



**C4120-1048**

**10GBASE-T to 10G Fiber Media Converter**

**Install Guide**

Part Number 33549  
Revision D October 2024

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## Revision History

Date	Rev	Notes
09/25/13	A	Initial release for v 1.2.3.
6/8/18	B	Update to v 2.0.1, DoC, and contact info.
<b>8/21/23</b>	C	Add note that the C4120 can only be installed in ION106-x or ION219-x chassis. Initial Lantronix rebrand. Change contact information.
<b>10/17/24</b>	D	Update compliance information and fix typo. Add note that Telnet is not secure.

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## Introduction

Lantronix' two-port C4120 series 10 Gigabit Ethernet ION slide-in card (SIC) is designed to install in an ION106-x or ION219-x chassis. The C4120 slide-in-card (SIC) connects 10GBase-T twisted-pair copper cable to 10GE fiber devices. The C4120 has one copper port and one fiber optic port.

## Models

The C4120-1048 is a 10 Gigabit Ethernet copper to fiber media converter. It offers conversion technology by providing one 10GBase-T RJ-45 port and one pluggable 10GBase-X fiber SFP+ port. The open SFP+ port supports a wide variety of Lantronix 10GE SFP+ fiber modules, as well as third party MSA compatible SFP+ modules.

The C4120 provides several 10G Ethernet enterprise and data center connectivity solutions. Since most 10G Ethernet switches support a combination of copper RJ-45 and open SFP+ ports, the C4120 allows users to convert either of these ports to the media type of their preference to match their network requirements.

The C4120 slide-in-card is a managed device when installed in a Managed ION106-x or ION219-x Chassis. The stand-alone version (S4120) is an unmanaged device, until it is linked to C4120 installed in a managed ION chassis, and then remote in-band management of the S4120 is available.

The C4120 fiber interfaces are modular; the fiber length and type are defined by the SFP+ module inserted. The C4120 supports a variety of SFP+ MSA modules. Make sure that the inserted SFP+ module is compatible with current C4120 operation mode (Fixed 10Gbps mode). The 10G fiber port supports 10Gbps and full duplex mode. The 10G Base-T copper port supports Auto cross, Auto-negotiation, and full duplex mode. You can enable/disable the fiber port and the copper port.

Model #	Port 1 - Copper 10GBase-T	Port 2 - Duplex Fiber-Optic	Form Factor
C4120-1048	RJ-45 100 m (328 ft)	10GE SFP+	ION Chassis Card
S4120-1048	RJ-45 100 m (328 ft)	10GE SFP+	ION Stand-alone device

The S4120 is used as remote device and can be managed by remote management protocol. The S4120 supports remote, in-band, management when linked to a managed chassis card, and support both a hardware mode and a software mode of management.

## Ethernet PHY Interfaces

The Ethernet PHY interfaces supported include 10GBase-LRM, 10GBase-SR, 10GBase-LR, 10GBase-ER, 10GBase-ZR, and 10GBase-T.

## Document Overview

The purpose of this manual is to provide the information needed to install the C4120 to the point of operation. Note that there is a separate install guide for the S4120.

## Related Manuals and Online Help

A printed documentation card is shipped with each x4120 device. Context-sensitive Help screens, as well as cursor-over-help (COH) facilities are built into the Web interface. A substantial set of technical documents, white papers, case studies, etc. are available on the Lantronix web site at <https://www.lantronix.com>. Note that this manual provides links to third party web sites for which Lantronix is not responsible. Other ION system and related device manuals are listed below.

1. Product Documentation Postcard, 33504
2. ION C4120 Install Guide, 33549 (this manual)
3. ION S4120 Install Guide , 33550
4. ION C4120 Web User Guide, 33551
5. ION C4120 CLI Reference, 33552
6. Local Management of Cards in a Remote Un-managed Chassis
7. ION Management Module (IONMM) Install Guide, 33420 and User Guide, 33457
8. Release Notes (firmware version specific)

**Note:** Information in this document is subject to change without notice. All information was deemed accurate and complete at the time of publication. This manual documents the latest software/firmware version. While all screen examples may not display the latest version number, all of the descriptions and procedures reflect the latest software/firmware version, noted in the [Record of Revisions on page 3](#).  
Note: Some Documentation may have Transition Networks named or pictured. Transition Networks was acquired by Lantronix in August 2021.

## Features

- Transparent Link Pass Through
- Auto-Negotiation and AutoCross
- Automatic Link Restoration
- Loopback on Fiber and Copper
- DMI (Diagnostic Monitoring Interface)
- For use in the ION 19-Slot or ION 6-Slot Chassis only
- Manageable when installed in a managed ION Chassis
- Remote Firmware Upgrade
- Supports 100m on Cat 6a or higher cable

## Application Examples

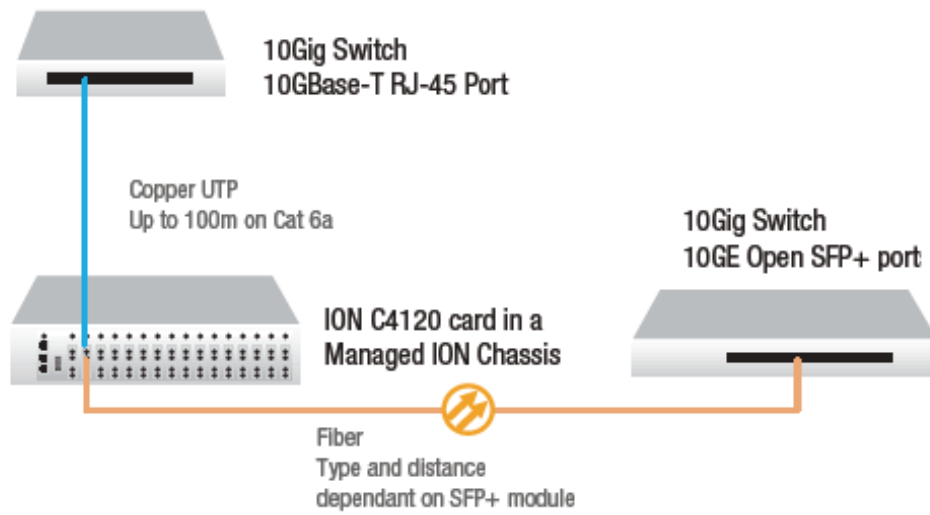


Figure 1: 10Gig Switch to Switch

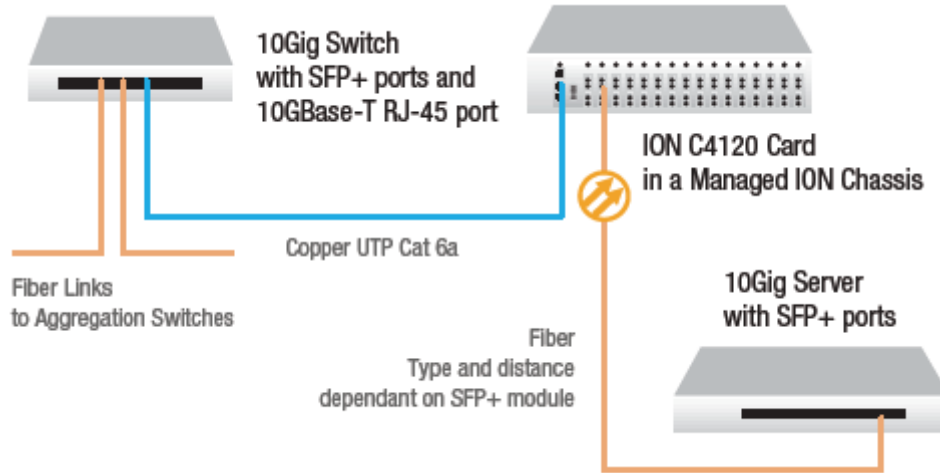


Figure 2: 10Gig Switch to Server

## Pre-Installation

**CAUTION:** Wear a grounding device and observe electrostatic discharge precautions when handling the SIC media converter. Failure to observe this caution could result in damage or failure of the SIC.

### DIP Switch

The C4120 has a field-configurable DIP Switch and Jumpers.

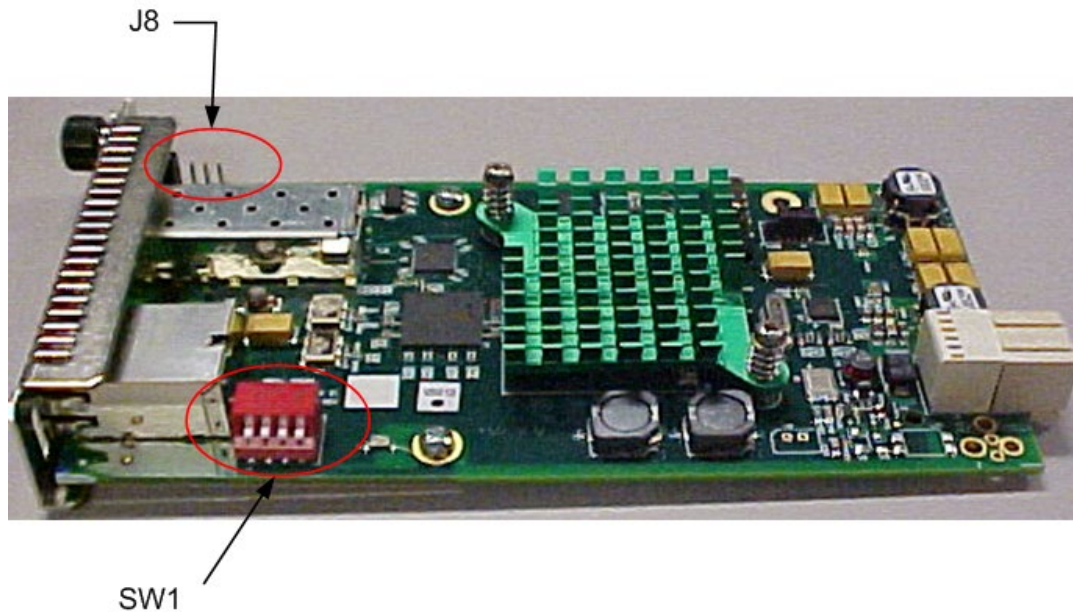


Figure 1. DIP Switch SW1 and Jumper J8

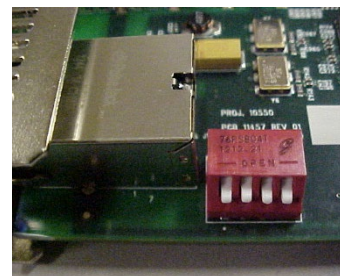
### DIP Switch SW1 (TLPT / Loopbacks)

The 4-position DIP switch labeled SW1 is on the bottom edge of the C4120 media converter PCB. Use a small, flat-blade screwdriver (or a similar tool) to set the switches according to the site requirements (see figure below).

<b>SW 1 and 2 (Loopback):</b>	<b><u>SW1</u></b>	<b><u>SW2</u></b>
No Loopback	Up	Up
Copper Loopback	Down	Up
Fiber Loopback	Up	Down
No Loopback	Down	Down

**SW 3:** Reserved (not used)

**SW 4 (TLPT):** Up = TLPT Enabled      Down = TLPT Disabled



The factory default setting is SW1 – SW4 in the Up position (all Up).

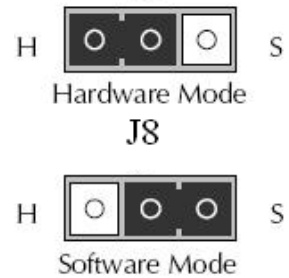
## Hardware/Software Mode Jumper (J8)

The hardware/software 3-pin header, J8 is located on the circuit board (labeled **H** and **S** in the figure below).

**Note:** Use small needle-nose pliers to set the jumper.

**H -Hardware** In this position, the mode of the C4120 is determined by the 4-position switch (hardware) settings.

**S -Software** In this position, the mode of the C4120 is determined by the most-recently saved, onboard microprocessor (software) settings.



Use the CLI command “**show card info**” to show the current Config mode setting (*hardware* or *software*).

From the web GUI, navigate to the ION Stack > Chassis > C4120 menu path and check the MAIN tab’s System Configuration section > Configuration Mode field setting (*hardware* or *software*).

See the related C4120 manual for more information.



## Installation and Setup

### General

This section describes how to install the C4120 and the procedures to access and initially set it up via either a local serial interface (USB) or a remote Ethernet connection (SSH/Telnet session or Web interface).

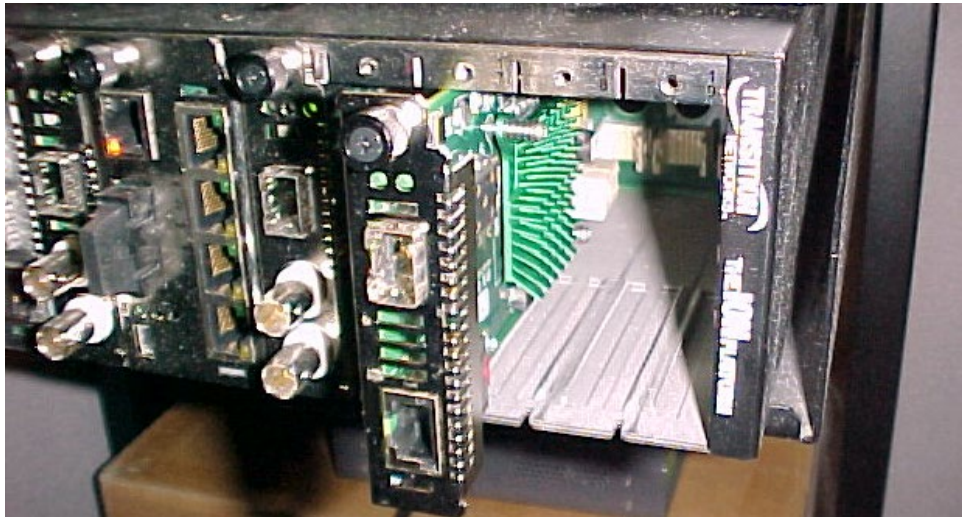
### Install the C4120 in the ION Chassis

The C4120 is a slide-in module that can only be installed in a Lantronix ION chassis (ION006 Series and ION219 Series). For a complete list of ION platform products, go to the ION Chassis product page at: <https://www.lantronix.com/products-class/chassis/>.

The following describes how to install the C4120 in the ION chassis.



**Caution:** Failure to wear a grounding device and observe electrostatic discharge precautions when installing the C4120 could result in damage or failure of the module.



**Figure 2: ION219 Chassis Installation**

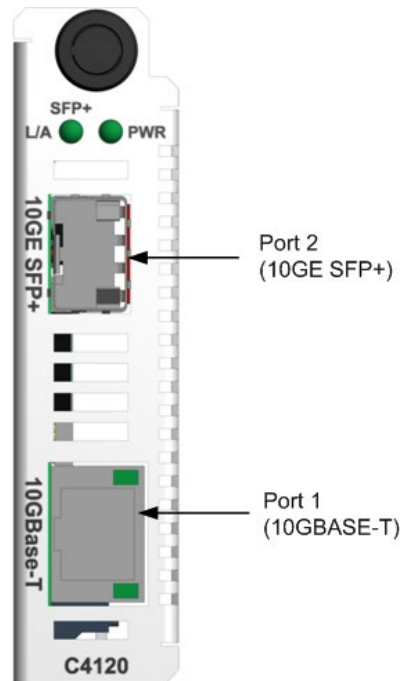
### IMPORTANT

The C4120 slide-in cards are “hot swappable” devices, and can be installed with chassis power on.

1. Locate an empty slot in the ION System chassis. If necessary, remove a chassis slot cover from the ION Chassis (*keep the slot cover and screw*).
2. Grasp the edges of the C4120 by its front panel, align the card with the upper and lower slot guides, and carefully insert the C4120 into the slot.
3. Firmly seat the C4120 against the chassis back panel.
4. Push in and rotate clockwise the panel fastener screw to secure the C4120 to the chassis (Figure 2).
5. Note that the card’s Power LED lights. See [Accessing the C4120](#) on page 13.

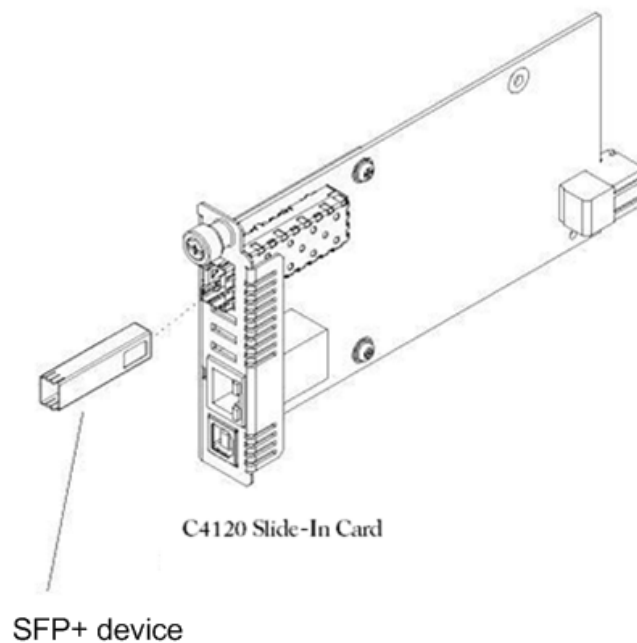
## Port Locations

The C4120 model has two ports. The drawing below shows the locations of Port 1 (10GE SFP+ for fiber) and Port 2 (10GBase-T for copper).



## Installing SFP+ Devices

The C4120 lets you install a SFP+ device of your choice in order to make a fiber connection. The C4120-1048 has a single SFP+ port.



**Figure 3: SFP+ Installation**

## SFP/XFP Optical Transceivers

Lantronix SFPs and XFPs are small form factor, hot-pluggable transceivers which allow for a single piece of network equipment to be connected to a multitude of interfaces, protocols, and transmission media via the SFP/XFP port.

All Lantronix SFPs and XFPs are compliant with the Multi-Sourcing Agreement (MSA) ensuring interoperability with all other MSA compliant networking devices.

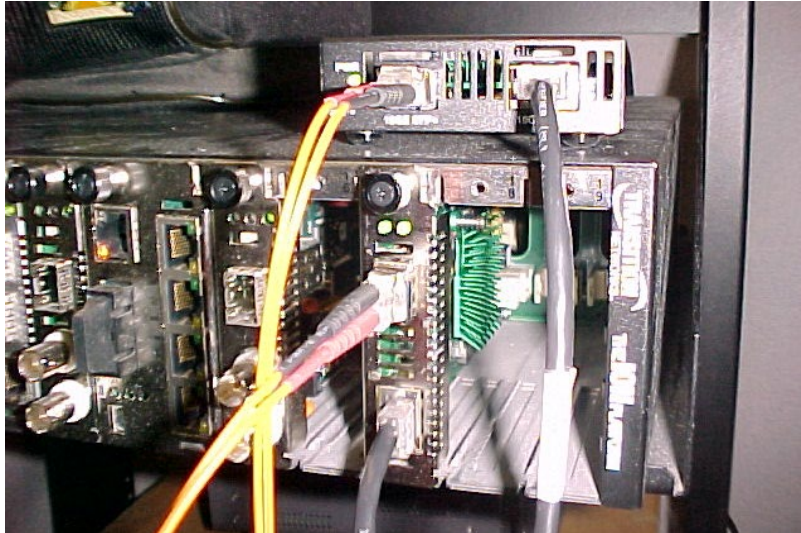
To install an SFP+ device in the C4120:

1. Position the SFP+ device at either installation slot, with the label facing up.
2. Carefully slide the SFP+ device into the slot, aligning it with the internal installation guides.
3. Ensure that the SFP+ device is firmly seated against the internal mating connector.
4. Connect the fiber cable to the fiber port connector of the SFP+ device.

See the Lantronix [SFP webpage](#) for the latest information.

## Cabling

The C4120 can be used to convert a 10GE fiber port to 10GE copper port, or vice versa. The C4120 can be used in telecom and enterprise applications where 10 GB Ethernet switches are already in place. Most 10Gb switches have a combination of copper and fiber ports, typically with more fiber ports than copper ports. When all the fiber ports are consumed, the C4120 can be used to convert one copper port to fiber. The C4120 can also convert 10 GB fiber ports to copper.

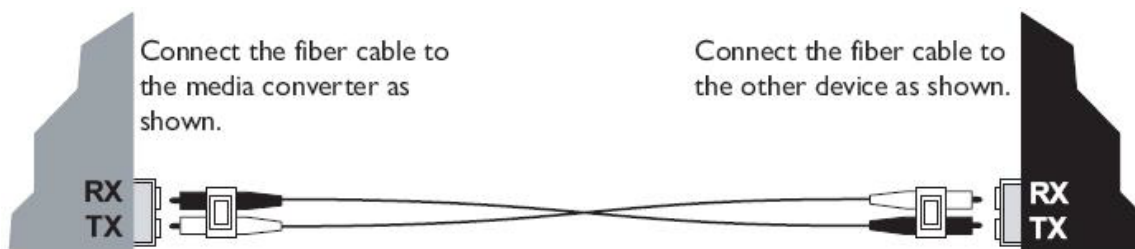


The figure above shows cabling a C4120 to an S4120. The procedures for fiber cable and copper cable installation are provided below.

## Install Fiber and Copper Cable

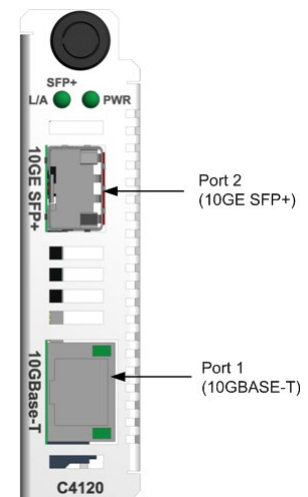
### Port 2: 10GE SFP+ Fiber Port

1. Locate a fiber cable with male, two-stranded TX-to-RX connectors installed at both ends. See “[Cable Specifications](#)” on page 23 for details.
2. Connect the fiber cable to the 10GE SFP+ fiber port (Port 2 labeled **10GE SFP+**) on the C4120 as described:
  - Connect the male TX cable connector to the female TX connector.
  - Connect the male RX cable connector to the female RX connector.
3. Connect the fiber cables to the 10GE fiber port on the other device (*another media converter, hub, S4120, etc.*) as described:
  - Connect the male TX cable connector to the female RX connector.
  - Connect the male RX cable connector to the female TX connector.



### Port 1: 10GBase-T Copper Port

1. Locate a cable with the applicable connectors installed at both ends. See “[Cable Specifications](#)” on page 23 for details.
2. Connect the connector at one end of the cable to the C4120 Port 1 (labeled **10GBASE-T**).
3. Connect the connector at the other end of the cable to the copper port on the other device (*switch, workstation, etc.*).



## IONMM Installation

For IONMM Management Module installation information, see the IONMM Install Guide, 33420. For IONMM operation see the *ION Management Module (IONMM) User Guide*, 33457.

## Accessing the C4120

The C4120 can be accessed through either a local serial interface via a USB connection or through an Ethernet network connection on the IONMM installed in the ION chassis along with the C4120. The network connection can be done via an SSH/Telnet session or the Web GUI.

### Access via Local Serial Interface (USB)

The IONMM can be connected to a local management station (PC) through a serial interface using a USB connection. The IONMM and the C4120 can be controlled by entering command line interface (CLI) commands at the local management station. To use the serial interface (USB) the following is required:

- Personal computer (PC)
- USB cable (type A male connector on one end and type B male connector on the other)
- Terminal emulator program (e.g., HyperTerminal) on the PC
- USB driver installed on the PC
- Configured COM port

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## IMPORTANT

In order to control the chassis slide-in module through a USB serial interface, the command line prompt must be showing the location of the module to be managed.

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### Operating Systems Supported

OS support includes Windows® 7, Windows 7 x64, Windows XP® 32 bit, Windows 2000, Windows 2003 32 bit, Windows Vista x64, and Windows XP 64 bit.

The USB drivers are provided on our [website](#). Virtual COM port (VCP) drivers make the USB device appear as an additional COM port available to the PC. Application software can access the USB device in the same way as it would access a standard COM port.

You can access the ION Management Module using a standard web browser.

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## Installing the USB Driver

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### IMPORTANT

The following driver installation instructions are for the *Windows XP* operating system only. Installing the USB driver using another operating system is similar, but not necessarily identical to the following procedure.

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To install the USB driver on a computer running *Windows XP*, do the following.

1. Extract the driver (from the provided CD or from the [website](#)) and place it in an accessible folder on the local drive of the PC.
2. Connect the C4120 to the USB port on the PC. **Note:** for slide-in modules installed in an ION Chassis, the USB connection will be made to the ION Management Module (IONMM) if one is installed in the ION chassis. The *Welcome to the Found New Hardware Wizard* window displays.
3. Select **No, not this time**.
4. Click **Next**. The installation options window displays.
5. Select **Install from a list or specific location (Advanced)**.
6. Click **Next**. The driver search installation options window displays.
7. Click **Browse**.
8. Locate and select the USB driver downloaded in step 1 above.
9. Click **Next**. Driver installation begins.
10. When the finished installing screen displays, click **Finish**. The USB driver installation is complete. You must now configure access the C4120 via an Ethernet network.

### Access via an Ethernet Network

The C4120 can be managed remotely through the Ethernet network via either an SSH/Telnet session or the Web UI. Before this is possible, you must set up the IP configuration for the C4120.

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### IMPORTANT

It is recommended that you initially set up the IP configuration through the serial interface (USB connection). See "[Accessing the C4120](#)" on page 13.

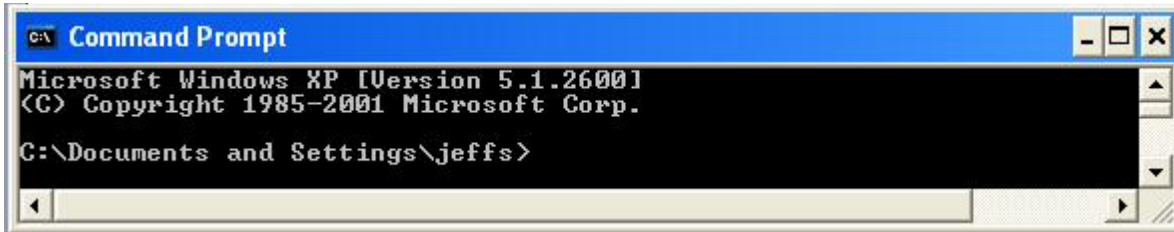
Otherwise, in order to communicate with the C4120 across the network for the first time, you must change the network settings (IP address, subnet mask and default gateway address) of your PC to coincide with the defaults of the C4120 (see "[Defaults](#)" on page 30). Make note of the original settings for the PC as you will need to reset them after setting the IP configuration for the C4120.

---

## Starting a Telnet Session

The C4120 can be controlled from a remote management station via a Telnet session over an Ethernet connection. The C4120 is controlled and configured through CLI commands. Use the following procedure to connect to and access the C4120 via a Telnet session.

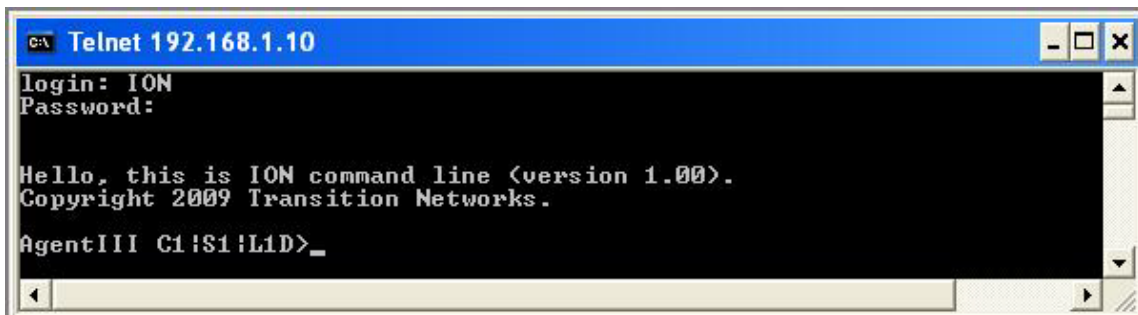
1. Click **Start**.
2. Select **All Programs > Accessories**.
3. Click **Command Prompt**. The command prompt window displays.



4. At the command line type: **telnet <xx>** where:  
xx = IP address of the C4120 (e.g., 192.168.1.10)
5. Press **Enter**. The login prompt displays.

**Note:** If your system uses a security protocol (e.g., RADIUS, SSH, etc.), enter the login and password required by that protocol.

6. Type your login (the default is **ION**). **Note:** the login is case sensitive.
7. Press **Enter**. The password prompt displays.
8. Type your password (the default is **private**). **Note:** the password is case sensitive.
9. Press **Enter**. The command line prompt displays.



10. Enter a **go** command to change the location for the command prompt. The **go** command format is:  
go [c=<0-16>] [s=<0-32>] [l1ap=<1-15>] [l2ap=<1-15>] (l1p=<1-5>|l2p=<1-15>|l3p=<1-15>|l1d|l2d|l3d)
11. Enter commands to set up the various configurations for the C4120. For web GUI configuration, see the x4120 Web User Guide. For a description of the available CLI commands see the *x4120 CLI Reference* manual.

**Note:** If required by your organization's security policies and procedures, use the CLI command **set community write=<xx>** to change the default password. See the *x4120 CLI Reference* manual.

## Terminating a Telnet Session

To terminate the Telnet session:

1. Type **q**(uit).
2. **Press the Enter key.**

## Using Telnet vs. SSH

Note that Telnet is not secure and can expose data to potential eavesdroppers. Consider using SSH for more secure communications. Per a Microsoft Tutorial dated 5/29/24 (<https://learn.microsoft.com/en-us/windows/terminal/tutorials/ssh>): "The latest builds of Windows 10 and Windows 11 include a built-in SSH server and client that are based on OpenSSH, a connectivity tool for remote sign-in that uses the SSH protocol. OpenSSH encrypts all traffic between client and server to eliminate eavesdropping, connection hijacking, and other attacks. Windows has a built-in SSH client and SSH server that you can use in Windows Terminal."

**Windows 10:** Microsoft announced it was bringing an integrated OpenSSH client to Windows in 2015. They've hidden an SSH client in Windows 10 Fall Creators Update. You can now connect to a Secure Shell server from Windows without installing PuTTY or any other third-party software.

**Windows 11:** See the "Get started with OpenSSH for Windows" article ([https://learn.microsoft.com/en-us/windows-server/administration/openssh/openssh\\_install\\_firstuse?tabs=gui&pivots=windows-server-2025](https://learn.microsoft.com/en-us/windows-server/administration/openssh/openssh_install_firstuse?tabs=gui&pivots=windows-server-2025)) dated 08/16/2024. The article applies to Windows 11, Windows 10, Windows Server 2025 and 2022, and Windows Server 2019.



## Web Browsers Supported

The ION system supports the latest version of most popular web browsers.

## Starting the Web Interface

The C4120 can be controlled and configured from a remote management station via a Web graphical user interface (GUI) over an Ethernet connection. Information is entered into fields on the various screens of the interface. **Note:** fields that have a grey background can not be modified.

A Web session can be used to connect to and set up the C4120.

---

## IMPORTANT

- Do not use the back button to navigate the screens. This will cause the connection to drop.
  - Do not use the back space key in grayed out fields. This will cause the connection to drop.
  - For DHCP operations, a DHCP server must be on the network and available.
- 

### To sign in to the C4120 via the Web:

1. Open a web browser.



2. In the address (URL) block, type the IP address of the IONMM (the default address is 192.168.1.10).
3. Click **Go** or press **Enter**. The ION System sign in screen displays.

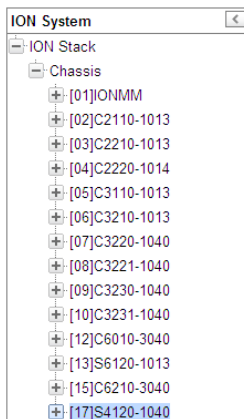


**Note:** If your system uses a security protocol (e.g., RADIUS, SSH, etc.), you must enter the login and password required by that protocol.

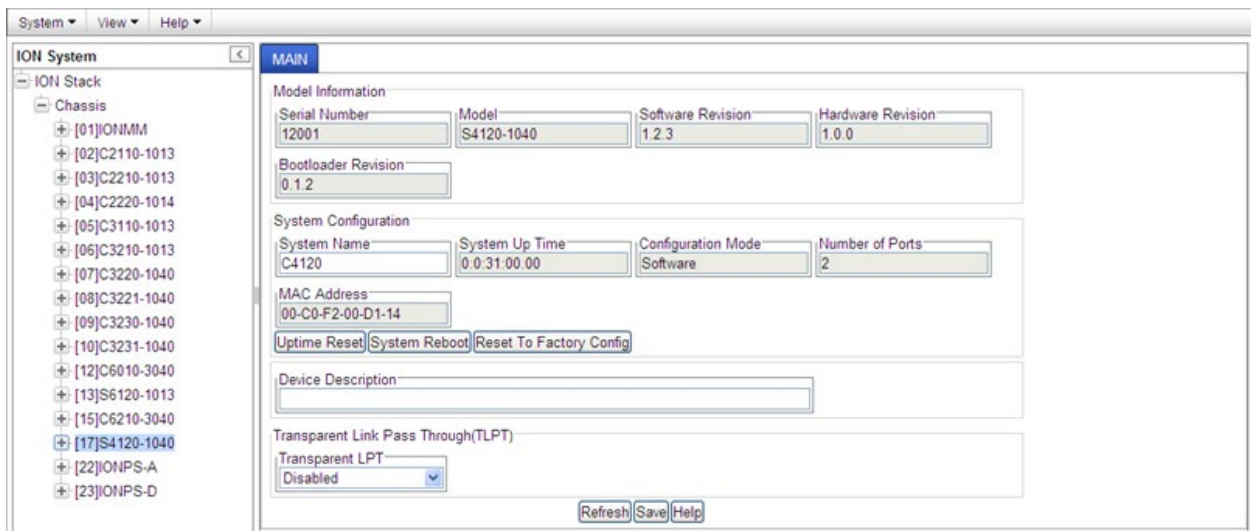
1. Type the System name (the default is **ION**). **Note:** the System name is case sensitive - all upper case.
2. Type the password (the default is **private**). **Note:** the password is case sensitive - all lower case.
3. Click **Sign in** or press **Enter**. The opening screen displays.



4. Click the plus sign [+] next to **ION Stack**. This unfolds "ION Stack" node in the left tree view and will refresh device status.
5. Click the plus sign [+] next to **Chassis** to unfold the chassis devices.



6. Select the appropriate C4120-1048 device. The **MAIN** screen displays for the selected C4120.

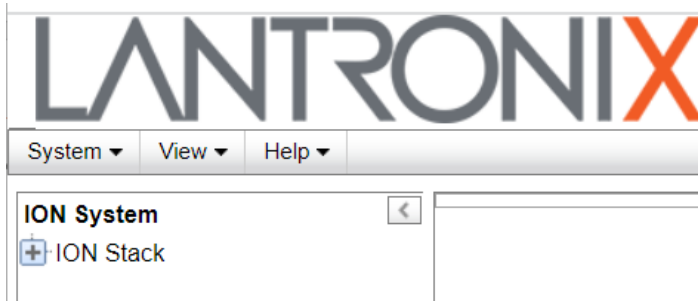


7. You can use the various fileds to configure the device and ports. For configuration information, see "[Section 4: Configuration](#)".

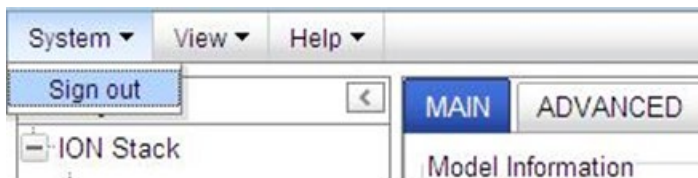
**Note:** If required, use the **set community** CLI command to change the default password according to your organization's security policies and procedures.

## Terminating the Web Interface

To sign out of the Web interface, in the upper left corner of the ION System Web Interface:



1. Click the **System** dropdown.
2. Click **Sign out**.



The ION sign-in screen displays.

**Note:** The C4120 does not automatically log out upon exit or after a timeout period, which could leave it vulnerable if left unattended. Follow your organizational policy on when to sign out from the ION System via the Web Interface.

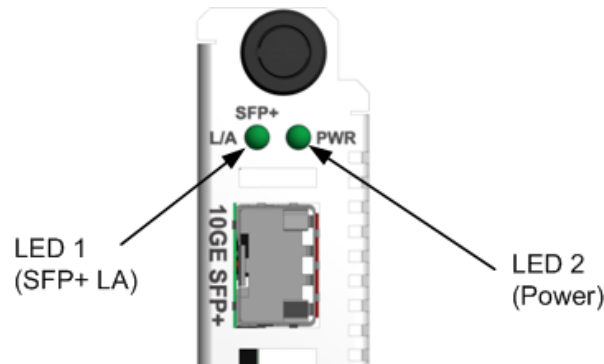
## Operation

### Status LEDs

Use the status LEDs to monitor C4120 operation in the network.

### Fiber Status and Power LEDs

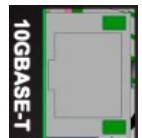
The status LED for the 10GE SFP+ fiber connection (labeled **SFP+ L/A**) and the device power LED (labeled **PWR**) are located above Port 2 (10GE SFP+). When the fiber link is down, and SFP+ module is in the SFP+ slot, the fiber LED is totally off.



LED Label	Meaning	Operation
<b>PWR</b>	Power	ON = Connection to chassis power.
<b>SFP+ L/A</b>	Link Activity	ON = A link has been established for the fiber connection (link OK). Off = Link fail. Flashing = The fiber connection is transmitting (Link OK and Activity OK).

### Copper Status LEDs

The Status LEDs for the copper port (Port 1 / 10GBase-T) are shown and described below.



LED / Location	Meaning	Operation
<b>Copper Link /</b> top left	Copper port link status	On = Copper link OK. Off = Copper link failure.
<b>Copper Act /</b> top right	Copper port activity status	Off = No copper activity Flash = Copper activity

## Product Features

### Auto-Negotiation

The Auto-Negotiation feature allows the C4120 to configure itself to achieve the best possible mode of operation over a link, automatically. The C4120 broadcasts its speed and duplex capabilities to the other devices and negotiates the best mode of operation.

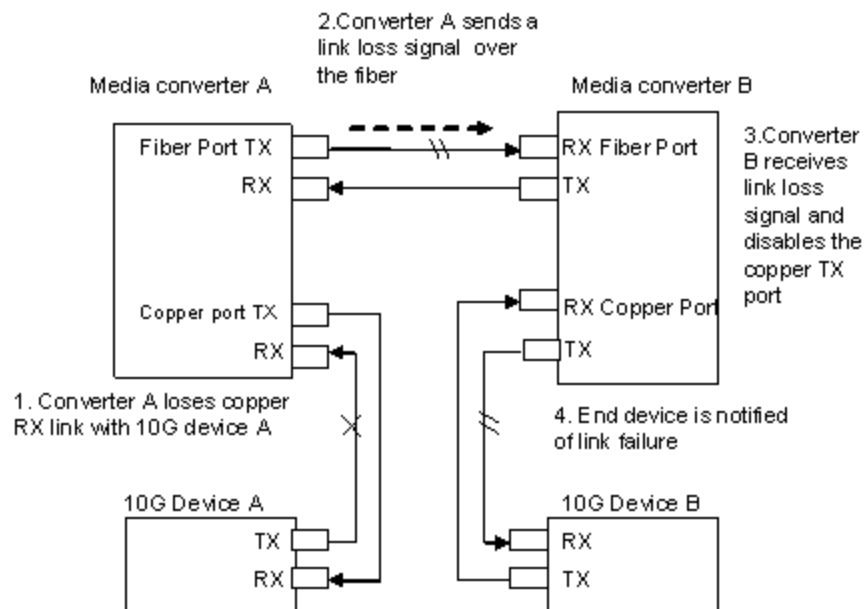
Auto-Negotiation allows quick and easy installation because the optimal link is established automatically. No user intervention is required to determine the best mode of operation.

### Transparent Link Pass-Through

Transparent Link Pass Through will notify an end device of a link failure just like Link Pass Through (LPT), however it uses a different method for “passing through” this information. Transparent Link Pass Through sends a link loss signal over the fiber, instructing the remote converter to shut down the copper port thus notifying the end device, while maintaining the fiber link between the two converters

TLPT functions as follows:

- End device is automatically notified with link loss;
- Fiber link remains up as it carries a link loss signal.



The TLPT function is configurable through customer interface (Web UI, FP and CLI) in software mode. In hardware mode, it is configured via DIP switch. The configuration option is enable/disable.

### AutoCross

The AutoCross feature allows either straight-through (MDI) or crossover (MDI-X) cables to be used when connecting to devices such as hubs, transceivers, or network interface cards (NICs). AutoCross determines the characteristics of the cable connection and automatically configures the unit to link up, regardless of the cable configuration.

## Automatic Link Restoration

The C4120 will automatically restore the link between networked devices after a fault condition is corrected.

## Digital Monitoring Interface (DMI)

The Diagnostic Monitoring Interface (DMI) feature allows diagnosing problems within the network. The DMI function displays C4120 diagnostic / maintenance information such as 10Gbps fiber interface characteristics, diagnostic monitoring parameters, and supported fiber media lengths. All DMI events will trigger notification. Intrusion detection, based on Rx Power level, is available for triggering any drop in the Rx power.

Within each function, the DMI device will send a trap whenever a high or low warning event or high or low alarm event occurs (for a total of 16 traps). If both the local and remote NIDs are DMI models, the DMI device will indicate whether the trap event is from a local or remote device.

C4120 Diagnostic Monitoring Interface information includes:

DMI connector type: e.g., LC

DMI identifier: e.g., SFP

DMI Nominal bit rate: e.g., 10500\*Mbps

DMI 9/125u Singlemode Fiber (m): N/A

DMI 50/125u Multimode Fiber (m): 80\*m

DMI 62.5/125u Multimode Fiber (m): 3\*10m

Copper(m): N/A

DMI fiber interface wavelength: 850\*nm

DMI temperature: 42.0\*C

DMI temperature: 107.6\*F

DMI temperature alarm: normal

DMI transmit bias current: 6240\*uA

DMI transmit bias alarm: normal

DMI Transmit power: 589\*uW

DMI Transmit power: -2.299\*dBM

DMI Transmit power alarm: normal

DMI Receive power: 573\*uW

DMI Receive power: -2.418\*dBM

DMI Receive power alarm: normal

DMI Receive power intrusion threshold: 0\*uW

## Remote Management in an Unmanaged Chassis

ION x4120 Version 1.2.6 was released August 12, 2016. This release added:

- Support for the management of a C4120 when installed in an unmanaged ION chassis. Management is supported by another C4120 installed in a managed chassis when the two are linked together via a fiber cable. On initial power up, additional time, approximately 1min & 10sec, is now required for the cards to be displayed in the management interface. This time is needed for the cards to determine if they are installed in a managed or an unmanaged chassis.
- Support for remote firmware upgrades of a C4120 in an unmanaged chassis. Remote firmware upgrades in an unmanaged chassis is supported only after a factory bootloader upgrade is performed. Remote firmware upgrades in an unmanaged chassis can take up to 3 minutes to transfer the file, reboot, search for management module, and display card in management interface.

For more information see “*Local Management of Cards in a Remote Un-managed Chassis*”.

## Cable Specifications

The physical characteristics must meet or exceed IEEE 802.3™ specifications.

**Fiber port:** SFP+, both Class-I and Class-II, 10.3125Gbps.

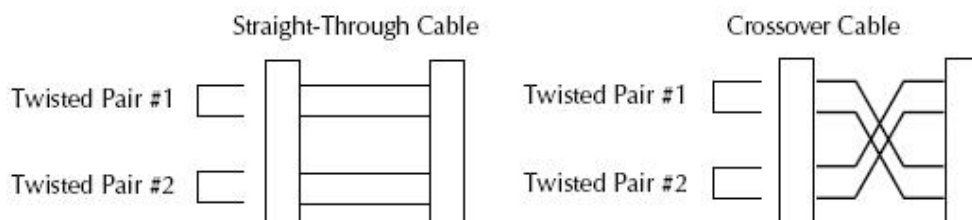
**Copper port:** RJ-45, 10Gbps.

## Copper Cable

Category 6a (*minimum requirement*)

Maximum Cable Distance: 100 meters

- Straight-through or crossover twisted-pair cable may be used.
- Shielded (STP) or unshielded (UTP) twisted-pair cable may be used.
- All pin pairs (1&2, 3&6, 4&5, 7&8) are active pins in a 10GB Ethernet network.
- Use only dedicated wire pairs for the active pins (*e.g., blue/white & white/blue, orange/white & white/orange, etc.*)
- Do not use flat or silver satin wire.



## Cable Types

The cabling specifications are provided for troubleshooting purposes.

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

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

**Table 7: Copper Cable Descriptions**

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

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

Common forms of 10GbE copper cables include:

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

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



**10GBASE-T:** These cables and connectors are similar to, but not the same as the cables used for 1000BASE-T. 10GBASE-T cables are Cat6a (Category 6 augmented), also known as Class EA cables. These support the higher frequencies required for 10Gb transmission up to 100 meters (330 feet). Cables must be certified to at least 500MHz to ensure 10GBASE-T compliance. Cat7 (Category 7, Class F) cable is also certified for 10GBASE-T compliance, and is typically deployed in Europe. Cat6 cables may work in 10GBASE-T deployments up to 55m, but should be tested first. Some newer 10GbE switches support 10GBASE-T (RJ45) connectors.

### Cat 6 (Category 6) Copper Cable

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

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

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

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

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

### Category 6a Copper Cable (Augmented Category 6)

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

The latest standard from the TIA for enhanced performance standards for twisted pair cable systems was defined in February 2008 in ANSI/TIA/EIA-568-B.2-10. Category 6a is defined at frequencies up to 500 MHz - twice that of Cat. 6. Category 6a performs at improved specifications, in particular in the area of alien crosstalk, as compared to Cat 6 UTP (unshielded twisted pair), which exhibited high alien noise in high frequencies.

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

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

### Maximum Length

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

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

### Installation Notes

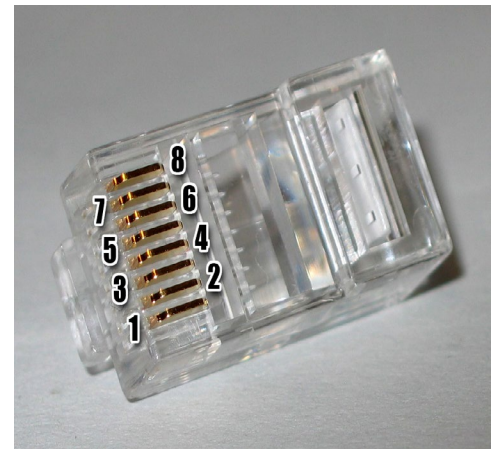
Category 6 and 6a cable must be properly installed and terminated to meet specifications. The cable must not be kinked or bent too tightly (the bend radius should be at least four times the outer diameter of the cable). The wire pairs must not be untwisted and the outer jacket must not be stripped back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

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

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

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

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



### Troubleshooting Cat 6 & Cat 6a Structured Copper Cabling Systems

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

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

## Fiber (10GbE) Cabling

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

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

**MMF** has an optical core of either 50  $\mu\text{m}$  or 62.5  $\mu\text{m}$ , and it supports distances up to 600 meters, depending on transmission speeds and transceivers.

**Table 8: Fiber Cable Descriptions**

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

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

### The C4120 supports:

**10GBase-SR:** The most common type of fiber-optic 10GbE cable that supports an SFP+ connector with an optical transceiver rated for 10Gb transmission speed (also known as “short reach” fiber-optic cables).

**10GBase-LR:** The the “long reach” fiber optic cables that support single-mode fiber optic cables and connectors. Provides serialized data at a line rate of 10.3125 Gbit/s. 10GBASE-LR has a specified reach of 10 kilometres (6.2 mi), but 10GBASE-LR optical modules can often manage distances of up to 25 kilometres (16 mi) with no data loss.

**10GBase-ER:** The "extended reach" port type for single-mode fiber that uses 1550 nm lasers. Its Physical Coding Sublayer 64b/66b PCS is defined in IEEE 802.3 Clause 49 and its Physical Medium Dependent PMD in Clause 52. It delivers serialized data at a line rate of 10.3125 Gbit/s.

**10GBase-ZR:** An 80 km (50 mile) range ER pluggable interface, the 80 km PHY is not specified within the IEEE 802.3ae standard, and manufacturers have created their own specifications based on the 80 km PHY described in the OC-192/STM-64 SDH/SONET specifications.

**10GBase-LRM:** The “Long Reach Multimode” originally specified in IEEE 802.3aq; a port type for multimode fiber that uses 1310 nm lasers. Its Physical Coding Sublayer 64b/66b PCS is defined in IEEE 802.3 Clause 49 and its Physical Medium Dependent PMD is defined in Clause 68. It delivers serialized data at a line rate of 10.3125 Gbit/s. 10GBASE-LRM supports distances up to 220 metres (720 ft) on FDDI-grade multimode fiber and the same 220m maximum reach on OM1, OM2 and OM3 fiber types.

The C4120 does not support 10GBase-LX4 or 10GBase-CX4.

## Technical Specifications

Standards:	IEEE802.3, IEEE 802.3an, IEEE 802.3ae, IEEE 802.3az
Data Rate:	10 Gbps
Status LEDs:	PWR (Power): On = power is on L/A SFP+ (Fiber port link and activity status): On = Link OK Flashing = Link and Activity OK Copper Link (Copper Link Status): On = Link OK Copper Act (Copper Link Activity): On = Activity OK
DIP Switches:	SW1: Copper Loopback SW2: Fiber Loopback SW3: not used SW4: Transparent Link Pass Through
Max. Frame Size:	16384 bytes jumbo frame support
Dimensions:	Width: 0.86" [21.85 mm] x Depth: 6.5" [165 mm] x Height: 3.4" [86.36 mm]
Power Consumption:	10.5 watts
Environment:	See ION chassis specifications
Storage Temp:	-15 to +65°C
Shipping Weight:	1 lb.
MTBF:	Greater than 250,000 hours (MIL-HDBK-217F) Greater than 687,000 hours (Bellcore)
Regulatory Compliance:	FCC Class A, EN55022 Class A, EN55024, CE Mark
Warranty:	Lifetime

The information in this manual is subject to change.

**WARNING:** Visible and invisible laser radiation when open. DO NOT stare into the beam or view the beam directly with optical instruments. Failure to observe this warning could result in an eye injury or blindness.

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

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

**High Risk Activities Disclaimer:** Components, units, or third-party products used in the product described herein are NOT fault-tolerant and are NOT designed, manufactured, or intended for use as on-line control equipment in the following hazardous environments requiring fail-safe controls: the operation of Nuclear Facilities, Aircraft Navigation or Aircraft Communication Systems, Air Traffic Control, Life Support, or Weapons Systems ("High Risk Activities"). Lantronix and its supplier(s) specifically disclaim any expressed or implied warranty of fitness for such High Risk Activities.

## ION C4120-1048 Loading Note

Special attention should be paid to the number of C4120 cards installed in an ION219 chassis based on the number of power supply modules installed and the ambient temperature of the install environment.

Ambient Temperature	Number of P/S modules	Number of C4120 Cards supported	Use of empty slots in ION219 chassis for other ION cards
50C / 122F	1	10	Yes
50C / 122F	1	15	No
40C / 104F	2	19	Chassis Full
32C / 90F	1	19	Chassis Full

## Defaults

After you configure the C4120 and insert it into ION chassis, it will start up and run automatically using its defaults. The C4120 initialization default values are shown below.

Parameter	Default Value	Property
- Link Pass Through	Enabled	Read & Write
- Configuration mode	Software (SW)	Read only
<b>Fiber Port</b>		
- Admin Status	Enabled	Read & Write
- Phy Mode	Auto	Read only
- Loopback	Disabled	Read & Write
<b>Copper Port</b>		
- Admin Status	Enabled	Read & Write
- Phy Mode	Auto	Read only
- Loopback	Disabled	Read & Write
- Auto Cross	Enabled	Read only
- Auto Negotiation	Enabled	Read only

You can change the default configuration via the ION Web GUI and the ION CLI (Command Line Interface).

## Troubleshooting

If a problem or exception occurs, the C4120 will send related Trap message to the Trap Server to report this event.

1. Is the PWR (power) LED lit?  
NO
  - Is the C4120 inserted properly into the chassis?
  - Is the power cord properly installed in the C4120 chassis and in the grounded AC outlet?
  - Does the grounded AC outlet provide power?
  - Contact Tech Support.YES
  - Proceed to step 2.
2. Is the L/A SFP+ LED lit?  
NO
  - Check that the SFP+ device is supported and properly connected. See “[Installing SFP+ Devices](#)” on page 10.
  - Check the fiber cables for proper connection.
  - Verify that the cable specs are met. See [Cable Specifications](#) on page 23.
  - Contact Tech Support.YES
  - Proceed to step 3.
3. Is the CLI accessible?  
NO
  - Check the Install process. See “[Installation and Setup](#)” on page 9.
  - Check the cabling. See “[Install Fiber and Copper Cable](#)” on page 12.
  - Contact Tech Support.YES
  - Proceed to step 4.
4. Is the web GUI accessible?  
NO
  - Check the Install process. See “[Installation and Setup](#)” on page 9.
  - Check the cabling. See [Cable Specifications](#) on page 23.
  - Contact Tech Support.

## Compliance Information

### Declaration of Conformity

Manufacture's Name: Lantronix, Inc.

Manufacture's Address: 48 Discovery, Suite 250, Irvine, California 92618 USA

Declares that the products: C4120, S4120

Conform to the following Product Regulations:

FCC Part 15 Class A, EN 55032:2012, EN 55024:2010

Directive 2014/30/EU, Directive 2015/863/EU

Low-Voltage Directive 2014/35/EU

IEC /EN 60950-1:2006+A2:2013

2011/65/EU EN 50581:2012

With the technical construction on file at the above address, this product carries the CE Mark.

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s).

Place: Irvine, California

Date: August 18, 2023

Signature: *Eric Bass*

Full Name: Eric Bass

Position: Vice President of Engineering

### FCC Regulations

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at the user's own expense.

### Canadian Regulations

This digital apparatus does not exceed the Class A limits for radio noise for digital apparatus set out on the radio interference regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la lass A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

## European Regulations

### Warning

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

### Achtung !

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

### Attention !

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



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



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

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

## NDA, RoHS, REACH and WEEE Compliance

See the compliance webpage at <https://www.lantronix.com/legal/rohs/>.

## Trade Agreement Act (TAA) Compliant Products

See the TAA webpage at <https://www.lantronix.com/legal/rohs/taa-compliant-products/>.

## Accessibility Statement

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**Technical Support**

Online: <https://www.lantronix.com/technical-support/>

**Sales Offices**

For a current list of our domestic and international sales offices, go to the Lantronix web site at [www.lantronix.com/about/contact](http://www.lantronix.com/about/contact).