EdgeAccess

CANOGA PERKINS

9145E Network Interface Device

User's Manual

NOTICE

Canoga Perkins has prepared this users manual for use by customers and Canoga Perkins personnel as a guide for the proper installation, operation and/or maintenance of Canoga Perkins equipment. The drawings, specifications and information contained in this document are the property of Canoga Perkins and any unauthorized use or disclosure of such drawings, specifications and information is prohibited.

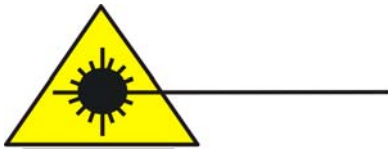
Canoga Perkins reserves the right to change or update the contents of this manual and to change the specifications of its products at any time without prior notification. Every effort has been made to keep the information in this document current and accurate as of the date of publication or revision. However, no guarantee is given or implied that the document is error free or that it is accurate with regard to any specification.

CANOGA PERKINS CORPORATION

20600 Prairie Street
Chatsworth, California 91311-6008
Business Phone: (818) 718-6300
(Monday through Friday 7 a.m. - 5 p.m. Pacific Time)
FAX: (818) 718-6312 (24 hrs.)
Web Site: www.canoga.com
E-mail: fiber@canoga.com

EdgeAccess®
9145E Ethernet Network Interface Device
User Manual
Model Number 9145E
Part Number 6913650
Rev. B 01/2009
s2.1
TG

To reference Technical Advisories and Product Release Notes, go to the Canoga Perkins web site at http://www.canoga.com.



CAUTION!

This product may contain a laser diode emitter operating at a wavelength of 1300 nm - 1600 nm. Use of optical instruments (for example: collimating optics) with this product may increase eye hazard. Use of controls or adjustments or performing procedures other than those specified herein may result in hazardous radiation exposure.

Under normal conditions, the radiation levels emitted by this product are under the Class 1 limits in 21 CFR Chapter 1, Subchapter J.

ATTENTION!

Ce produit peut contenir un émetteur de diode de laser fonctionnant à une longueur d'onde 1300 de nm - nm 1600. Utilisation des instruments optiques (par exemple: la collimation du système optique) avec ce produit peut augmenter le danger. L'utilisation des commandes ou des ajustements ou les procédures d'exécution autre que ceux indiquées ci-dessus peut avoir comme conséquence l'exposition de la radiation dangereuse.

Dans des conditions normales, les niveaux de rayonnement émis par ce produit sont sous les limites de la classe 1 en chapitre 1, Subchapter J de 21 CFR.

NOTICE!

This device contains static sensitive components. It should be handled only with proper Electrostatic Discharge (ESD) grounding procedures.

AVIS!

Ce dispositif contient les composants sensibles statiques. Il devrait être manipulé seulement avec la Décharge Electrostatique (DES) appropriée procédures.

General Safety Considerations

Installation

The 9145E is suitable for installation in Network telecommunication facilities and locations where the National Electric Code (NEC) applies.

Cabling

The 9145E has been designed and tested and has passed all the pertinent sections of GR-1089 and GR-63 for Type 2 and Type 4 equipment. This equipment does not have direct electrical connection to outside plant equipment.

The Copper (RJ45) ports of the 9145E are not intended for direct connection to "Outside Plant" metallic conductors and shall be isolated (by channel banks or office repeaters) from any connections to network or terminal equipment that lie outside of the same building. The telecommunication interface connections are considered to be, and meet the requirements of, SELV circuits (not TNV).

Power

> **WARNING:** The 9145E with redundant power supplies must have both power supply cords disconnected before servicing.

Wiring methods used for the connection of the equipment to the AC or DC MAINS SUPPLY shall be in accordance with the National Electrical Code, ANSI/NFPA 70, and the Canadian Electrical Code, Part I, CSA C22.1.

The 9145E AC and DC units do not incorporate a disconnect device. The plug on the power supply cord is intended to serve as the disconnect device. It is also recommended that the AC socket-outlet shall be installed near the equipment and shall be easily accessible.

The 9145E DC has a nominal operating DC voltage of -48 VDC and passes the minimal steady state DC operating voltage of -40 VDC in accordance with GR-1089 Issue 4 which References American National Standards Institute (ANSI) T1.315, Table 1. Additionally, Canoga Perkins design allows for a minimal steady state of -36VDC.

The 9145E DC model is configured for a DC-I, Isolated DC return.

Fuses

The 9145E is equipped with internal fuses. The AC model is fused at 2A and the DC at 1.5A.

Surge Protection

The AC powered 9145E does not contain an internal Surge Protective Device. An external Surge Protective Device (SPD) should be used at the AC input of the network equipment according to facilities procedures and as defined by the National Electric Code (NEC).

Grounding

The 9145E AC & DC models are suitable for installation as part of the Common Bonding Network (CBN).

The 9145E AC and DC are provided with a safety ground connection which is capable of conducting any fault current likely to be imposed such as fault current from sources within the chassis. For the DC model use an approved 18ga insulated wire connected to the terminal block's middle conductor. The plus and minus 48VDC conductors should be a minimum of 20ga.

The AC will be grounded via the ground conductor of the power cord and must be connected to an earthed mains socket-outlet.

An electrical conducting path should exist between the 9145E chassis and the metal surface of the enclosure or rack in which it is mounted or to a grounding conductor. Electrical continuity should be provided by using thread-forming type mounting screws that remove any paint or nonconductive coatings and establish a metal-to-metal contact. Any paint or other nonconductive coatings should be removed on the surfaces between the mounting hardware and the enclosure or rack. The surfaces should be cleaned and an antioxidant applied before installation.

Lightning Protection

The intra-building ports of the 9145E are suitable for connection to intrabuilding or unexposed wiring or cabling only. The intra-building port(s) of the equipment or subassembly MUST NOT be metallically connected to interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE, Issue 4) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection in order to connect these interfaces metallically to OSP wiring.

To protect the port against intra-building lightning surges, the RJ45 ports of 9145E are suitable for connection to shielded intra-building cabling grounded at both ends.

ESD

The 9145E has been tested and passes the ESD requirements of Test level 4 for air and contact discharges. However to protect the exposed components from electrostatic damage when removing or replacing the SFP optical modules requires the proper use of static mitigation procedures such as properly wearing a wrist strap.

Operation Temperature

The 9145E is designed and Nationally Recognized Test Laboratory (NRTL) tested and verified to operate between 0°C to 50°C, and type tested for short term emergency ambient temperature of -5°C to 55°C.

Fans

The 9145E models equipped with fans are constructed with a Mid-front to mid-rear (EC class F2-R2) airflow scheme i.e. draws air from the front and exhausts to the rear.

The 9145E models equipped with redundant fans are designed to function normally over the entire long term operating temperature range; in the unlikely event of a single fan failure the 9145E will continue to perform normally over the long term operation temperature range until a replacement can be installed.

Fan replacement cannot be performed in the field. Call Canoga-Perkins for an RMA number to arrange a repair.

Emissions and Immunity

This device cpmplies with part 15 of the FCC rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference
2. This device must accept any interference received, including interference that may cause undesired operation.

The authority to operate this equipment is conditioned by the requirements that no modifications will be made to the equipment unless the changes or modifications are expressly approved by the Canoga Perkins Corporation.

To Users of Digital Apparatus in Canada: This Class A digital apparatus meets all requirements of the Canadian interference-causing equipment regulations.

Aux utilisateurs des appareillages de Digital au Canada: Cet appareil numérique de la classe A respecte toutes les exigences du règlement sur le matérial brouilleur du Canada.

Special Accessories

The 9145E does not require any special accessories to achieve compliance for emission and immunity criteria.

Double Pole/Neutral Fusing

On the 9145E a fuse may be in place in the neutral path on the AC power supply. After operation of the fuse, parts of the equipment that remain energized might represent a hazard during servicing.

Waste Electrical and Electronic Equipment (WEEE)

Product Disposal Information

Do not dispose of this product in unsorted municipal waste. This product is recyclable, and should be recycled according to your local standards. For more information, contact Canoga Perkins technical support.

Contents

Chapter 1

Introduction

1.1 Description

The 9145E (see Figure 1-1) is Canoga Perkins second generation Network Interface Device (NID) that can be used by a Service Provider (SP) to provide layer 1 and layer 2 termination of Ethernet services.

The 9145E encompasses features and functions needed by SPs to deliver Metro Ethernet Forum (MEF) compliant Ethernet services with end-to-end Quality of Service (QoS) guarantees and Operation, Administration, Maintenance and Provisioning (OAM&P) capabilities.

In addition to the Standard and Enhanced NIDS used in Central Office and Customer Premise Equipment locations, an Extended Temperature (hardened) NID is also available for use in Outside Plant locations. (Page <ref table>)

The 9145E Extended Temperature (hardened) NID has been designed and tested to operate reliably for the intended service in Outside Plant (OSP) cabinet locations and has been NEBS 3 tested for extended temperature range and exposure to Outdoor Airborne Contaminant Levels, demonstrating its ability to withstand gaseous environmental contaminants and hygroscopic dust and accelerated atmospheric corrosion for outdoor levels per GR-63-CORE Issue 3. It also has been tested to the suite of GR-3108 Class 2 tests including Salt Fog testing.

The hardened NID can be installed in a partially controlled OSP location.

Figure 1-1. 9145E Ethernet Network Interface Device

1.2 9145E Specifications

1.2.1 Physical Characteristics

- **Dimensions:** 1.75" H x 8.25" W x 11.5" D (44.5 x 209.5 x 292 mm)
- **Weight:** 4.75 lb to 5.1 lb (2.15 Kg to 2.31 Kg) (depending on model)

1.2.2 Environmental Characteristics

- **Operating Temperature:** 0° to 50° C
- **Operating Humidity:** 0 to 90% Relative Humidity (non-condensing)

1.2.3 Power Requirements

- 100 VAC to 240 VAC (auto-ranging), 50/60 Hz, 0.5 Amps
- 48VDC (36 to 72VDC), 1 Amp

1.2.4 Regulatory Compliance

- EN60825-1 (laser safety)
- CE Mark
- EMC Directive (EN55022 Class A, EN 55024, EN 61000-3-2/-3-3)
- ETL, cETL & LVD (U.S. UL60950, CAN/CSA C22.2 No. 60950, EN/IEC 60950)
- FCC Part 15B Class A (U.S.), ICES-003 (CAN), VCCI Class A (Japan), C-Tick (AS/NZS 3548 - Australia)
- NEBS Level 3

1.3 Hardened 9145E Specifications

1.3.1 Physical Characteristics

- **Dimensions:** 1.75" H x 8.25" W x 11.5" D (44.5 x 209.5 x 292 mm)
- **Weight:** 4.75 lb to 5.1 lb (2.15 Kg to 2.31 Kg) (depending on model)

1.3.2 Environmental Characteristics

- **Operating Temperature**: -40°C to +65°C
- **Operating Humidity:** 0 to 90% Relative Humidity (non-condensing)

1.3.3 Power Requirements

- 48VDC (36 to 72VDC), 1 Amp
- 24VDC (18 to 36VDC), 2 Amps

1.3.4 Regulatory Compliance

- EN60825-1 (laser safety)
- CE Mark
- EMC Directive (EN55022 Class A, EN 55024, EN 61000-3-2/-3-3)
- ETL, cETL & LVD (U.S. UL60950, CAN/CSA C22.2 No. 60950, EN/IEC 60950)
- FCC Part 15B Class A (U.S.), ICES-003 (CAN), VCCI Class A (Japan), C-Tick (AS/NZS 3548 - Australia)
- NEBS Level 3
- GR-3108 Class 2
- ETSI 300-019 Class 3.3

1.4 Mounting Options

- 19-Inch or 23-Inch rack mount (single unit or two units side by side in a 1U)
- Wall Mount (face down or to either side)
- Table Top

Reference Chapter 3, Installation, for installation procedures.

1.4.1 Rack Mounting

The customer is required to order the brackets required (see Figure 1-2) for their particular rack installation.

Figure 1-2. 9145E Mounting Brackets

1.4.2 Wall Mounting

Canoga Perkins includes a mounting template in the shipping container (see Figure 1-3) to assist the customer in mounting the 9145E on a wall.

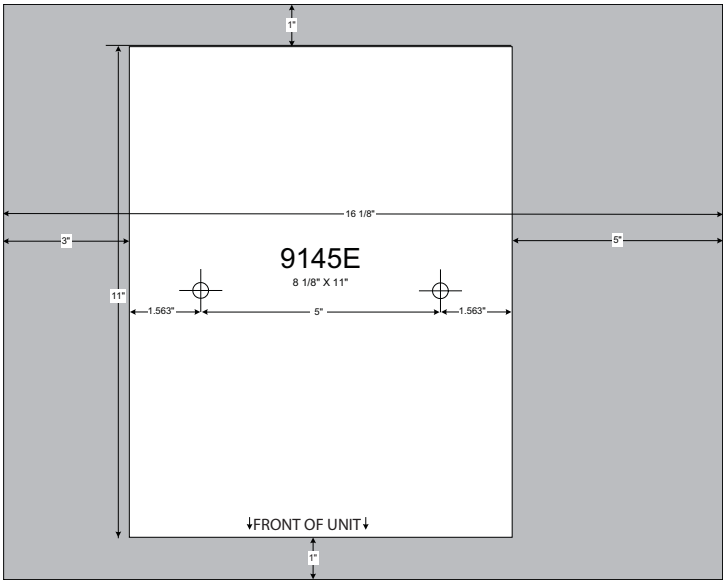


Figure 1-3. Wall Mounting Template

Chapter 2

Functional Description

2.1 Base Unit

The 9145E is designed with front-panel data and management ports and rear-panel power and ground connectors. This design allows for a multitude of power and port options. The 9145E is available as a normal (see Table 2-1) or hardened (see Table 2-2) unit. In addition, both 9145Es come as Standard NID (V2 engine), or as an Enhanced NID (V1 engine) units. Both types of 9145E are able to accommodate feature enhancements through firmware upgrades.

Table 2-1. 9145E Model Numbers and Configuration

MODEL NUMBER	EXTENDED DESCRIPTION
9145E-101-0-0	V1 Engine, UTP/SFP User Port, UTP/SFP Network Port, UTP/SFP Multipurpose Port, Local Ethernet UTP Management Port, Single AC Power Supply, Integral Fans
9145E-101-1-0	V1 Engine, UTP/SFP User Port, UTP/SFP Network Port, UTP/SFP Multipurpose Port, Local Ethernet UTP Management Port, Single 48VDC Power Supply, Integral Fans
9145E-101-2-0	V1 Engine, UTP/SFP User Port, UTP/SFP Network Port, UTP/SFP Multipurpose Port, Local Ethernet UTP Management Port, Redundant AC Power Supply, Integral Fans
9145E-101-3-0	V1 Engine, UTP/SFP User Port, UTP/SFP Network Port, UTP/SFP Multipurpose Port, Local Ethernet UTP Management Port, Redundant 48VDC Power Supply, Integral Fans
9145E-101-4-0	V1 Engine, UTP/SFP User Port, UTP/SFP Network Port, UTP/SFP Multipurpose Port, Local Ethernet UTP Management Port, Redundant AC/48VDC Power Supply, Integral Fans
9145E-104-0-0	V1 Engine, UTP/SFP User Port, UTP/SFP Network Port, Single AC Power Supply, Integral Fans
9145E-104-1-0	V1 Engine, UTP/SFP User Port, UTP/SFP Network Port, Single 48VDC Power Supply, Integral Fans
9145E-104-2-0	V1 Engine, UTP/SFP User Port, UTP/SFP Network Port, Redundant AC Power Supply, Integral Fans
9145E-104-3-0	V1 Engine, UTP/SFP User Port, UTP/SFP Network Port, Redundant 48VDC Power Supply, Integral Fans
9145E-104-4-0	V1 Engine, UTP/SFP User Port, UTP/SFP Network Port, Redundant AC/48VDC Power Supply, Integral Fans
9145E-203-5-0	V2 Engine, UTP/SFP User Port, UTP/SFP Network Port, Single AC Power Supply
9145E-203-6-0	V2 Engine, UTP/SFP User Port, UTP/SFP Network Port, Single 48VDC Power Supply
9145E-203-7-0	V2 Engine, UTP/SFP User Port, UTP/SFP Network Port, Redundant AC Power Supply
9145E-203-8-0	V2 Engine, UTP/SFP User Port, UTP/SFP Network Port, Redundant 48VDC Power Supply
9145E-203-9-0	V2 Engine, UTP/SFP User Port, UTP/SFP Network Port, Redundant AC/48VDC Power Supply

Table 2-1. 9145E Model Numbers and Configuration

MODEL NUMBER	EXTENDED DESCRIPTION
9145E-204-5-0	V2 Engine, UTP/SFP User Port, UTP/SFP Network Port, Single AC Power Supply
9145E-204-6-0	V2 Engine, UTP/SFP User Port, UTP/SFP Network Port, Single 48VDC Power Supply
9145E-204-7-0	V2 Engine, UTP/SFP User Port, UTP/SFP Network Port, Redundant AC Power Supply
9145E-204-8-0	V2 Engine, UTP/SFP User Port, UTP/SFP Network Port, Redundant 48VDC Power Supply
9145E-204-9-0	V2 Engine, UTP/SFP User Port, UTP/SFP Network Port, Redundant AC/48VDC Power Supply

Table 2-2. Hardened 9145E Model Numbers and Configuration

MODEL NUMBER	EXTENDED DESCRIPTION
9145E-301-1-0	Hardened V1 Engine, UTP/SFP User Port, UTP/SFP Network Port, UTP/SFP Multipurpose Port, Local Ethernet UTP Management Port, Single 48VDC Power Supply, Integral Fans
9145E-301-3-0	Hardened V1 Engine, UTP/SFP User Port, UTP/SFP Network Port, UTP/SFP Multipurpose Port, Local Ethernet UTP Management Port, Redundant 48VDC Power Supply, Integral Fans
9145E-301-A-0	Hardened V1 Engine, UTP/SFP User Port, UTP/SFP Network Port, UTP/SFP Multipurpose Port, Local Ethernet UTP Management Port, Single 24VDC Power Supply, Integral Fans
9145E-301-B-0	Hardened V1 Engine, UTP/SFP User Port, UTP/SFP Network Port, UTP/SFP Multipurpose Port, Local Ethernet UTP Management Port, Redundant 24VDC Power Supply, Integral Fans
9145E-303-1-0	Hardened V1 Engine, UTP/SFP User Port, UTP/SFP Network Port, Local Ethernet UTP Management Port, Single 48VDC Power Supply, Integral Fans
9145E-303-3-0	Hardened V1 Engine, UTP/SFP User Port, UTP/SFP Network Port, Local Ethernet UTP Management Port, Redundant 48VDC Power Supply, Integral Fans
9145E-303-A-0	Hardened V1 Engine, UTP/SFP User Port, UTP/SFP Network Port, Local Ethernet UTP Management Port, Single 24VDC Power Supply, Integral Fans
9145E-303-B-0	Hardened V1 Engine, UTP/SFP User Port, UTP/SFP Network Port, Local Ethernet UTP Management Port, Redundant 24VDC Power Supply, Integral Fans
9145E-304-1-0	Hardened V1 Engine, UTP/SFP User Port, UTP/SFP Network Port, Single 48VDC Power Supply, Integral Fans
9145E-304-3-0	Hardened V1 Engine, UTP/SFP User Port, UTP/SFP Network Port, Redundant 48VDC Power Supply, Integral Fans
9145E-304-A-0	Hardened V1 Engine, UTP/SFP User Port, UTP/SFP Network Port, Single 24VDC Power Supply, Integral Fans
9145E-304-B-0	Hardened V1 Engine, UTP/SFP User Port, UTP/SFP Network Port, Redundant 24VDC Power Supply, Integral Fans
9145E-404-6-0	Hardened V2 Engine, UTP/SFP User Port, UTP/SFP Network Port, Single 48VDC Power Supply
9145E-404-8-0	Hardened V2 Engine, UTP/SFP User Port, UTP/SFP Network Port, Redundant 48VDC Power Supply
9145E-404-C-0	Hardened V2 Engine, UTP/SFP User Port, UTP/SFP Network Port, Single 24VDC Power Supply
9145E-404-D-0	Hardened V2 Engine, UTP/SFP User Port, UTP/SFP Network Port, Redundant 24VDC Power Supply

2.2 Hardware Configuration

The 9145E can be ordered with different port and connector options (see Figure 2-1).

2.2.1 Front Panel

The 9145E has a variety of models and configurations (see Tables 2-1 and 2-2). Customers can choose a model depending on the application.

1. One EIA-232 console port with DE-9 female connector
2. One Ethernet Management Port with UTP connector
3. One User Port (for service data) with both SFP and UTP connectors
4. One Network Port (for service data) with both SFP and UTP connectors
5. One Multi-Purpose Port (service data and/or management traffic) with both SFP and UTP connectors

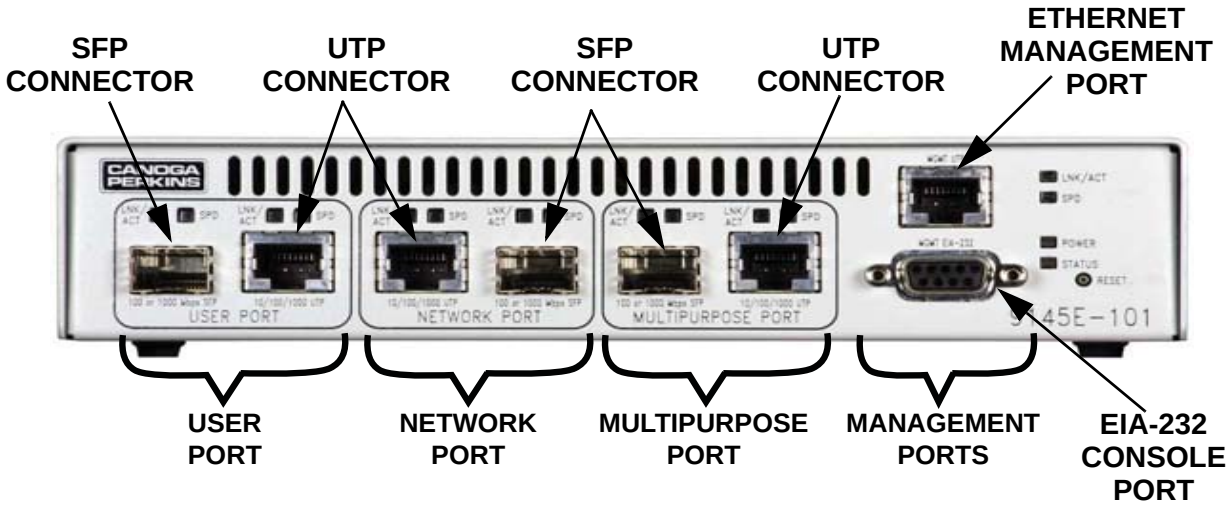


Figure 2-1. 9145E Ports

2.2.2 Rear Panel

Customers will also have a selection of power options to choose from (see Figure 2-2). Five options are offered:

1. Single AC Power
2. Redundant AC Power
3. Single DC Power
4. Redundant DC Power
5. Redundant AC and DC mix

Figure 2-2. 9145E Rear Panel

The Standard and Enhanced versions of the normal 9145E accommodate all five power options. Both the Standard and Enhanced versions of the hardened 9145E are limited to 24 VDC or 48VDC power options.

2.3 Service Data Ports

The Service Data Ports (see Figure 2-1) provide both fixed UTP and SFP connectors. The user can configure the 9145E through software to allow for either the UTP or SFP connector within each port to be active. Both connectors can not be active simultaneously.

- UTP connectors are IEEE802.3 compliant for 10/100/1000BASE-T.
- UTP connectors support MDI and MDIX connections.
- UTP connectors support both full-duplex and half-duplex operation in 10/100/1000 Mbps mode.
- SFP connectors support full-duplex operation in 10/1000 Mbps mode.

2.4 Management Ports

2.4.1 EIA-232 Console Port

The console port of the 9145E is used for communication between the 9145E and a VT100 terminal or emulator. The console port is a DE-9 female connector with a DCE pin-out, which can be directly connected to a terminal with a straight through cable (see Figure 2-3).

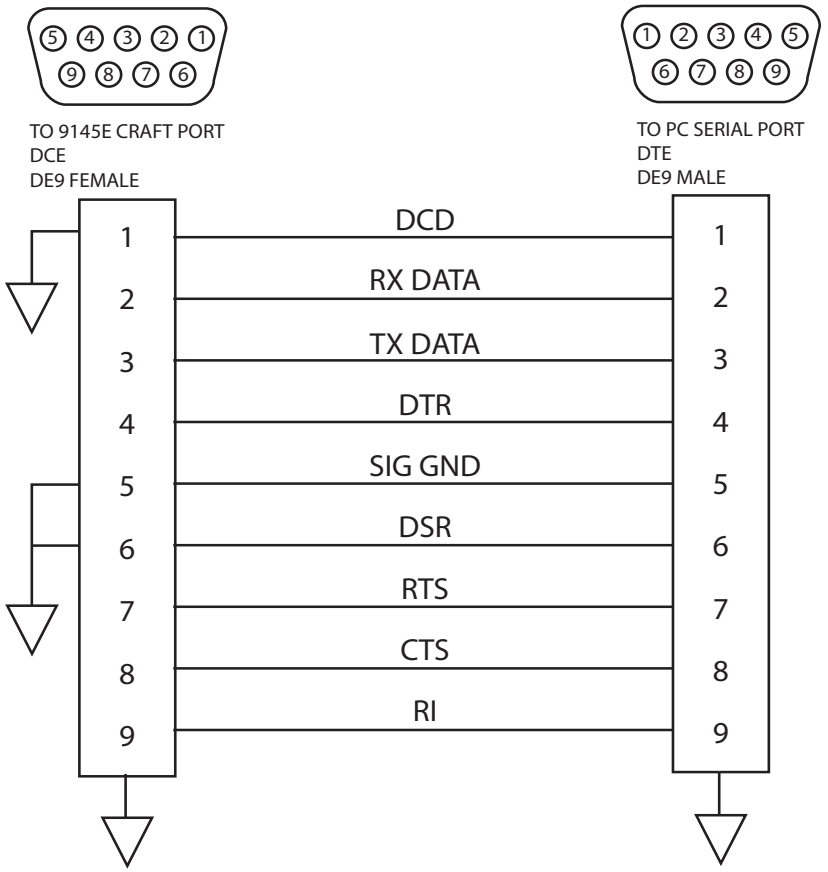


Figure 2-3. EIA-232 Console Port Pinouts

2.4.2 Ethernet Management Port

The Ethernet Management port is used for remote management of the 9145E. The 9145E has a management interface with an RJ45 UTP connector. The management port can sense and automatically cross-over the Tx and Rx pairs.

The UTP port is IEEE 802.3 compliant for 10BASE-T and 100BASE-TX and supports the following modes of operation:

- 10 Auto
- 100 Auto

2.5 Port Default Settings

Table 2-2 represents the default settings for each of the ports. The term active connector refers to the connector, either UTP or SFP, that is currently enabled. For example, if a particular 9145E model has a User Port with both UTP and SFP connectors present, by default the UTP is the Active Connector (it can currently transmit and receive data), while the SFP is the Inactive Connector (i.e., it currently cannot transmit or receive data).

Table 2-3. Default Port Settings

	UTP	SFP w/ 100 Mbps Optics	SFP w/ 1000 Mbps Optics	SFP w/ Multispeed Optics (100 to 1000)
User Port	Auto	100 FD	1000 FD	1000 FD
Network Port	Auto	100 FD	1000 FD	1000 FD
Multipurpose Port	Auto	100 FD	1000 FD	1000 FD
Mgmt UTP port	Auto	N/A	N/A	N/A

NOTE:Cells in yellow denote which of the connectors are active by default

2.6 Power Connectors

The normal version of the 9145E will accommodate both single and redundant AC and DC powering options, along with mixed AC and DC power, while the hardened version is limited to DC power only.

2.6.1 Power Requirements

100 VAC to 240 VAC (auto-ranging), 50 to 60 Hz, 0.5 Amps (9145E only)

36 VDC to 72 VDC, 1.0 Amps (Both 9145E and hardened 9145E)

18 VDC to 36 VDC, 2.0 Amps (Hardened 9145E only)

2.6.2 Single AC Power Base Unit

The Single AC powered 9145E base unit (see Figure 2-4) has an IEC 320 power connector on the rear panel. An appropriate AC power cord is supplied with the unit.

Figure 2-4. Single AC Power

2.6.3 Redundant AC Power Base Unit

The Redundant AC powered 9145E base unit (see Figure 2-5) has two power connectors on the rear panel. Appropriate AC power cords are supplied with the unit.

Figure 2-5. Redundant AC Power

2.6.4 Single DC Power Base Unit

The Single DC powered 9145E base unit (see Figure 2-6) has a three terminal receptacle on the rear panel. A DC terminal block is supplied with the unit.

Figure 2-6. Single DC Power

2.6.5 Redundant DC Power Base Unit

The Redundant DC powered 9145E base unit (see Figure 2-7) has two three terminal receptacles on the rear-panel. Two DC terminal blocks are supplied with the unit.

Figure 2-7. Redundant DC Power

2.6.6 AC/DC Power Base Unit

The AC/DC powered 9145E base unit (see Figure 2-8) has two power interfaces on the rear-panel, one that supports DC power input and one that supports a AC power input. An appropriate AC power cord and a DC terminal block are supplied with the unit.

Figure 2-8. AC/DC Power

2.7 LED Indicators

The following paragraphs describe the functions of the LED indicators (see Figure 2-9) on the 9145E base unit.

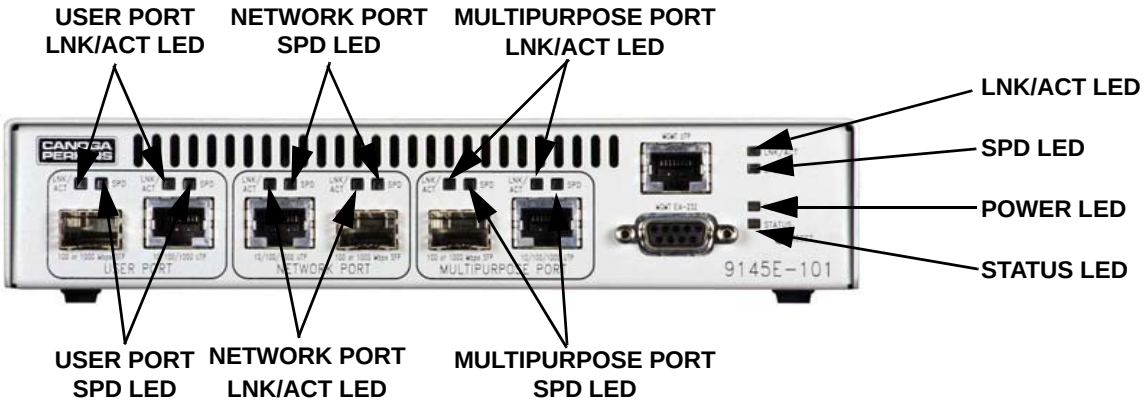


Figure 2-9. LED Indicators

2.7.1 Management Section LEDs

Table 2-4 provides the indications supplied by the STATUS, POWER, SPD, and LNK/ACT LEDs, located to the right of the Ethernet Management and Console ports.

Table 2-4. LED Indicators

LED Name	State	Condition
STATUS	Off	No Power
	Green	Normal operation
	Amber	System self-test in progress/Loopback mode
	Blinking Amber	System is booting
	Red	Major alarms including Link Loss at the User, Extension or MP Port (if MP port is supported)
	Blinking Red	Critical Alarms requiring immediate user intervention, such as the failure of one of the redundant power supplies, temperature or voltage out of range alarm or a fan failure.
POWER	Off	Power is off
	Green	Power is on
	Amber	System is booting / One power supply failed in a redundant power supply configuration
	Red	One of the board supply voltages has exceeded a threshold value
SPD	Off	10BaseT
		Auto and no link
		Connector Not Selected
	Amber	100BaseT
		System booting
	Slow Blinking Green*	Port Enabled but No Link
LNK/ACT	Off	No link
		No transmit or receive activity
	Green	Link on with full duplex
	Blinking Green	Transmission or receiving activity with full duplex
	Amber	System Booting
		Link on with half duplex
	Blinking Amber	Transmission or receiving activity with half duplex

* Slow Blinking Green means LED toggles between OFF and GREEN approximately once per second.

2.7.2 Data Interface Section LEDs

Table 2-5 represents the indications supplied by the SPD and LNK/ACT LEDs of the User, Network, and Multipurpose ports. Indications apply to both the SFP and UTP LEDs.

Table 2-5. User, Network, and Multipurpose Port LED Indicators

LED Name	State	Condition
SPD	Off	10BaseT
		Auto
		Connector Not Selected
	Green	1000BaseT
	Amber	100BaseT
		System Test
	Red	Remote Fault (SFP Only)
	Blinking Red	Invalid/Unsupported SFP installed (SFP Only)
	Slow Blinking Green*	Connector Selected with No Link
LNK/ACT	Off	No link
		No transmit or receive activity
	Green	Link on with full duplex
	Blinking Green	Transmission or receiving activity with full duplex
	Amber	System test
		Link up with half duplex
	Blinking Amber	Transmission or receiving activity with half duplex
	Red	Port Disabled
		LLF
	Blinking Red	No Link, but transmitting OAM packets in unidirectional mode

* Slow Blinking Green means the LED toggles between OFF and GREEN approximately once per second.

Chapter 3

Installation

3.1 9145E Installation Procedures

This section describes how to unpack, install, and set up the 9145E. Before setting up the 9145E, make sure a 9 pin EIA-232 cable is available to connect the 9145E's console port to a VT100 type terminal or PC for setup and configuration.

Keep the shipping container and all packing materials until the unit is installed and fully operational. In the event that the unit needs to be returned, contact Canoga Perkins Customer Service for a Return Authorization Number (RMA) and instructions for return shipment.

CAUTION: Follow electrostatic discharge (ESD) safety precautions when handling Canoga Perkins products, as with all electronic devices with static sensitive components.

3.2 Unpacking

Open the shipping container, remove the accessories tray, and remove the accessories from the tray (see Figure 3-1). Lift the 9145E out of the shipping container and remove the foam end caps from the unit. Return all packing materials to the shipping container and put it in a safe place in the event the unit needs to be returned.

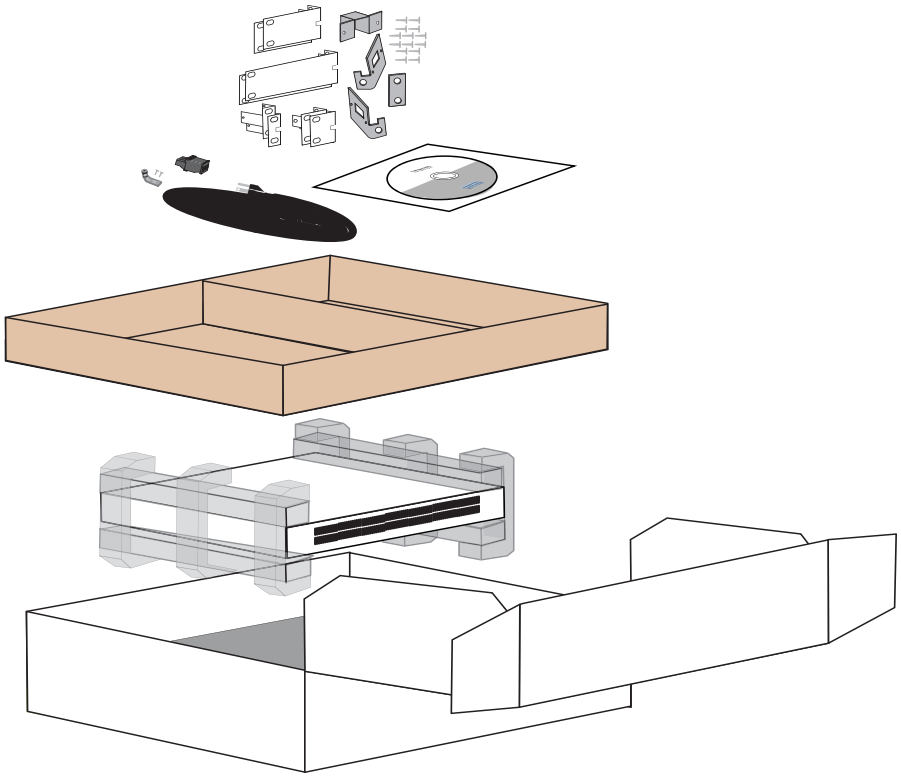


Figure 3-1. Unpacking the 9145E

3.3 Mounting Options

The 9145E can be rack mounted, wall mounted, or placed on any horizontal flat surface such as a shelf or table.

3.3.1 Rack Mounting

One 9145E can be mounted in either a 19" rack or a 23" rack, and two 9145Es can be mounted side by side in either a 19" rack or a 23" rack. Rack mounting kits (reference Table 3-1) are available for each of the four rack mounting possibilities. Each rack mount kit contains the brackets necessary for installing the 9145E (see Figure 3-2), as well as the mounting hardware required to attach the brackets to the unit(s). Rack mount screws are provided by the rack manufacturer.

Table 3-1. Rack Mount Kits

Rack Mount Kit	Part Number	Component	Part Number	Qty
Rack Mount Bracket Kit, 19" Single Unit	1802-2016	Bracket, rack mount,single, 19"	6213614-119	2
		Screw, flat head,8-32 x 0.25"	80680041	4
Rack Mount Bracket Kit, 23" Single Unit	1802-2017	Bracket, rack mount,single, 23"	6213614-123	2
		Screw, flat head,8-32 x 0.25"	80680041	4
Rack Mount Bracket Kit, 19" Dual Unit	1802-2019	Bracket, rack mount,dual, 19"	6213614-219	2
		Screw, flat head,8-32 x 0.25"	80680041	4
		Bracket, rack mount, center	6213615	2
		Strap, rack mount, center	6213616	1
		Bracket, rack mount, dual, rear	6213617	1
		Screw, flat head, 8-32 x 0.25", SS, Phil-lips	80680041	4
		Screw, pan head, 8-32 x 0.25", SS, Phillips	80880041	4
Rack Mount Bracket Kit, 23" Dual Unit	1802-2021	Bracket, rack mount,dual, 23"	6213614-223	2
		Bracket, rack mount, center	6213615	2
		Strap, rack mount, center	6213616	1
		Bracket, rack mount, dual, rear	6213617	1
		Screw, flat head, 8-32 x 0.25", SS, Phil-lips	80680041	4
		Screw, pan head, 8-32 x 0.25", SS, Phillips	80880041	4

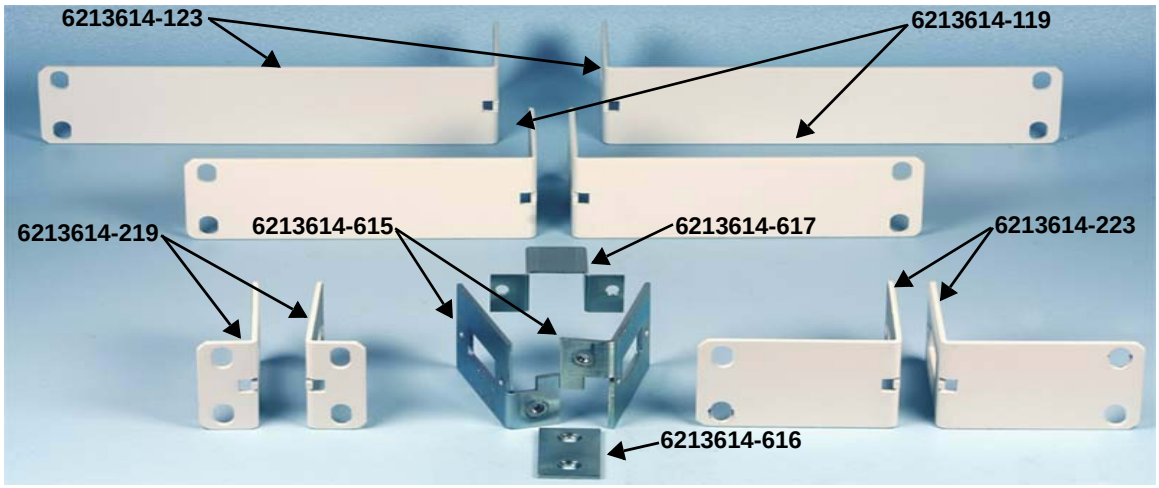


Figure 3-2. 9145E Rack Mounting Brackets

Mounting One 9145E in a 19" or 23" Rack - To rack mount one 9145E, perform the following steps:

1. Install the 19" Single Unit or 23" Single Unit Rack Mount Bracket Kit. The Rack Mount Kit includes two mounting brackets, and the screws required to attach the brackets to the 9145E. The brackets attach to the two threaded holes on each side of the 9145E, toward the front (see Figure 3-3) using the flat head screws provided. Torque the flat head screws to 14.5 – 15.5 in-lb.

Figure 3-3. Install Rack Mount Kit

2. Place unit with brackets attached in place on the mounting rack.
3. Install two screws through each bracket into the threaded holes on the mounting rack (see Figure 3-4). Torque the screws to the rack manufacturer's specifications.

Figure 3-4. Mount 9145E on Rack

Mounting Two 9145Es, Side by Side, in a 19" or 23" Rack - To rack mount two 9145Es, perform the following steps:

1. Install the 19" Dual Unit or 23" Dual Unit Rack Mount Bracket Kit. The Rack Mount Kit includes two rack mount brackets, two center brackets, a strap, a rear bracket, and the screws required to attach the brackets to the 9145Es. The mounting brackets attach to the two threaded holes on the outside of each 9145E, toward the front (see Figure 3-3). The two center brackets attach to the two threaded holes on the inside of each 9145E, and the strap mounts over the front of each center bracket (see Figure 3-5). The rear center bracket is attached to the threaded holes at the top inside corner of the back of each 9145E (see Figure 3-6).

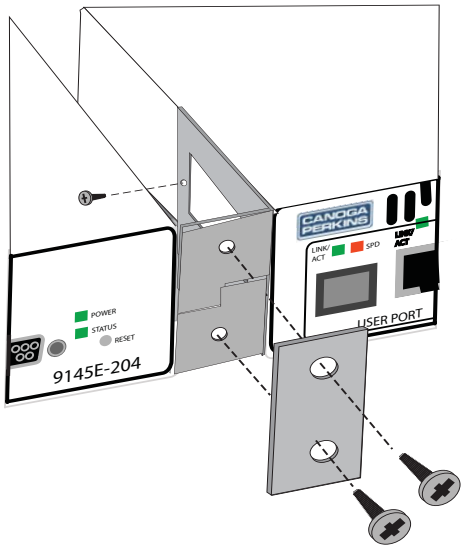


Figure 3-5. Install Center Brackets and Strap

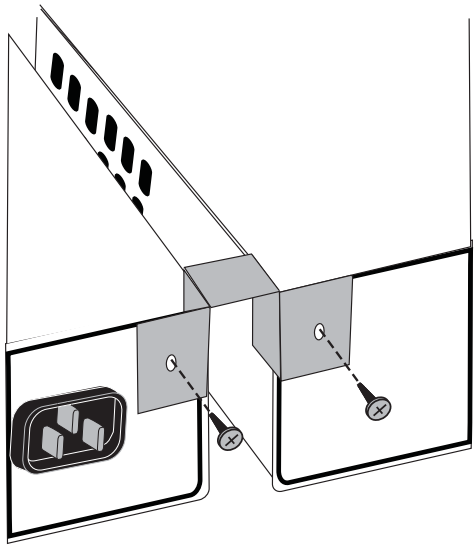


Figure 3-6. Install Rear Center Bracket

2. Place unit with brackets attached in place on the desired mounting rack.
3. Install two screws through each bracket into the threaded holes of the mounting rack (see Figure 3-7). Torque the screws to the rack manufacturer's specifications.

Figure 3-7. Mount Two 9145Es on Rack

3.3.2 Wall Mounting

CAUTION:Fasteners used for wall mounting of the 9145E are required to withstand a force of three times the weight of the 9145E, applied in any direction. Failure to meet these requirements could result in damage to the equipment.

The bottom panel of the 9145E is designed with keyhole cutouts to accommodate wall mounting. A template is provided with the Quick-Start Guide so that the installer can precisely fasten mounting screws onto a wall. Two number 8 screws and wall anchors, which are not provided by Canoga Perkins, are used for wall mounting. The keyholes are designed so that the 9145E unit can be mounted in three positions: with front panel facing the floor, to the right or to the left (see Figure 3-8).

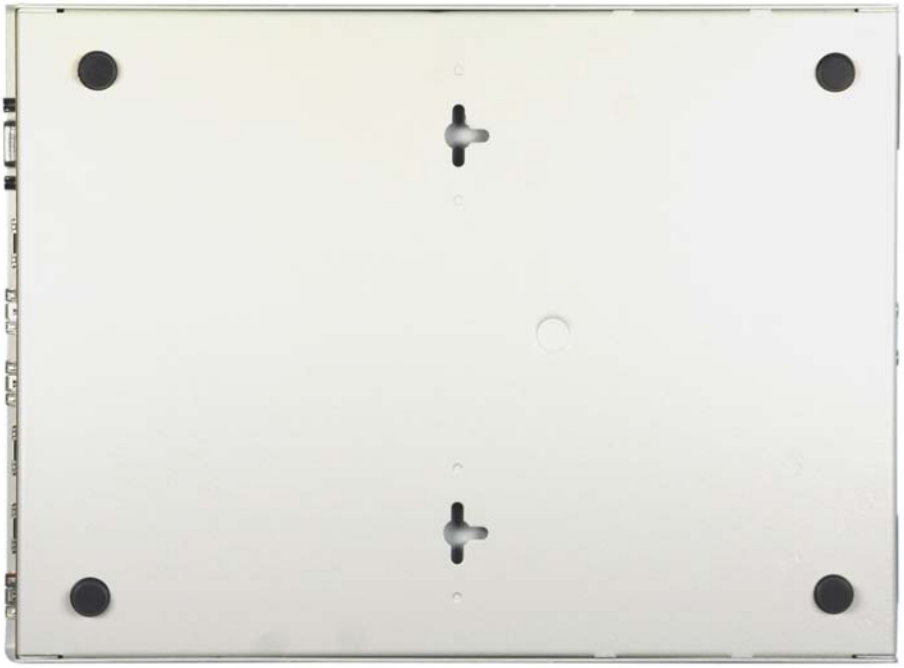


Figure 3-8. Wall Mounting Cutout Locations

Assure that there is enough unobstructed space around the perimeter of the 9145E to allow for adequate airflow and servicing. Install the 9145E on a wall as follows:

1. Tape the template (see Figure 3-9) to the wall, ensuring that the edge of the template corresponding to the direction you wish to mount the unit is parallel to the floor and ceiling.
2. Drill a hole through the center of each hole position marker on the template.
3. Remove the template from the wall
4. Install a screw anchor in each drilled hole, then install a #8 screw into each anchor. Leave the screws protruding from the wall approximately 1/8".
5. Place the keyholes of the 9145E over the screws, then slide the unit down to lock it into position on the screws.

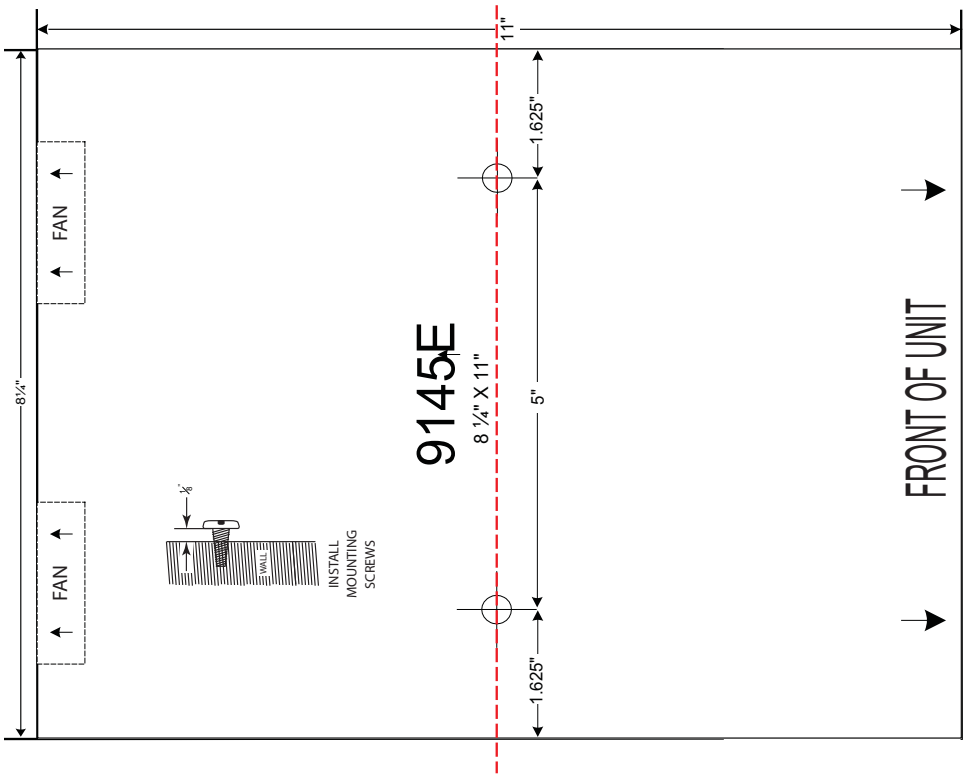


Figure 3-9. 9145E Wall Mount Template

3.3.3 Horizontal Flat Surface Mounting

The 9145E requires at least one inch of unobstructed space around the perimeter for ventilation. Canoga Perkins recommends a space of 3 to 5 inches be left unobstructed to allow for SFP module access, cable access and power connections. To install the 9145E on a flat surface, place the 9145E on a secure flat surface such as a table, a shelf, or a desk within reach of the power and fiber optic cables. Connect the power and fiber optic cables to the 9145E as required.

3.4 Installing the SFP Modules

1. Determine which SFP Module(s) is/are required for the User, Network, and Multipurpose ports by referencing the SFP Product Data Sheet.
2. Insert a module into each available port and push firmly to seat module (see Figure 3-10).
3. Raise latch to lock module in place.

Figure 3-10. SFP Modules

3.5 Connecting the Electrical Power

NOTE: When power is applied, all LED indicators will light amber.

3.5.1 AC Power

NOTE: Country specific power cords are available locally for installations outside of North America

The 9145E uses a standard IEC320 AC Power Connector. Plug the AC power cord into the socket at the rear of the 9145E and plug the other end of the AC power cord into a convenient AC outlet.

3.5.2 DC Power

CAUTION: The 24 VDC and 48VDC 9145Es are only intended to be used in a restricted access location in accordance with Articles 110-16, -17, and -18 of the National Electric Code ANSI/NFPA 70.

NOTE: The DC Power Terminal Block is removable for ease of installation and replacement. It is recommended the Terminal Block be removed when connecting power to avoid accidentally crossed or shorted power leads from damaging the 9145E or your DC Power Source.

The 9145E is shipped with a compatible DC Power terminal block. Connect DC power to the 9145E as follows (see Figure 3-11):

NOTE: The 9145E supports both Positive and Negative grounded DC Power.

1. Loosen the terminal screws for +, -, and GND
2. Slide the wires one at a time (green = GND, red = +, black = -) into the square openings in the bottom of the terminal block.
3. Tighten the terminal screws as wires are installed.
4. Use an ohmmeter to verify that power leads are not shorted to GND.
5. Connect the power cables to the power source.
6. Insert the terminal block into the DC power receptacle at the rear of the 9145E.

Figure 3-11. Connect D.C. Power

3.5.3 Grounding

A grounding lug kit is included in the 9145E accessory tray. Connect a 6AWG to 10AWG grounding cable to the 9145E as follows (see Figure 3-12):

1. Strip approximately ¾-inch of insulation from the end of the grounding cable.
2. Twist the exposed wires together and trim the ends off evenly.
3. Insert exposed wire into the grounding lug until it bottoms out inside the barrel.
4. Position the crimping tool over the center of the grounding lug, with the lug in the crimping tool's proper crimp pocket.
5. Squeeze handles firmly until grounding wire is secured within the grounding lug.
6. Insulate the grounding connection as required.
7. Align the screw holes in the grounding lug with the mounting holes at the center of the back of the 9145E.
8. Install the two screws included with the grounding lug kit. Torque screws to 14.5 – 15.5 in-lb.

Figure 3-12. Install Grounding Lug

3.5.4 Connecting the Fiber Optic and UTP Ethernet Cables

3.5.4.1 Optical Fiber Cable Installation

NOTE: To avoid damaging the fiber end-surface or connector, use extreme care when installing or removing cables.

Connect the Optical Fiber cables to the SFP modules as follows:

1. Plug in the optical cables with proper Tx to Rx or Rx to Tx orientation.
2. Ensure cable locks in place.
3. Label each cable with the signal direction (TX or RX).

3.5.4.2 UTP Cable Installation

Connect the UTP cables to the UTP connectors as follows:

1. Plug the UTP Cable into the RJ45 connector.
2. Be sure the locking tab is properly seated.

Chapter 4

Operation

4.1 Power-Up and Front Panel Functions

The LEDs on the front panel indicate the system and port status of the 9145E (see Figure 4-1). During power-up, all LEDs on the 9145E will light amber. When power-up has been completed, the LEDs will display status as described in the following paragraphs. Additional information about fault conditions appears in the System Alarms and System Status & Configuration screens (Reference 6913601, 9145E NID Software User's Manual).

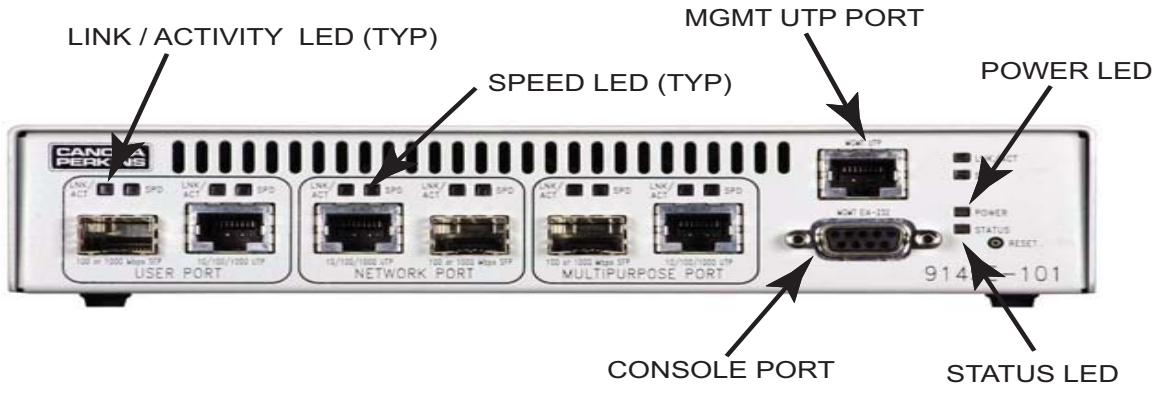


Figure 4-1. 9145E Status Indicators

4.1.1 Power and Status LEDs

The power (PWR) and status (STA) LEDs, located to the right of the console port (see Figure 4-1), indicate condition and state of the 9145E. See Table 4-1 for significance of LED conditions.

4.1.1 Ethernet Management LEDS

The Link/Activity (LNK/ACT) front panel LED, located to the right of the MGMT UTP Port (see Figure 4-1), indicates the presence of transmit or receive activity. The Speed (SPD) front panel LED, located directly below the LINK/ACT LED, indicates the speed of the transmissions. See Table 4-1 to determine the 9145E status.

Table 4-1. Power, Status, and Ethernet Management LED Indications

LED Name	State	Condition
STATUS	Off	No Power
	Green	Normal operation
	Amber	System self-test in progress
	Blinking Amber	System is booting / Loopback mode
	Red	Major alarms including Link Loss at the User, Extension or MP Port (if MP port is supported)
	Blinking Red	Critical Alarms requiring immediate user intervention, such as the failure of one of the redundant power supplies, temperature or voltage out of range alarm or a fan failure.
POWER	Off	Power is off
	Green	Power is on
	Amber	System is booting or one power supply failed in a redundant power supply configuration
	Red	One of the board supply voltages has exceeded a threshold value
SPD	Off	10BaseT
		Auto and no link
		Connector Not Selected
	Amber	100BaseT
		System booting
	Slow Blinking Green*	Port Enabled but No Link
LNK/ACT	Off	No link
		No transmit or receive activity
	Green	Link on with full duplex
	Blinking Green	Transmission or receiving activity with full duplex
	Amber	System Booting
		Link on with half duplex
	Blinking Amber	Transmission or receiving activity with half duplex

* Slow Blinking Green means LED toggles between OFF and GREEN approximately once per second.

4.1.2 SFP/UTP Port Status LEDS

The Link/Activity (LNK/ACT) LEDs are located above the SFP and UTP Ports of the each port section (see Figure 4-1). See Table 4-2 to determine the current condition of the User Ports.

Table 4-2. User, Network, and Multipurpose Port LED Indications

LED Name	State	Condition
SPD	Off	10BaseT
		Auto
		Connector Not Selected
	Green	1000BaseT
	Amber	100BaseT
		System Test
	Red	Remote Fault (SFP Only)
	Blinking Red	Invalid/Unsupported SFP installed (SFP Only)
	Slow Blinking Green*	Connector Selected with No Link
LNK/ACT	Off	No link
		No transmit or receive activity
	Green	Link on with full duplex
	Blinking Green	Transmission or receiving activity with full duplex
	Amber	System test
		Link up with half duplex
	Blinking Amber	Transmission or receiving activity with half duplex
	Red	Port Disabled
		LLF
	Blinking Red	No Link, but transmitting OAM packets in unidirectional mode

* Slow Blinking Green means the LED toggles between OFF and GREEN approximately once per second.

4.2 Interface Management

The 9145E is managed locally through the console port and remotely either through the Management UTP port or inband via the user port. The console port is connected to a VT-100 terminal, through an emulation program, through the RS-232 serial port using a DE-9 cable. UTP is an out-of-band 10/100 Mbps port supporting Telnet, SSH, and SNMP V1/V2C/V3 that is used for network management.

4.2.1 Setting Up the VT-100 Terminal

When using the console port, you can use the HyperTerminal Emulation program that is included with Microsoft Windows operating systems. The Telnet session is only available after the management TCP/IP configuration is completed.

NOTE: The Microsoft Vista operating system does not include HyperTerminal. If your terminal interface computer uses Windows Vista, you will need to use a separate terminal emulation program.

The following steps describe how to set up HyperTerminal on your PC.

1. Select Start>All Programs>Accessories>Communications>HyperTerminal. The **New Connection - HyperTerminal** window will open.
2. Enter a name for the connection to the system in the **Name** box, select an **icon** to identify this connection on your desktop, and click **OK**. The **Connect To** window will open.
3. Select **COM** from the **Connect using** drop down menu, and click **OK**. The **Com1 Properties** window will open.
4. At the **COM 1 Properties** window, on the **Port Settings** tab, select the following from the appropriate dropdown menus, then Click **Apply**:
    - **Bits per second**: 9600 bps
    - **Data bits**: 8
    - **Parity**: None
    - **Stop bits**: 1
    - **Flow control**: None
5. Click **OK**. HyperTerminal connects to the system and VT100 terminal emulation starts.
6. In the **Hyperterminal** window, select the **Properties** button from the tool bar, select the **Settings** tab, select **VT100** from the **Emulation** drop down menu, and click **OK**.
7. Default username is admin
8. Default password is admin (case sensitive)

Chapter 5

Troubleshooting

This chapter covers identifying fault conditions and determining corrective action. The front panel LEDs provide both normal and fault information. To aid troubleshooting, Tables 5-1and 5-2 list all LED functions and indications.

5.1 Optical Power Loss

Whenever there is a significant signal loss, the Rx indictor turns off. Check cable integrity, and remove and inspect the cable connectors, being careful not to damage the fiber end-face surface or the connector housing. Clean all optical connectors before reinstalling them.

5.2 Fault Conditions

The 9145E front panel and interface module LEDs show fault conditions. Additional information about fault conditions appears on the System Alarms Log. Use the System Alarms Screen to view alarms and faults on the 9145E (reference 6913303, 9145E NID Software Version 1.0 Users Manual).

5.2.1 Remote Fault (RMTF)

If an optical port loses the RX optical signal, it sends a Remote Fault (RMTF) signal on its Transmit to the distant end on the optical link. The SPD LED is off, and an alarm flags the link loss on the optical port. When an optical port receives a Remote Fault signal, the ACT/LNK LED lights red and an alarm flags the remote side optical link failure. Both local and remote link partners must be configured to the same RMTF enable/disable setting (See Figure 5-1).

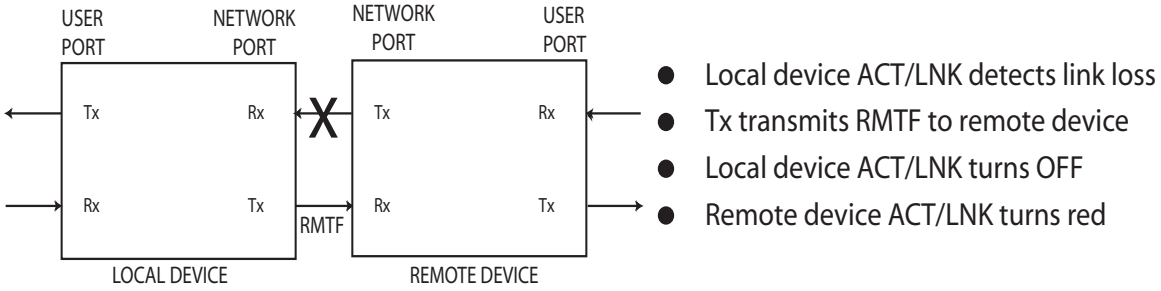


Figure 5-1. Remote Fault Signal

Table 5-1. Power, Status, and Ethernet Management LED Indications

LED Name	State	Condition
STATUS	Off	No Power
	Green	Normal operation
	Amber	System self-test in progress / Loopback mode
	Blinking Amber	System is booting
	Red	Major alarms including Link Loss at the User, Extension or MP Port (if MP port is supported)
	Blinking Red	Critical Alarms requiring immediate user intervention, such as the failure of one of the redundant power supplies, temperature or voltage out of range alarm or a fan failure.
POWER	Off	Power is off
	Green	Power is on
	Amber	System is booting or one power supply failed in a redundant power supply configuration
	Red	One of the board supply voltages has exceeded a threshold value
SPD	Off	10BaseT
		Auto and no link
		Connector Not Selected
	Amber	100BaseT
		System booting
	Slow Blinking Green*	Port Enabled but No Link
LNK/ACT	Off	No link
		No transmit or receive activity
	Green	Link on with full duplex
	Blinking Green	Transmission or receiving activity with full duplex
	Amber	System Booting
		Link on with half duplex
	Blinking Amber	Transmission or receiving activity with half duplex

* Slow Blinking Green means LED toggles between OFF and GREEN approximately once per second.

Table 5-2. User, Network, and Multipurpose Port LED Indications

LED Name	State	Condition
SPD	Off	10BaseT
		Auto
		Connector Not Selected
	Green	1000BaseT
	Amber	100BaseT
		System Test
	Red	Remote Fault (SFP Only)
	Blinking Red	Invalid/Unsupported SFP installed (SFP Only)
	Slow Blinking Green*	Connector Selected with No Link
LNK/ACT	Off	No link
		No transmit or receive activity
	Green	Link on with full duplex
	Blinking Green	Transmission or receiving activity with full duplex
	Amber	System test
		Link up with half duplex
	Blinking Amber	Transmission or receiving activity with half duplex
	Red	Port Disabled
		LLF
	Blinking Red	No Link, but transmitting OAM packets in unidirectional mode

* Slow Blinking Green means the LED toggles between OFF and GREEN approximately once per second.

5.2.2 Link Loss Forwarding

When Link Loss Forwarding (LLF) is enabled, a fault on one side of the 9145E propagates to the other side to notify that device and stops signal transmission (see Figure 5-2). Set the LLF propagation to User to Network, Network to User, or both directions. Set this in the User Interface at the Functional Configuration screen (reference 6913303, 9145E NID Software Users Manual).

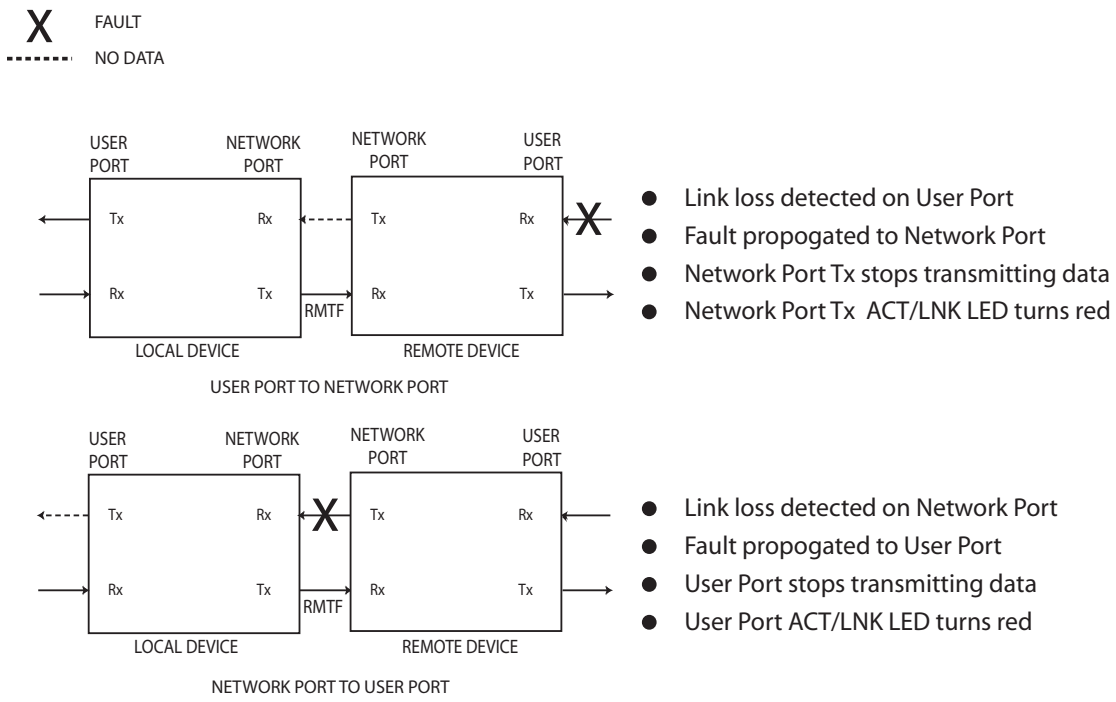


Figure 5-2. Link Loss Forwarding Propagation

5.3 Running Diagnostics

When you set up a new connection, you can verify the link connectivity using PING prior to sending data. A Latency and Jitter Test will verify the quality of the link.

5.3.1 PING Testing

You can verify network connectivity with another IP device within the subnet by sending a PING to the IP address for that device. For PING testing instructions, reference 6913303, 9145E NID Software Version 1.0 Users Manual.

5.3.2 Latency and Jitter Testing

Latency/Jitter Testing measures and reports performance and quality of the link between the 9145E and another Canoga Perkins capable device. Results reported include the Frame Loss Ratio (FLR), and the minimums, average, and maximums for latency and jitter. For latency and jitter testing instructions, reference 6913601, 9145E Ethernet Network Interface Device Software User's Manual.

5.4 Loopback Diagnostics

Use Loopbacks to diagnose a fault on the optical link. The 9145E supports two loopback modes that you can set at the local site for both the local and remote 9145Es. These modes loop the data through either the physical layer on the User side or the Network side.

When performing loopback diagnostics, the 9145E uses a unique MAC address, designated as the Loop Test MAC Address, which is displayed on the Loopback Setup Screen (reference 6913303, 9145E NID Software Version 1.0 Users Manual). When in loopback mode, the 9145E filters and discards all service frames.

The 9145E is configurable to swap the origination and destination MAC Addresses and to recalculate the looped frame's CRC. Test packets are returned to the source according to the selected options. To display current loopback status, initiate loopbacks, configure address swapping and CRC recalculation options, and to run a loopback test, reference 6913303, 9145E NID Software Version 1.0 Users Manual.

5.4.1 User Mode

User Mode loops data received on the local User Port Rx through the FPGA to the User Port Tx. Data is not sent out the Network Port Tx and incoming data on the Network Port Rx is ignored (see Figure 5-3). To set this mode, set the Loopback State for the Local Module to Local (reference 6913303, 9145E NID Software Version 1.0 Users Manual).

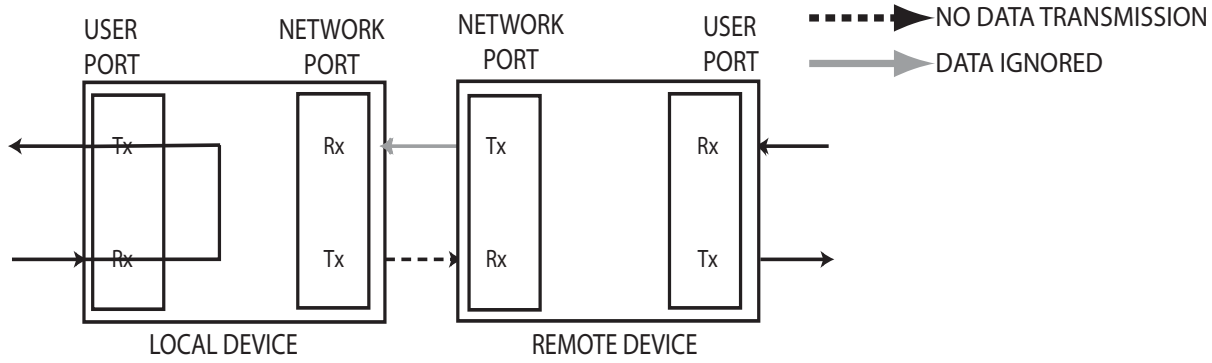


Figure 5-3. User Mode

5.4.2 Network Mode

Network Mode loops data received on the Network Port Rx through the Local User side to the Network Port Tx. Data is not sent out the local User Port Tx and incoming data on the local User Port Rx is ignored (see Figure 5-4). To set this mode, set the Loopback State for the Remote module to Remote (reference 6913303, 9145E NID Software Users Manual).

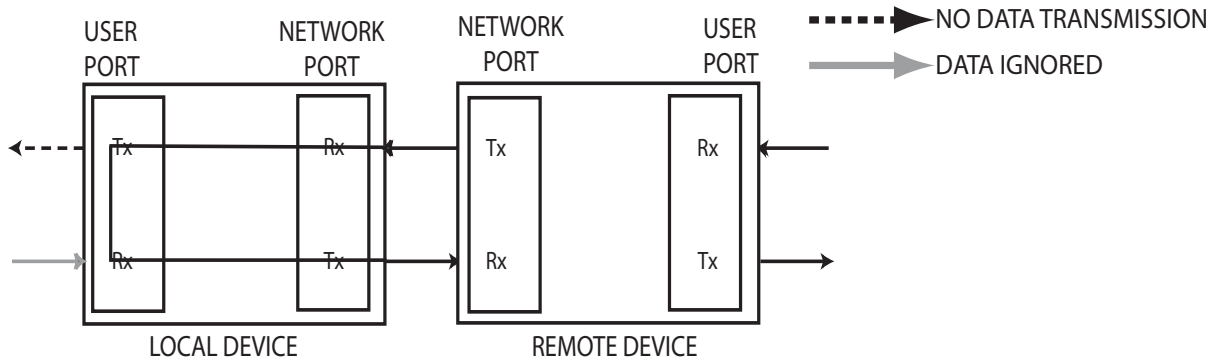


Figure 5-4. Remote-Remote Loopback Mode

Chapter 6

Maintenance

6.1 General Maintenance

Well maintained components and clearly identified cables help assure optimum system operation. Damaged fiber optic cables and dirty connectors are a common source of signal loss or attenuation. Fiber optics are especially susceptible to contamination. Inspect, clean, and test all components to maintain optimum performance. Inspect the surface of the fiber optic ferrules and clean as required.

CAUTION: To avoid damage and signal loss, do not over-tighten or force-fit optical connectors.

6.2 Check Optical Power Levels

NOTE: For accurate results, warm up each unit for at least 30 minutes before checking power levels. Ensure the Transmit laser is turned on when the unit is powered up.

To ensure proper performance levels, measure Transmitter Output Power, Receiver Input Power, and attenuation for all fiber links. Each 9145E is shipped with a document that lists the output power for each optical transceiver.

6.2.1 Measuring Transmitter Output Power

To measure the output power, follow these steps (see Figure 6-1):

1. Inspect and clean connectors on a fiber optic test cable with a known loss, then connect it to the Tx connector on the 9145E.
2. Set the optical power meter to the proper wavelength.
3. Connect the other end of the optic test cable to the optical power meter, wait two or three minutes for the power reading to stabilize, and read the output power.
4. Add the test cable loss, then record the power level and compare it to the value on the performance sheet that was included for that transceiver. Measurement tolerance is +/- 0.5 dBm.

5. If the reading is low, repeat the measurement with a different test cable. If the power level is still not within range, call Canoga Perkins Technical Support.

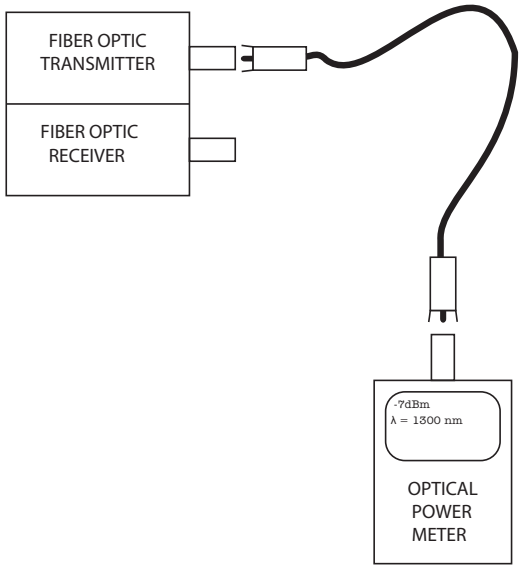


Figure 6-1. Measuring Transmitter Output Power

6.2.2 Measuring Receiver Input Power

To measure receiver input power, follow these steps (seeFigure 6-2):

1. Connect the transmit fiber to the transmit side of the equipment at the local site.
2. Connect a calibrated optical power meter to the end of the transmit fiber at the remote site.
3. Measure and record the optical power on the transmit fiber at the remote site. This is the receiver input power for the transmit fiber from the local site.
4. Connect the transmit fiber to the transmit side of the equipment at the remote site.
5. Connect a calibrated optical power meter to the end of the transmit fiber at the local site.
6. Measure and record the optical power on the transmit fiber at the local site. This is the receiver input power for the transmit fiber from the remote site.
7. Compare the receiver input power with the sensitivity level listed on the optical specifications sheet, located in the Client Support Area of the Canoga Perkins web site. The power level must be within the sensitivity range listed on the data sheet. If not, contact Canoga Perkins Technical Support.
8. Compare the receiver input power to the receiver's saturation (overdrive) level shown on the optical specifications sheet, located in the Client Support Area of the Canoga Perkins web site. The power level must be lower than the saturation level. If not, contact Canoga Perkins Technical Support.

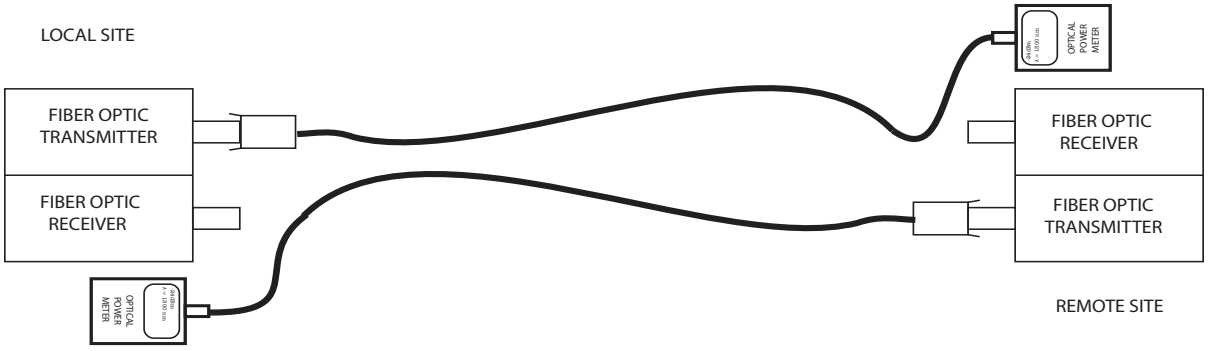


Figure 6-2. Measuring Receiver Input Power

6.2.3 Calculating Fiber Link Attenuation

Link attenuation measurement identifies potential problems with links that are on the threshold of receiver sensitivity. Measure optical fiber links at the shortest wavelength of operation, as it is the limiting factor in the loss budget. Use a power meter calibrated for the laser source, then factor in approximately 1 dB for the connector loss from the patch cables between the 9145E and the local device. (Each fiber connection can generate 0.5 dB of additional loss.)

NOTE: If you cannot determine the Rx sensitivity, contact Canoga Perkins Technical Support for assistance.

Follow these steps to calculate fiber link attenuation:

1. Determine transmitter output power as described in paragraph 6.2.1 above.
2. Determine receiver input power as described in paragraph 6.2.2 above.
3. Subtract receiver input power from transmitter output power. The result is the fiber link attenuation.

Transmit Output Power	-7.0 dBm
Receiver Input Power	-28.2 dBm
Fiber Link Attenuation	21.2 dB

CANOGA PERKINS CORPORATION

20600 Prairie Street
Chatsworth, California 91311-6008 USA
Phone: (818) 718-6300 FAX: (818) 718-6312
Web Site: www.canoga.com
Email: fiber@canoga.com