



HES-5105SFP+

**1 PORT 10G/5G/2.5G/1G/100MBASE-T RJ-45 +
3 PORTS 2.5G/1G/100MBASE-T RJ-45 +
1 PORT 10/1GBASE-X SFP+
MANAGED ETHERNET CPE SWITCH**

User's Guide

Version: 1.0

Trademarks

CTS is a registered trademark of Connection Technology Systems Inc. All trademarks belong to their respective proprietors.

Contents subject to change without prior notice.

Copyright Statement

Copyright © 2024 Connection Technology Systems Inc.

This publication may not be reproduced as a whole or in part, in any way whatsoever unless prior consent has been obtained from Connection Technology Systems Inc.

FCC Warning

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limitations are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if the equipment is not installed and used in accordance with the instructions, it may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult your local distributors or an experienced radio/TV technician for help.
- Shielded interface cables must be used in order to comply with emission limits.

Changes or modifications to the equipment, which are not approved by the party responsible for compliance, could affect the user's authority to operate the equipment.

CE Mark Warning

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

Revision History

Version	Date	Description
1.0	11/26/2024	First release

CTS Contact Information

■ Headquarter/Manufacturer

Connection Technology Systems Inc.

18F-6, No.79, Sec.1, Xintai 5th Rd.,
XiZhi Dist., New Taipei City 221, Taiwan(R.O.C)
Tel: +886-2-2698-9661
Fax: +886-2-2698-3960
Dir.Line:+886-2-2698-9201
www.ctsystem.com

■ Global Authorized Representatives

Connection Technology Systems NE AB

E A Rosengrens gata 31,
421 31 Västra Frölunda, Sweden
Tel: +46-31-221980

E-mail: info@ctsystem.se

Connection Technology Systems Japan

Higobashi Bldg, No3 R503, 1-23-13, Edobori, Nisi-ku,
Osaka 550-0002, Japan
Tel: +81-6-6450-8890

E-mail: cts_japan@ctsystem.com

Connection Technology Systems CE GmbH

Wienerbergstraße 11 / Tower B / 6th Floor / Office 2
1100 Vienna
AUSTRIA
Tel: +43 1 343 9553 50

E-mail: cts_ce@ctsystem.com

Connection Technology USA Inc.

40538 La Purissima Way, Fremont, CA 94539, USA
Tel: +1-510-509-0304
Sales Direct Line: +1-510-509-0305

E-mail: cts_us@ctsystem.com

Connection Technology Systems India Private Limited

No.1,1st Floor,RK Residency Vajarahalli,
Uttarahalli,Talgatpura, Kanakpura MN Rd, Bangalore,
Karnataka, India, 560062

E-mail: cts_in@ctsystem.com

Table of Contents

REVISION HISTORY	III
CTS CONTACT INFORMATION	IV
TABLE OF CONTENTS	V
1 INTRODUCTION	6
1.1 OVERVIEW OF THE SWITCH.....	6
1.2 KEY FEATURES	7
1.3 APPEARANCE	11
1.3.1 FRONT AND REAR PANELS	11
1.3.2 TOP PANEL.....	12
1.3.3 SIDE PANELS	13
1.4 LED DEFINITIONS	14
1.5 CABLE SPECIFICATIONS	15
2 INSTALLATION	16
2.1 INSTALLATION REQUIREMENTS	17
2.2 CHECKING THE PACKAGE CONTENTS	17
2.3 INSTALLING THE SWITCH	18
2.4 POWERING THE SWITCH	18
2.5 CONNECTING THE SWITCH TO NETWORK	19
2.6 INSTALLING AND REMOVING SFP/SFP+ MODULES	19
2.6.1 INSTALLING SFP/SFP+ MODULES.....	19
2.6.2 REMOVING SFP/SFP+ MODULES.....	19
3 OPERATION	20
3.1 NETWORK MANAGEMENT	20
4 MAINTENANCE	21
4.1 FAULT IDENTIFICATION.....	21
4.1.1 LOCAL CHECK.....	21
4.1.2 REMOTE CHECK.....	21
4.2 HARDWARE REPLACEMENT PROCEDURES.....	22
4.3 FIRMWARE UPGRADE.....	22

Introduction

Thank you for purchasing the CTS HES-5105SFP+.

The HES-5105SFP+ is a Managed CPE Switch that delivers 10G and Multi-Gigabit FTTX solutions to meet modern network requirements, offering an optimal balance of performance and cost-effectiveness.

This user's guide primarily introduces the hardware aspects of the HES-5105SFP+ Managed CPE Switch, including its appearance, LED definitions, installation, operation, and maintenance.

1.1 Overview of the Switch

The HES-5105SFP+ is a Managed CPE Switch designed for home environments, delivering high-performance connectivity that meets modern household networking needs. With its compact design and versatile features, it is ideal for seamless integration into FTTX and high-speed broadband applications. Equipped with Multi-Gigabit and 10G uplink capabilities, the HES-5105SFP+ supports flexible deployment across various scenarios, ensuring optimal performance for bandwidth-intensive applications such as video streaming, gaming, and remote work.

Additionally, the intuitive web-based user interface and clear LED indicators simplify management, enabling users to easily monitor network status, configure settings, and maintain operations. This user-friendly approach reduces the complexity typically associated with home networking management.

To further enhance reliability, the HES-5105SFP+ integrates iProbe Advanced Diagnostics, offering robust tools for network troubleshooting and performance analysis. Features such as cable tests, client emulation, and IPTV diagnostics ensure the network remains optimized and delivers consistent performance.

1.2 Key Features

■ Interface

RJ-45 Port

- 1 x 10G/5G/2.5G/1G/100MBase-T RJ-45
- 3 x 2.5G/1G/100MBase-T RJ-45

Fiber Port

- 1 x 10/1GBase-X SFP+

Standards

- IEEE 802.3 10Base-T
- IEEE 802.3u 100Base-TX/FX
- IEEE 802.3ab 1000Base-T
- IEEE 802.3z 1000Base-X
- IEEE 802.3bz 2.5G/5GBase-T (NBase-T)
- IEEE 802.3an 10GBase-T
- IEEE 802.3az 10GBase-R
- IEEE 802.1p Priority
- IEEE 802.1q Tag VLAN
- IEEE 802.3x Flow Control
- IEEE 802.1ab LLDP *

■ H/W Specification

- MAC Address Table: 4K
- Non-Blocking Switching Fabric: 55Gbps
- Throughput @ 64Bytes: 40.92Mpps
- Packet Buffer: 8Mbit
- Jumbo Frame: 16K Bytes
- Store and Forward Switching Mechanism
- Auto-Cross Over for MDI/MDIX in TP Ports
- Auto-Negotiation in TP Ports
- Full/Half Duplex Mode Operation

■ LED

- Power, Status
- Link/ACT/Speed (LAN 1~4, WAN)

■ Forward/Filter Rate

- 10M: 14,880/14,880pps
- 100M: 148,800/148,800pps
- 1000M: 1,488,000/1,488,000pps
- 2.5G: 3,720,000/3,720,000pps
- 5G: 7,440,000/7,440,000pps
- 10G: 14,880,000/14,880,000pps

■ Layer 2 Switch Features

Port Management

- State, Description, Media Type, Port Type, Speed, Duplex and Flow Control

VLAN

- IEEE 802.1q VLAN
VLAN ID: 4094 IDs
VLAN Concurrent Groups: 128 VLAN Groups
- Port-Based VLAN
- Q-in-Q Double tag with Configurable Ether Type (ISP mode) *

QoS

- QoS based on 802.1p CoS and DSCP
- Scheduling Algorithm
Weighted Round Robin (WRR)
Strict Priority Queuing (SPQ)
- QoS Priority Queues: 8 Queues
- 802.1p P-bit & DSCP Remarking
- Port-Based Rate Limit (Ingress/Egress)

Multicast

- IGMP Snooping v1/v2/v3
- IGMP Fast Leave and Querier
- MLD Snooping v1/v2
- MLD Fast Leave and Querier
- IGMP/MLD Snooping Group: 64/32 Groups

IPv6 Feature

- IPv6 over Ethernet (RFC 2464)
- IPv6 Addressing Architecture (RFC 4291)
- IPv6 Dual Stack (RFC 4213)
- ICMPv6 (RFC 4884)
- Path MTU Discovery for IPv6 (RFC 1981)
- Neighbor Discovery (RFC 4861)
- DHCPv6 Client

Security

- 802.1x RADIUS Authentication for Login
Username/Password
- DHCP Option 82 Relay Agent
- DHCP Snooping and DHCP Server Trust Port
- Port Isolation
- Storm Control (Unknown Unicast/Unknown Multicast/Broadcast)
- Loop Detection

■ Management

- SNMP v1, v2c & v3 (Support Traps)
- Web (HTTP/HTTPS)
- CLI (Telnet/SSHv2)
- SNTP with Daylight Saving Time
- LLDP*

Upgrade/Restore

- Firmware Upgrade/Downgrade
HTTP/HTTPS/FTP/TFTP
DHCP Auto-provision via DHCP Option 60/43
- Configuration Upload/Backup
HTTP/HTTPS/FTP/TFTP
DHCP Auto-provision via DHCP Option 60/43
- Auto Configure Backup
FTP/TFTP

■ Maintenance

Diagnostic

- Port Mirror
- ICMP Ping
- Event log
- Syslog
- SFP SFF-8472 DDMI Monitor
Temp/Voltage/TX Bias/TX Power/RX Power
- CPU Temperature/Utilization
- Memory Statistics

iProbe Advanced Diagnostic *

- Cable Test
- Client Emulation
- HTTP Reachability Diagnostic
- DHCP Client Emulation
- DNS Connection Measurement
- Throughput Test (iPerf3 / Nuttcp)
- Ping Test
- IPTV Multicast Diagnostic
MPEG Loss / PCR Jitter / Throughput /
General Query Interval / General Query
Response / Zapping Time
- Diagnostics Schedule

■ Power Requirement

- Power Input (Main Body): 12 VDC
- Power Adapter (Including in package):
Input: 100~240 VAC, 50/60Hz
Output: 12 VDC, 1.5A
- Max. Power Consumption: 9.1W (31 BTU/h)

■ Environmental Condition

- Operation: 0°C ~ 40°C
- Storage: -20°C ~ 60°C
- Humidity: 5% ~ 90%, Non-condensing

■ Dimension & Weight

- Size: 180 x 130 x 30mm (W x D x H)
- Weight: 380g

■ Standards and Certifications

CE/FCC Class B

- Safety: EN/IEC 62368-1
- EMC: EN 55032 / EN 55035
- ESD
 - Air Discharge: +/-8kV
 - Contact Discharge: +/-4kV
- EFT
 - AC input: +/-1kV
 - Signal (RJ-45): +/-0.5kV
- Surge Protection
 - AC input: +/-1kV
 - Signal (RJ-45): +/-1kV

VCCI/UKCA/RCM

RoHS 2.0

1.3 Appearance

1.3.1 Front and Rear Panels

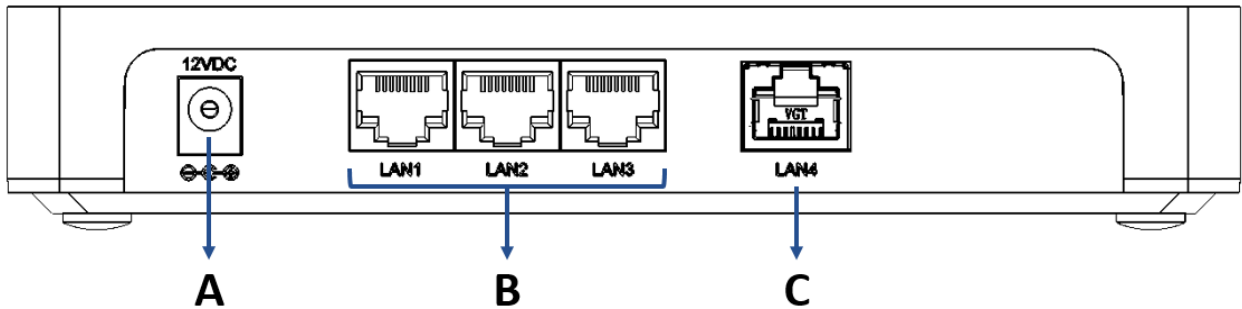


Figure 1-1. Front Panel of HES-5105SFP+

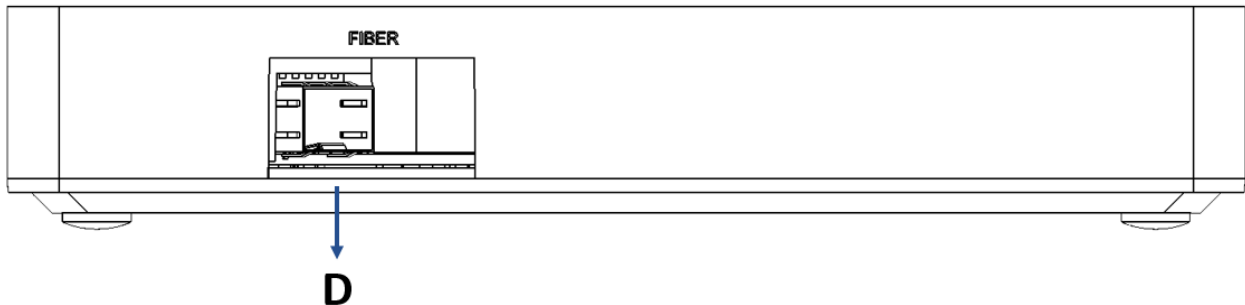


Figure 1-2. Rear Panels of HES-5105SFP+

The interfaces on the front and rear panels of the switch are described below:

A. Power Jack Connector:

- Compatible with the included power adapter, which has an input of 100-240VAC, 50/60Hz, and an output of 12VDC, 1.5A.

B. 3 x 2.5G/1G/100M NBase-T RJ-45 (LAN1~LAN3)

C. 1 x 10G/5G/2.5G/1G/100MBase-T RJ-45 (LAN4)

D. 1 x 10/1GBase-X SFP+

1.3.2 Top Panel

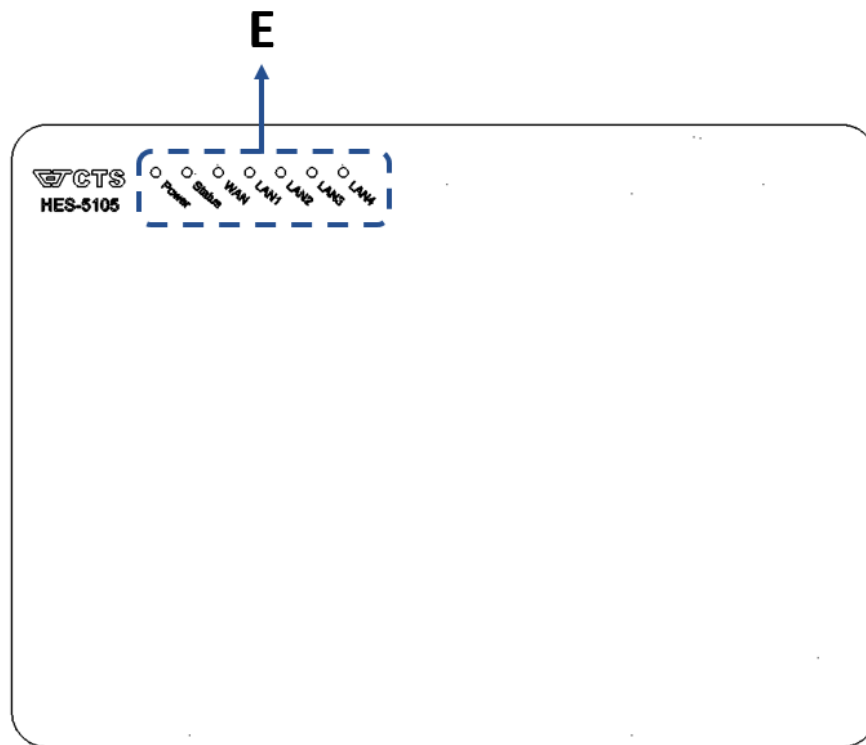


Figure 1-3. Top Panel of HES-5105SFP+

The interfaces on the top panel of the switch are described below:

E. LEDs

- Includes Power LEDs of Power, Status, WAN (Link/ACT/Speed), LAN1~LAN4 (Link/ACT/Speed). For more details, please refer to [Section 1.4 LED Definitions](#).

1.3.3 Side Panels

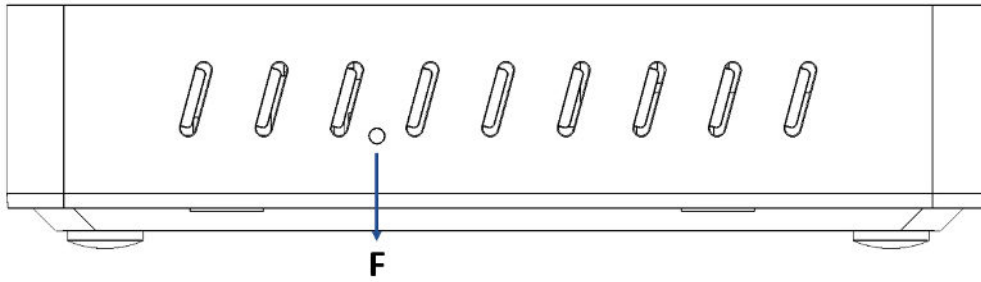


Figure 1-4. Side Panel (right) of HES-5105SFP+

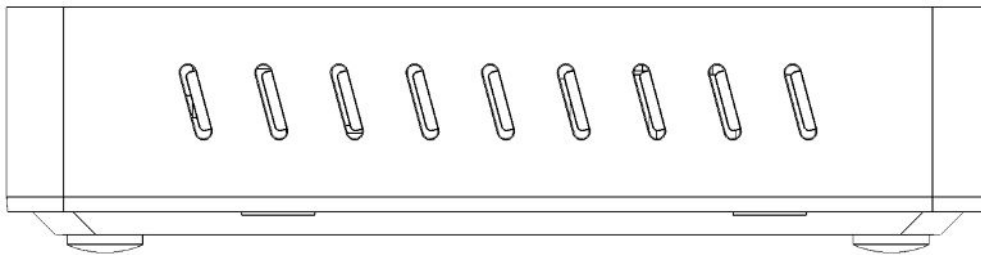


Figure 1-5. Side Panel (left) of HES-5105SFP+

The interfaces on the side panel of the switch are described below:

F. Reset Button :

- **To restart the system:** Press and hold the reset button for more than 5 seconds until the Status LED lights up orange, then release it
- **To reset the system to default settings:** Press and hold the reset button for more than 10 seconds until the Status LED blinks orange, then release it. The system will restart with its factory settings.

1.4 LED Definitions

The switch is Plug & Play compliant. The real-time operational status can be monitored through a set of LED indicators located on the top panel.

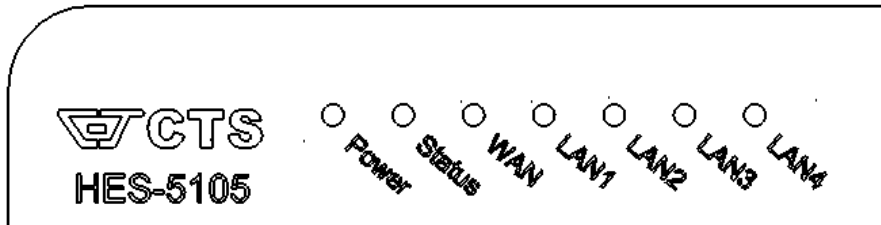


Figure 1-5. LEDs of HES-5105SFP+

LED	Color	Operation
Power	OFF	Device is powered down or works abnormally.
	Green	Lit when the power is operating normally.
Status	Green	Lit when the power is operating normally.
	Orange	Lit when the device is currently booting up. Blinks when the device is resetting to default settings.
WAN	OFF	No link is established.
	Orange	Lit when 1Gbps link is established. Blinks when the port is receiving and transmitting data at the speed of 1Gbps.
	Blue	Lit when 10Gbps link is established. Blinks when the port is receiving and transmitting data at the speed of 10Gbps.
LAN1~LAN3	OFF	No link is established.
	Orange	Lit when 1Gbps or 100Mbps link is established. Blinks when the port is receiving and transmitting data at the speed of 1Gbps or 100Mbps.
	Blue	Lit when 2.5Gbps link is established. Blinks when the port is receiving and transmitting data at the speed of 2.5Gbps.
LAN4	OFF	No link is established.
	Orange	Lit when 1Gbps or 100Mbps link is established. Blinks when the port is receiving and transmitting data at the speed of 1Gbps or 100Mbps.
	Blue	Lit when 10G/5G/2.5Gbps link is established. Blinks when the port is receiving and transmitting data at the speed of 10G/5G/2.5Gbps.

1.5 Cable Specifications

The following table contains various cable specifications for the Managed Switch. Please make sure that you use the proper cable when connecting the Switch.

Cable Type	Description
100Base-TX	UTP Cat. 5 (100 meters max.) EIA/TIA-568 150-ohm STP (100 meters max.)
1000Base-T	UTP Cat. 5e (100 meters max.) UTP Cat. 5 (100 meters max.) EIA/TIA-568B 150-ohm STP (100 meters max.)
1000BASE-SX	Multi-mode fiber module (550m)
1000BASE-LX	Single-mode fiber module (10km)
1000BASE-LH	Single-mode fiber module (30km/50km)
1000BASE-ZX	Single-mode fiber module (80km)
SFP Transceiver	SFP Transceiver for 1000BASE-SX Multi-mode fiber module (550m) SFP Transceiver for 1000BASE-LX Single-mode fiber module (10km) SFP Transceiver for 1000BASE-LH Single-mode fiber module (30km/50km) SFP Transceiver for 1000BASE-ZX Single-mode fiber module (80km)
10GBASE-SR	Multi-mode fiber module (26m or 400m)
10GBASE-LR	Single-mode fiber module (10km)
10GBASE-ER	Single-mode fiber module (40km)
10GBASE-LRM	Multi-mode fiber module (220m)

1.6 Transmission Distance Using Copper Cables

The following table shows the maximum transmission distance for HES-5105SFP+ Managed Switch at the speed of 1G/2.5G/5G/10G when using various copper cables.

Speed(bps) Cable	1G	2.5G	5G	10G
Cat. 5E (22~24 AWG)	100	100	N/A	N/A
Cat. 6 (22~24 AWG)	100	100	100*	N/A
Cat. 6A (22~24 AWG)	100	100	100	100

Unit: meter

*The port speed needs to be configured as 5Gbps manually, otherwise, the link will fail.

Note:

1. Use UTP or STP cable as Cat.5E (Max. 100 meters)
2. Use STP cable as Cat.6/6A (Max. 100 meters)

2

Installation

To properly install the Switch, please follow the procedures listed below. These procedures will be respectively described in detail in the following sections.

- Installation Requirements
- Checking the Package Contents
- Installing the Switch
- Powering on the Switch
- Connecting the Switch to the Network

2.1 Installation Requirements

Basic requirements for installation are as follows:

- Environmental conditions
 - One power outlet
 - Proper ventilation
 - Proper isolation to electrical noise, radio, etc.
 - UTP cables should not run in the same duct with power and phone line cables
- Required SFP/SFP+ Transceivers or UTP cables

2.2 Checking the Package Contents

Unpack the package carefully and check the package contents. The standard package should contain the following items:

- Managed Switch x 1
- Quick Guide x 1 (with QR code on it)
- AC to DC Power Adapter x 1

If any of the above items is found missing or damaged, please contact your local sales representative for support or replacement.

2.3 Installing the Switch

CAUTION

To prevent any damage or failure of the Managed Switch, please **DO NOT** block the ventilation holes.

Use the following guidelines when choosing a place to install the Switch:

- Firm and steady flat surface.
- The location of power outlet should not be far away from the device.
- Make sure that there is proper heat dissipation from and adequate ventilation around the switch. Do not place heavy objects on the Managed Switch.
- Make sure water and moisture cannot enter the case.
- Keep the cabling away from electrical noise.

2.4 Powering the Switch

The Managed Switch is compatible with the included power adaptor, which has an input of 100-240VAC, 50/60Hz, and an output of 12VDC, 1.5A. The input connector is located on the front panel of the Managed Switch. Before turning on the Managed Switch, please make sure that network cables and power cables are securely connected.

Procedures:

1. Plug one end of the power adaptor into the power jack on the front panel.
2. Plug the other end of the power adaptor into the power outlet. After the power is on, the Power LED indicator should light in green.

Power Failure

In the event of power failure, unplug the power that is plugged into the switch on the front panel of the device. When power is resumed, plug the power back to the switch. Please note that the Managed Switch has no Power ON/OFF Button. Therefore, the only way to power on or power off the switch is to connect or disconnect the power adaptor.

2.5 Connecting the Switch to Network

Connect to Network

This HES-5105SFP+ has 1 x 10/1Gbps SFP+ slot, 1 x 10G/5G/2.5G/1G/100Mbps RJ-45 port and 3 x 2.5G/1G/100Mbps RJ-45 Port for you to implement it in your environment. The SFP+ slot can be plugged with 10G/1G Base-X SFP/SFP+ Fiber transceiver. The connection of the fiber port must be matched, i.e. Transmitter to Receiver, and vice versa.

2.6 Installing and Removing SFP/SFP+ Modules

2.6.1 Installing SFP/SFP+ Modules

To connect the fiber transceiver and LC cable, please refer to the following guidelines:

1. Position the SFP/SFP+ transceiver with the handle on top.
2. Locate the triangular marking in the slot and align it with the bottom of the transceiver.
3. Insert the SFP/SFP+ transceiver into the slot until it clicks into place.
4. Make sure the module is seated correctly before sliding the module into the slot. A click sounds when it is locked in place.

Note: If you are attaching fiber optic cables to the transceiver, continue with the following step. Otherwise, repeat the previous steps to install the remaining SFP/SFP+ transceivers in the device.

1. Remove the protective plug from the SFP/SFP+ transceiver.

Note: Do not remove the dust plug from the transceiver if you are not installing the fiber optic cable at this time. The dust plug protects hardware from dust contamination.

2. Insert the fiber cable into the transceiver. The connector snaps into place and locks.
3. Repeat the previous procedures to install any additional SFP/SFP+ transceivers in the switch. The fiber port is now set up.

2.6.2 Removing SFP/SFP+ Modules

To disconnect an LC connector, please refer to the following guidelines:

1. Press down and hold the locking clips on the upper side of the optic cable.
2. Pull the optic cable out to release it from the transceiver.
3. Hold the handle on the transceiver and pull the transceiver out of the slot.

3

Operation

A built-in management module of the Managed Switch provides users flexible interfaces to configure, control and monitor the system remotely and locally. To know the further information about the operation of this switch, please refer to our Network Management User's Manual for the detailed management functions and required installation and operation procedures.

3.1 Network Management

The following is a list of management options available on this Managed Switch, the Managed Switch will be refer to as "the network device" below:

- Telnet Management
- SNMP Management
- Web Management

Telnet Management

Upon establishing a network connection to the network device, users have the capability to employ Telnet for system configuration, control, and monitoring. This method of management via the network is commonly known as In-Band Management.

SNMP Management

SNMP, being another form of In-Band Management, necessitates a network connection to the network device. The private Management Information Bases (MIB) specific to the network device are made available for SNMP-based network management programs, enabling the configuration, control, and monitoring of the system.

Web Management

Upon the network device being accessible on the network, users can log in and remotely or locally monitor its status through a web browser. For local web management, particularly during the initial setup of the network device to configure the necessary IP, users can also utilize the RJ-45 ports situated on the front panel. To facilitate this management, a direct RJ-45 LAN cable connection between a PC and the network device are necessary.

Username	Admin
Password	No password (empty)
IP Address	192.168.0.1/24

4

Maintenance

It is easy to use and maintain this Managed Switch. The procedures are suggested when you want to identify faults, perform hardware replacement and firmware upgrading.

4.1 Fault Identification

Identifying faults can greatly reduce the time required to find problem and solution. Users may perform local check or remote check to find the problems.

4.1.1 Local Check

Users can perform local check by observing LED indicators status.

- When the whole system fails to function,
 1. Check Power LED status
 2. Check Power connection
 3. Reset power

- When certain network link fails to function,
 1. Locate the port of the switch
 2. Check LED of the port
 3. Check cable connection between the port and the connected device
 4. Reset power

4.1.2 Remote Check

Users may check the Managed Switch through SNMP manager remotely. For detailed procedures, please refer to the Network Management User's Manual.

4.2 Hardware Replacement Procedures

WARNING!

The Managed Switch contains no user-serviceable parts. DO NOT, UNDER ANY CIRCUMSTANCES, open and attempt to repair it.

Failure to observe this warning could result in personal injury or death from electrical shock.

Failure to observe the above warning will immediately void any Warranty.

4.3 Firmware Upgrade

The Managed Switch may require a firmware upgrade when necessary.

The latest firmware can be obtained through your sales representative or downloaded from our website. For detailed upgrade procedures, please refer to the Network Management User's Manual.



CONNECTION TECHNOLOGY SYSTEMS

18F-6, No.79, Sec.1, Xintai 5th Rd.,

XiZhi Dist., New Taipei City 221, Taiwan(R.O.C)

Tel: +886-2-2698-9661

Fax: +886-2-2698-9662

Dir.Line:+886-2-2698-9201

www.ctsystem.com