



# **24 Port 10/100Mbit/s Ethernet Switch with Optional Fiber Uplink Port**

## **Product User Guide**

### **Introduction**

This Tyco auto-negotiating high-speed Ethernet workgroup switch with optional fiber uplink enables clusters of up to 24 users to have high speed, low latency LAN connections to the corporate network.

Local management functions such as control of port speed, duplex mode, QoS and VLAN membership are supported.

The optional fiber uplink module enables the switch to be connected using a fiber link to servers, routers and other devices over distances of up to 2km for multimode or 15km for singlemode.

### **Package Contents**

Unpack the contents and verify them against the items below:-

1. 24 Port Ethernet Switch with fiber uplink option port
2. AC Power cord
3. Four rubber feet
4. Rack mounting kit (2 x brackets and 4 x screws)
5. RS-232 cable

If any item is damaged or missing, please contact your dealer.

## Features

- 24 x Auto-sensing 10/100Base-T RJ-45 Ethernet ports
- 1 x Option slot for 100Mbit/s fiber uplink module that operates over distances of up to 2Km (multi-mode) or 15 Km (single-mode) fiber
- Meets IEEE 802.3, .3u and .3x Ethernet standards
- Uses store-and-forward switching to separate collision domains and abnormal packet filtering
- Local management using an RS232 console port
- Management enables detailed control of each port
- Auto-MDI/MDI-X support on every RJ-45 port
- Support for 25 port-based VLANs
- Quality of service with 2 queue levels per port
- Integral 4K MAC address table automatic learning
- Backplane bandwidth up to 4.8Gbit/s
- Supports back-pressure & flow control
- Numerous diagnostic LED indicators
- Internal AC/DC power unit
- Stand-alone or mountable in 19" racking
- FCC Class A, CE mark certification

### **Technical Support and Service**

If you require technical advice for these products, please see the FAQ pages on the web address <http://www.lan-electronics.com>

If you still have problems, please contact us using the support form located on the above web site.

If you have a faulty unit then please contact us through the web site to arrange for a replacement unit. The faulty unit must be returned to us as part of the replacement agreement.

## Front Panel

The front panel of the switch has 24 x RJ-45 Shielded/Unshielded Ethernet Ports, an optional fiber Ethernet 100Base-FX uplink port, a console management port and an array of LED indicators.

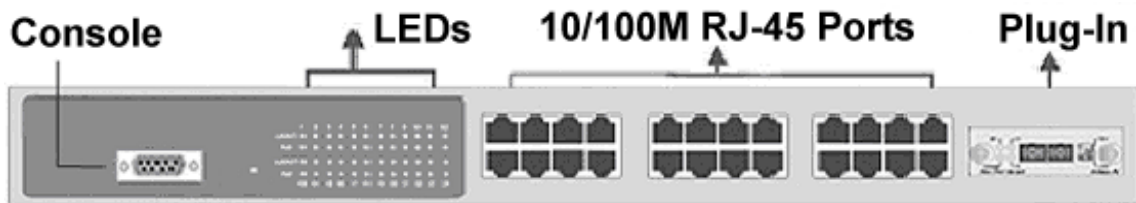


Figure 1 - Switch with optional fiber module fitted

- **RJ-45 Ports.** These Ethernet RJ-45 ports support both shielded and unshielded cabling systems. The port auto-negotiates the 10/100Mbit/s network speed or can be forced by the console management interface into either 10Mbit/s or 100Mbit/s at either full-duplex or half-duplex. Each port supports Auto-MDI/MDI-X which allows either straight through or cross-over cables to be used.
- **100FX Fiber Port.** This optional, field installable plug-in module provides the fiber link to the distant media converter, NIC card or Ethernet switch. The port operates in either full duplex or half duplex modes depending on the setting of DIP switch on the panel of the plug-in module. Modules with SC, ST and MT-RJ fiber optic connectors are available. See page 6 for order codes.
- **Console Port.** A PC or other RS232 terminal is connected to this port to enable detailed management of the switch. See the documentation on the web site for full information.

## Rear Panel

The rear panel contains the 110/240v AC 50/60Hz power socket and power switch. Note that the fusing is external to the switch. To disconnect power, remove the plug.

## Installation

### ***Copper and Fiber Cabling Guidelines***

1. The RJ-45 ports can be connected to unshielded twisted pair (UTP) or shielded twisted pair (STP) cabling systems compliant with the IEEE 802.3u 100Base TX standard for Category 5. The cable between the switch and the link partner device (router, hub, workstation, etc.) must be less than 100 metres long.
2. The fiber link on the optional multi-mode module must use either 50 or 62.5/125 micron multi-mode fiber cable. You can link two devices over a distance of up to 2 kilometres.
3. The fiber link on the optional single-mode module must use 8/125 or 9/125 micron single-mode fiber cable. You can link two devices over a distance of up to 15 kilometres in full duplex mode or 412 metres (1,352 ft.) in half-duplex.
4. The console port is an RS232 port and should not be used for cable distances greater than 20 metres.

### ***Desktop Installation***

1. Locate the switch in a clean, flat and safe position that has easy access to AC power. Ensure that there is sufficient clearance around the switch to enable air circulation.
2. Fit the self-adhesive rubber feet to the underside of the switch.

### ***Installing The Switch Into a 19" Rack***

1. Identify the required locations and ensure that there is at least 10cm clearance at the front and rear of the switch to allow cables to be accommodated.
2. Fit the supplied rackmount bracket on both side plates of the switch using a screwdriver.
3. Locate the switch into the rack and align the holes in the brackets with holes in the rack vertical strips. Secure the switch using the supplied bolts.

### ***Installing The Optional Fiber Uplink Module***

1. Remove AC power from the switch.
2. Remove the two screws securing the front panel blanking plate.
3. Observe anti-static handling precautions and carefully fit the plug-in module into the switch and secure it using the thumb screws.

### ***Completing The Installation***

When the switch has been installed as specified above, then the unit can be configured as detailed below:-

1. Apply AC power to the switch. The green Power LED on the front panel should light.
2. Connect the Cat. 5/5e twisted pair cables from the network partner devices to the RJ-45 ports on the front panel of the switch. When a connection is obtained, the green LK/ACT LED associated with the port will light.
3. If the fiber uplink is used, then connect the fiber link to the partner device (media converter, fiber NIC card or fiber switch etc). Ensure that the fiber uplink is set in the correct duplex mode (default = Full Duplex) using the front panel switch on the module. Verify that the green Link LED on the fiber module is lit which indicates that the optical link is valid.
4. If advanced modes such as port-based VLANs are needed, then use the console port to configure the switch.
5. If legacy devices that do not support auto-negotiation are connected to the RJ-45 ports, then it may be necessary to program the switch to match the speed and duplex modes of the partner devices.
6. Note that auto-negotiation can take up to 30 seconds to complete depending on the partner device.

## Optional Fiber Uplink Port

This switch can support one plug-in optical port that is located on slides in the front panel.

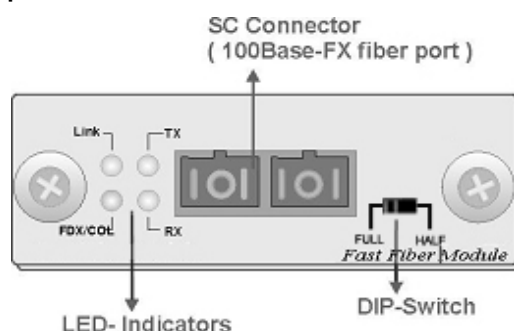


Figure 2 - Plug-in SC option module

The option module is installed as described on page 4. The only configuration needed is the Full/Half duplex switch on the front panel. The default setting is **Full** and this will work for most applications.

The following plug-in fiber modules are available as field installable accessories for this switch:-

Product	Part Number
Module with SC multimode connectors	0-1591050-0
Module with ST multimode connectors	0-1591052-0
Module with MT-RJ multimode connector	0-1591054-0
Module with SC singlemode connectors	0-1591056-0

Table 1 - Uplink Option Ports

The optional modules operate at the 1310nm optical wavelength. The fiber size used for multimode links is 50/125 or 62/125 micron and the fiber size used for singlemode links is 8/125 or 9/125 micron.

### Optical Link Calculations

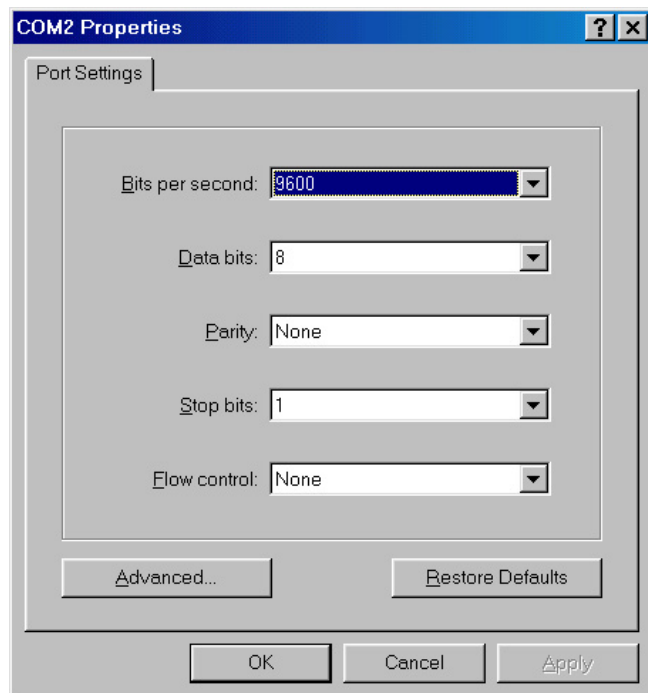
The maximum distance between any two fiber optic devices is determined by a number of factors including optical link loss, the type and number of patch cords and joints in the link, the launch power of the transmitter and the sensitivity of the receiver. These variables make calculating the maximum working distance between two units quite difficult and so it is best to design networks using optical loss budgets rather than using just working distance.

## Programming The Switch

The switch can be controlled using a PC via the front panel RS232 console port and the supplied cable. When the connection between Switch and PC is complete, turn on the PC and run a terminal emulation program such as HyperTerminal and configure its communication parameters to match the following default characteristics of the console port:

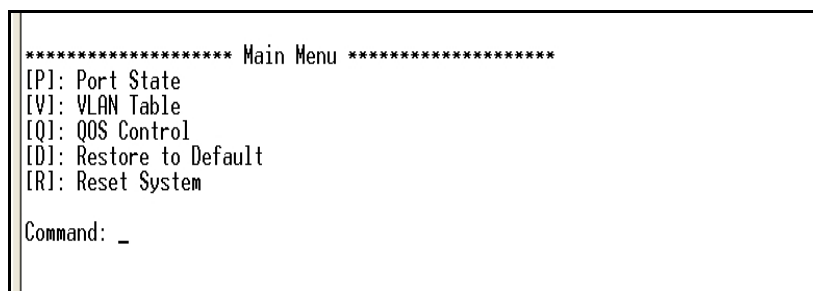
*Com 1 or Com 2*

Baud Rate = 9600 bps  
Data Bits = 8  
Parity = None  
Stop Bits = 1  
Flow Control = None



**Figure 3. Settings the PC communication parameters**

Press <CR> return key several times to view the main start-up screen. There are five key controls in the main menu:



**Figure 4 - Main Menu Screen**

- (P) = Port State lists the status and settings of the selected port(s)
- (V) = Port based VLAN settings
- (Q) = Port based QoS settings
- (D) = Restore factory default settings
- (R) = Reset the switch

### Port State

This menu enables the detail configuration of each switch port and also lists the entire port status of the switch.

```
***** Main Menu *****
[P]: Port State
[V]: VLAN Table
[Q]: QOS Control
[D]: Restore to Default
[R]: Reset System

Command: p

===== Port State =====
[1..24]: Port State Config
[L]: List All Port State
[R]: Restore to Default Setting
[Q]: Previous Menu

Command:
```

**Figure 5 - Port State Menu**

To modify the status of a port, first access the Port State menu and then enter the number of the RJ-45 port (1..24) to be configured. A specific port menu is then displayed with the following options:-

- (M) Select to toggle between 10 or 100Mbit/s port speeds
- (D) Select to toggle between port half or full duplex models
- (N) Select to toggle between Force Negotiation and Auto-Negotiation
- (S) Save the port settings
- (Q) Exit to the previous menu

```
===== Port State =====
[1..24]: Port State Config
[L]: List All Port State
[R]: Restore to Default Setting
[Q]: Previous Menu

Command: 1

----- Port-01 -----
[M]: 100/10 Mbps
[D]: Full/Half Duplex
[N]: Auto/Force Negotiation
[S]: Save Port Setting
[Q]: Previous Menu

Port-01 [100 Mbps, Full Duplex, Auto Negotiation]: _
```

**Figure 6 - Port 1 Configuration**

When the required option is selected, a summary of the port status is displayed as shown in Figure 6.

### List All Port State

This is a sub-menu under Port State and shows the configuration of every port on the switch. To view the details, press the **L** key.

```
===== Port State =====
[1..24]: Port State Config
[L]: List All Port State
[R]: Restore to Default Setting
[Q]: Previous Menu

Command: l

                10                20
                1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4
-----
100(H)/10(T) Mbps Speed:  H H H H H H H H H H H H H H H H H H H H H H H H
(F)ull/(H)alf Duplex:    F F F F F F F F F F F F F F F F F F F F F F F F
(A)uto/(F)orce Negotiation: A A A A A A A A A A A A A A A A A A A A A A A A
```

Figure 7 - Port List Display

This menu details the port status for the switch. If a fibre module is fitted then the list will show 25 ports, otherwise just 24 ports will be displayed as shown above.

The optical module settings cannot be changed from the console as the speed is fixed at 100Mbit/s and the duplex control is via the module front panel switch.

### Restore to Default Setting

This is a sub-menu under Port State and allows all the ports to be reset to the default 100Mbit/s, Full duplex, Auto-Negotiation mode. To reset the ports, press the **R** key.

### Previous Menu

This is a sub-menu under Port State and is used to move back up to the Main Menu. To move to the Main menu, press the **Q** key.

## VLAN Table

The switch supports up to 25 Port Based VLANs that can be configured using the console. To access the VLAN control menu, go to the top level menu and select option **V** and the VLAN table menu is displayed.

```
***** Main Menu *****
[ P ]: Port State
[ V ]: VLAN Table
[ Q ]: QOS Control
[ D ]: Restore to Default
[ R ]: Reset System

Command: v

===== VLAN Table =====
[ 1..24 ]: VLAN Table Config
[ L ]: List VLAN Table
[ R ]: Restore to Default
[ Q ]: Previous Menu

Command: _
```

Figure 8 - Accessing the VLAN Table menu

## VLAN Table Configuration

In this menu the user can insert ports or delete ports from a VLAN. Enter the number of the VLAN to modify (1..24), press the <CR> or enter key and a new menu is displayed as in Figure 9 below.

```
===== VLAN Table =====
[ 1..24 ]: VLAN Table Config
[ L ]: List VLAN Table
[ R ]: Restore to Default
[ Q ]: Previous Menu

Command: 1

----- VLAN-01 -----
[ +1..+24 ]: Insert Port
[ -1..-24 ]: Delete Port
[ +A ]: Insert All
[ -A ]: Delete All
[ S ]: Save Port Setting
[ Q ]: Previous Menu

VLAN-01 [ 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24 ]:
```

Figure 9 - VLAN Configuration

1. To add a port to the selected VLAN, enter the “+” key followed by the port number and then the <CR> or enter key. The ports that are members of the VLAN are displayed in a summary line. Ports can be deleted from VLAN membership by using the “-“ key followed by the port number.
2. All ports can be inserted or deleted from the selected VLAN by using the “+” and then “A” or “-“ and then A.
3. Save the VLAN settings by using the S key.
4. Go back to the VLAN main menu by using the Q key.

### List VLAN Table

To show the port membership of each of the 24 VLANs, use the L option in the main VLAN menu. This menu shows the mapping of each port against the VLANs.

```
===== VLAN Table =====
[1..24]: VLAN Table Config
[L]: List VLAN Table
[R]: Restore to Default
[Q]: Previous Menu

Command: l

      1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4
-----
01: . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
02: * * * * * . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
03: . . . . * * * * . . . . . . . . . . . . . . . . . . . . . . . . . . . .
04: . . . . . . . . . . * * * * * . . . . . . . . . . . . . . . . . . . . .
05: . . . . . . . . . . . . . . * * * * * . . . . . . . . . . . . . . . . .
06: . . . . . . . . . . . . . . . . . . * * * * * . . . . . . . . . . . . .
07: . . . . . . . . . . . . . . . . . . . . . . * * * * * . . . . . . . . .
08: . . . . . . . . . . . . . . . . . . . . . . . . . . * * * * * . . . . .
09: . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . * * * * *
```

Figure 10 - VLAN list display

### Restore to Default

This option resets all the VLAN mapping to the default state of all ports being members of VLAN 1. Navigate to the VLAN main menu and select option R. This option will restore the default VLAN membership without requesting an acknowledgement.

### QOS Control

The switch allows basic prioritization of packets through the switch using a central dual queue system. Each port can be programmed to forward all traffic at either low priority or high priority. These priorities are assigned on a per-port basis and are not dependent on the QoS or ToS bits within the packet. A typical application of this would be to allow high priority VoIP traffic on a port to be forwarded by the switch in preference to traffic from a standard PC connected on another port.

```
***** Main Menu *****
[P]: Port State
[V]: VLAN Table
[Q]: QOS Control
[D]: Restore to Default
[R]: Reset System

Command: q

===== QOS Control =====
[P]: Priority Setting
[C]: Pause Control
[L]: List QOS Setting
[R]: Restore to Default
[Q]: Previous Menu

QOS OFF: _
```

Figure 11 - QoS Control Screen

This QoS screen is selected from the main menu using the Q option.

### Priority Setting

The priority level can map the selected port to use either the high or low priority queue. This control is applied on a per-port basis. To configure the priority setting, select P from the QoS Control menu. The screen below will be displayed.

```
===== QOS Control =====
[P]: Priority Setting
[C]: Pause Control
[L]: List QOS Setting
[R]: Restore to Default
[Q]: Previous Menu

QOS OFF: p

----- Priority Setting -----
[+1..+24]: Insert Port
[-1..-24]: Delete Port
[+A]: Insert All
[-A]: Delete All
[S]: Save Port Setting
[Q]: Previous Menu

Priority Setting [...]: _
```

Figure 12 - QoS Priority menu

1. To set a port at high priority, enter the “+” key and then the port number followed by the <CR> or enter key. The screen will show the port number in square brackets. Each time a port is set at high priority, the list in the brackets will be modified to show the ports in high priority mode. If one or more ports is in the high priority mode, then the QoS Control menu will show QoS On.
2. To set a port at low priority, enter the “-” key and then the port number followed by the <CR> or enter key. This command will only work with ports that are high priority (listed within the square brackets). If all ports are in the low priority mode, then the QoS Control menu will show QoS Off.
3. To set all ports at high priority use the “+” key and then “A” followed by the <CR> or enter key. To set all the ports at low priority, use the “-” key and then “A” followed by the <CR> or enter key.
4. Save the QoS settings using the “S” key.
5. Exit to the QoS Control menu using the “Q” key.

### Pause Control

When the priority mode is active, then packets can be delayed from being processed by use of the pause control. This pause control is only relevant when operating in the full duplex mode. To enable or disable the pause control on a port, select the option C in the QoS Control menu and then add or delete ports using the same “+” and “-” key methods as described above.

When the pause control on a port is enabled, then it will be shown in the List QoS setting map with the letter E. When the pause control is disabled, it will be shown in the List QoS screen with the letter D.

Note that for pause control to function properly, both ends of the link must be capable of using pause control. Some legacy units do not support pause control.

### List QoS Setting

This screen displays the QoS status of the unit, the port priority assignment and the pause control setting.

```
===== QoS Control =====
[PI]: Priority Setting
[CI]: Pause Control
[LI]: List QoS Setting
[RI]: Restore to Default
[QI]: Previous Menu

QoS OFF: 1

          1 2 3 4 5 6 7 8 9 0 10 1 2 3 4 5 6 7 8 9 0 20 1 2 3 4
-----
Port Priority: L L L L L L L L L L L L L L L L L L L L L L L L L L
Pause Control: D D D D D D D D D D D D D D D D D D D D D D D D D D

===== QoS Control =====
[PI]: Priority Setting
[CI]: Pause Control
[LI]: List QoS Setting
[RI]: Restore to Default
[QI]: Previous Menu

QoS OFF: _
```

Figure 13 - List QoS Setting screen

### Restore to Default

The command in the QoS Control menu resets the priority and pause controls to the default state or low priority and disabled, respectively.

### Restore to Default

This Main Menu command resets the following elements of the switch to the factory default state:-

- Port State
- QoS Priority and Pause Controls
- VLANs

Note that this command is implemented immediately without offering a confirmation message.

### Reset System

This Main Menu command is used to reset the switch without changing the programmed settings. During the reset, the firmware version of the switch is displayed.

Activate the reset by selecting R from the main menu. Note that this command is implemented immediately without offering a confirmation message.

## LED Indicators

The diagnostic LED indicators located on the front panel of the switch provide real-time information about switch status. The following table describes the LED status and meaning.

	LED	Color	Function
<b>UTP PORT</b>	Power	Green	Power on
	LK/ACT	Green	Ethernet link pulses are present
		Blinks	The port is transmitting or receiving packets
		Off	No device is attached or faulty cable
	Full	Orange	The port is in full-duplex mode
		Off	The port is in half-duplex mode

### Optional Fiber Plug-In Module

	LED	Color	Function
<b>FIBER PORT</b>	TX	Blinks	Fiber port is transmitting data
		Off	No data is being transmitted
	RX	Blinks	Fiber port is receiving data
		Off	No data is being receiving
	Link	Green	The port is connected to a valid 100Base-FX fiber partner unit
		Off	No fiber connection is detected
	FDX/COL	Orange	The port is in full-duplex mode
		Blinks	Collisions in half-duplex mode
		Off	No device attached or in half duplex

Table 1 - LED Status and description

## Trouble Shooting

### ***Power***

1. Verify that the AC power is present and that the external fusing is correct and compliant with national requirements. The green Power LED should be lit to indicate that the switch is powered.

### ***Data Problems***

1. Ensure that the Ethernet partner device (switch, router, NIC etc) connected to the RJ-45 UTP port of the switch is set for auto-negotiation. If this Ethernet partner device does not support auto-negotiation, then you need to program that device to operate at 100Mbit/s half duplex or 10Mbit/s half duplex. If this is not possible, then the switch can be programmed to apply the required speed and duplex modes to match the legacy partner equipment.
2. If the switch and the partner device cannot auto-negotiate then the units automatically revert to the lower level of half-duplex operation. This issue is common to all auto-negotiating Ethernet devices and symptoms of incorrect negotiation include data errors and fragmented packets.
3. Auto-negotiation can take up to 30 seconds to complete, depending on the partner device.
4. Ensure that the switch is not overheating due to obstructed airflow around the side vents.

### ***Optional Fiber Uplink Module***

1. Select the proper fiber cable for your network. The multi-mode module must use multi-mode fiber cable and the single-mode module must use single-mode fiber cable. See page 4 for the supported cable types and installation settings.
2. Ensure that the optical loss budget of the fiber uplink is within the limits specified on page 18. Note that optical patch cables and other joints and splices can introduce additional optical losses that reduce the working distance of the fiber link.

If you still have problems and need further advice, please see Technical Support section on page 2 for more information.

## Product Specification

<b>Standards Compliance</b>	IEEE 802.3 10Base-T Ethernet IEEE 802.3u 100 BASE-TX Fast Ethernet IEEE 802.3u 100 Base-FX Fast Ethernet ANSI/IEEE standard 802.3 N-way Auto-Negotiation
<b>RJ-45 Port Mode</b>	Auto-MDI/MDI-X
<b>Max Forwarding Rate</b>	14,880 pps Ethernet port (10Mbit/s) 148,800 pps Fast Ethernet port (100Mbit/s)
<b>LED Indicators</b>	Power, UTP Ports: Link Activity, Full
<b>Ethernet LAN Copper Network Cable</b>	10Base-T: 2-pair UTP/STP Cat. 3, 4, 5 cable EIA/TIA-568 100-ohm 100Base-TX: 2-pair UTP/STP Cat. 5 cable EIA/TIA-568 100-ohm
<b>Optional Fiber Link Max. Distance</b>	ST/SC/MT-RJ Multi-mode: Half-duplex: 412m, Full-duplex: 2Km SC Single-mode: Half-duplex: 412m, Full-duplex: 15Km.
<b>Dimensions</b>	440mm x 165mm x 44mm (W x D x H)
<b>Weight</b>	2.5Kg
<b>Operating Temperature</b>	0°C to 45°C (32°F to 113°F)
<b>Operating Humidity</b>	10% to 90% (Non-condensing)
<b>Power Supply</b>	Internal 100v to 240v AC, 50/60Hz auto-ranging, externally fused.
<b>Power Consumption</b>	19 Watts (Max.)
<b>EMI</b>	FCC Class A, CE Mark

### **Optical Port Specifications**

<b>Plug-In Fiber Ethernet Module Type</b>	<b>Average Launch Power dB</b>	<b>Average Power Loss Budget dBm</b>	<b>Average Sensitivity dB</b>
Multimode Converter (SC)	-18dB	12dBm	-30dB
Multimode Converter (ST)	-18dB	12dBm	-30dB
Multimode Converter (MT-RJ)	-16dB	14dBm	-30dB
Singlemode Converter (SC)	-18dB	12dBm	-30dB

**Table 3 - Optical Specifications**

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