

EtherWORKS Switch 2TTX

Installation

Part Number: EK-DEL2X-IN. A01

This document describes how to install and operate the EtherWORKS Switch 2TTX.

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Preface

About This Manual

This guide is designed for the experienced network installer. It describes how to install and operate Digital's EtherWORKS Switch 2TTX (DEL2X) switch (also referred to as the DEL2X or switch).

Conventions

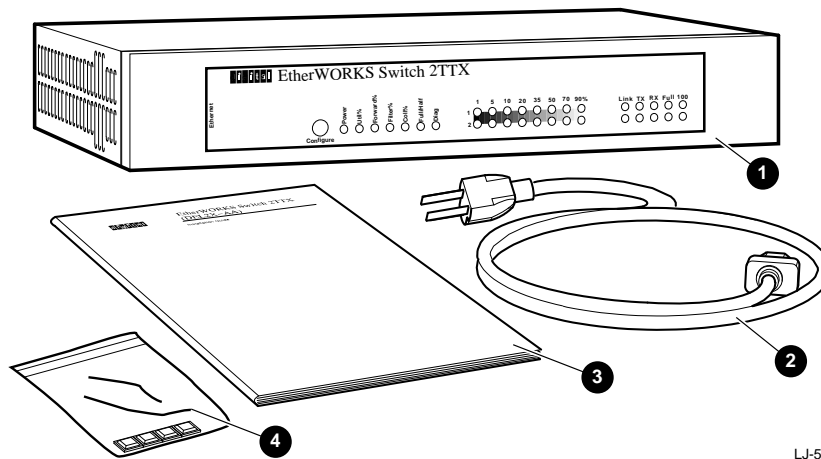
The following conventions are used in this manual

Convention	Description
Note	Contains information of special importance.
<i>Italics</i>	In examples, indicates a variable. In text, emphasizes a term or indicates a book title.
Monospaced type	Indicates a literal example of system output.

Package Contents

The EtherWORKS Switch 2TTX package contains the items in the following list and shown in the following figure:

- The EtherWORKS Switch 2TTX ❶
- An ac power cord ❷
- This installation guide ❸
- Four rubber feet ❹



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Quick Installation

The EtherWORKS Switch 2TTX contains two Ethernet ports that support 100Base-TX or 10Base-T selectable connections operating in full- or half-duplex mode. The design built into the front display panel and configuration options provides a friendly interface that simplifies installation and network troubleshooting.

Use the following procedure to install the DEL2X :

1. Unpack the DEL2X.
2. Choose a location close to the network device you need to connect, and within easy reach of an electrical outlet.
3. Connect to other switches or hubs using the straight-wired port (//) for daisy-chain configurations.
4. Connect PCs, workstations, or servers to the 8-pin MJ crossover-wired ports (x).
5. Set the transmission mode for each port to full- or half-duplex operation.
6. Verify network communications by ensuring the following:
 - You have made all the necessary connections.
 - You can access any connected resources.
 - The DEL2X LEDs are functioning properly.

Note

Upon powerup, the DEL2X will be in autonegotiation mode (the default). The transmission speed (10/100 Mb/s) and full- and half-duplex mode will be automatically detected for devices connected directly to either port on the DEL2X. You may manually set the transmission mode to either full- or half-duplex mode by using the **Configure** button. Refer to the Setting Communication Mode (Full- and Half-Duplex) section in Chapter 2 for further information.

Autonegotiation mode will be resumed when you turn the power to the DEL2X off then on again, or when you turn the Link status display off then on.

If you encounter any problems installing the DEL2X, refer to Chapter 3 for a detailed description of installation procedures, or to Appendix A for troubleshooting help.

Overview of Switching Technology

The Ethernet switch allows simultaneous transmission of multiple packets using an internal high-speed data channel. This means that it can partition a network more efficiently than bridges or routers in most environments. Therefore, the Ethernet switch is recognized as one of the most important building blocks for today's networking technology.

The learning function in the switching hub stores the address and corresponding port number of each incoming and outgoing packet in a routing table. This information is subsequently used to filter packets whose destination address is on the same segment as the resource address.

The switch scans the destination address from the packet header, searches the routing table provided for the incoming port, then forwards the packet only if required, often before fully received. This fast forwarding makes the switch attractive for connecting servers directly to the network, thereby increasing throughput and availability. However, the switch is most commonly used to segment existing hubs, which usually improves overall performance. A switching hub can be easily configured in any Ethernet network to significantly boost bandwidth using conventional cabling and adapters.

EtherWORKS Switch 2TTX

The DEL2X can boost network bandwidth fourfold, depending on your configuration (that is, if your system is running at 100 Mb/s in full-duplex operation for both ports). It provides two 10/100 Mb/s 8-pin MJ ports (set at full- or half-duplex mode) to connect to either a subnetwork, or directly to a server or key workstation. In addition to partitioning an overloaded network, the DEL2X provides connection between legacy 10Base-T networks and the newer generation 100Base-TX. It can be configured to operate in either full-duplex or half-duplex data transfer mode to support the interconnection requirements of other high-speed devices.

As a device functioning on the media access control (MAC) layer, the DEL2X is protocol independent, and therefore compatible with IEEE 802.3, IEEE 802.3u, TCP/IP, NetWare, DECnet, and XNS protocols. The DEL2X can be configured as a two-port bridge for a 10Base-T environment; it can provide a connection between conventional 10Base-T and high-speed 100Base-TX networks; or it can serve as a two-port bridge in a 100Base-TX environment. Moreover, where traditional 100Base-TX networks restrict the maximum distance between end nodes to 205 meters, the DEL2X divides your network into smaller and more manageable segments, each linked to the larger network with a switch. This enables unlimited maximum distance for communications between end nodes.

Cut-Through Switching

The DEL2X performs “on-the-fly” cut-through switching, which sends a packet to the other port according to the destination address scanned from the packet header. This reduces the latency of packet transmission to 20 microseconds or less. Compared to approximately 800 microseconds for a bridge or 1800 microseconds for a router, both of which have to store the entire packet before it can be forwarded, the DEL2X can deliver a quantum improvement to network performance.

Although cut-through switching is recommended as the fastest method for most applications, the other methods mentioned previously are also supported by the DEL2X to guarantee flawless performance.

The cut-through techniques used are described as follows:

Fragment-Free Cut-Through Switching

This technique uses a more conservative approach to cut-through switching by waiting until the collision window has elapsed (that is, the first full 64 bytes has been received) before processing the packet. This prevents runts from being passed along, effectively cleaning up the data stream.

Adaptive Cut-Through Switching

To ensure that you can manage any kind of network load, the DEL2X uses adaptive cut-through switching based on its smart algorithm. Based on the current error rate, this method dynamically changes the way data is handled as it passes through the switch. These switching alternatives start at standard cut-through switching for a clean data environment, change to fragment-free cut-through switching for a moderate error rate, then progress to store-and-forward switching for a highly contentious environment. By using this method, the DEL2X delivers the best networking performance under any environment.

Store-and-Forward Switching

Traditional bridges and routers use a switching method called store-and-forward in which the entire frame must be received before the bridge can perform a table lookup for the destination node and forward the packet to the corresponding port. As a result, each packet is delayed by approximately 800 microseconds. It may be necessary to use store-and-forward when many data errors are occurring over the network, or when connecting to very slow devices. Compared to this “safe” mode of operation, cut-through switching reduces the packet transmission delay to approximately 20 microseconds by picking the destination address out of the header as soon as it is received, then directing the frame to the appropriate port long before the full packet has been received.

Features

The main features of the DEL2X are as follows:

- Conforms to the IEEE 802.3 and IEEE 802.3u specifications (10Base-T and 100Base-TX standards)
- Provides two independent 8-pin MJ 10Base-T and 100Base-TX Ethernet station ports, where each logical port consists of one straight-wired port (/) for connecting to switches or hubs, and one crossover-wired port (x) for connecting to PCs, workstations, or servers, thereby eliminating the need for crossover cables
- Both ports support full-duplex and half-duplex operation
- Total bandwidth of up to 200 Mb/s (when full-duplex mode is used)
- Autosenses transmission speed (10/100 Mb/s)
- Uses adaptive cut-through switching (which dynamically changes data handling among standard cut-through, fragment-free cut-through, and store-and-forward switching, depending on the error rate)
- Uses back pressure to eliminate frame loss by “blocking” traffic from end stations or segments connected directly to the switch when its buffers fill
- Minimum latency of packet transmission (leading edge to leading edge) of less than 20 microseconds when using cut-through switching
- Uses on-the-fly cut-through switching technique to transport packets
- Supports transparent bridging function
- Provides address learning function to build the routing information database
- Operates at maximum packet filtering and forwarding rate
- Provides frame filtering and forwarding functions for each port, which are capable of filtering and forwarding 100% of all Ethernet packets at line speed
- Provides a 160 KB buffer per port
- Routing table contains 4K entries per port to store node MAC addresses
- Uses fast hashing scheme to retrieve information from routing table when making routing decisions
- Provides an indicator panel for configuring the system or monitoring the overall condition of the DEL2X, including utilization, forwarding, and collision rates

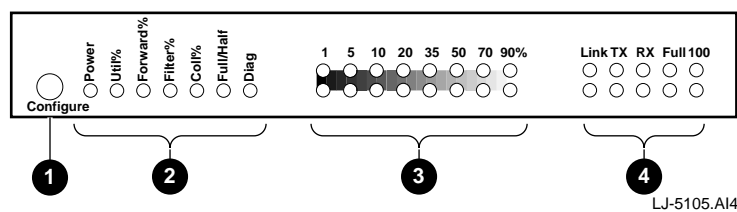
Hardware Description

Overview

This chapter describes the hardware features of the EtherWORKS Switch 2TTX. Before connecting any network device to the switch, familiarize yourself with the front panel display LEDs, ports, and Configure button shown in the following illustrations and described in the following sections.

Front Panel

The front panel on the DEL2X (shown in the following figure) provides a simple interface for configuring or monitoring the switch. It includes a Configure button **1**, power and display mode LEDs **2**, statistical display LEDs for network traffic **3**, and port status LEDs **4**.



Configure Button

The Configure button, located on the left of the front panel, is used to select the following configuration functions:

- System performance (displays relative bandwidth utilization rate, forwarding ratio, filtering ratio, and collision ratio for each port)
- Full- and half-duplex mode (sets port communication to full-duplex or half-duplex operations)
- Diagnostics (tests the status of various system components)

To set system performance or diagnostic mode, use the following procedures:

Note

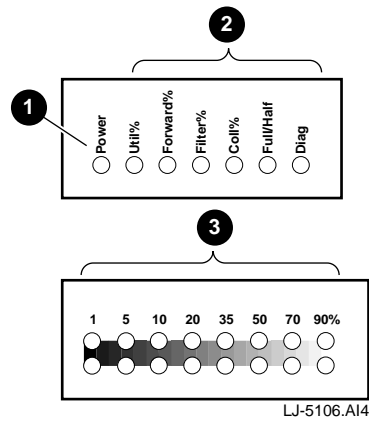
The term “long press” means to press the Configure button for more than 2 seconds, then release it. The term “short press” means to press the Configure button, then immediately release it. If the Configure button is not pressed within 10 seconds, the system returns to normal operation.

1. **To start the configuration**, use a long press on the Configure button. The LEDs will light to show the selected configuration function. (Refer to the related sections in this chapter and in Chapter 3 for complete details.)
2. **To scan through the configuration functions**, use a short press on the Configure button. (Refer to Chapter 3 for information on how to select full- and half-duplex communications.)
3. **To accept and implement the current settings**, use a long press on the Configure button.

LEDs

The LEDs shown in the following figure indicate:

- If the unit is receiving power ❶
- The current display mode ❷
- The network performance for each port ❸



Power LED

The power LED indicates the conditions described in the following table:

LED Activity	Condition	Indication
Steady light	ON	Unit is receiving power, CPU is running
No light	OFF	Power is disconnected, no power received

Statistical Display for System Performance

The statistical display LEDs indicate a functional value for each port depending on the selected display mode. (Refer to the previous Configure Button section for instructions on how to select display mode.) These LEDs are described in the following table and sections:

Label (%)	Color
90%	Amber
70%	Amber
50%	Amber
35%	Green
20%	Green
10%	Green
5%	Green
1%	Green

Utilization Display Mode (Util%)

These statistical LEDs show the percentage of valid data passing through each port compared to overall network bandwidth (updated every 0.5 seconds). There are 8 LEDs representing the percentage of network utilization. The corresponding LEDs light to show that the utilization of LAN bandwidth has reached this percentage. When active, these LEDs function similar to a stereo system's equalizer display.

For example, if network utilization reaches 1%, the LED labeled 1% will light. However, if network utilization rises above 1% (for example, 35%), the LED labeled 35 and all the other LEDs before it (1, 5, 10, and 20) will also light in rapid succession. These LEDs monitor the share network frames handled by each port within a 10 Mb/s or 100 Mb/s bandwidth, depending on the Ethernet type currently selected on the back panel. The LEDs provide a quick way to monitor the current traffic load relative to the network's capacity.

Forward Display Mode (Forward%)

These statistical LEDs show the percentage of packets that must be forwarded by bridging hardware to the other port on the DEL2X (that is, another LAN segment or connected workstation). When viewing the Forward% LEDs, remember that under normal conditions, the DEL2X forwards 100% of all Ethernet packets that must be transferred among the connected LAN segments at line speed.

Filter Display Mode (Filter%)

These statistical LEDs show the percentage of packets that must be filtered from the DEL2X by bridging hardware because the destination address is on the same segment connected to the receiving port. When viewing the Filter% indications, remember that under normal conditions, the DEL2X filters 100% of all Ethernet packets that belong to the local LAN segments at line speed.

Collision Display Mode (Coll%)

These statistical LEDs show the percentage of packet collisions that occur out of the total packets transmitted by the port. Collisions occur when two or more devices connected to a DEL2X attempt to transmit data simultaneously on the network. When a collision occurs, devices pause, then retransmit after a pseudo-random wait period. Because wait periods differ among devices, successive collisions become increasingly improbable.

These collision LEDs are labeled by row to indicate the percentage of collisions encountered by the corresponding port. When collisions reach a level marked on the front panel display, the corresponding LED lights. For example, if packet collision reaches 1%, the LED labeled 1% will light. However, if collisions go beyond 1% (for example, 30%), the LED labeled 30% and all the other LEDs before it (1, 5, 10, and 20) also light in rapid succession.

Setting Communication Mode (Full- and Half-Duplex)

The communication mode can be set to either full-duplex or half-duplex operation. Use the **Configure** button to light the Full/Half display mode LED, indicating that transmission mode may now be set for the ports. Next, set the port status LED for the corresponding port in the LED column labeled Full as indicated in the following table:

LED	Color	Condition	Indication
Full/Half display mode	Green	Steady light-ON	Transmission mode selection enabled
		No light-OFF	Transmission mode selection disabled
Full port status	Green	Steady light-ON	Port is set for full-duplex operation
		No light-OFF	Port is set for half-duplex operation

Note

The DEL2X supports full-duplex mode for both ports. The full-duplex operation applies only to point-to-point access (for example, when attaching the DEL2X to a PC, workstation, server, or another switch). Repeater hubs use a common collision domain for all communications, and therefore cannot support full-duplex mode. When connecting the DEL2X to a repeater hub, use a standard cascaded connection set for half-duplex communications.

Diagnostics Display Mode

The function of the diagnostic display mode is to indicate that the system is in diagnostic mode. (Refer to the previous Configure Button section for instructions on how to select display mode.)

After power on, the DEL2X automatically performs a self-diagnostic test. This test is done in two stages: the first stage is the system diagnostic test; the second stage is the port diagnostic test. If a problem is detected, the current diagnostic process (that is, system or port test) will continue until completed. If the test does not complete successfully, the corresponding LEDs (described in the following sections) will flash after test completion to indicate which component failed the test.

System Diagnostic Test

The following table describes the system-level failures and corresponding LEDs. If a problem is detected, the statistical LEDs in the eighth column (90°) in both rows will flash to indicate that the device failed the test. The following LEDs will also flash to indicate the failure condition.

LED (Row, Column)	Color	Component Tested
1, 1 (1%)	Green	System ROM
1, 2 (5%)	Green	System EEPROM

Port Diagnostic Test

The port diagnostic test checks all ports. If a problem is detected, a LED in the corresponding row (which indicates the malfunctioning port) and column (which indicates the failed component) will light as described in the following table:

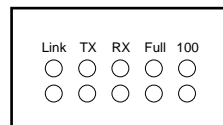
LED (Column)	Color	Diagnostic Test Status
4 (20%)	Green	Failed Port IC Test
5 (35%)	Green	Failed Routing Table Test
6 (50%)	Amber	Failed Input Queue RAM Test
7 (70%)	Amber	Failed Output Queue RAM Test

Note

Enabling the Diagnostic function activates tests similar to the one performed when you power on your system. After successfully completing diagnostics, the system returns to normal operation.

Port Status Display

The function of the port status display (shown in the following figure) is to show the port status for the DEL2X. The following sections describe the LEDs used for this function.



Hardware Description

Link Status (Link)

The following table describes the Link status LEDs during a valid network connection associated with the port:

LED Activity	Condition	Indication
Steady light	ON	Valid link has been established on this port
No light	OFF	No valid link has been established on this port

Note

If the Link LED does not light when a device is connected to its corresponding port, make sure that both the DEL2X and the connected device are powered on. For devices connected to the DEL2X using twisted-pair cable, make sure that the cable length does not exceed 100 meters. Use standard, straight-through cables. Do not use crossover or other specialized cables.

Transmit Status (TX)

The following table describes the Transmit status LEDs when outgoing traffic exits the port:

LED Activity	Condition	Indication
Blinking light	ON	Port is transmitting packets; frequency of blinking is proportional to the traffic passing through the port
No light	OFF	No packets are being transmitted from this port

Receive Status (RX)

The following table describes the Receive status LEDs when incoming traffic enters the port:

LED Activity	Condition	Indication
Blinking light	ON	Port is receiving packets; frequency of blinking is proportional to the traffic passing through the port
No light	OFF	No packets are being received on this port

Full-Duplex Status (Full)

The following table describes the Full status LEDs when communications have been set to full-duplex operation for the indicated port:

LED Activity	Condition	Indication
Blinking light	ON	Port is set for full-duplex operation
No light	OFF	Port is set for half-duplex operation

Note

Full-duplex operation applies only to point-to-point access (for example, when attaching the DEL2X to a PC, workstation, or server).

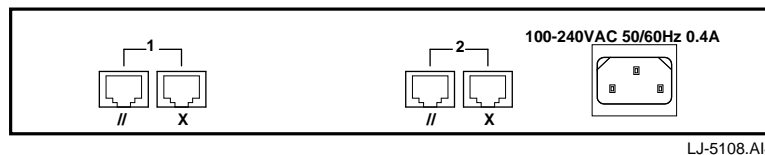
100BASE-TX Status (100)

The following table describes the 100 status LEDs when communications have been set to 100 Mb/s. The transmission speed for any device directly attached to the DEL2X is automatically sensed at 10 Mb/s or 100 Mb/s.

LED Activity	Condition	Indication
Steady light	ON	Port is set for 100Base-TX connection
No light	OFF	Port is set for 10Base-T connection

Back Panel

The back panel on the DEL2X (shown in the following figure) includes two Ethernet ports and a full-range power socket. Although 10Base-T and 100Base-TX connections are automatically sensed by the DEL2X, you must use the **Configure** button to set the data transfer mode to full-duplex or half-duplex operation. Refer to the **Setting Communication Mode (Full- and Half-Duplex)** section in this chapter for more information.



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Ethernet Ports

The DEL2X has two logical 8-pin MJ Ethernet ports: one straight-wired port (//) for connecting to another network interconnection device, such as a switch or a compatible hub, and one crossover-wired port (x) for connecting to a PC, workstation, or server. When using Fast Ethernet, these ports can also be connected to devices such as a high-speed server or Ethernet backbone. Use straight-through twisted-pair cable to connect to the DEL2X ports.

Power Socket

The DEL2X is equipped with a universal full-range power source. The power socket accepts 100 Vac to 240 Vac at 50 to 60 Hz.

Setup and Configuration

Overview

This chapter provides information on the EtherWORKS Switch 2TTX preinstallation requirements, how to establish network connections, and how to configure the system.

PreInstallation Requirements

Before connecting the DEL2X to the network, make sure you provide the right operating environment, including power requirements and proximity to other network devices that are to be connected. Verify the following installation requirements:

- Power requirements of 100 Vac to 240 Vac at 50 Hz to 60 Hz. The DEL2X power supply automatically detects the input voltage level.
- The DEL2X is located in a cool, dry place, with at least 10 cm of space at the front and back of the switch for ventilation.
- The network cables and connectors needed for installation are available.
- The DEL2X is installed at the center of the devices you plan to link, and near a power outlet.

Connecting the DEL2X

The DEL2X has two logical 8-pin MJ Ethernet ports. Use twisted-pair cable to connect either of the ports to a PC, server, workstation, to another switch, or to a compatible hub (see the following sections).

PC, Server, and Workstation Connection

To connect the DEL2X to a PC, server, or workstation, use the following procedure:

1. Prepare the systems you wish to network. Make sure they have properly installed 10Base-T or 100Base-TX network interface cards (NICs).
2. Prepare straight-through twisted-pair cables with 8-pin MJ connectors at both ends. Connect one end of the cable to the MJ port on the computer's NIC and the other end to one of the crossover-wired ports (x) on the DEL2X.

Category 5 twisted-pair cable must be used for 100 Mb/s connections. Although Category 3, 4, or 5 cable can be used for 10 Mb/s connections, it is recommended that you use Category 5 cable for these connections to avoid any unnecessary expense or confusion if you subsequently upgrade to Fast Ethernet.

3. Set the communication mode using the **Configure** button to half-duplex or full-duplex operation to match the NIC installed in your computer. (Refer to the Setting Communication Mode (Full- and Half-Duplex) section in Chapter 2.)

Note

Make sure that the length of any twisted-pair cable does not exceed 100 meters. Do not plug a phone jack connector into the 8-pin MJ port. This may damage the DEL2X. Use only twisted-pair cables with 8-pin MJ connectors that conform to FCC standards.

Digital recommends using BN25G-xx (UTP) or BN26M-xx (ScTP) point-to-point twisted-pair cable for connections. The xx stands for cable length in meters.

Daisy-Chain Connection

To connect the DEL2X to another switch or compatible hub, use the following procedure:

1. Prepare Category 5 straight-through twisted-pair cables with 8-pin MJ connectors at both ends. Connect the DEL2X to another switch or compatible hub using the straight-wired port (//) on the DEL2X and the crossover-wired port (x) on the other device. As a general rule, the length of twisted-pair cable should not exceed 100 meters.
2. Set the communication mode using the **Configure** button to half-duplex or full-duplex operation to match the connected device. (Refer to the Setting Communication Mode (Full- and Half-Duplex) section in Chapter 2.)

The DEL2X divides the path for connected devices into separate collision domains, therefore, do not include the switch or connected cabling in your calculations for cascade length involving other devices.

Note

The IEEE 802.3 standard recommends restricting the number of hubs connected in a stack using twisted-pair cable to 5, while IEEE 802.3u provides even stricter recommendations for Fast Ethernet. Therefore, when cascading devices other than the DEL2X, refer to the accompanying documentation for restrictions on stack size.

In contrast to repeater hubs, a cascade of switches divides the collision domain. The number of switches that can be daisy chained is theoretically unlimited. However, in practice, the length of a cascade may be limited by the timeout requirements of the particular applications running on the network.

Providing Power to the DEL2X

To provide power to the DEL2X, use the following procedure:

1. Power on the DEL2X by plugging the power cord into the power socket at the back of the switch, then plugging the other end into a power outlet.
2. Check the **Power LED** located on the front panel to make sure that it is turned on. The DEL2X will automatically select the setting that matches the connected input voltage. Therefore, no additional adjustments are necessary when connecting to any input voltage within the range marked on the back panel.
3. The DEL2X performs a self-diagnostic test upon powerup. (This test takes about 50 seconds to complete.) For details about the system self-diagnostic test, refer to the following section.

Diagnostic Test

Upon powerup, the DEL2X performs an internal self-diagnostic test of major switch components. If any component fails during the test, the DEL2X will try to complete the diagnostic procedure. Otherwise, the system will hang. For related information, refer to the Diagnostics Display Mode section in Chapter 2.

The components to be tested include the following:

- System ROM
- System EEPROM
- Ports 1 and 2

During normal operation, you can use the **Configure** button any time you want to perform a diagnostic test. When testing begins, the system leaves normal operation. If no problem is encountered by diagnostics, the system automatically returns to normal operation.

Setting the Display Mode

This section describes the information available for each display mode and the corresponding LEDs. The display functions are listed in the sequence selected by the Configure button. For a more detailed description of these LEDs, refer to Chapter 2.

A long press on the Configure button is used to initiate basic configuration. (The LEDs light to indicate the configuration function.) A short press switches between functions. A second long press implements the current selection.

Bandwidth Utilization

Active LED: Util% (ON)

In this mode, the statistical LEDs show the percentage of valid data handled by each DEL2X port compared to available bandwidth.

Packet Forwarding Ratio

Active LED: Forward% (ON)

In this mode, the statistical LEDs show the percentage of packets that are forwarded by bridging hardware to the other DEL2X port.

Packet Filtering Ratio

Active LED: Filter% (ON)

In this mode, the statistical LEDs show the percentage of packets that are filtered from the DEL2X by bridging hardware because the destination address is on the segment connected to the receiving port (that is, in the same segment with the source address).

Collision Ratio

Active LED: Coll% (ON)

In this mode, the statistical LEDs show the percentage of packet collisions occurring out of the total packets transmitted by the respective port.

Full-/Half-Duplex Mode Selection

Active LED: Full/Half (ON)

This function is used to set the communication mode for selected ports to half-duplex or full-duplex.

1. Use the **Configure** button to light the Full/Half display mode LED. Note that before the **Configure** button is released, the current communication mode selections will be displayed by the port status Full LEDs (that is, if full-duplex mode has been previously set for a port, the corresponding Full LED will light). After the **Configure** button is released, the Full LED for Port 1 will begin to flash.
2. To change the current setting for a port, use a short press (that is, turn on the Full LED to select full-duplex communications, or turn off the Full LED to select half-duplex communications), then use a long press to effect the setting and move on to Port 2.
3. When finished, use a long press to terminate duplex mode selection.

Diagnostic Function

Active LED: Diag (ON)

Enabling the diagnostic function will activate tests similar to the one performed upon powerup. For details on these tests, refer to the Diagnostics Test section in this chapter. After successfully completing diagnostics, the system returns to normal operation.

Verifying Port Status

Check each connection by viewing the following list of port status LEDs. (For a more detailed description of these LEDs, refer to Chapter 2.)

- **Link**—Indicates that the port has established valid network connection.
- **TX (Transmit)**—Indicates outgoing traffic exiting the port.
- **RX (Receive)**—Indicates incoming traffic entering the port.
- **Full**—Indicates that communications have been set to full-duplex operation.
- **100**—Indicates that communications have been set to 100 Mb/s.

If the Link status LED is not functioning properly, or you experience any other difficulties in setting up the DEL2X, refer to Appendix A.

Verifying System Operation

Verify that all attached devices have a valid connection. The DEL2X monitors link status for each port. If any device is properly connected to the DEL2X and is transmitting a link beat signal, the Link LED lights for the corresponding port.

If the Link LED fails to light when you connect a device to the DEL2X, check the following items:

- Ensure that the twisted-pair cable is properly attached to the DEL2X and the connected device. Verify that the 8-pin MJ connector snaps into place when attached.
- Ensure that the twisted-pair cable is functioning properly by using it for another port and an attached device that displays valid indications when connected to the network.
- Check the length of the twisted-pair cable to be sure it does not exceed 100 meters.
- Verify that the computer's adapter is functioning properly by trying it in another computer that has been successfully connected to the network.

If you still cannot resolve the problem, refer to Appendix A.

Diagnosing DEL2X LEDs

The DEL2X can be easily monitored through its comprehensive array of LEDs located on the front panel. These LEDs assist the network manager in identifying problems the DEL2X may encounter. The following table describes the common problems you may encounter and possible solutions.

Symptom	Cause	Solution
Link LED does not light after making a connection.	The most common cause is a defective NIC or cable connection.	Check the NIC and cable connections for possible defects. Replace the defective NIC or cable.
Power LED does not light after power on.	Defective power supply, CPU, or cord.	Check the cord and wall outlet. Replace the cord if defective. If the power supply or CPU is defective, see your reseller or Authorized Digital Distributor.

Use the diagnostic procedures described in Chapter 2 and Chapter 3 to verify that all other system components are functioning properly. If any component fails the diagnostic test, contact your Digital Services Representative.

System Diagnostics

This section describes the system components to be verified.

Installation

Verify that all system components have been properly installed. If one or more components appear to be malfunctioning, test them in an alternate environment where you are sure that all the other components function properly.

Transmission Mode

Be sure each port on the DEL2X is set to the same transmission mode as the attached device; that is, full-duplex or half-duplex operation. (Refer to the Setting Communication Mode (Full- and Half-Full) section in Chapter 2 for a detailed description.)

Cabling

Verify the DEL2X cabling as follows:

1. Check that you are using the correct cable type. Straight-through cable should be used for all standard twisted-pair connections. Be sure all cable connectors are securely seated in the required ports.
2. Make sure all devices are connected to the network. Equipment may have been unintentionally disconnected from the network.

External Adapters

Make sure the network adapter cards installed in the computers are in good working condition.

Configuration

If a problem occurs after altering the network configuration, restore the original connections, then try to isolate the problem by implementing the new changes, one step at a time. Ensure that cable distances and other physical aspects of the installation do not exceed recommendations.

DEL2X Integrity

As a last resort, verify the DEL2X's integrity with a power-on reset. Turn the power to the DEL2X off, then on. If the problem persists and you have completed the preceding diagnosis, then contact your Digital Services Representative.

B

General Information

Overview

This appendix provides the following general EtherWORKS Switch 2TTX information:

- Physical characteristics
- Operating environment and power requirements
- Connector pin assignments
- Regulatory standards compliance
- Other Digital network adapter products

Physical Description

The DEL2X switch measures 273 mm (10.75 inches) by 166 mm (6.54 inches) and is 42.9 mm (1.69 inches) in height. The DEL2X conforms to IEEE 802.3 10Base-T and IEEE 802.3u 100Base-TX Class II standards.

The DEL2X has two 8-pin MJ ports that are 10Base-T or 100Base-TX selectable per port.

Operating Environment Specifications

The following table lists the operating environment and power requirements for the DEL2X:

Specification	Rating
Operating temperature (sea level)	0°C to 50°C (standard operating)
Relative humidity	5% to 95% (noncondensing)
Radiated emissions	FCC, CISPR Class A VCCI Class 1 CE Mark Safety UL CSA TUV/GS
Power requirements	100 Vac to 240 Vac, 50/60 Hz, 27 W maximum (full range)

Bridging Criteria

The following table lists the bridging criteria for the DEL2X:

Criteria	Description
Network bridging function	Filtering, forwarding, and learning
Maximum filtering rate	14,800 pps/port (10 Mb/s ports) 148,800 pps/port (100 Mb/s ports)
Maximum forwarding rate	14,800 pps/port (10 Mb/s ports) 148,800 pps/port (100 Mb/s ports)
Network latency	Less than 20 microseconds
Address table	4K entries/port
Queue buffer	160 KB/port

Acoustical Specifications

The following table lists the acoustical specifications for the DEL2X.

Acoustics - Preliminary declared values per ISO 9296 and ISO 779:

Product	Sound Power Level L_{wAd} B	Sound Pressure Level L_{pAm} dBA (bystander positions)
	Idle/Operate	Idle/Operate
DEL2X	5.7	41

Current values for specific configurations are available from Digital Equipment Corporation representatives. 1 B = 10 dBA.

Schallemissionswerte - Vorläufige Werteangaben nach ISO 9296 and ISO 7779/DIN EN27779:

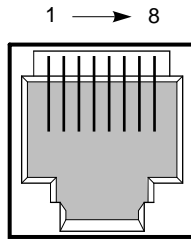
Produkt	Schalleistungspegel L_{wAd} B	Schalldruckpegel L_{pAm} dBA (Zuschauerpositionen)
	Leerlauf/Betrieb	Leerlauf/Betrieb
DEL2X	5,7	41

Aktuelle Werte für spezielle Ausrüstungsstufen sind über die Digital Equipment Vertretungen erhältlich. 1 B = 10 dBA.

Connector Pin Assignments

The DEL2X twisted-pair network connector pin signals are shown in the following figure and explained in the following table:

MJ Port Pin Assignments



LJ-4797.A14

Pin	Port x (Port 1 and Port 2)	Port // (Cascade Port 1 and Port 2)
1	Input Receive Data+	Output Transmit Data+
2	Input Receive Data-	Output Transmit Data-
3	Output Transmit Data+	Input Receive Data+
6	Output Transmit Data-	Input Receive Data-
4,5,7,8	Not used	Not used

Other Digital Network Adapter Products

The EtherWORKS Switch 2TTX is part of a complete family of low-cost network adapters and boot ROMs developed by Digital Equipment Corporation. Other products include the following:

DE45X-AR Remote Boot ROM

This option ROM is installed on an EtherWORKS Turbo PCI 10 adapter (either DE450-CA or DE450-TA) in a DOS-based system. The installed ROM can be configured and tested using the EZWORKS Installation utility. The DE45X-AR remote boot ROM enables your computer to perform a remote boot using the MOP or RPL protocols.

Digital offers the following remote boot ROMs to be used with the EZWORKS Turbo PCI 10 adapter:

- DE45D-AR, 28-pin remote boot ROM
- DE45F-AR, 32-pin upgradable FLASH remote boot ROM

DE20M-AR Remote Boot ROM

This option ROM is installed on an EtherWORKS 3 Turbo adapter (either DE204 or DE205) in a DOS-based system. The installed ROM can be configured and tested using the EZWORKS Installation utility. This remote boot ROM enables your computer to perform a remote boot using the MOP or RPL protocols.

EtherWORKS Hub 8TX (DELXR) Repeater

This 8-port Class II 100Base-TX repeater complies with the IEEE 802.3u standard. The Hub 8TX is used for 100 Mb/s Ethernet networks. It can link two to eight PCs or workstations using Category 5 unshielded or screened twisted-pair (UTP or ScTP) cables to form a simple, Fast Ethernet LAN. The Hub 8TX also contains a daisy-chain port to connect to another compatible repeater or switch using twisted-pair cable. The Hub 8TX is ready to run with all network operating systems and protocols. A Lifetime Warranty is included.

Fast EtherWORKS PCI 10/100 Adapter

This 32-bit dual-speed adapter uses a single connector for either a 10 Mb/s or a 100 Mb/s IEEE 802.3 Ethernet network connection. The adapter automatically senses and adjusts to either speed. The Fast EtherWORKS PCI 10/100 adapter is software configurable to operate in full-duplex mode, increasing aggregate bandwidth up to 20 Mb/s and 200 Mb/s. Easy installation of this adapter is ensured by using the EZWORKS Installation utility. The adapter supports IEEE 802.3u autonegotiation (DE500-AA) and IEEE 802.3 autosensing (DE500-XA) functions. In addition, the DE500-AA model provides optional boot ROM support (FLASH or OTP) up to 128 KB. The device drivers for the Fast EtherWORKS 10/100 adapter includes NetWare, Windows for Workgroups, Windows NT, Windows 95, PATHWORKS, LAN Manager, LAN Server, Banyan VINES client, SCO OpenServer, UnixWare, Digital UNIX, and OpenVMS. The adapter supports twisted-pair connections. A Lifetime Warranty is included.

EtherWORKS Turbo PCI 10 Adapter

This 32-bit, low-cost 10 Mb/s PCI Ethernet adapter features DMA bus master design with a fast cut-through FIFO buffer (2 x 256B FIFOs). Easy installation of this adapter is ensured by using the EZWORKS Installation utility. The adapter provides optional remote boot ROM interface for RPL, MOP, and other future protocols. The device drivers for the EtherWORKS Turbo PCI 10 adapter include NetWare, Windows for Workgroups, Windows NT, PATHWORKS, LAN Manager, LAN Server, Banyan VINES client, SCO OpenServer, UnixWare, Digital UNIX, and OpenVMS. The DE450-TA adapter supports twisted-pair connections and the DE450-CA adapter supports twisted-pair, ThinWire, and AUI connections. A Lifetime Warranty is included.

EtherWORKS 3 Turbo Adapter

This high-performance, 16-bit ISA adapter is designed to meet client/server needs. The low-cost adapter features 128 KB of on-board buffer RAM that is dynamically allocated for optimal transmit/receive performance. The device drivers for the EtherWORKS 3 Turbo adapter include NetWare, Windows for Workgroups, Windows NT, Windows 95, PATHWORKS, LAN Manager, LAN Server, Banyan VINES client, Packet Driver, SCO OpenServer, UnixWare, Digital UNIX, and OpenVMS. The DE204-AB supports twisted-pair connection and the DE204-AC supports ThinWire, twisted-pair, and AUI connections. A Lifetime Warranty is included.

EtherWORKS Turbo EISA Adapter

This 32-bit Ethernet adapter maximizes throughput without compromising CPU time or network performance. Ideal for intensive server-based applications, this adapter features a fast cut-through FIFO buffer (2x 256B FIFOs). The EtherWORKS Turbo EISA adapter supports full-duplex operation of 20 Mb/s. The device drivers for this adapter includes NetWare, Windows for Workgroups, PATHWORKS, LAN Manager, LAN Server, Banyan VINES client, Packet Driver, SCO OpenServer, UnixWare, Digital UNIX, and OpenVMS. The adapter supports ThinWire, twisted-pair, and AUI connections. A Lifetime Warranty is included.

EtherWORKS PCMCIA Turbo Adapter

This credit card sized adapter is designed to link laptop and notebook systems to 10 Mb/s Ethernet networks quickly and affordably. This adapter for PCMCIA-compliant (Type II) PCs features a highly integrated single-chip design, easy installation, hot-swapping capabilities, and card and socket services. The device drivers for the EtherWORKS PCMCIA Turbo adapter include NetWare, Windows for Workgroups, PATHWORKS, LAN Manager, LAN Server, Banyan VINES client, Packet Driver, SCO OpenServer, UnixWare, Digital UNIX, and OpenVMS.

DEC FDDIcontroller/PCI Adapter

As the first PCI FDDI adapter in the industry, this custom high-performance, low-cost 32-bit adapter features on-board CPU for SMT processing, DMA chip, and 1 MB buffer. Full-duplex capability extends bandwidth to 200 Mb/s. The device drivers for the DEC FDDIcontroller/PCI adapter includes NetWare, Windows for Workgroups, Windows NT, Windows 95, PATHWORKS, LAN Manager, LAN Server, Banyan VINES client, SCO OpenServer, UnixWare, Digital UNIX, and OpenVMS. This adapter can be used with PCI-based Alpha, Intel, MIPS, and PowerPC systems. Four models are offered: UTP SAS and DAS (DEFPA-UB, DEFPA-MB), and MMF SAS and DAS.(DEFPA-AB, DEFPA-DB). A Lifetime Warranty is included.

General Information

DEC FDDIcontroller/EISA Adapter

This custom high-performance, low-cost 32-bit adapter features on-board CPU for SMT processing, DMA chip, and 1 MB buffer. Full-duplex capability extends bandwidth to 200 Mb/s. The device drivers for the DEC FDDIcontroller/EISA adapter include NetWare, Windows for Workgroups, Windows NT, Windows 95, PATHWORKS, LAN Manager, LAN Server, Banyan VINES client, SCO OpenServer, UnixWare, Digital UNIX, and OpenVMS. This adapter can be used with Alpha, Intel, MIPS, and PowerPC systems. Four models are offered: UTP SAS and DAS (DEFEA-UA, DEFEA-MA), and MMF SAS and DAS.(DEFEA-AB, DEFEA-DA). A Lifetime Warranty is included.

Ordering Information

To order these products, contact an Authorized Digital Distributor or Digital sales representative. For more information, call 800-457-8211 in the U.S. and Canada, 508-692-2562 in other locations, or your local sales office.

Glossary

8-pin MJ connector

Most common terminator for twisted-pair wiring.

10Base-T

IEEE specifications for 10 Mb/s Ethernet using unshielded or screened twisted-pair cable (UTP or 100-ohm ScTP). The maximum length of cable for a point-to-point connection is 100 meters.

100Base-TX

IEEE specifications for 100 Mb/s Ethernet using unshielded or screened twisted-pair cable (UTP or 100-ohm ScTP). The maximum length of cable for a point-to-point connection is 100 meters.

bus topology

A network topological arrangement where only one path exists between any two nodes and data transmitted by any node is concurrently available to all other nodes on the same transmission medium.

configuration

The way to set up a computer, server, or local area network.

connection

A logical binding between two or more users of an interconnection service.

Glossary

daisy-chain

A serial connection of devices with or without a faceplate. On the DEL2X, the straight-wired port (//) on Port 1 and Port 2 can be used to connect to other switches or compatible hubs in a daisy-chain configuration.

Ethernet

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

IEEE 802.3 standard

Standard for the physical and electrical connections in local area networks (LANs) developed by the IEEE. The IEEE 802.3u standard covers these same issues for 100 Mb/s networks.

LED

Light-emitting diode. A semiconductor device used as an indicator or control light in electronic hardware. On the front panel of the DEL2X, LEDs are used to monitor a switch or network condition.

local area network (LAN)

A group of interconnected computers and support devices.

screened twisted-pair (ScTP)

100-ohm screened twisted-pair cable.

unshielded twisted-pair (UTP)

Cable composed of two insulated wires twisted together to reduce electrical interference; used in common telephone cord.