



24 and 16 Port 10/100Mbit/s Ethernet Smart Switch II with Optional Fibre Uplink Port

-

Product User Guide

Introduction

This Tyco auto-negotiating high-speed Ethernet workgroup switch with optional fibre 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 Smart Switch II also supports uplink modules that can provide both 100Mb/s and 1000Mb/s fibre connectivity.

The optional fibre uplink modules enable the switch to be connected using a fibre link to servers, routers and other devices.

Package Contents

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

1. 16 or 24 Port Ethernet Switch II
2. AC Power cord
3. Four rubber feet
4. Rack mounting kit (2 x brackets and 4 x screws)
5. RS-232 cable
6. Instruction manual

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

Features: -

- 24 or 16 x Auto-sensing 10/100Base-T RJ-45 Ethernet ports
- 1 x Option slot for 100Mb/s and dual 1000 Mb/s uplink module.
- 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 26 port-based VLANs (18 for 16 port switch)
- 3 Modes of Quality of service with 2 queue levels per port
- Integral 8K MAC address table automatic learning
- Backplane bandwidth 8.8 or 7.2Gbit/s (full wire speed)
- 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 or 16 x RJ-45 Ethernet Ports, an optional fibre uplink port, a console management port and an array of LED indicators.

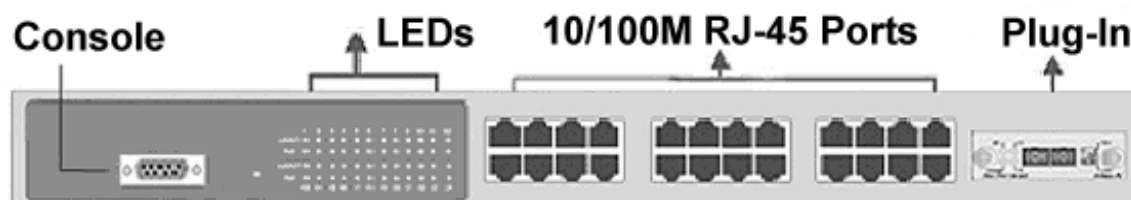


Figure 1 – Switch with optional fibre module (SC Connector) fitted

Ports

- **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 crossover cables to be used.
- **Fibre Port Uplink.** This optional, field installable plug-in module provides the fibre link to the distant media converter, NIC card or Ethernet switch. Modules are available that provide support for 100Mb/s Fx (multimode or single mode) and also dual Gigabit Sx and Lx. See page 8 for order codes.
- **Console Port.** A PC or other RS232 terminal can be connected to this port to enable detailed management of the switch. See Page 11 on for details.

Rear Panel

The rear panel contains the 100/240v AC 50/60Hz power socket and power switch. Note that the fusing is external to the switch. To disconnect power from the switch remove the plug from rear.

Installation

Copper and Fibre 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 100 Fx fibre link on the optional multi-mode module must use either 50 or 62.5/125 micron multi-mode fibre cable. You can link two devices over a distance of up to 2 Km. ST or SC connector types are supported.
3. The 100 Fx fibre link on the optional single mode module must use 8/125 or 9/125-micron single-mode fibre cable. You can link two devices over a distance of up to 30 Km in full duplex mode or 412 m (1,352 ft.) in half-duplex. The single mode module uses the SC type connector.
4. The dual Gigabit fibre Sx or Lx complies with IEEE802.3z. The SC type connector is used.
 - Sx:** Module must use either 50 or 62.5/125 micron multimode fibre cable. Supports distances up to 500 metres.
 - Lx:** Module must use either 8/125 or 9/125-micron single mode fibre cable. Supports distances up to 10 Km.
5. The console port is an RS232 port and should not be used for cable distances greater than 20 m.

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 rack mount 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 Fibre 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 thumbscrews.

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 fibre uplink is used, then connect the fibre link to the partner device (media converter, fibre NIC card or fibre switch etc). Verify that the green Link LED on the fibre 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 RJ45 ports then it may be necessary to configure 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 Fibre Uplink Port

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

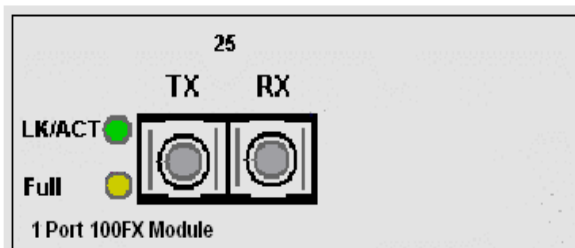


Figure 2 – 100 Fx Plug-in SC option module

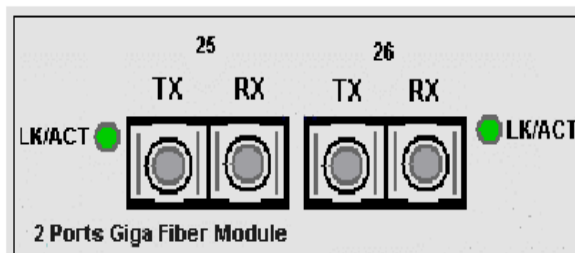


Figure 3 Dual Gigabit Plug in module

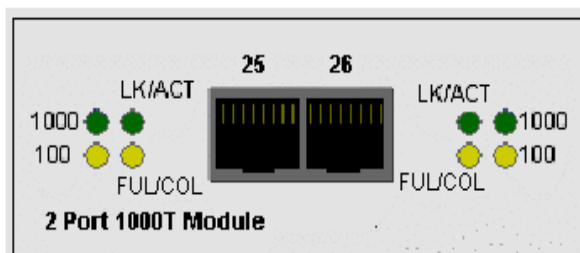


Figure 4 – Dual Gigabit Copper Module

These option modules are installed as described on page 6.
The following plug-in fibre modules are available as field installable accessories for this switch: -

Product	Part Number
100 Fx Module with SC multimode connectors	0-1591094-0
100 Fx Module with ST multimode connectors	0-1591095-0
100 Fx Module with SC singlemode connectors	0-1591096-0
Dual Gigabit Sx Multimode SC connectors	0-1591097-0
Dual Gigabit Lx Singlemode SC connectors	0-1591098-0
Dual Gigabit Copper Module 1000BaseT	2-1591019-0

Table 1 - Uplink Option Ports

Optical Link Wavelength

The 100 Fx optional modules operate at the 1310nm optical wavelength. The Gigabit Lx Singlemode module operates at 1310nm and the Gigabit Sx multimode module operates at 850nm optical wavelength.

Optical Link Calculations

The maximum distance between any two fibre 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.

Dual Gigabit 1000BaseT copper module

The RJ-45 will auto-negotiate 100Base-TX and Gigabit 1000T connections. Support for Auto MDI/MDIX is also provided. It should be noted that Gigabit 1000T (1000Mbps) connection must use Cat-6 or Cat5-E twisted cable pair cable. If use cat-5 cable is used then support 100Mbps link speed is available only. The available link distance is up to 100Meters.

Programming The Switch

The switch can be managed 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

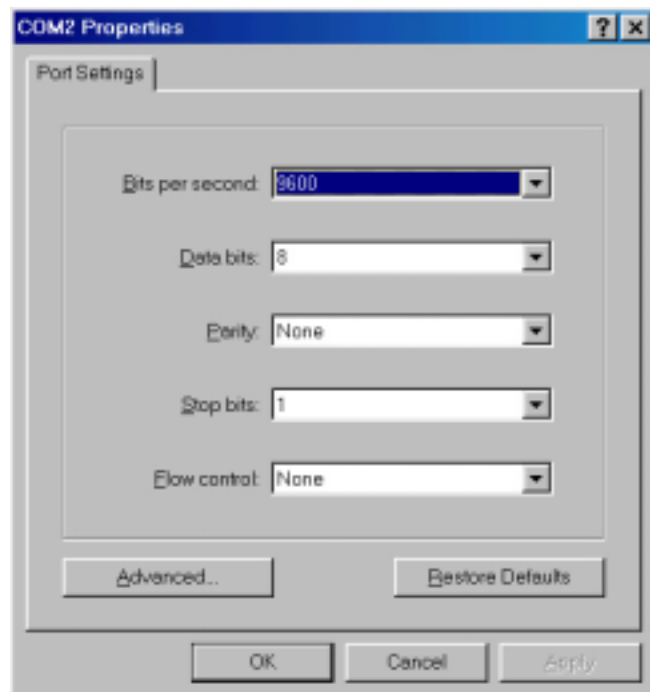


Figure 5. Settings the PC communication parameters

Press <CR> return key several times to view the main start-up screen :-

```
Tyco 24 Port Smart switch          Tyco          Version: 1.01
-----
Main Menu
-----
[1] Port Status
[2] Port Configuration
[3] Trunk Configuration
[4] Trunk Status
[5] QoS
[6] Port Tagging Control
[7] System Control
[8] VLAN Member Setup
[9] Save
-----
Function Key
To select menu item, type item number. [Enter]Refresh Screen
_ |
```

Figure 6 - Main Menu Screen

There are nine key controls in the main menu: -

- (1) = Port Status - lists the status and settings of the selected port
- (2) = Port Configuration - changes settings on a port
- (3) = Trunk configuration - changes trunk settings on the switch
- (4) = Trunk status - displays trunk settings of the switch
- (5) = QOS settings – changes QoS settings for the switch
- (6) = Port Tagging Control - configures the priority tag for the port
- (7) = System Control - allows configuration of global switch settings
- (8) = VLAN Member Setup - configuration of port based VLANs
- (9) = Save - saves the configuration that a user has made

Port State

This menu lists the entire port status of the switch. From the main menu type number 1 and the port status menu will be displayed.

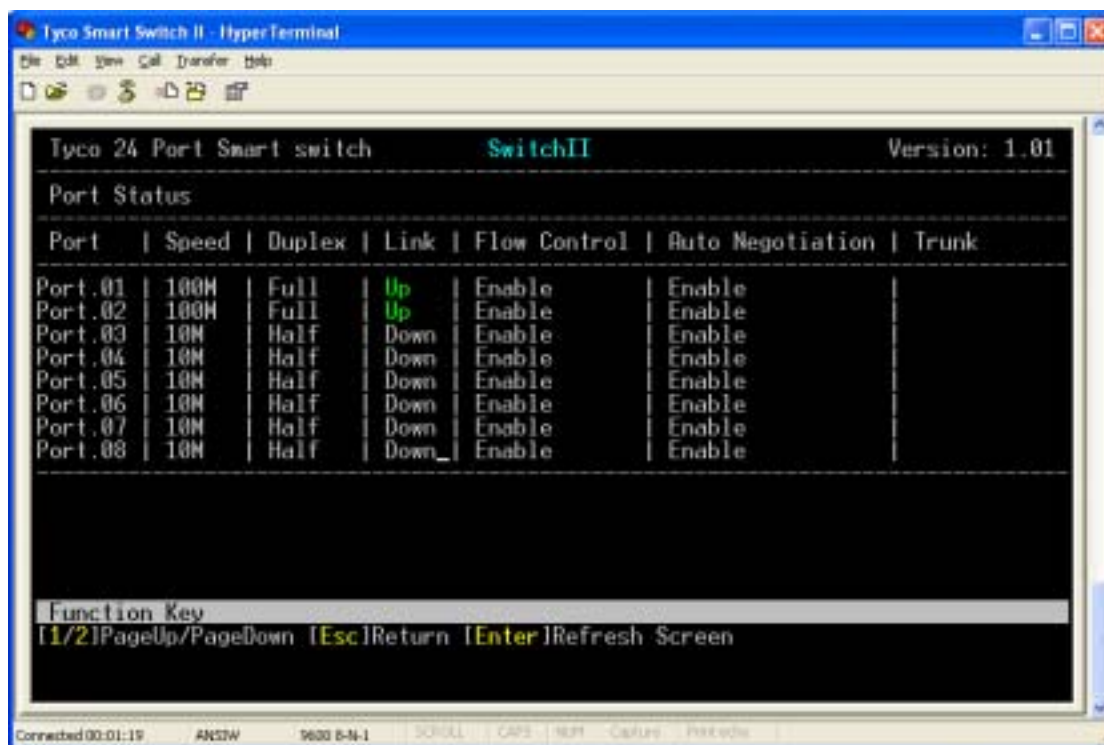


Figure 7 - Port Status Menu

Speed	Displays the speed that the port has connected at
Duplex	Displays if the port is connected at Full or Half Duplex
Link	Displays if the port is connected to active equipment
Flow control	Displays if flow control is enabled or disabled on a port
Auto Negotiation	Displays if Auto Negotiation is enabled on a port
Trunk	Displays if a port belongs to a trunk group

Port Configuration

This Menu allows for the configuration of all the ports on the switch. From the main menu select menu item **2** Port Configuration. The following menu is displayed: -

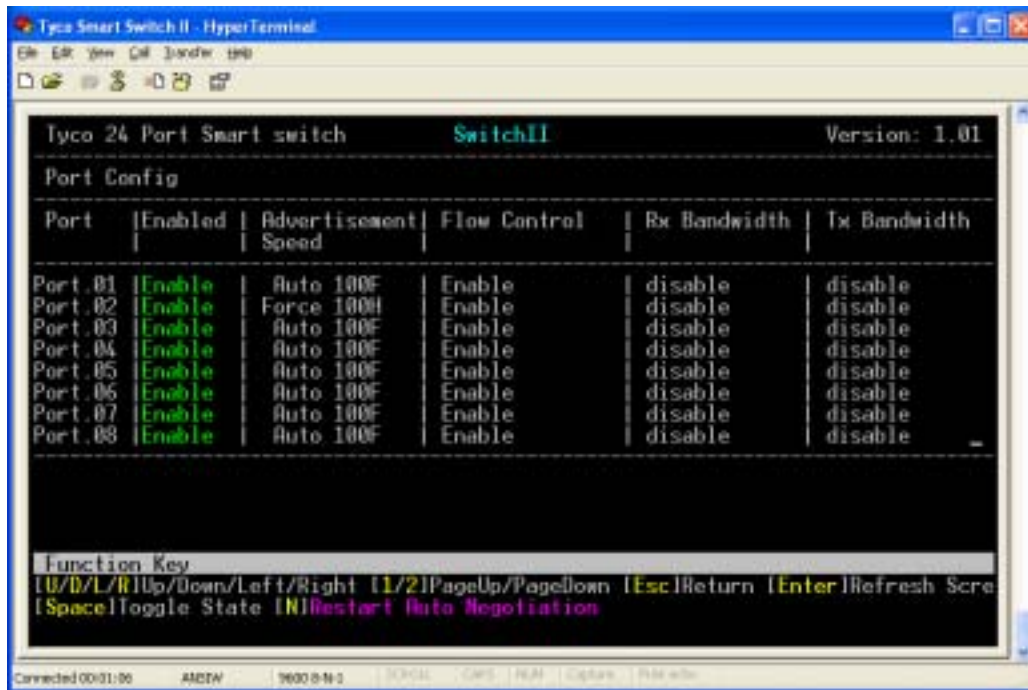


Figure 8 - Port 1 Configuration

The function keys are listed at the bottom of the page these are: -

- U** - This moves the cursor up
- D** - This moves the cursor down
- L** - This moves the cursor Left
- R** - This moves the cursor

1 - Moves up a page and shows previous list of ports

2 - Moves down a page and shows next list of ports

Esc - Displays previous menu

Enter - Refreshes information displayed on that page

Space - Changes the state of the selected menu item

N - Causes the switch to refresh and restart auto-negotiation. It is necessary to select this if any changes have made to the port speed or duplex mode.

The configurable items are shown in the table below :-

Port	Selects the port to be configured
Enabled	Enables and disables the selected port
Advertisement Speed	Configures the speed of the selected port or sets the port for auto negotiation.
Flow control	Enables flow control on the selected port
Rx Bandwidth	Sets the received bandwidth on the selected port
Tx Bandwidth	Sets the transmitted bandwidth of the selected port

Trunk configuration

The Smart Switch II supports up to 8 trunk groups this allows for the “virtual” combining of network ports to provide a high bandwidth link between switches. Up to 4 ports can be combined in this way.

To access this menu select **3** from the main menu and the following menu is displayed: -

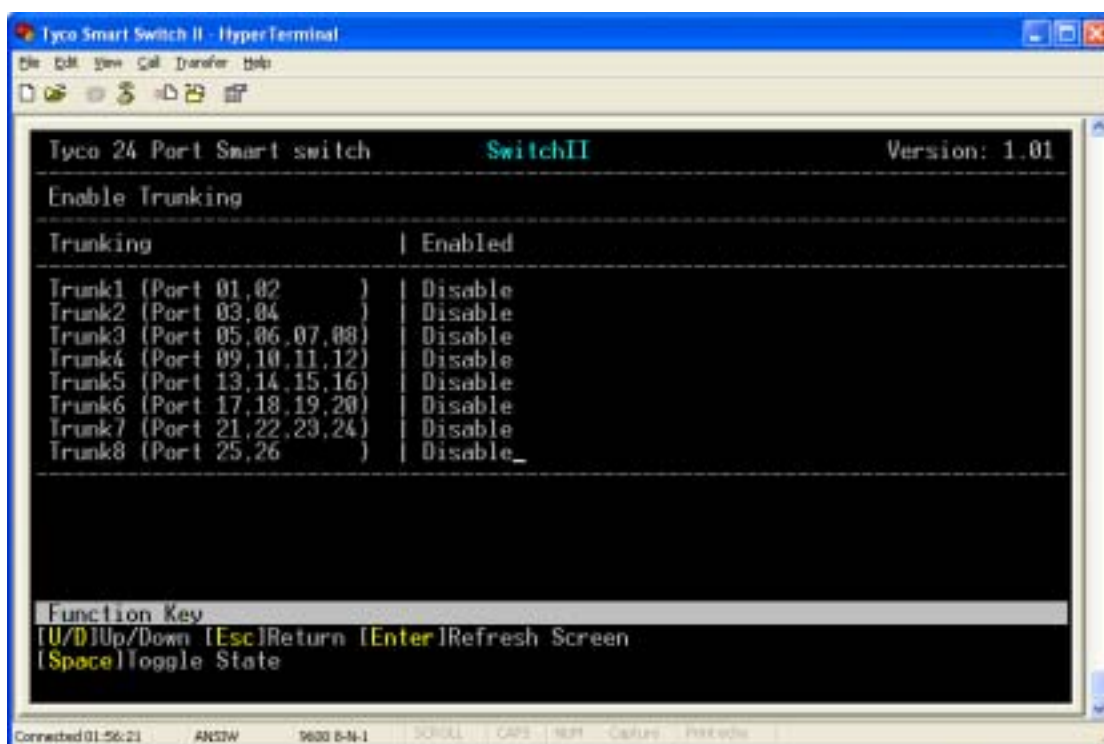


Figure 9 Trunking

To enable trunking use the **U/D** keys to highlight a trunk group and the **Space** bar to enable that particular trunk group.

Trunk Status

This Menu shows if faults are present on trunks that have been configured. If **4** is selected from the main menu the following screen is displayed: -

```

Tyco Smart Switch II - HyperTerminal
File Edit View Call Transfer Help
Trunk Status
-----
Trunking      | Trunk port member
-----
Link State    | Trunk1(P01,02) => [X] | Trunk5(P13,14,15,16) => [ ] |
              | Trunk2(P03,04)  => [ ] | Trunk6(P17,18,19,20) => [ ] |
              | Trunk3(P05,06,07,08) => [ ] | Trunk7(P21,22,23,24) => [ ] |
              | Trunk4(P09,10,11,12) => [ ] | Trunk8(25,26)         => [ ] |
-----
Note: Link down detected on trunk group member port.

Function Key
[Enter] Refresh Screen [Esc] Return

```

Figure 10 – Trunk Status screen

If a port that is a member of a trunk group shows no link then an “**x**” is displayed next to the trunk group to which the port belongs.

Use the Esc key to return to the previous menu.

QOS

This menu can be used to configure the priority of traffic through the switch.

Three types of QOS are supported: -

1. TOS/Diff Serv Priority -This allows the switch to prioritise traffic through the switch using the TOS/Diff Serv field contained in the IP packet.
2. 802.1p Priority - This allows the switch to prioritise traffic through the switch using the 802.1p priority tag in the MAC header.
3. Port Priority – This allows traffic being received from certain ports on the switch to be given greater priority through the switch than that of other ports that are given a lower priority.

By selecting menu option **5** from the main menu the following menu is displayed: -

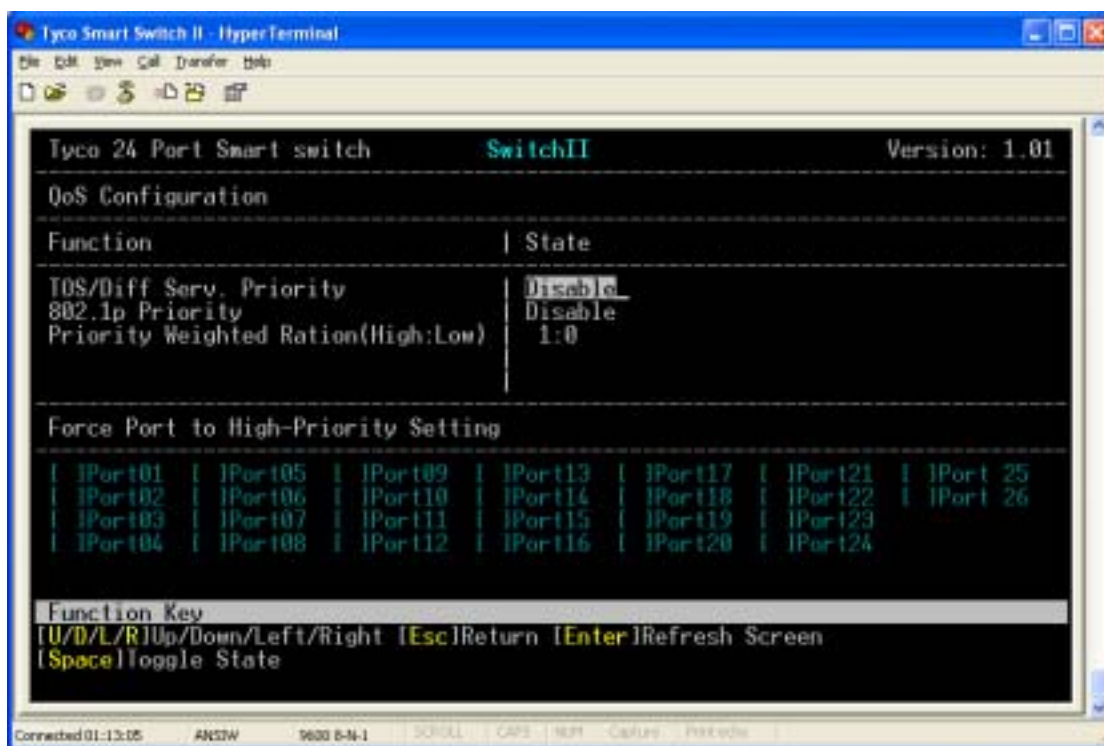


Figure 11 – QOS Configuration

The **U/D/L/R** keys can be used to navigate the menu and the **SPACE** bar can be used to change the state of a particular field.

It is important that only one method of QOS is enabled on the switch at any one time. Enabling more than one method could cause unpredictable prioritisation of traffic.

To enable TOS/Diff Serve priority then first highlight the TOS/Diff Serve field and press the space bar. This will then show enabled.

To enable 802.1p priority highlight that field and press the space bar. This will then show enabled.

To enable Port priority then first ensure that TOS/Diff Serv and 802.1p are disabled. Use the navigation keys to move to the cursor to the **Force Port to High Priority Setting** section of the menu. Navigate to the ports that are required to be high priority and press the space bar. The high priority ports will display an **x** next to them. The traffic arriving at these priority ports will be assigned a greater priority than the traffic arriving at ports that have not been assigned high priority.

The **Priority Weighted Ration (High: Low)** field is used to set the precedence ratio between the high and low prioritised traffic.

There are 4 different ratios that can be allocated: -

1:0 -This will force the switch to process all high-prioritised traffic before it starts to process traffic that has been prioritised as low.

4:1 -This will force the switch to give high priority traffic 4 times more precedence to that of low priority packets. For every low priority packet that is processed 4 high priority packets will be processed.

8:1 - This will force the switch to give high priority traffic 8 times more precedence to that of low priority packets.

16:1 - This will force the switch to give high priority traffic 16 times more precedence to that of low priority packets.

Port Tagging Control

This menu can be used to control the priority tag on Ethernet packets leaving the switch. This is set on a per port level. If option 6 is selected from the main menu then the following menu is displayed: -

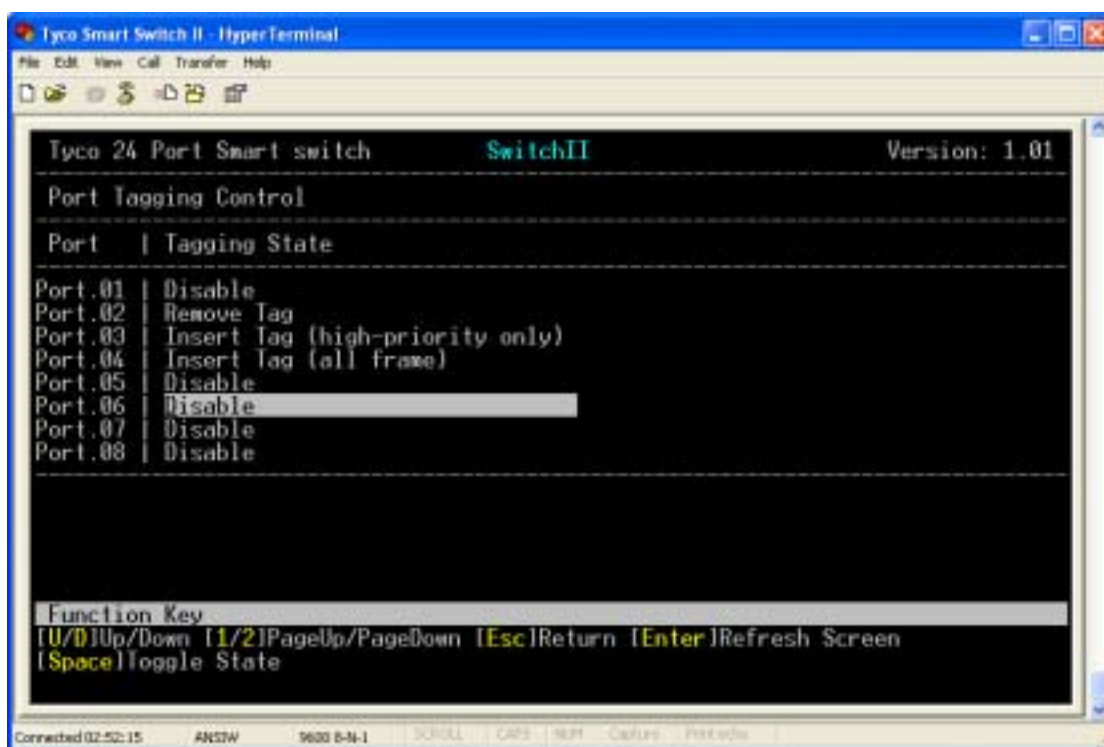


Figure 12 – Port Tagging Control

There are 4 different settings for each port: -

Disable – No change to the priority tag will occur. If the tag is set on incoming packets, then it will remain on any outgoing packet that leaves the switch via the selected port.

Remove Tag – When a packet leaves this port the priority tag is removed.

Insert Tag (high priority only) – When a packet leaves this port a priority tag is inserted for all high priority port packets only.

Insert Tag (All Frame) - When a packet leaves this port a priority tag is inserted for all high and low priority packets.

System Control

This menu allows configuration of variables that will effect the

operation of the entire switch. By selecting item 7 from the main menu the following screen is displayed: -

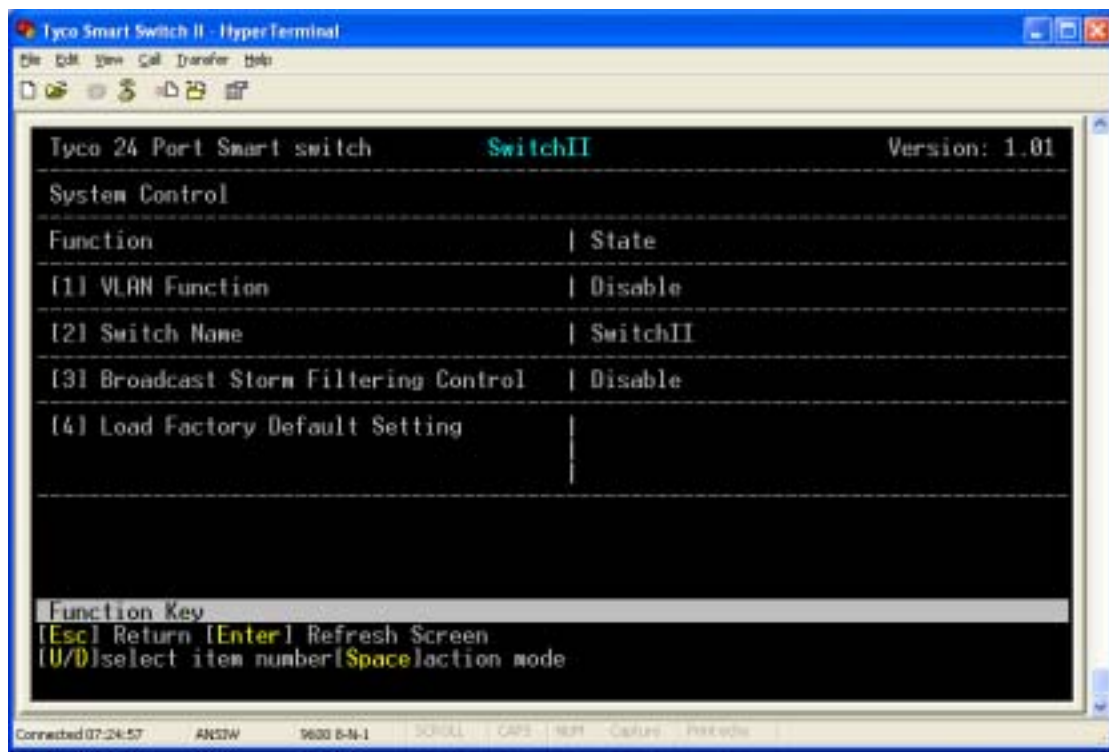


Figure 13 - System Control

This menu has 4 separate items. Using the **U/D** keys each menu item can be selected and the **Space** bar can be used to change the menu item value.

VLAN Function – This enables the VLAN functionality for the switch. If VLANs are disabled then regardless of the settings made in the *VLAN Member Setup*, VLANs will not operate on the switch. With VLAN Function enabled then VLAN configurations made in the *VLAN Member Setup* menu will be implemented and become active.

Switch Name – This item can be used to name the switch. This name is then shown at the top of each menu. To action this menu item use the **U/D** key to highlight the switch name field and press the **Space** bar to action the field. A name (maximum 8 characters) can now be typed. Once the name is typed press the **Enter** key and the name will be changed.

Broadcast Storm Filtering – To Enable Broadcast Storm Filtering highlight item 3 and press the **Space** bar. With Broadcast Storm Filtering enabled multicast/broadcast traffic received at a port will be blocked when a threshold is met. This prevents the switch and network being overloaded by broadcast traffic, which could cause loss of connectivity.

Load Factory Defaults – With this menu item selected the switch is set to a configuration the same as originally shipped from the manufacturer. Use the **U/D** keys until cursor is adjacent to the **Load Factory Defaults** field and press the **Space** bar and the following menu will be displayed: -

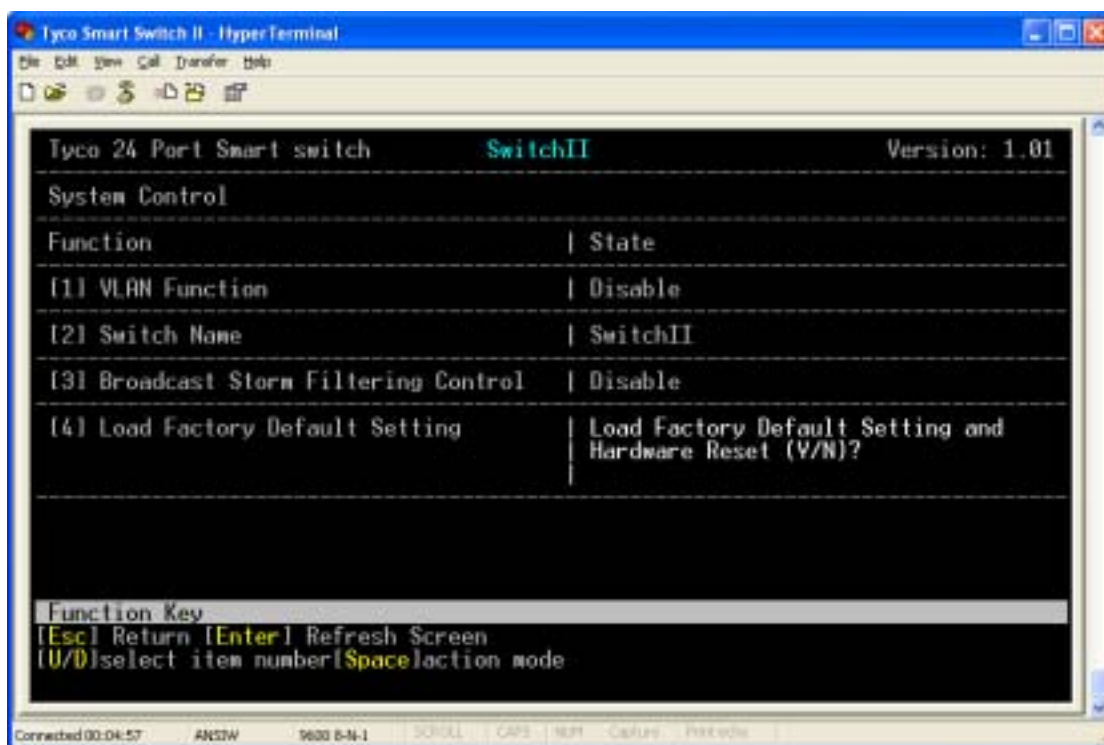


Figure 14 - Loading Factory Defaults

Select **Y** and the factory defaults will be loaded.

VLAN Member Setup

The 16 and 24 Smart Switch II supports simple port based VLANs. These can be configured using the VLAN Member Setup menu. If Option **8** is selected from the main menu the following menu is displayed: -

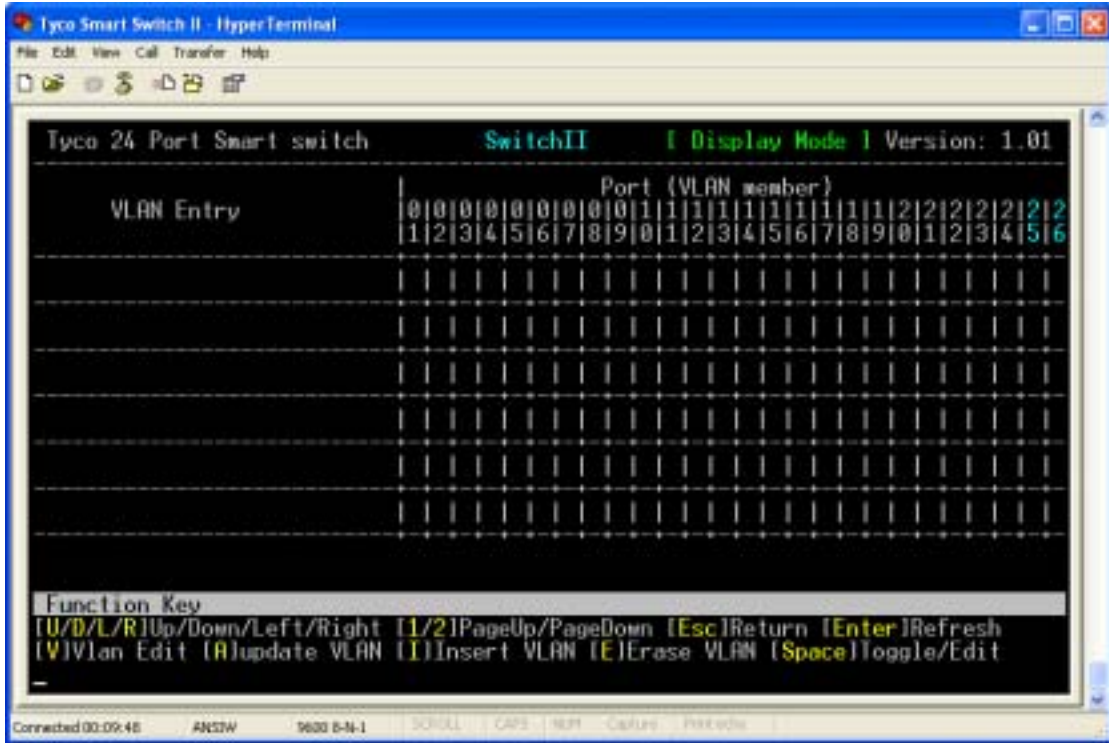


Figure 15 – VLAN Member Setup screen

On initially entering the menu the user is in display mode only, to insert or delete VLANs then **V** should be selected and the user will then be in Edit mode.

Adding VLANS

To Insert a VLAN **I** should be inputted and this will add a new VLAN. Keep typing **I** to insert multiple VLANs. To select or deselect port members use the **U/D/L/R** to navigate to the relevant port and press the **Space** bar. A **V** indicates a port is a member of a VLAN, as shown below: -

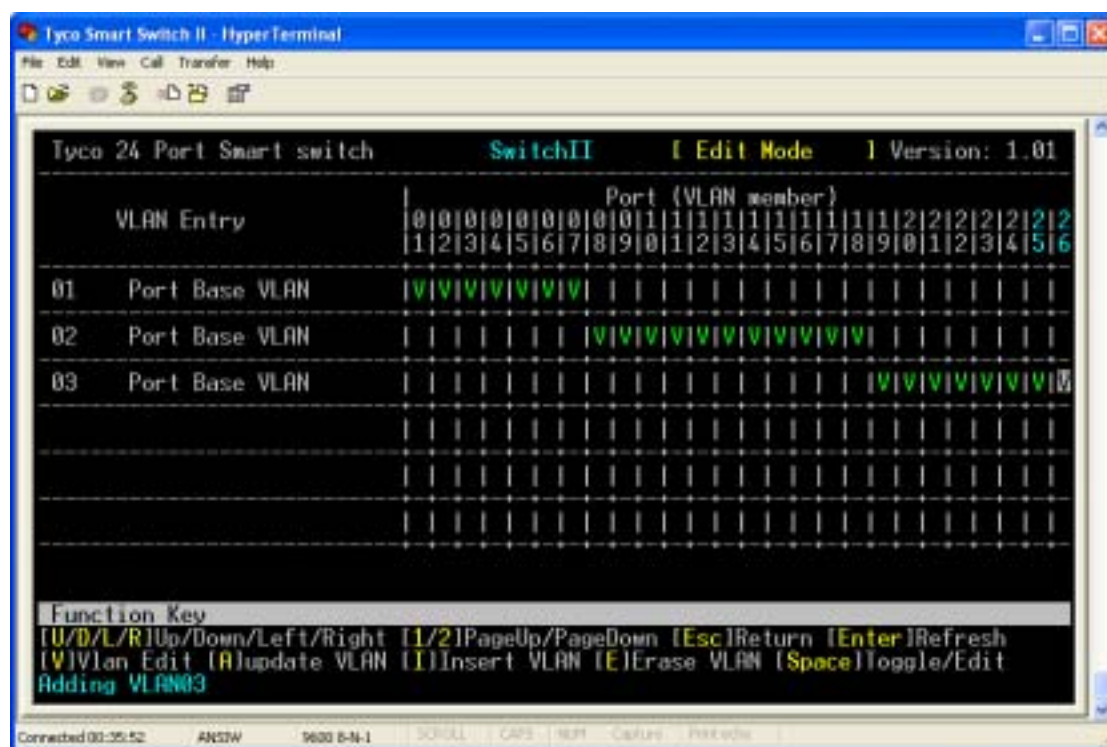


Figure 16 - Inserting VLAN Members

After all VLANS have been added and ports allocated then press **A** to update the VLAN settings and revert the menu back to Display mode. It is important that VLANs are then enabled in the **System Control Menu** (see page 19) or VLAN functionality will not be active.

Save configurations

Any configuration changes made to the switch will need saving to non-volatile memory to ensure the changes remain if the switch is power cycled. Select item **9** from the main menu the following screen is displayed: -

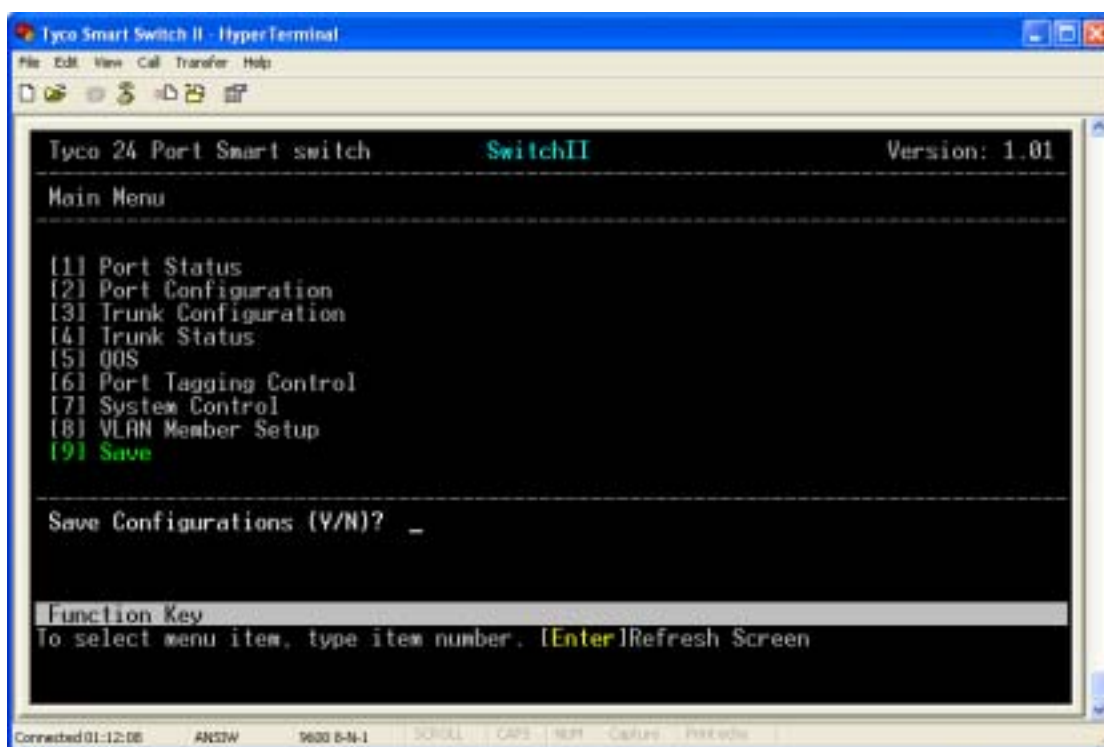


Figure 17 - Save configuration

Type **Y** and configuration changes will be saved.

LED Indicators

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

	LED	Colour	Function
RJ45 Port	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
		Blinks	Collisions in half-duplex mode
		Off	Port is in half-duplex mode

Optional Fibre Plug-In Module

	LED	Colour	Function
Fibre Port	LK/ACT	Green	Fibre Connected to another Device
		Blinks	The Fibre port is transmitting and receiving data
	FDX/COL	Orange	The port is configured for full-duplex
		Off	The port is configured for half duplex

Table 2 - 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 port of the switch is set for auto-negotiation. If this Ethernet partner device does not support auto-negotiation, 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 Fibre Uplink Module

1. Select the proper fibre cable for your network. The multi-mode module must use multi-mode fibre cable and the single-mode module must use single-mode fibre cable. See page 5 for the supported cable types and installation settings.
2. Ensure that the optical loss budget of the fibre uplink is within the limits specified on page 27. Note that optical patch cables and other joints and splices can introduce additional optical losses that reduce the working distance of the fibre link.

Product Specification

Standards Compliance	IEEE802.3 10BASE-T IEEE802.3u 100BASE-TX/100BASE-FX IEEE802.3ab 1000BASE-T IEEE802.3z Gigabit fibre IEEE802.3x Flow control and Back pressure IEEE802.3ad Port Trunk IEEE802.1p Class of service
RJ-45 Port Mode	Auto-MDI/MDI-X
Max Forwarding Rate	14,880 pps Ethernet port (10Mbit/s) 148,800 pps Fast Ethernet port (100Mbit/s) 1488,00 pps Gigabit Ethernet (1000Mbit/s)
LED Indicators	Power, RJ45 Ports: Link Activity, Duplex / Collision
Ethernet LAN Copper Network Cable	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
Dimensions	440mm x 165mm x 44mm (W x D x H)
Operating Temperature	0°C to 45°C (32°F to 113°F)
Operating Humidity	10% to 90% (Non-condensing)
Power Supply	Internal 100v to 240v AC, 50/60Hz auto-ranging, externally fused.
Power Consumption	20 Watts (Max.)
EMI Safety	FCC Class A, CE, UL, cUL, CE/EN60950

Optical Port Specifications

Optical Transceiver	TX power	RX sensitivity	Power Budget
100Mbps Multi-mode Transceiver	-19dBm	-31dBm	12dBm
100Mbps single mode Transceiver (30KM)	-15dBm	-34dBm	19dBm
Gigabit Transceiver (SX, multi--mode fibre)	-9.5dBm	-17dBm	7.5dBm
Gigabit Transceiver (LX, single-mode Fibre)	-9.5dBm	-20dBm	10.5dBm

Table 3 - Optical Specifications

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