network:

◆ Cable type: Unshielded twisted pair (UTP) or shielded twisted pair (STP) cables with RJ-45 connectors; Category 3 or better for 10BASE-T, Category 5 or better for 100BASE-TX, and Category 5, 5e or 6 for 1000BASE-T.

◆ Protection from radio frequency interference emissions

◆ Electrical surge suppression

◆ Separation of electrical wires (switch related or other) and electromagnetic fields from data based network wiring

◆ Safe connections with no damaged cables, connectors or shields

Figure 13: RJ-45 Connections
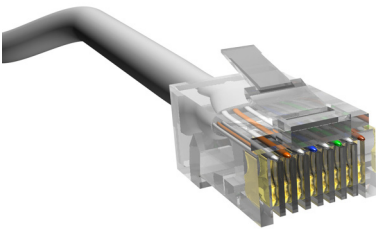
EQUIPMENT CHECKLIST

After unpacking this switch, check the contents to be sure you have received all the components. Then, before beginning the installation, be sure you have all other necessary installation equipment.

PACKAGE CONTENTS

◆ 28/52-port Gigabit Ethernet Switch
(ECS4510-28T, ECS4510-28P, ECS4510-28F, ECS4510-52T,
or ECS4510-52P)

◆ Four adhesive foot pads

◆ Bracket Mounting Kit containing two brackets and eight screws for attaching the brackets to the switch

◆ Power cord—either US, Continental Europe or UK

◆ Console cable (RJ-45 to DB-9)

◆ This Installation Guide

◆ Management Guide CD

OPTIONAL RACK-MOUNTING EQUIPMENT

If you plan to rack-mount the switch, be sure to have the following equipment available:

◆ Four mounting screws for each device you plan to install in a rack—these are not included

◆ A screwdriver (Phillips or flathead, depending on the type of screws used)

MOUNTING

The switch can be mounted in a standard 19-inch equipment rack or on a desktop or shelf. Mounting instructions for each type of site follow.

RACK MOUNTING

Before rack mounting the switch, pay particular attention to the following factors:

◆ Temperature: Since the temperature within a rack assembly may be higher than the ambient room temperature, check that the rack-environment temperature is within the specified operating temperature range. (See .)

◆ Mechanical Loading: Do not place any equipment on top of a rack-mounted unit.

◆ Circuit Overloading: Be sure that the supply circuit to the rack assembly is not overloaded.

◆ Grounding: Rack-mounted equipment should be properly grounded. Particular attention should be given to supply connections other than direct connections to the mains.

To rack-mount devices:

1. Attach the brackets to the device using the screws provided in the Bracket Mounting Kit.

Figure 14: Attaching the Brackets

2. Mount the device in the rack, using four rack-mounting screws (not provided).

Figure 15: Installing the Switch in a Rack

3. If installing a single switch only, turn to .

4. If installing multiple switches, mount them in the rack, one below the other, in any order.

5. If also installing an RPS, mount it in the rack below the other devices.

DESKTOP OR SHELF MOUNTING

1. Attach the four adhesive feet to the bottom of the first switch.

Figure 16: Attaching the Adhesive Feet

2. Set the device on a flat surface near an AC power source, making sure there are at least two inches of space on all sides for proper air flow.

3. If installing a single switch only, go to "Connecting to a Power Source" on page 49.

4. If installing multiple switches, attach four adhesive feet to each one. Place each device squarely on top of the one below, in any order.

5. If also installing an RPS, place it close to the stack.

INSTALLING AN OPTIONAL MODULE INTO THE SWITCH

Figure 17: Installing an Optional Module
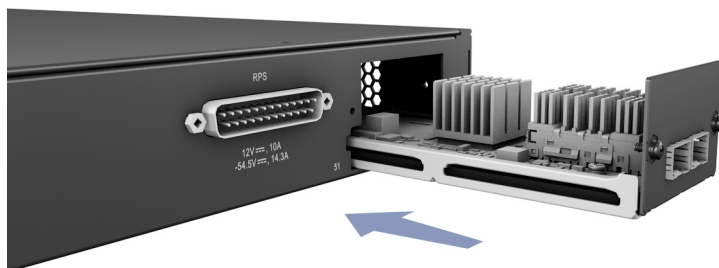
ⓘ **NOTE:** The slide-in modules are hot-swappable, you do not need to power off the switch before installing or removing a module.

To install an optional module into the switch, do the following:

1. Remove the blank metal plate (or a previously installed module) from the appropriate slot by removing the two screws with a flat-head screwdriver.

2. Before opening the package that contains the module, touch the bag to the switch casing to discharge any potential static electricity. Also, it is recommended to use an ESD wrist strap during installation.

3. Remove the module from the anti-static shielded bag.

4. Holding the module level, guide it into the carrier rails on each side and gently push it all the way into the slot, ensuring that it firmly engages with the connector.

5. If you are sure the module is properly mated with the connector, tighten the retainer screws to secure the module in the slot.

6. The Module LED on the switch's front panel should turn green to confirm that the module is correctly installed and ready to use.

INSTALLING AN SFP OR SFP+ TRANSCEIVER

Figure 18: Inserting an SFP Transceiver into a Slot

The switch supports the following optional transceivers:

Table 3: Optional Transceivers

SFP	SFP+
1000BASE-SX (ET4201-SX)	10GBASE-SR (ET5402-SR)
1000BASE-LX (ET4201-LX)	10GBASE-LR (ET5402-LR)
1000BASE-ZX (ET4201-ZX)	10GBASE-ER (ET5402-ER)

To install an SFP or SFP+ transceiver, do the following:

1. Consider network and cabling requirements to select an appropriate transceiver type. See "Connectivity Rules" on page 60.

2. Insert the transceiver with the optical connector facing outward and the slot connector facing down. Note that SFP and SFP+ transceivers are keyed so they can only be installed in one orientation.

3. Slide the transceiver into the slot until it clicks into place.

> ⓘ **NOTE:** SFP/SFP+ transceivers are hot-swappable. The switch does not need to be powered off before installing or removing a transceiver. However, always first disconnect the network cable before removing a transceiver.
>
> **NOTE:** SFP/SFP+ transceivers are not provided in the switch package.

CONNECTING SWITCHES IN A STACK

Figure 19 on page 48 shows how the stack cables are connected between switches in a stack. Each stacking connection is a 10 Gbps full-duplex link using Direct Attach Cable (DAC) or other SFP+ transceivers and cables. The switch supports a line- and ring-topology stacking configuration, or can be used stand alone. To ensure minimal disruption in case a unit or stack cable fails, we recommend always use a ring-topology.

In line-topology stacking there is a single stack cable connection between each switch that carries two-way communications across the stack. In ring-topology stacking, an extra cable is connected between the top and bottom switches forming a "ring" or "closed-loop." The closed-loop cable provides a redundant path for the stack link, so if one link fails, stack communications can still be maintained. Figure 19 illustrates a ring-topology stacking configuration.

When the stack is initially powered on, the Master unit is designated as unit 1 for a ring topology. For a line topology, the stack is simply numbered from top to bottom, with the first unit in the stack designated at unit 1. This unit identification number appears on the Stack Unit ID LCD on the front panel of the switch. For more information on stack configuration, refer to the *CLI Reference Guide* and *Web Management Guide*.

To connect up to eight switches in a stack, perform the following steps:

1. Plug one end of a stack cable in the right port of the top unit.

2. Plug the other end of a stack cable into the left port of the next unit.

3. Repeat steps 1 and 2 for each unit in the stack. Form a simple chain starting at the right port on the top unit and ending at the left port on the bottom unit (stacking up to 8 units).

4. (Optional) To form a wrap-around topology, plug one end of a stack cable into the right port on the bottom unit and the other end into the left port on the top unit.

Figure 19: Making Stack Connections
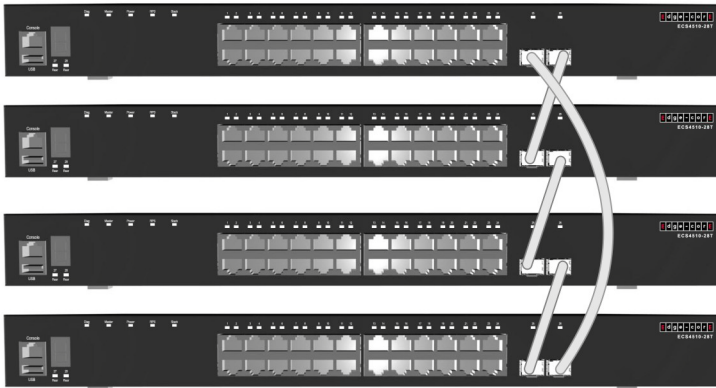
5. To complete the stack configuration, you must use the switch CLI or web interface to enable stacking on the SFP+ ports for each switch in the stack (refer to the *CLI Reference Guide* and *Web Management Guide*). You can also select the stack Master and number units in the stack.

6. Reboot each switch in the stack to start stack operation.

CONNECTING TO A POWER SOURCE

To connect a switch to a power source:

1. Insert the power cable plug directly into the AC socket located at the back of the switch.

Figure 20: Power Socket

2. Plug the other end of the cable into a grounded, 3-pin, AC power source.

> (i) **NOTE:** For International use, you may need to change the AC line cord. You must use a line cord set that has been approved for the socket type in your country.

3. Check the front-panel LEDs as the device is powered on to be sure the PWR LED is on. If not, check that the power cable is correctly plugged in.

4. If you have purchased a Redundant Power Supply, connect it to the switch and to an AC power source now, following the instructions included with the package.

CONNECTING TO THE CONSOLE PORT

The RJ-45 serial port on the switch's front panel is used to connect to the switch for out-of-band console configuration. The on-board configuration program can be accessed from a terminal or a PC running a terminal emulation program. The pin assignments used to connect to the serial port are provided in the following table.

Figure 21: Serial Port (RJ-45) Pin-Out
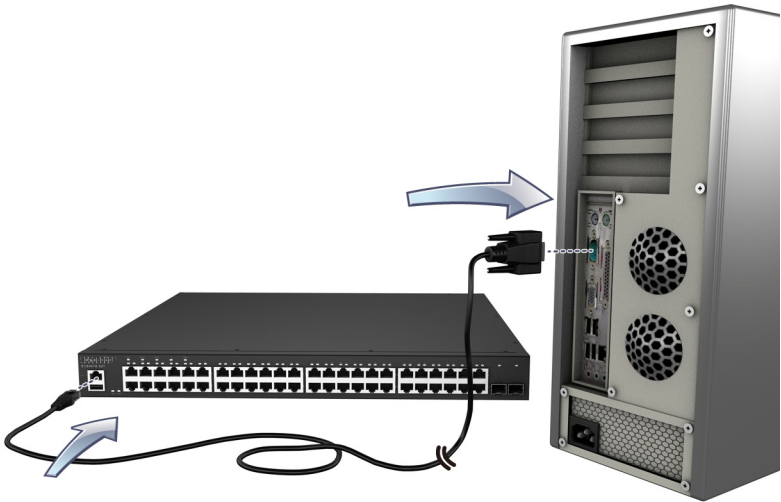
WIRING MAP FOR SERIAL CABLE

Table 4: Serial Cable Wiring

Switch's 8-Pin Serial Port	Null Modem	PC's 9-Pin DTE Port
6 RXD (receive data)	<--------------------	3 TXD (transmit data)
3 TXD (transmit data)	-------------------->	2 RXD (receive data)
5 SGND (signal ground)	----------------------	5 SGND (signal ground)

No other pins are used.

The serial port's configuration requirements are as follows:

◆ Default Baud rate—115,200 bps

◆ Character Size—8 Characters

◆ Parity—None

◆ Stop bit—One

◆ Data bits—8

◆ Flow control—none

4 MAKING NETWORK CONNECTIONS

CONNECTING NETWORK DEVICES

This switch is designed to interconnect multiple segments (or collision domains). It can be connected to network cards in PCs and servers, as well as to hubs, switches or routers. It may also be connected to devices using optional 1G SFP or 10 SFP+ transceivers.

TWISTED-PAIR DEVICES

Each device requires an unshielded twisted-pair (UTP) cable with RJ-45 connectors at both ends. Use Category 5e or better for 1000BASE-T connections, Category 5 or better for 100BASE-TX connections, and Category 3 or better for 10BASE-T connections.

CABLING GUIDELINES

The RJ-45 ports on the switch support automatic MDI/MDI-X pinout configuration, so you can use standard straight-through twisted-pair cables to connect to any other network device (PCs, servers, switches, routers, or hubs).

See Appendix B for further information on cabling.

⚠ **CAUTION:** Do not plug a phone jack connector into an RJ-45 port. This will damage the switch. Use only twisted-pair cables with RJ-45 connectors that conform to FCC standards.

CONNECTING TO PCS, SERVERS, HUBS AND SWITCHES

1. Attach one end of a twisted-pair cable segment to the device's RJ-45 connector.

Figure 22: Making Twisted-Pair Connections
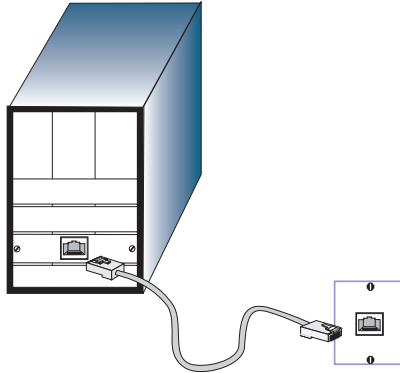
2. If the device is a network card and the switch is in the wiring closet, attach the other end of the cable segment to a modular wall outlet that is connected to the wiring closet. (See the section "Network Wiring Connections" on page 54.) Otherwise, attach the other end to an available port on the switch.

Make sure each twisted pair cable does not exceed 100 meters (328 ft) in length.

3. As each connection is made, the Link LED (on the switch) corresponding to each port will turn on to indicate that the connection is valid.

NETWORK WIRING CONNECTIONS

Today, the punch-down block is an integral part of many of the newer equipment racks. It is actually part of the patch panel. Instructions for making connections in the wiring closet with this type of equipment follows.

1. Attach one end of a patch cable to an available port on the switch, and the other end to the patch panel.

2. If not already in place, attach one end of a cable segment to the back of the patch panel where the punch-down block is located, and the other end to a modular wall outlet.

3. Label the cables to simplify future troubleshooting. See "Cable Labeling and Connection Records" on page 62.

Figure 23: Network Wiring Connections
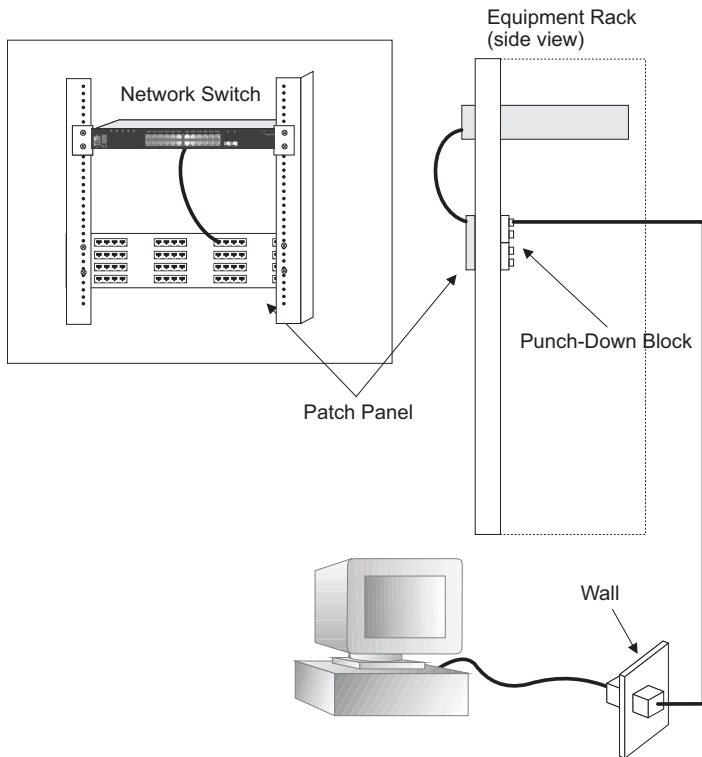
FIBER OPTIC SFP DEVICES

An optional Gigabit SFP transceiver (1000BASE-SX, 1000BASE-LX, or 1000BASE-ZX) can be used for a backbone connection between switches, or for connecting to a high-speed server.

Each single-mode fiber port requires 9/125 micron single-mode fiber optic cable with an LC connector at both ends. Each multimode fiber optic port requires 50/125 or 62.5/125 micron multimode fiber optic cabling with an LC connector at both ends.

WARNING: This switch uses lasers to transmit signals over fiber optic cable. The lasers are compliant with the requirements of a Class 1 Laser Product and are inherently eye safe in normal operation. However, you should never look directly at a transmit port when it is powered on.

WARNING: When selecting a fiber SFP device, considering safety, please make sure that it can function at a temperature that is not less than the recommended maximum operational temperature of the product. You must also use an approved Laser Class 1 SFP transceiver.

1. Remove and keep the LC port's rubber plug. When not connected to a fiber cable, the rubber plug should be replaced to protect the optics.

2. Check that the fiber terminators are clean. You can clean the cable plugs by wiping them gently with a clean tissue or cotton ball moistened with a little ethanol. Dirty fiber terminators on fiber optic cables will impair the quality of the light transmitted through the cable and lead to degraded performance on the port.

3. Connect one end of the cable to the LC port on the switch and the other end to the LC port on the other device. Since LC connectors are keyed, the cable can be attached in only one orientation.

Figure 24: Making Fiber Port Connections

4. As a connection is made, check the Link LED on the switch corresponding to the port to be sure that the connection is valid.

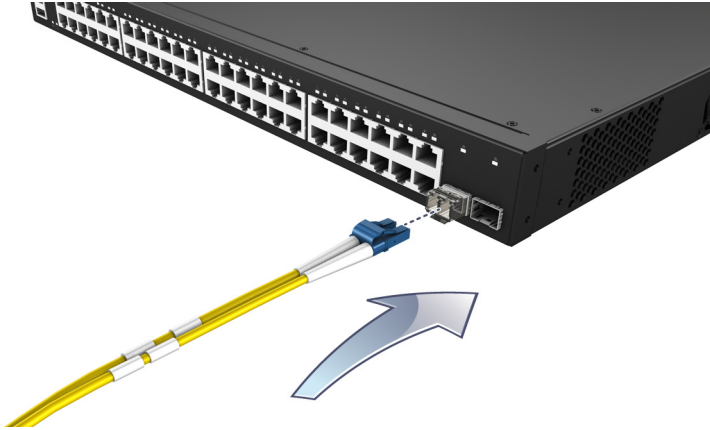The 1000BASE-SX, 1000BASE-LX, 1000BASE-ZX fiber optic ports operate at 1 Gbps, full duplex, with auto-negotiation of flow control. The maximum length for fiber optic cable operating at Gigabit speed will depend on the fiber type as listed under "1000 Mbps Gigabit Ethernet Collision Domain" on page 61.

10 GBPS FIBER OPTIC CONNECTIONS

An optional 10 Gigabit transceiver (SFP+) can be used for a backbone connection between switches.

Single-mode fiber ports require 9/125 micron single-mode fiber optic cable. Multimode fiber optic ports require 50/125 or 62.5/125 micron multimode fiber optic cable. Each fiber optic cable must have an LC connector attached at both ends.

> **WARNING:** This switch uses lasers to transmit signals over fiber optic cable. The lasers are compliant with the requirements of a Class 1 Laser Product and are inherently eye safe in normal operation. However, you should never look directly at a transmit port when it is powered on.
>
> **WARNING:** When selecting a fiber device, considering safety, please make sure that it can function at a temperature that is not less than the recommended maximum operational temperature of the product. You must also use an approved Laser Class 1 SFP transceiver.

1. Remove and keep the port's protective cover. When not connected to a fiber cable, the cover should be replaced to protect the optics.

2. Check that the fiber terminators are clean. You can clean the cable plugs by wiping them gently with a clean tissue or cotton ball moistened with a little ethanol. Dirty fiber terminators on fiber cables will impair the quality of the light transmitted through the cable and lead to degraded performance on the port.

3. Connect one end of the cable to the LC port on the switch and the other end to the LC port on the other device. Since LC connectors are keyed, the cable can be attached in only one orientation.

4. As a connection is made, check the Link LED on the module to be sure that the connection is valid.

The 10G fiber optic ports operate at 10 Gbps full duplex. The maximum length for fiber optic cable operating at 10 Gbps will depend on the fiber type as listed under "10 Gbps Ethernet Collision Domain" on page 60.

10 GBPS DAC CONNECTIONS

Direct Attach Cable (DAC) is a method of connecting two SFP+ interfaces without using optics and fiber cable. A fixed length of twinax copper cable is terminated at each end with physically-compliant SFP+ transceivers that do not include all their normal electronic and optical components. The result is a low cost, low-latency, 10G Ethernet solution for short distances, ideal for connections within a rack or for stacking switches.

A 10G DAC connection is also known as twinax copper or 10GBASE-CR. DAC copper cables are available in pre-terminated lengths up to 7 m (22.9 ft).

1. Plug the SFP+ transceiver connector on one end of a twinax copper cable segment into an SFP+ slot on the link device.

2. Plug the other end of the twinax cable into an SFP+ slot on the switch.

3. Check that the Link LED on the switch turns on green to indicate that the connection is valid.

> **NOTE:** When using DAC connections in a switch stack, be sure to follow the procedure in "Connecting Switches in a Stack" on page 47.

CONNECTIVITY RULES

When adding hubs (repeaters) to your network, please follow the connectivity rules listed in the manuals for these products. However, note that because switches break up the path for connected devices into separate collision domains, you should not include the switch or connected cabling in your calculations for cascade length involving other devices.

1000BASE-T CABLE REQUIREMENTS

All Category 5 UTP cables that are used for 100BASE-TX connections should also work for 1000BASE-T, providing that all four wire pairs are connected. However, it is recommended that for all critical connections, or any new cable installations, Category 5e (enhanced Category 5) or Category 6 cable should be used. The Category 5e specification includes test parameters that are only recommendations for Category 5. Therefore, the first step in preparing existing Category 5 cabling for running 1000BASE-T is a simple test of the cable installation to be sure that it complies with the IEEE 802.3-2008 standards.

10 GBPS ETHERNET COLLISION DOMAIN

Table 5: Maximum 1000BASE-SR Gigabit Ethernet Cable Lengths

Fiber Size	Fiber Bandwidth	Maximum Cable Length	Connector
62.5/125 micron multimode fiber	160 MHz/km	2-26 m (7-85 ft.)	LC
	200 MHz/km	2-33 m (7-108 ft.)	LC
50/125 micron multimode fiber	400 MHz/km	2-66 m (7-216 ft.)	LC
	500 MHz/km	2-82 m (7-269 ft.)	LC
	2000 MHz/km	2-300 m (7-984 ft.)	LC

Table 6: Maximum 10GBASE-LR 10 Gigabit Ethernet Cable Length

Fiber Size	Fiber Bandwidth	Maximum Cable Length	Connector
9/125 micron single-mode fiber	N/A	10 km (6.2 miles)	LC

Table 7: Maximum 10GBASE-ER 10 Gigabit Ethernet Cable Length

Fiber Size	Fiber Bandwidth	Maximum Cable Length	Connector
9/125 micron single-mode fiber	N/A	40 km (24.85 miles)	LC

Table 8: Maximum 10GBASE-CR 10 Gigabit Ethernet Cable Lengths

Cable Type	Cable Lengths	Connector
Pre-terminated Direct Attach Cable (DAC) — (twinax copper cable)	1 m (3.28 ft) 2 m (6.56 ft) 3 m (9.8 ft) 5 m (16.4 ft) 7 m (22.9 ft)	SFP+

1000 MBPS GIGABIT ETHERNET COLLISION DOMAIN

Table 9: Maximum 1000BASE-T Gigabit Ethernet Cable Length

Cable Type	Maximum Cable Length	Connector
Category 5, 5e, or 6 100-ohm UTP or STP	100 m (328 ft)	RJ-45

Table 10: Maximum 1000BASE-SX Gigabit Ethernet Cable Lengths

Fiber Size	Fiber Bandwidth	Maximum Cable Length	Connector
62.5/125 micron multimode fiber	160 MHz/km	2-220 m (7-722 ft)	LC
	200 MHz/km	2-275 m (7-902 ft)	LC
50/125 micron multimode fiber	400 MHz/km	2-500 m (7-1641 ft)	LC
	500 MHz/km	2-550 m (7-1805 ft)	LC

Table 11: Maximum 1000BASE-LX Gigabit Ethernet Cable Length

Fiber Size	Fiber Bandwidth	Maximum Cable Length	Connector
9/125 micron single-mode fiber	N/A	2 m - 10 km (7 ft - 6.2 miles)	LC

Table 12: Maximum 1000BASE-ZX Gigabit Ethernet Cable Length

Fiber Size	Fiber Bandwidth	Maximum Cable Length	Connector
9/125 micron single-mode fiber	N/A	2 m - 100 km (7 ft - 62 miles)	LC

100 MBPS FAST ETHERNET COLLISION DOMAIN

Table 13: Maximum Fast Ethernet Cable Lengths

Type	Cable Type	Max. Cable Length	Connector
100BASE-TX	Category 5 or better 100-ohm UTP or STP	100 m (328 ft)	RJ-45

10 MBPS ETHERNET COLLISION DOMAIN

Table 14: Maximum Ethernet Cable Length

Type	Cable Type	Max. Cable Length	Connector
10BASE-T	Category 3 or better 100-ohm UTP	100 m (328 ft)	RJ-45

CABLE LABELING AND CONNECTION RECORDS

When planning a network installation, it is essential to label the opposing ends of cables and to record where each cable is connected. Doing so will enable you to easily locate inter-connected devices, isolate faults and change your topology without need for unnecessary time consumption.

To best manage the physical implementations of your network, follow these guidelines:

◆ Clearly label the opposing ends of each cable.

◆ Using your building's floor plans, draw a map of the location of all network-connected equipment. For each piece of equipment, identify the devices to which it is connected.

◆ Note the length of each cable and the maximum cable length supported by the switch ports.

◆ For ease of understanding, use a location-based key when assigning prefixes to your cable labeling.

◆ Use sequential numbers for cables that originate from the same equipment.

◆ Differentiate between racks by naming accordingly.

◆ Label each separate piece of equipment.

◆ Display a copy of your equipment map, including keys to all abbreviations at each equipment rack.

A

TROUBLESHOOTING

DIAGNOSING SWITCH INDICATORS

Table 15: Troubleshooting Chart

Symptom	Action
Power LED is Off	◆ Check connections between the switch, the power cord and the wall outlet. ◆ Contact your dealer for assistance.
Power LED is Amber	◆ Internal power supply has failed. Contact your local dealer for assistance.
DIAG LED on Amber	◆ Power cycle the switch to try and clear the condition. ◆ If the condition does not clear, contact your dealer for assistance.
Link LED is Off	◆ Verify that the switch and attached device are powered on. ◆ Be sure the cable is plugged into both the switch and corresponding device. ◆ If the switch is installed in a rack, check the connections to the punch-down block and patch panel. ◆ Verify that the proper cable type is used and its length does not exceed specified limits. ◆ Check the adapter on the attached device and cable connections for possible defects. Replace the defective adapter or cable if necessary.

DIAGNOSING POWER PROBLEMS WITH THE LEDS

The Power and RPS LEDs work in combination to indicate power status as follows.

Table 16: Power/RPS LEDs

Power LED	RPU LED	Status
Green	Green	Internal power functioning normally; RPS is present.
Green	Amber	Internal power functioning normally; RPS plugged in but faulty.
Green	Off	Internal power functioning normally; RPS not plugged in.
Amber	Green	Internal power faulty; RPU delivering power.
Off	Off	Both internal power and RPU unplugged or not functioning.

POWER AND COOLING PROBLEMS

If the power indicator does not turn on when the power cord is plugged in, you may have a problem with the power outlet, power cord, or internal power supply. However, if the unit powers off after running for a while, check for loose power connections, power losses or surges at the power outlet. If you still cannot isolate the problem, the internal power supply may be defective.

INSTALLATION

Verify that all system components have been properly installed. If one or more components appear to be malfunctioning (such as the power cord or network cabling), test them in an alternate environment where you are sure that all the other components are functioning properly.

IN-BAND ACCESS

You can access the management agent in the switch from anywhere within the attached network using Telnet, a web browser, or other network management software tools. However, you must first configure the switch with a valid IP address, subnet mask, and default gateway. If you have trouble establishing a link to the management agent, check to see if you have a valid network connection. Then verify that you entered the correct IP address. Also, be sure the port through which you are connecting to the switch has not been disabled. If it has not been disabled, then check the network cabling that runs between your remote location and the switch.

NOTE: The management agent accepts up to four simultaneous Telnet sessions. If the maximum number of sessions already exists, an additional Telnet connection will not be able to log into the system.

B CABLES

TWISTED-PAIR CABLE AND PIN ASSIGNMENTS

For 10/100BASE-TX connections, the twisted-pair cable must have two pairs of wires. For 1000BASE-T connections the twisted-pair cable must have four pairs of wires. Each wire pair is identified by two different colors. For example, one wire might be green and the other, green with white stripes. Also, an RJ-45 connector must be attached to both ends of the cable.

⚠ **CAUTION:** DO NOT plug a phone jack connector into any RJ-45 port. Use only twisted-pair cables with RJ-45 connectors that conform with FCC standards.

CAUTION: Each wire pair must be attached to the RJ-45 connectors in a specific orientation.

The figure below illustrates how the pins on the RJ-45 connector are numbered. Be sure to hold the connectors in the same orientation when attaching the wires to the pins.

Figure 25: RJ-45 Connector Pin Numbers
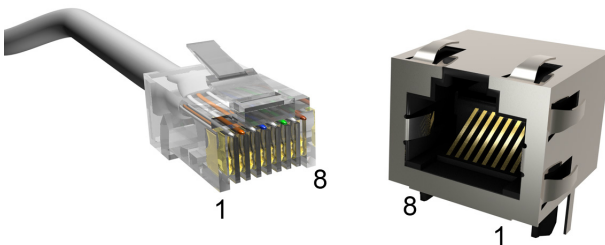
10BASE-T/100BASE-TX PIN ASSIGNMENTS

Use unshielded twisted-pair (UTP) or shielded twisted-pair (STP) cable for RJ-45 connections: 100-ohm Category 3 or better cable for 10 Mbps connections, or 100-ohm Category 5 or better cable for 100 Mbps connections. Also be sure that the length of any twisted-pair connection does not exceed 100 meters (328 feet).

The RJ-45 ports on the switch base unit support automatic MDI/MDI-X operation, so you can use straight-through cables for all network connections to PCs or servers, or to other switches or hubs. In straight-through cable, pins 1, 2, 3, and 6, at one end of the cable, are connected straight through to pins 1, 2, 3, and 6 at the other end of the cable. When using any RJ-45 port on this switch, you can use either straight-through or crossover cable.

Table 17: 10/100BASE-TX MDI and MDI-X Port Pinouts

Pin	MDI Signal Name	MDI-X Signal Name
1	Transmit Data plus (TD+)	Receive Data plus (RD+)
2	Transmit Data minus (TD-)	Receive Data minus (RD-)
3	Receive Data plus (RD+)	Transmit Data plus (TD+)
6	Receive Data minus (RD-)	Transmit Data minus (TD-)
4,5,7,8	Not used	Not used

Note: The "+" and "-" signs represent the polarity of the wires that make up each wire pair.

STRAIGHT-THROUGH WIRING

If the twisted-pair cable is to join two ports and only one of the ports has an internal crossover (MDI-X), the two pairs of wires must be straight-through. (When auto-negotiation is enabled for any RJ-45 port on this switch, you can use either straight-through or crossover cable to connect to any device type.)

You must connect all four wire pairs as shown in the following diagram to support Gigabit Ethernet.

Figure 26: Straight-through Wiring

EIA/TIA 568B RJ-45 Wiring Standard
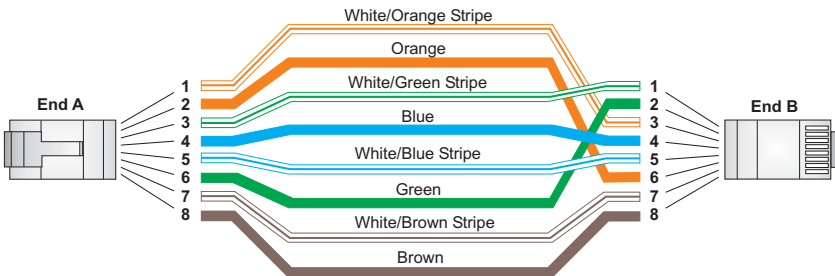10/100BASE-TX Straight-through Cable
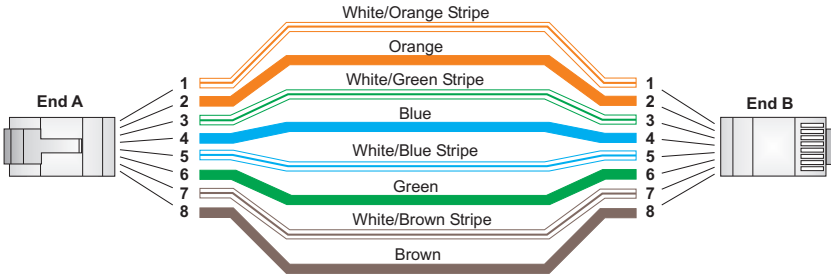
CROSSOVER WIRING

If the twisted-pair cable is to join two ports and either both ports are labeled with an "X" (MDI-X) or neither port is labeled with an "X" (MDI), a crossover must be implemented in the wiring. (When auto-negotiation is enabled for any RJ-45 port on this switch, you can use either straight-through or crossover cable to connect to any device type.)

You must connect all four wire pairs as shown in the following diagram to support Gigabit Ethernet.

Figure 27: Crossover Wiring

EIA/TIA 568B RJ-45 Wiring Standard
10/100BASE-TX Crossover Cable

1000BASE-T PIN ASSIGNMENTS

All 1000BASE-T ports support automatic MDI/MDI-X operation, so you can use straight-through cables for all network connections to PCs or servers, or to other switches or hubs.

The table below shows the 1000BASE-T MDI and MDI-X port pinouts. These ports require that all four pairs of wires be connected. Note that for 1000BASE-T operation, all four pairs of wires are used for both transmit and receive.

Use 100-ohm Category 5, 5e or 6 unshielded twisted-pair (UTP) or shielded twisted-pair (STP) cable for 1000BASE-T connections. Also be sure that the length of any twisted-pair connection does not exceed 100 meters (328 feet).

Table 18: 1000BASE-T MDI/MDI-X Port Pinouts

Pin	MDI Signal Name	MDI-X Signal Name
1	Bi-directional Pair A Plus (BI_DA+)	Bi-directional Pair B Plus (BI_DB+)
2	Bi-directional Pair A Minus (BI_DA-)	Bi-directional Pair B Minus (BI_DB-)
3	Bi-directional Pair B Plus (BI_DB+)	Bi-directional Pair A Plus (BI_DA+)
4	Bi-directional Pair C Plus (BI_DC+)	Bi-directional Pair D Plus (BI_DD+)
5	Bi-directional Pair C Minus (BI_DC-)	Bi-directional Pair D Minus (BI_DD-)
6	Bi-directional Pair B Minus (BI_DB-)	Bi-directional Pair A Minus (BI_DA-)
7	Bi-directional Pair D Plus (BI_DD+)	Bi-directional Pair C Plus (BI_DC+)
8	Bi-directional Pair D Minus (BI_DD-)	Bi-directional Pair C Minus (BI_DC-)

CABLE TESTING FOR EXISTING CATEGORY 5 CABLE

Installed Category 5 cabling must pass tests for Attenuation, Near-End Crosstalk (NEXT), and Far-End Crosstalk (FEXT). This cable testing information is specified in the ANSI/TIA/EIA-TSB-67 standard. Additionally, cables must also pass test parameters for Return Loss and Equal-Level Far-End Crosstalk (ELFEXT). These tests are specified in the ANSI/TIA/EIA-TSB-95 Bulletin, "The Additional Transmission Performance Guidelines for 100 Ohm 4-Pair Category 5 Cabling."

Note that when testing your cable installation, be sure to include all patch cables between switches and end devices.

ADJUSTING EXISTING CABLING FOR 1000BASE-T

If your existing cable installation does not meet one of the test parameters for 1000BASE-T, there are basically three measures that can be applied to try and correct the problem:

1. Replace any Category 5 patch cables with high-performance Category 5e or Category 6 cables.

2. Reduce the number of connectors used in the link.

3. Reconnect some of the connectors in the link.

FIBER STANDARDS

The International Telecommunication Union (ITU-T) has standardized various fiber types for data networks. These are summarized in the following table.

Table 19: Fiber Standards

ITU-T Standard	Description	Application
G.651	**Multimode Fiber** 50/125-micron core	Short-reach connections in the 1300-nm or 850-nm band
G.652	**Non-Dispersion-Shifted Fiber** Single-mode, 9/125-micron core	Longer spans and extended reach. Optimized for operation in the 1310-nm band. but can also be used in the 1550-nm band
G.652.C	**Low Water Peak Non-Dispersion-Shifted Fiber** Single-mode, 9/125-micron core	Longer spans and extended reach. Optimized for wavelength-division multiplexing (WDM) transmission across wavelengths from 1285 to 1625 nm. The zero dispersion wavelength is in the 1310-nm region.
G.653	**Dispersion-Shifted Fiber** Single-mode, 9/125-micron core	Longer spans and extended reach. Optimized for operation in the region from 1500 to 1600-nm.

Table 19: Fiber Standards (Continued)

ITU-T Standard	Description	Application
G.654	**1550-nm Loss-Minimized Fiber** Single-mode, 9/125-micron core	Extended long-haul applications. Optimized for high-power transmission in the 1500 to 1600-nm region, with low loss in the 1550-nm band.
G.655	**Non-Zero Dispersion-Shifted Fiber** Single-mode, 9/125-micron core	Extended long-haul applications. Optimized for high-power dense wavelength-division multiplexing (DWDM) operation in the region from 1500 to 1600-nm.

C SPECIFICATIONS

PHYSICAL CHARACTERISTICS

PORTS
24/48 10/100/1000BASE-T (RJ-45) ports
2 10 Gigabit SFP+ ports (for uplink or stacking)
1 expansion module slot (supporting dual-port 10G SFP+ module)
ECS4510-28F:
    24 1000BASE-SFP, with auto-negotiation
    2 10/100/1000BASE-T, shared with two SFP transceiver slots
    2 10 Gigabit SFP+ ports
    1 expansion module slot (supporting dual-port 10G SFP+ module)

NETWORK INTERFACE
Ports 1-24/48: RJ-45 connector, auto MDI/MDI-X
    10BASE-T: RJ-45 (100-ohm, UTP cable; Category 3 or better)
    100BASE-TX: RJ-45 (100-ohm, UTP cable; Category 5 or better)
    1000BASE-T: RJ-45 (100-ohm, UTP or STP cable; Category 5, 5e or 6)
    Maximum Cable Length - 100 m (328 ft)
ECS4510-28F:
    Ports 1-24: SFP connector
    Shared Ports 23-24: RJ-45 connector, auto MDI/X
Ports 25-28 (49-52): SFP+ ports
    10 Gigabit transmission: SFP+ transceiver slots
    *Maximum length for cables operating at 10 Gbps are listed under "10 Gbps Ethernet Collision Domain" on page 60.

BUFFER ARCHITECTURE
1.5 Mbytes

AGGREGATE BANDWIDTH
ECS4510-28T/P/F: 128 Gbps
ECS4510-52T/P: 176 Gbps

SWITCHING DATABASE

16K MAC address entries, 1024 static MAC addresses, 32 IP interfaces,
1023 multicast groups

LEDS

System: Power, Diag, RPS, Stack, Master
Port: Status (link, activity)

WEIGHT

ECS4510-28T/P/F: 3.7 kg (8.1 lbs)
ECS4510-52T/P: 4.8 kg (10.58 lbs)

SIZE

ECS4510-28T/P/F: 44.0 x 31.5 x 4.4 cm (17.3 x 12.4 x 1.7 in.)
ECS4510-52T/P: 44.0 x 39.1 x 4.4 cm (17.3 x 15.4 x 1.7 in.)

TEMPERATURE

Operating: 0 to 45 °C (32 to 113 °F)
Storage: -40 to 70 °C (-40 to 158 °F)

HUMIDITY

Operating: 5% to 95% (non-condensing)
ECS4510-28F Operating: 10% to 90% (non-condensing)

AC INPUT

ECS4510-28T: 100 to 240 V, 50-60 Hz, 1.5 A
ECS4510-28P: 100 to 240 V, 50-60 Hz, 10 A
ECS4510-28F: 100 to 240 V, 50-60 Hz, 2 A
ECS4510-52T: 100 to 240 V, 50-60 Hz, 2 A
ECS4510-52P: 50-60 Hz
                100 to 127 VAC, 12 A
                200 to 240 VAC, 6 A

POWER SUPPLY
Internal, auto-ranging transformer: 100 to 240 VAC, 50/60 Hz
External, supports connection for redundant power supply

POWER CONSUMPTION
ECS4510-28T: 40 W max. (with one expansion module)
ECS4510-28P: 501 W max. (with one expansion module and PoE enabled)
ECS4510-28F: 50 W max. (with one expansion module)
ECS4510-52T: 63 W max. (with one expansion module)
ECS4510-52P: 871 W max. (with one expansion module and PoE enabled)

> **(i)** **NOTE:** The ECS4510-52P maximum power consumption is reduced to 780 W when the device is powered from a connected RPS.

MAXIMUM CURRENT
ECS4510-28T: 1.1 A @ 110 VAC (with one expansion module)
ECS4510-28P: 4.56A @110 VAC (with one expansion module and PoE enabled)
ECS4510-28F: 0.51 A @ 100 VAC (with one expansion module)
ECS4510-52T: 0.58 A @ 110 VAC (with one expansion module)
ECS4510-52P: 7.92A @110 VAC (with one expansion module and PoE enabled)

SWITCH FEATURES

FORWARDING MODE
Store-and-forward

THROUGHPUT
Wire speed

FLOW CONTROL
Full-duplex: IEEE 802.3x
Half-duplex: Back pressure

MANAGEMENT FEATURES

IN-BAND MANAGEMENT
Telnet, SSH, SNMP, or HTTP

OUT-OF-BAND MANAGEMENT
RS-232 RJ-45 console port

SOFTWARE LOADING
FTP/TFTP or HTTP in-band, or XModem out-of-band

STANDARDS

IEEE 802.3-2008
   Ethernet, Fast Ethernet, Gigabit Ethernet, and
   10 Gigabit Ethernet (10GBASE-SR, 10GBASE-LR, 10GBASE-ER)
IEEE 802.1D Spanning Tree Protocol
IEEE 802.1w Rapid Spanning Tree Protocol
IEEE 802.1s Multiple Spanning Tree Protocol
IEEE 802.1Q Virtual LAN
ISO/IEC 8802-3 CSMA/CD

COMPLIANCES

CE MARK

EMISSIONS
FCC Class A

EN55022 (CISPR 22) Class A
EN 61000-3-2/3
VCCI Class A

IMMUNITY
EN 61000-4-2/3/4/5/6/8/11

SAFETY
UL 60950-1 & CSA 60950-1
IEC 60950-1 & EN 60950-1
ECS4510-28F:
  UL/CUL (CSA 22.2 NO 60950-1 & UL 60950-1)
  CB (IEC/EN60950-1)

10GBASE-SFP+ EXTENDER MODULE

PORTS
2 slots for 10GBASE SFP+ transceivers

COMMUNICATION SPEED
10 Gbps

COMMUNICATION MODE
Full duplex

NETWORK INTERFACE
SFP+ slot

STANDARDS
IEEE 802.3ae 10 Gigabit Ethernet

REDUNDANT POWER SUPPLY

This accessory and specifications only apply to the ECS4510-52P.

INPUT POWER
100-240 VAC, 50-60 Hz, 12 A

OUTPUT POWER
12 VDC, 10 A
-54.5 VDC, 14.3 A

GLOSSARY

10BASE-T

IEEE 802.3 specification for 10 Mbps Ethernet over two pairs of Category 3, 4, or 5 UTP cable.

100BASE-TX

IEEE 802.3u specification for 100 Mbps Ethernet over two pairs of Category 5 UTP cable.

1000BASE-LH

Specification for long-haul Gigabit Ethernet over two strands of 9/125 micron core fiber cable.

1000BASE-LX

IEEE 802.3z specification for Gigabit Ethernet over two strands of 50/125, 62.5/125 or 9/125 micron core fiber cable.

1000BASE-SX

IEEE 802.3z specification for Gigabit Ethernet over two strands of 50/125 or 62.5/125 micron core fiber cable.

1000BASE-T

IEEE 802.3ab specification for Gigabit Ethernet over 100-ohm Category 5, 5e or 6 twisted-pair cable (using all four wire pairs).

10GBASE-ER

IEEE 802.3ae specification for 10 Gigabit Ethernet over two strands of 9/125 micron core single-mode fiber cable.

10GBASE-LR

IEEE 802.3ae specification for 10 Gigabit Ethernet over two strands of 9/125 micron core single-mode fiber cable.

10GBASE-SR

IEEE 802.3ae specification for 10 Gigabit Ethernet over two strands of 62.5/125 micron core multimode fiber cable.

10 GIGABIT ETHERNET

A 10 Gbps network communication system based on Ethernet.

AUTO-NEGOTIATION

Signalling method allowing each node to select its optimum operational mode (e.g., speed and duplex mode) based on the capabilities of the node to which it is connected.

BANDWIDTH

The difference between the highest and lowest frequencies available for network signals. Also synonymous with wire speed, the actual speed of the data transmission along the cable.

COLLISION DOMAIN

Single CSMA/CD LAN segment.

CSMA/CD

CSMA/CD (Carrier Sense Multiple Access/Collision Detect) is the communication method employed by Ethernet, Fast Ethernet, and Gigabit Ethernet.

END STATION

A workstation, server, or other device that does not forward traffic.

ETHERNET

A network communication system developed and standardized by DEC, Intel, and Xerox, using baseband transmission, CSMA/CD access, logical bus topology, and coaxial cable. The successor IEEE 802.3 standard provides for integration into the OSI model and extends the physical layer and media with repeaters and implementations that operate on fiber, thin coax and twisted-pair cable.

FAST ETHERNET

A 100 Mbps network communication system based on Ethernet and the CSMA/CD access method.

FULL-DUPLEX

Transmission method that allows two network devices to transmit and receive concurrently, effectively doubling the bandwidth of that link.

GIGABIT ETHERNET

A 1000 Mbps network communication system based on Ethernet and the CSMA/CD access method.

IEEE

Institute of Electrical and Electronic Engineers.

IEEE 802.3

Defines carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications.

IEEE 802.3AB

Defines CSMA/CD access method and physical layer specifications for 1000BASE-T Gigabit Ethernet. (Now incorporated in IEEE 802.3-2008.)

IEEE 802.3AE

Defines the physical layer specifications for 10 Gigabit Ethernet.

IEEE 802.3U

Defines CSMA/CD access method and physical layer specifications for 100BASE-TX Fast Ethernet. (Now incorporated in IEEE 802.3-2008.)

IEEE 802.3X

Defines Ethernet frame start and stop requests and timers used for flow control on full-duplex links. (Now incorporated in IEEE 802.3-2008.)

IEEE 802.3Z

Defines CSMA/CD access method and physical layer specifications for 1000BASE Gigabit Ethernet. (Now incorporated in IEEE 802.3-2008.)

LAN SEGMENT

Separate LAN or collision domain.

LED

Light emitting diode used for monitoring a device or network condition.

LOCAL AREA NETWORK (LAN)

A group of interconnected computer and support devices.

MEDIA ACCESS CONTROL (MAC)

A portion of the networking protocol that governs access to the transmission medium, facilitating the exchange of data between network nodes.

MIB

An acronym for Management Information Base. It is a set of database objects that contains information about the device.

MODAL BANDWIDTH

Bandwidth for multimode fiber is referred to as modal bandwidth because it varies with the modal field (or core diameter) of the fiber. Modal bandwidth is

specified in units of MHz per km, which indicates the amount of bandwidth supported by the fiber for a one km distance.

NETWORK DIAMETER
Wire distance between two end stations in the same collision domain.

REDUNDANT POWER SUPPLY (RPS)
A backup power supply unit that automatically takes over in case the primary power supply should fail.

RJ-45 CONNECTOR
A connector for twisted-pair wiring.

SWITCHED PORTS
Ports that are on separate collision domains or LAN segments.

TIA
Telecommunications Industry Association

TRANSMISSION CONTROL PROTOCOL/INTERNET PROTOCOL (TCP/IP)
Protocol suite that includes TCP as the primary transport protocol, and IP as the network layer protocol.

UTP
Unshielded twisted-pair cable.

VIRTUAL LAN (VLAN)
A Virtual LAN is a collection of network nodes that share the same collision domain regardless of their physical location or connection point in the network. A VLAN serves as a logical workgroup with no physical barriers, allowing users to share information and resources as though located on the same LAN.

GLOSSARY

INDEX

Declaration of Conformity (DoC) can be obtained from www.edge-core.com
-> support -> download -> declarations & certifications