TC3720

Self-Healing Industrial Ethernet Fiber Optic Switch

User's Manual

MODEL:_____

S/N: _____

DATE:_____

Notice!

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Chapter 1 - Overview

Features

- **Self-Healing or Redundancy Capable (recover time is less than 250ms (when connected in a ring setup)**
- **One Management Port for Advanced Configurations and Status Monitoring**
- **Six 10/100 Full/Half Duplex Auto-Negotiation Twisted RJ-45 Ports**
- **Two 100 Full Duplex Fiber Optic Pair Ports**
- **Converts Twisted Pair Media (RJ-45) to Fiber Optics**
- **Rate Limiting or Bandwidth Control on Copper Ports**
- **MDI/MDIX Auto Detection and Operation on Copper Ports**
- **Multimode (1310nm) and Single Mode (1310nm/1550nm)**
- **Standard Single Mode Distances 50km (optional 100km)**
- **Hardened Temperature (-40ºC to 80ºC) - Optional**
- **Standalone/Rackmount**
- **Alarm Relay**
- **Web-Based/Serial Configuration**

Standards

IEEE 802.3, 802.3u, and 802.3x

Description

Intended for Multidrop Self-Healing Ring (SHR) topologies, the TC3720 Ethernet Fiber Optic Switch interconnects up to six 10/100M devices at each drop. The ring can consist of either multimode or single mode fibers or CAT5 UTP cables. Fault recovery time is less than 250 milliseconds.

The TC3720 offers a sophisticated Self-Healing Ring scheme. Fault conditions are detected on both Tx and Rx, upstream and downstream of each unit, and automatically re-routed to maintain Ring integrity.

A Web-based configuration user interface is provided to view and change network settings such as IP Address, Subnet, Gateway, Speed, Half/Full Duplex, Name, Password and other parameters. It also monitors the fiber ring status, alarm conditions, fault locations for local and remote units. The TC3720 can also be configured through a serial console (Out-of-Band).

The TC3720's store-forward switching technology eliminates the congestion problem inherent to the contention-oriented Ethernet CSMA/CD protocol. This improves predictable response times under heavy network loads. Previously, expensive routing technology was used to alleviate congestion from heavy traffic loads.

The TC3720 offers two multimode (1300nm) or single mode (1300/1550nm) ports and six independent Ethernet 10/100-Base Auto-Sensing switched ports. As options, there are two versions (Model TC3720T) for extreme temperature applications (-20° to 70°C, -40° to 80°C).

Power is 12VDC, optional 24VDC, -48VDC, 125VDC or 115/230VAC. Power redundancy is standard on 12VDC. The unit is 19" rack mountable. Optical connectors can be ST, FC or SC.

Fiber Optic Specifications

Multimode Model

Transmitter:	LED; typical Launch Power	-17.0 dBm* (1310nm, @62.5/125µm)
Receiver:	PIN Diode; typical Sensitivity Optic saturation level	-33.0 dBm* (1310nm, @62.5/125µm) -11.0 dBm*(1310nm, @62.5/125µm
Loss Budget:	1310nm Multimode @62.5/125µm	15 dB
Distance:	1310nm Multimode, @62.5/125µm	up to 4km distance*
Wavelength:	1310nm Multimode	
Connector:	SC ST	

Single Mode 1310nm, 20km Model

Transmitter:	FP Laser; typical Launch Power	-15 to -7 dBm* (1310nm, @9/125µm)
Receiver:	PIN Diode; typical Sensitivity Optic saturation level	-34.0 dBm* (1310nm, @9/125µm) -3 dBm*(1310nm, @9/125µm)
Loss Budget:	1310nm Single Mode, @9/125µm	19 dB
Distance:	1310nm Single Mode, @9/125µm	up to 20 km distance*
Wavelength:	1310nm Single Mode(LASER)	
Connector:	ST FC SC	

Single Mode 1310nm, 75km Model

Transmitter:	FP Laser; typical Launch Power	-3 to +2dBm* (1310nm, @9/125µm)
Receiver:	PIN Diode; typical Sensitivity Optic saturation level	-36.0 dBm* (1310nm, @9/125µm) -3 dBm* (1310nm, @9/125µm)
Loss Budget:	1310nm Single Mode, @9/125µm	33dB
Distance:	1310nm Single Mode, @9/125µm	up to 75km distance*
Wavelength:	1310nm Single Mode (LASER)	
Connector:	ST FC SC	

Single Mode 1550nm, 75km Model

Transmitter:	DFB Laser; typical Launch Power	-10 to -1dBm* (1550nm, @9/125µm)
Receiver:	PIN Diode; typical Sensitivity Optic saturation level	-34.0 dBm* (1550nm, @9/125µm) 0 dBm* (1550nm, @9/125µm)
Loss Budget:	1550nm Single Mode, @9/125µm	24dB
Distance:	1550nm Single Mode, @9/125µm	up to 75km distance*
Wavelength:	1550nm Single Mode (LASER)	
Connector:	ST FC SC	

Launch power, sensitivity and distance are listed for reference only. These numbers may vary.

Single Fiber, 50km Model

Transmitter:	Typical Launch Power	-8 to -3 dBm* (1310nm/1550nm, @9/125µm)
Receiver:	PIN Diode; typical Sensitivity Optic saturation level	-33.0 dBm* (1310nm/1550nm, @9/125µm) -3 dBm*
Loss Budget:	1310nm/1550nm Single Mode, @9/125µm	29 dB
Distance:	1310nm/1550nm Single Mode, @9/125µm	up to 50km distance*
Wavelength:	1310nm/1550nm Single Mode	
Connector:	SC Only	

Launch power, sensitivity and distance are listed for reference only. These numbers may vary.

Front Panel Connectors, DIP Switches and LED Indicators

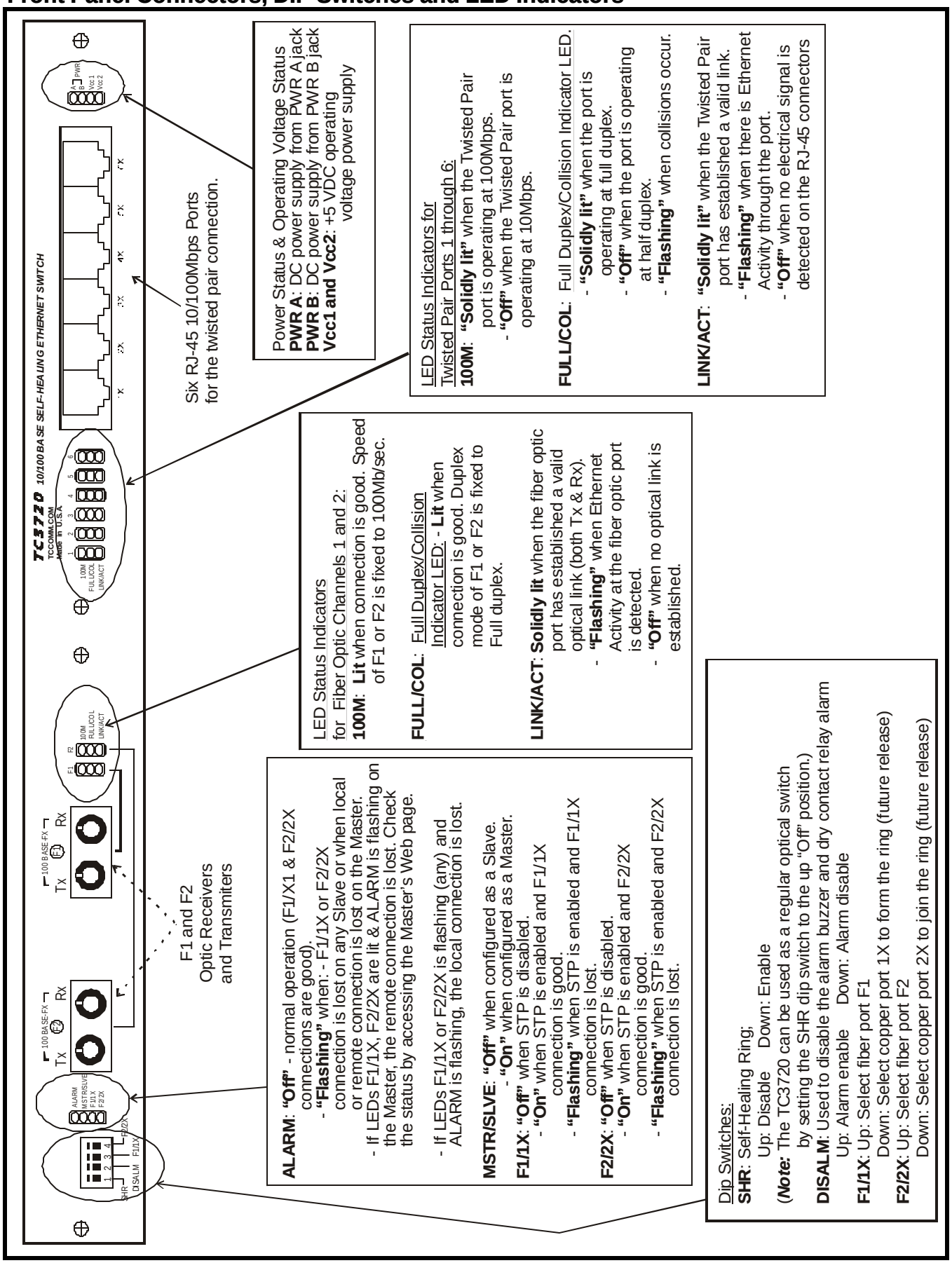


Figure 1. TC3720's Front Panel View

Rear Panel Connectors, DIP Switches and Reset Button

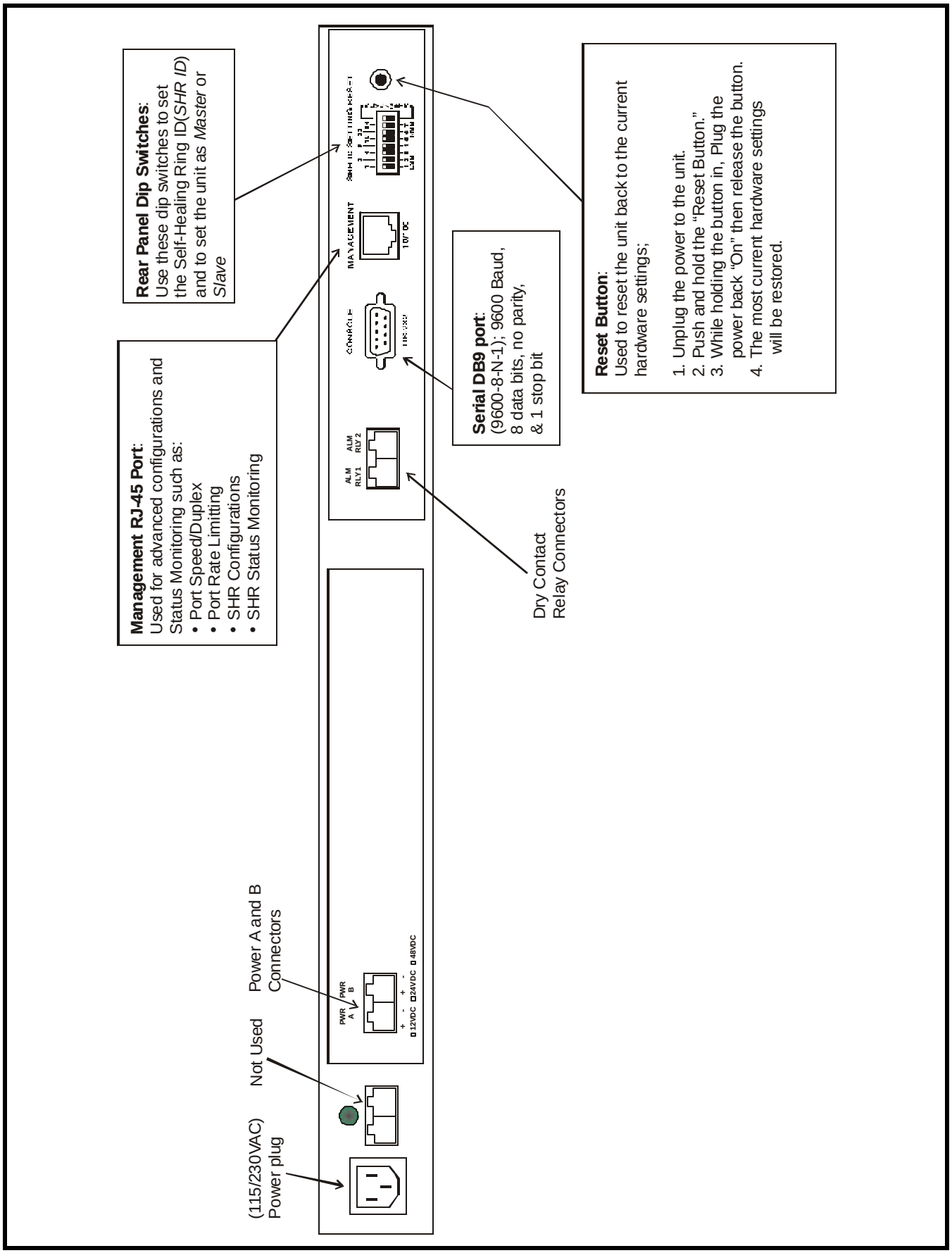


Figure 2. TC3720's Rear Panel View

Chapter 2 - Installation

Unpacking the Unit

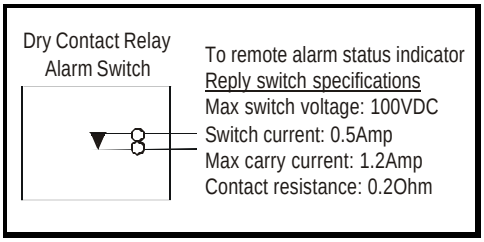
Before unpacking any equipment, inspect all shipping containers for evidence of external damage caused during transportation. The equipment should also be inspected for damage after it is removed from the container(s). Claims concerning shipping damage should be made directly to the pertinent shipping agencies. Any discrepancies should be reported immediately to the Customer Service Department at TC Communications, Inc.

Equipment Location

The TC3720 should be located in an area that provides adequate light, work space and ventilation. Avoid locating it next to any equipment that may produce electrical interference or strong magnetic fields, such as elevator shafts and heavy duty power supplies. As with any electronic equipment, keep the unit from excessive moisture, heat, vibration and freezing temperatures.

Dry Contact Alarm Relay

Two terminal block connectors on the rear panel (labeled "ALM RLY1," & "ALM RLY2") provide for the dry contact relay alarm (see Figure 2). Normally in the OPEN position, any loss of optical signal will trigger an alarm condition and force the switch to the CLOSED position. This relay can be used in conjunction with an external device to monitor the condition of the fiber optic links.



Power Supply

Standard input power is 12V DC @500mA for the TC3720. The power plug is a terminal block connector with positive & negative polarity indicated on the rear panel of the unit. Two connectors, labeled "PWR A" & "PWR B" are provided for a built-in power redundancy feature. While only one connection is required to power the unit, both connectors can be used simultaneously. When power redundancy is utilized, both power "A" & "B" share the load. If one power supply fails, the other will take over the full load. Alternate power sources are available as an option (see Chapter 7 - Specifications).

Should an external power adapter need to be replaced, use one with the following specifications: 12V DC @500mA. You may order it directly from TC Communications.

Power Up Test:

Apply power by plugging the power plug into any power jack on the rear panel. After the power is applied, the following LED status should be observed from the front panel.

After power up, if no LEDs are lit, refer to Chapter 6 (Troubleshooting).

1. The "PWR A" or "PWR B" LEDs on the front panel will light according to which power jack (A or B) is connected. Both LEDs will light when power redundancy is utilized.
2. Both "Vcc1" and "Vcc2" LEDs should be solidly lit, indicating an adequate operating voltage is being derived from the power source.
3. The "100M" & "FULL/COL" LEDs for both F1 and F2 should be solidly lit. The "LINK/ACT" LED should be Off since there is no Ethernet or optical activity.
4. The "ALARM," "F1/1X," and "F2/2X" LEDs should be flashing indicating that there is no fiber optic cables connected.

Note: On power up, if the self-healing function is disabled with front panel dip switch #1 in the "Up" position, the "ALARM" LED will flash and the "F1/1X," and "F2/2X" LEDs will be off. All other LEDs will behave as indicated above.

(Continue next page)

Installation Procedure Summary (Continue)

To install the TC3720 units, you must first configure them for your specific application (for example, the setup on figure 4). Regardless of how the units are configured, each unit in the ring must have a unique Self Healing Ring (SHR) ID.

There are two ways to configure the TC3720's to be installed in the SHR setup. By hardware configurations or software configurations.

A. **Hardware configurations**: If the units are configured using hardware configurations with the DIP switches on the rear panel, there is a limit to the SHR ID hardware settings. The maximum number of SHR ID's that can be used are 128 (see Appendix B), therefore the SHR can be connected with a maximum of 128 units when hardware settings are used. (Generally, hardware configurations are used when bench testing the units). See Chapter 3 (Hardware Configuration).

Note: Software configurations will overwrite the hardware settings for SHR ID and for Master/Slave (refer to chapter 4 for software configurations). The reset button on the rear panel can be used to return the unit to the current hardware settings.

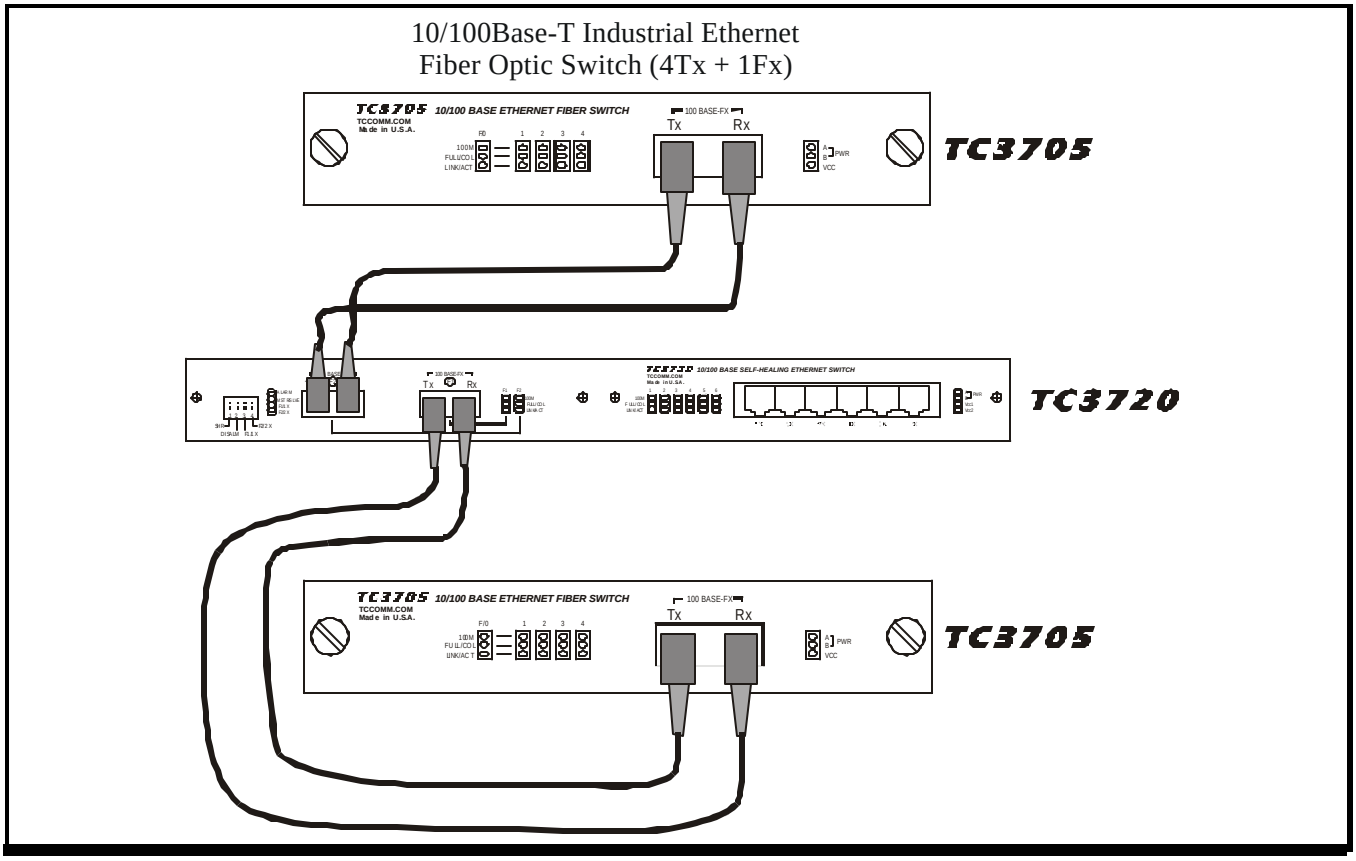
B. **Software Configurations**: The units are configured through the Management port (RJ-45 connector on the rear panel of the switches). See Chapter 4 (Software Configuration).

Note: If you want to configure the IP address, username, or password, you can also use the Console port (DB9 connector on the rear panel). Refer to console port settings on page 26.

Using the TC3720's as Regular Optical Switches (SHR Disabled)

The TC3720 units can be used as regular optical switches by disabling the self-healing ring function. They can be used for point to point applications using either fiber port 1 (F1) or fiber port 2 (F2). For example, as shown on the diagram below.

To set the TC3720's as regular optical switches, simply set the front panel DIP switch #1 (SHR) to the up "Off" position. Refer to dip switches on figure 1.



Chapter 3 - Hardware Configuration

Self Healing Ring (SHR) ID Setting

The Self Healing Ring (SHR) can be connected with a maximum of 128 units. The ID setting can be configured with either hardware or software (each unit must have a unique ID). Hardware configuration is limited to the default IP addresses. Therefore, it is generally used for bench testing.

Note: Software configurations will overwrite the hardware settings for SHR ID and for Master/Slave (see chapter 4 for software configurations). The reset button can be used to return the unit to the current hardware settings.

Hardware SHR ID Settings

Dip switches 1-7 on the rear panel of the unit are used to configure the SHR ID's. They represent bit numbers, #1, least significant and #7, most significant. The values(1, 2, 4, 8, 16, 32, and 64) for setting the SHR ID are represented by the bit number exponent of 2 (see table 1 and figure 3). Also refer to Appendix B.

Dip switch # (Bit #)	Values for setting the SHR ID's
1	$2^0 = 1$
2	$2^1 = 2$
3	$2^2 = 4$
4	$2^3 = 8$
5	$2^4 = 16$
6	$2^5 = 32$
7	$2^6 = 64$

Table 1. SHR ID Setting

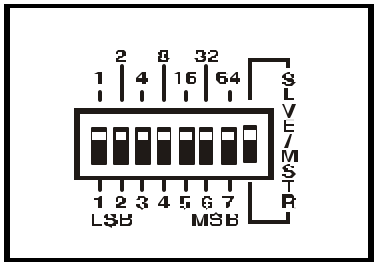


Figure 3. SHR ID Setting

Examples: To set the SHR ID

ID=1: Set dip switch 1 to the down position and the rest to the up position.

ID=2: Set dip switch 2 to the down position and the rest to the up position.

ID=3: Set dip switches 1 and 2 to the down position and the rest to the up position.

ID=4: Set dip switch 3 to down the position and the rest to the up position.

ID=5: Set dip switches 1 and 3 to the down position and the rest to the up position.

ID=6: Set dip switches 2 and 3 to the down position and the rest to the up position.

ID=7: Set dip switches 1, 2 and 3 to the down position and the rest to the up position.

ID=8: Set dip switch 4 to the down position and the rest to the up position.

ID=9 to 127: Please refer to the SHR ID Setting Tables on Appendix B.

Dip switch 8: The Slave/Master dip switch (each ring can only have 1 Master) is used to set the unit as a Master or a Slave. **Master:** Set to down position. **Slave:** Set to up position.

Note: The Master unit must be set to SHR ID = 0 (All SHR ID dip switches must be in the up position). When using hardware configurations, the SHR ID = N will set the IP address to 192.168.254.[100+N]. For example, if the unit is set for SHR ID = 12, the IP address is 192.168.254.112.

Bench Test

It is highly recommended to conduct bench tests before actual installation. Bench testing allows the user to become familiar with the functions and features of the TC3720 in a controlled environment. Knowledge of the TC3720's functions and features will facilitate installation and troubleshooting efforts later on.

Figure 4, depicts the connections, configurations and settings for the SHR setup of one Master and three Slave units for bench testing using the hardware configurations. Follow the instructions below for the configurations for the Master and Slave units.

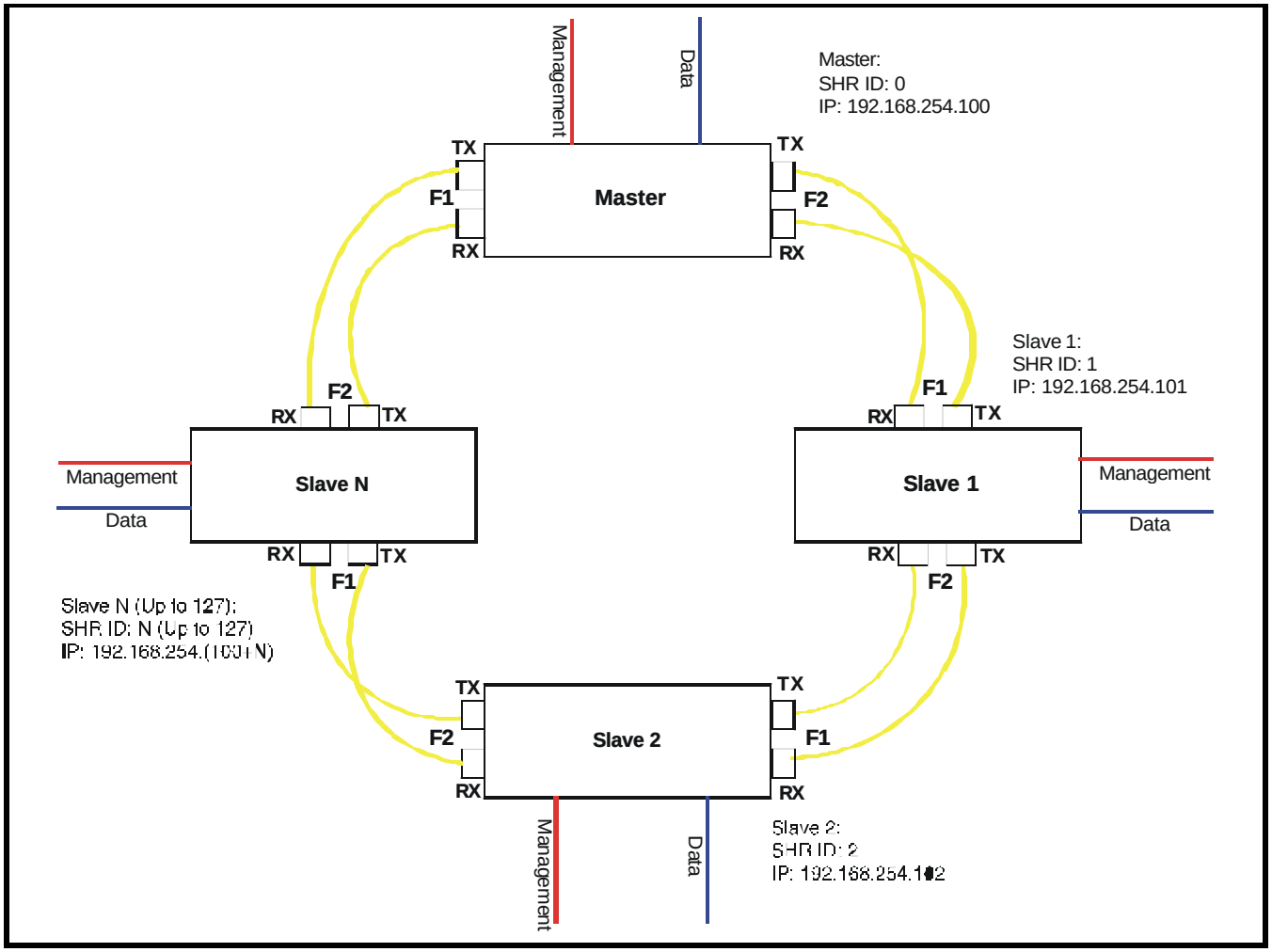


Figure 4. Self-Healing Ring Connection Diagram

Configuring the Master unit:

1. Enable the SHR dip switch on the front panel by setting it to the down position.
2. Select the fiber ports to form the SHR (set the F1/1X and F2/2X dip switches on the front panel to the up position).
3. Enable the MSTR dip switch on the rear panel to the down position.
4. Make sure that all the SHR ID dip switches are in the up position (SHR ID = 0)
5. To ensure that hardware settings are enabled, unplug the power to the unit, press and hold the reset button on the rear of the unit, then plug in the power and release the reset button.
6. The ALARM LED will flash and the audible alarm will sound until the SHR is complete. If desired, the audible alarm can be disabled by setting the DISALM dip switch on the front panel to the down position.
7. The MSTR/SLVE LED should be solidly lit.

Configuring the Slave units:

1. Enable the SHR dip switch on the front panel by setting it to the down position.
2. Select the fiber ports to form the SHR (set the F1/1X and F2/2X dip switches on the front panel to the up position).
3. Enable the unit to be a Slave by setting the rear panel's SLVE/MSTR dip switch to the up position.
4. Make sure that at least one SHR ID dip switch is in the down position (Slave SHR ID must be unique. See Appendix B: SHR ID Setting).
5. To ensure that hardware settings are enabled, unplug the power to the unit, press and hold the reset button on the rear of the unit, then plug in the power and release the reset button.
6. The ALARM LED will flash and the audible alarm will sound until the SHR is complete. If desired, the audible alarm can be disabled by setting the DISALM dip switch on the front panel to the down position.
7. The MSTR/SLVE LED on the front panel should be off.

Repeat steps 1-5 for the remaining slave units.

After completing the configurations for the Master and Slave units:

1. Interconnect the switches in a ring setup using the fiber ports as shown in figure 4. The SHR must be configured as a ring.
2. Connect the Fiber Ports F1 to F2 of adjacent unit (Rx to Tx and Tx to Rx) as shown in Figure 4.

The following LEDs status should be observed to verify the integrity of the units and all connections after power up and all connections have been made as in figure 4:

On the Master unit:	"ALARM" LED Off, "MSTR/SLVE" LED solidly lit, "F1/1X" and "F2/2X" LEDs solidly lit, "100M" and "FULL/COL" LEDs solidly lit, "LINK/ACT" LED solidly lit or flashing (as optical communication has been established and there is Ethernet activity), "PWRA" and/or "PRWB" LEDs solidly lit.
On the Slave units:	"MSTR/SLVE" LED Off on all Slave units. All other LEDs should behave the same way as those on the Master unit.

Note: See chapter 4 for software configurations and system monitoring.

Chapter 4 - Software Configuration

Configuring the TC3720's

Software Configurations are done through the Management port (RJ-45 connector on the rear panel of the switches).

Note: Software configurations will overwrite the current hardware settings. If changed, the hardware settings will not reflect the current software settings.

In order to configure the TC3720's that is, set to default, the user needs to use a PC with a web browser installed. Furthermore, the PC's IP address must be set within the range of 192.168.254.1 to 192.168.254.99, and with a Network Mask of 255.255.255.0. We recommend that you set your PC within these ranges to avoid a potential conflict with the IP configuration of the TC3720's. If your PC does not have a compatible IP Address and Network Mask, or you are not sure about the settings, refer to the "PC IP Configuration" section on page 30 for more detail. You can also change the IP address of the TC3720 by matching it up with that of your PC, refer to Console Port Settings on page 26.

To configure the TC3720, simply enter the default IP address of the TC3720 in the Web browser's address box. For example, if the unit is set to Master by hardware settings, SHR ID=0, the default IP address should be 192.168.254.100.

If, for example, the unit is set to be a Slave with SHR ID=4 (with rear panel DIP switch #3 to the down position), then the default IP address should be 192.168.254.(100+4).

(**Attention**: Contact your network administrator if you are unsure about the settings. Improper settings may result in disruption of the existing network.)

Once you enter the IP address and click enter, you will see a verification window, where you will be prompted to enter a username and password:

Enter ***user*** under User Name and enter ***password*** under Password and click "OK."

You will then see a window as in figure 5.

Note: The username and password can be returned to the default username and password by using the reset button (refer to rear panel diagram on figure 2). All settings will be returned to the current hardware settings.

If you would like to use the default IP addresses, see page 11 to do the configurations using the SHR ID settings.

Site Map: The site map below can be used as a guide to navigate through the desired sections for software configurations.

Login

- *Basic*
  - Switch Name
  - Location
  - Contact
  - Description
  - Mac Address
- *Network*
  - IP Address
  - Subnet Mask
  - Default Gateway
  - SHR Master
  - SHR Port
  - SHR ID
  - SHR Master ID
- *Port Settings*
  - Copper Ports (1 - 6)
    - Port State
    - Speed Duplex
    - Ingress Limit
    - Egress Limit
    - Flow Control
  - Fiber Ports (F1 and F2)
    - Port State
    - Ingress Limit
    - Egress Limit
    - Flow Control
- *SHR Status*
- *Login Settings* (Username and Password)

Software Configuration Continue

Configure Basic:

Use the links on the left side of the page to navigate to the desired section.

Click the "Basic" link on the left side of the page and you will see the window as in figure 5, and you can begin the configurations. You may change the values/names of the Switch Name, Location or Contact fields as you like or you can leave as they appear.

The location field will be shown on the SHR error report to assist in locating the units with broken fiber optic links (see figure 12 on page 23).

MAC Address (cannot be changed).

When done, click Apply to save the changes.

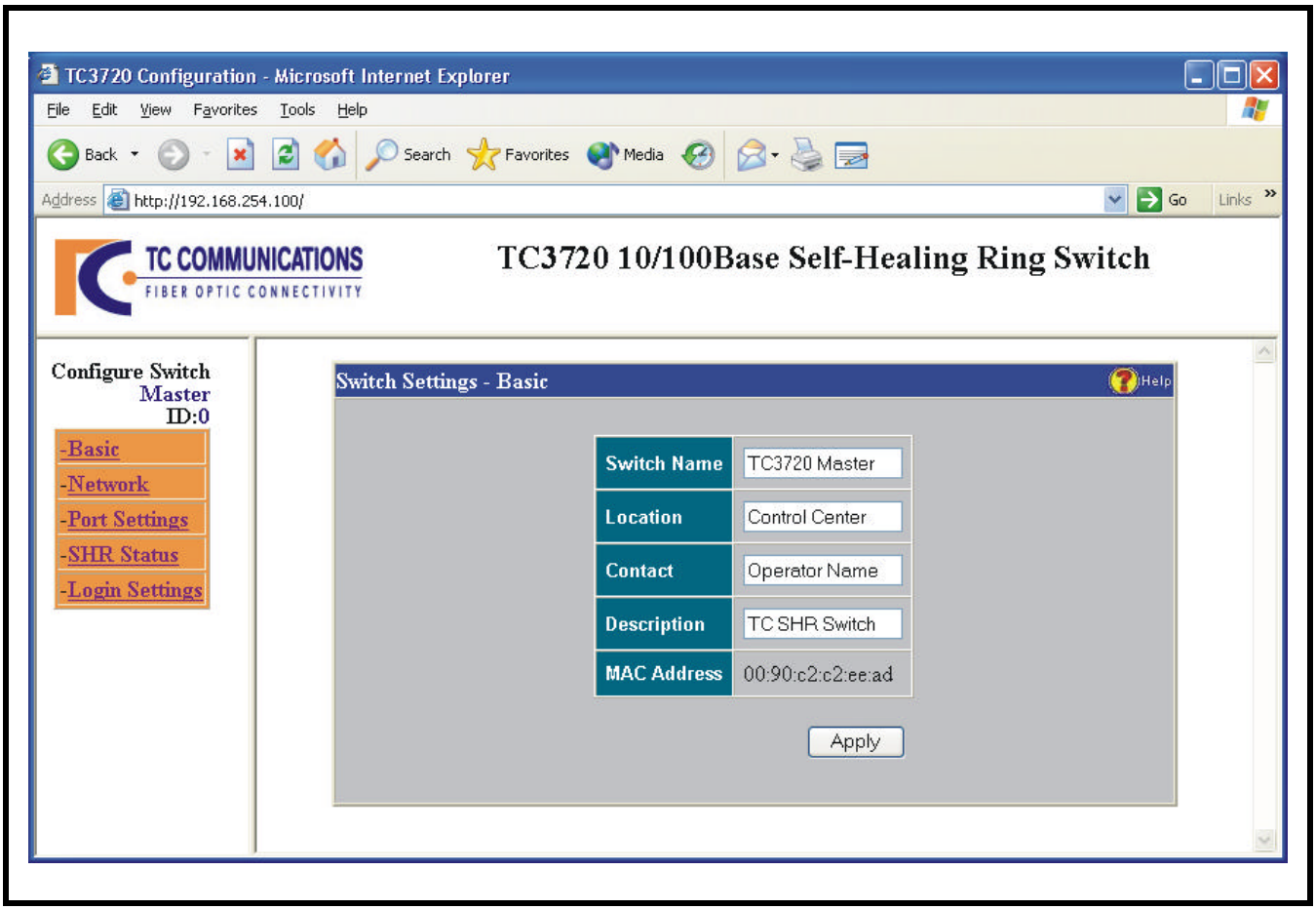


Figure 5. TC3720 Configure Basic Window

Software Configuration Continue

Configure IP Settings:

To configure the IP settings, click the "IP Settings" link on the left side of the page. On the IP settings window, enter in the related IP address, Subnet Mask and Default Gateway as shown on figure 6, below.

***Note*:** All switches and monitoring systems should be on the same network (Contact your network administrator for valid n etwork settings).

SHR Master: Select either Master or Slave.

SHR Port: This is the UDP port used by the TC3720. It can be any number as long as it is not used for public port such as 80, 23 and etc. We recommend to use the factory default UDP port.

***Note*:** All SHR ports of the switches on the ring should be kept the same.

SHR ID: Any integer. All units in a ring must have a unique SHR ID.

SHR Master ID: All units in a ring must be set to the same SHR Master ID.

***For example*:** The "SHR Master ID" and "SHR ID" for the Master should always be the same (by default they should be zero "0"). The "SHR Master ID" value should also be set to zero on all Slave units in the ring to match that of the Master. If this value is changed in the Master unit, it should also be changed to the same value on all Slave units in the ring.

When done, click Apply to save the changes.

***Note*:** A window as in figure 14, page 25 will pop-up asking you to reset the new settings. After you click "reset" all the changes will be saved. Then you will see a window asking you to refresh your browser or enter a new IP (only when you change the IP address) to continue the software configurations.

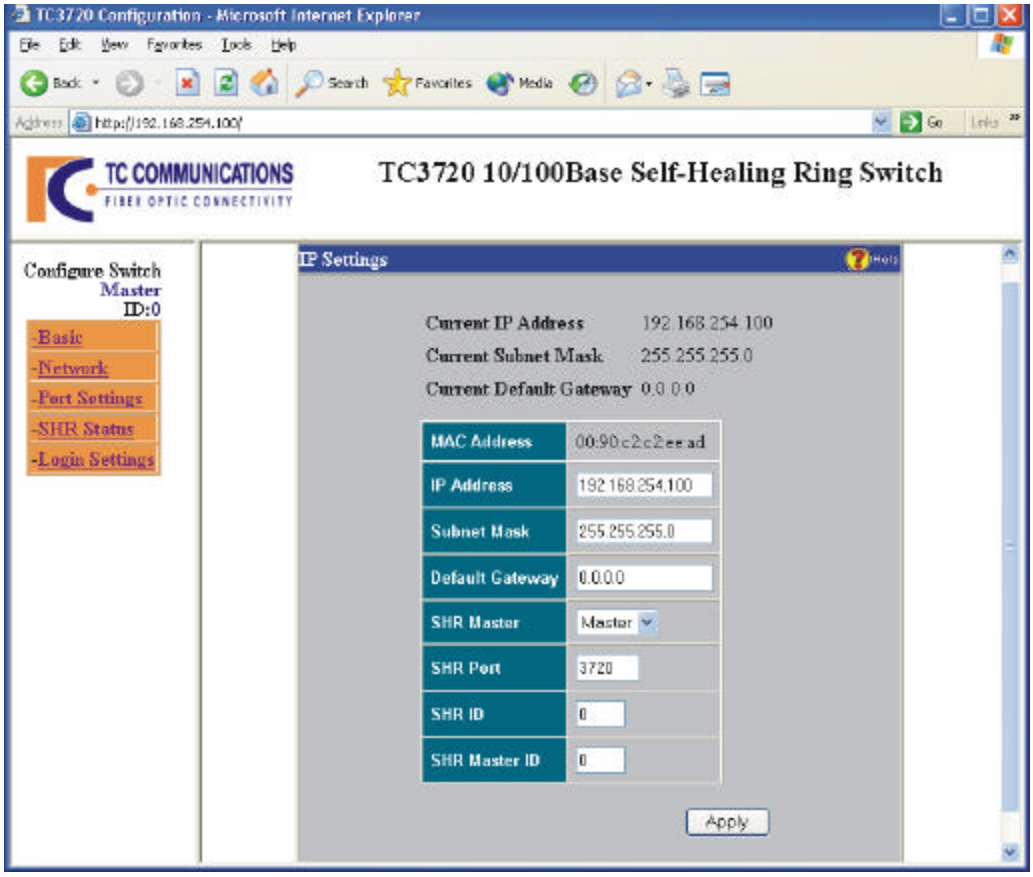


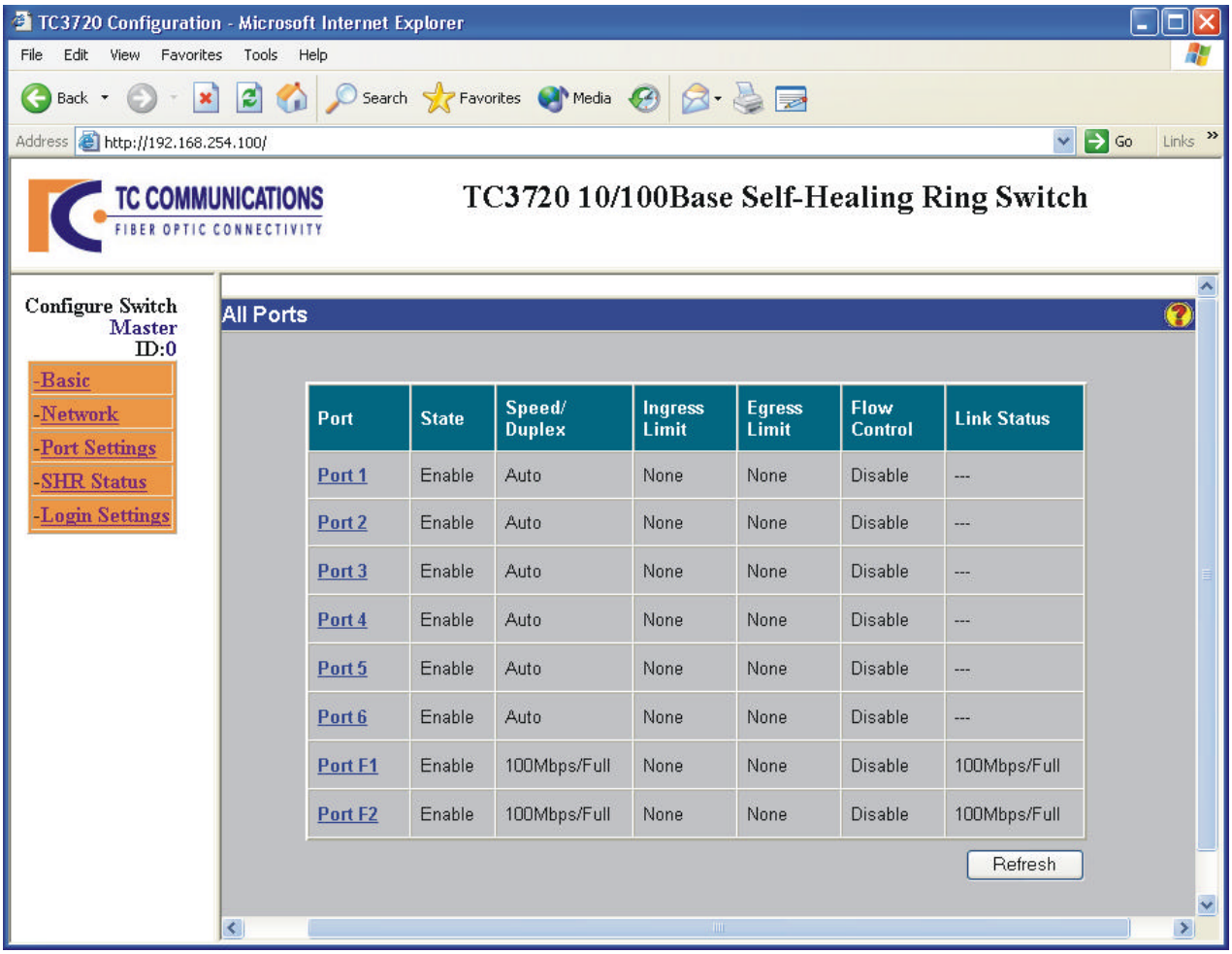
Figure 6. TC3720 IP Settings Window

Software Configuration Continue

Configure Port Settings

Click the "Port Settings" link on the left side of the page to configure either the "RJ-45 Ports" 1 through 6 or the "Fiber Ports" F1 or F2 settings. After clicking the "Port Settings" link, you will see the following window shown on figure 7, below. It shows the information of all ports.

For example, click on the copper Port 5 and you will see a window as in figure 8, next page.



Port	State	Speed/ Duplex	Ingress Limit	Egress Limit	Flow Control	Link Status
Port 1	Enable	Auto	None	None	Disable	---
Port 2	Enable	Auto	None	None	Disable	---
Port 3	Enable	Auto	None	None	Disable	---
Port 4	Enable	Auto	None	None	Disable	---
Port 5	Enable	Auto	None	None	Disable	---
Port 6	Enable	Auto	None	None	Disable	---
Port F1	Enable	100Mbps/Full	None	None	Disable	100Mbps/Full
Port F2	Enable	100Mbps/Full	None	None	Disable	100Mbps/Full

Figure 7. TC3720 Port Settings Window

Software Configuration Continue

Port State: Enable or disable the port state.

Speed/Duplex: The speed and duplex on the fiber port is fixed to 100M/Full. You can select the speed and duplex mode of the RJ-45 ports as follows:

Auto-Negotiating, 100Mbps/Full Duplex, 100Mbps/Half Duplex, 10Mbps/Full Duplex, or 10Mbps/Half Duplex.

Ingress Limit: Rate limiting for inbound traffic (data going into the TC3720 port). The default value of the rate limit is None (no limit on the inbound traffic). The rate limit can be set to 128K, 256K, 512K, 1M, 2M, 4M, 8M, 16M, 32M, or 64M. (bps).

Egress Limit: Rate limiting for outbound traffic (data going out from the TC3720 port). The default value of the rate limit is None (no limit on the outbound traffic). The rate limit can be set to 128K, 256K, 512K, 1M, 2M, 4M, or 8M. (bps).

Flow Control: Enable or disable the flow control. (Keep it in the default setting - "Disabled.")

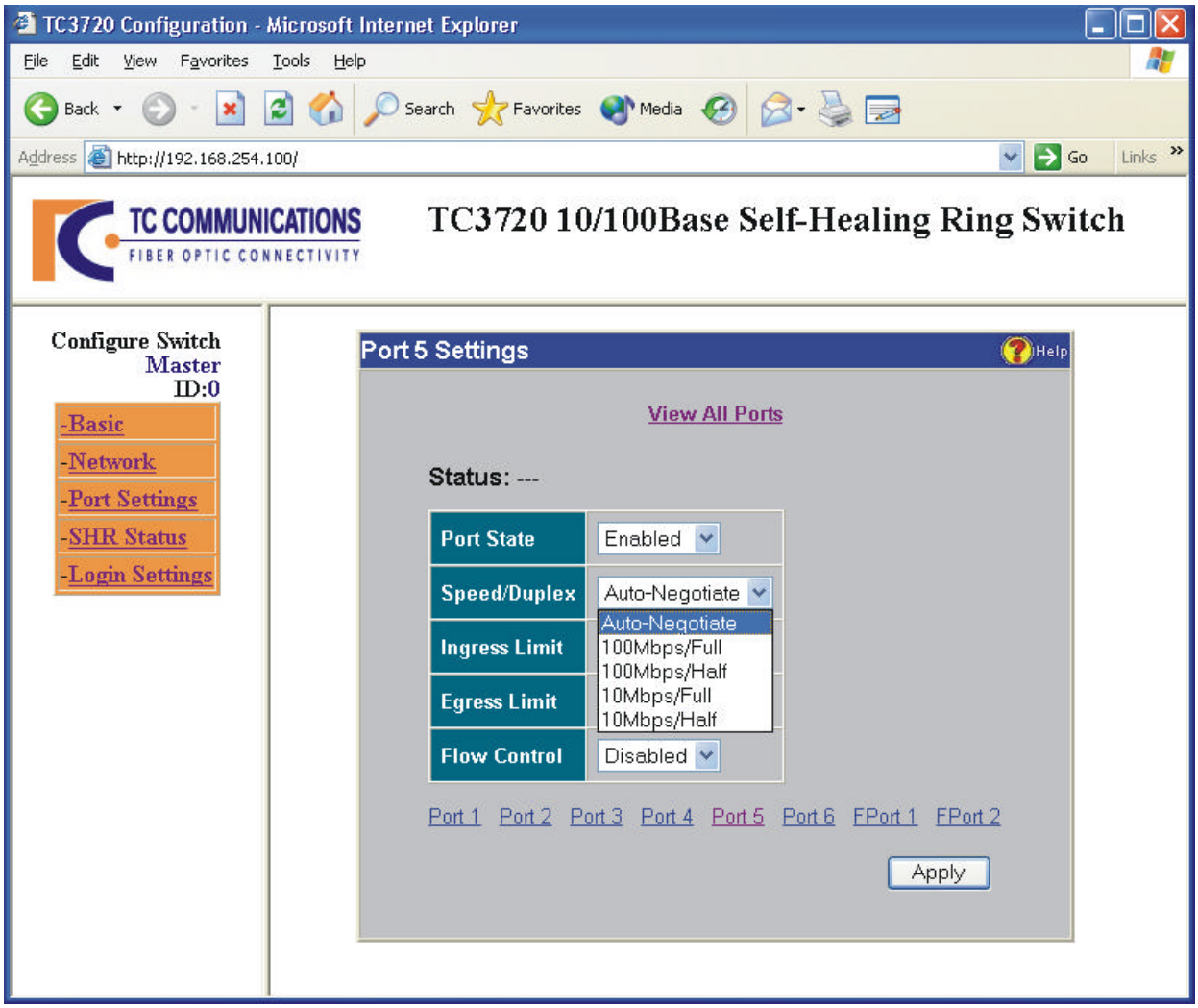


Figure 8. TC3720 Port Settings Dialog Box

Software Configuration Continue

Ingress Limit: Rate limiting for inbound traffic.

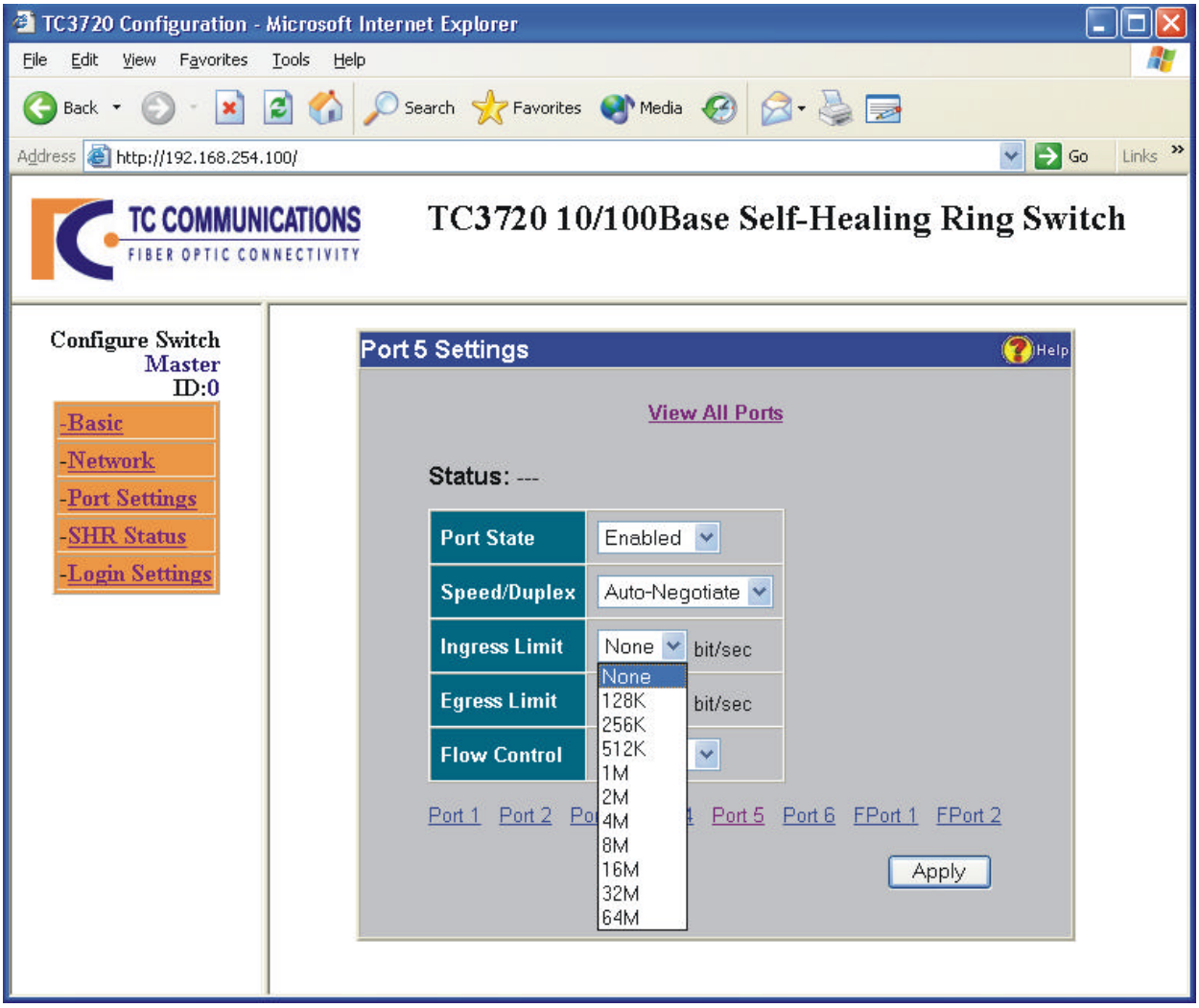


Figure 9. TC3720 Port Settings Dialog Box

SHR Status Report:

To view the SHR status report of the switches on the ring, click the "SHR Status" link on the left side of the page. It will show the Switch SHR ID, and IP address of related switches as in figure 10.

Three soft buttons labeled "All Units," "Error Report," and "Clear Missing Units" on the lower portion of the SHR Status Report Window are provided for system monitoring.

All Units: When you click on this button, you will see all the units in the SHR link working under normal conditions as in figure 10.

Note: When there is a fiber breakage in the link, there will be a star in front of the SHR ID as shown on figure 11, indicating a fiber loss on that particular switch.

Error Report: When you click on this button, you will see the units in the SHR link that have a fiber problem. Refer to figure 12 on page 23.

Note: For Master: All switches will be shown (All Units). For Slave: Only the Master and itself will be shown.

Clear Missing Units: Clears the missing units in the error report status window. This is used when a unit is removed or isolated from the ring or the ID has been changed.

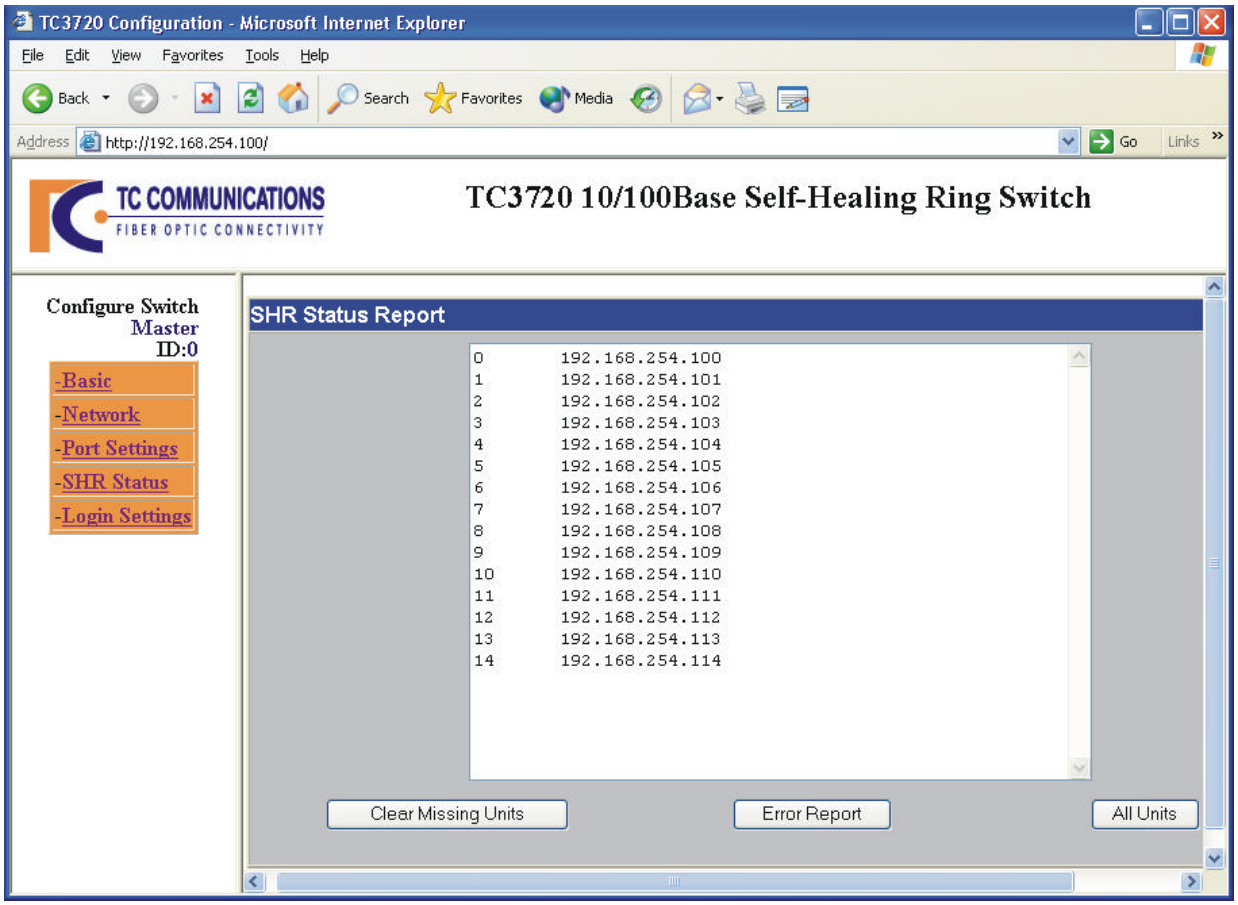


Figure 10. TC3720 SHR Status Report Window

Software Configuration Continue

SHR Status Report Continue:

Figure 11 shows that there is a fiber breakage in the SHR link. The particular units with broken fiber links will be displayed with a star in front of its SHR ID's. To view the details on the fiber breakage, click on the "Error Report" button and you will see the window as in figure 12 with the details of the units with the problem.

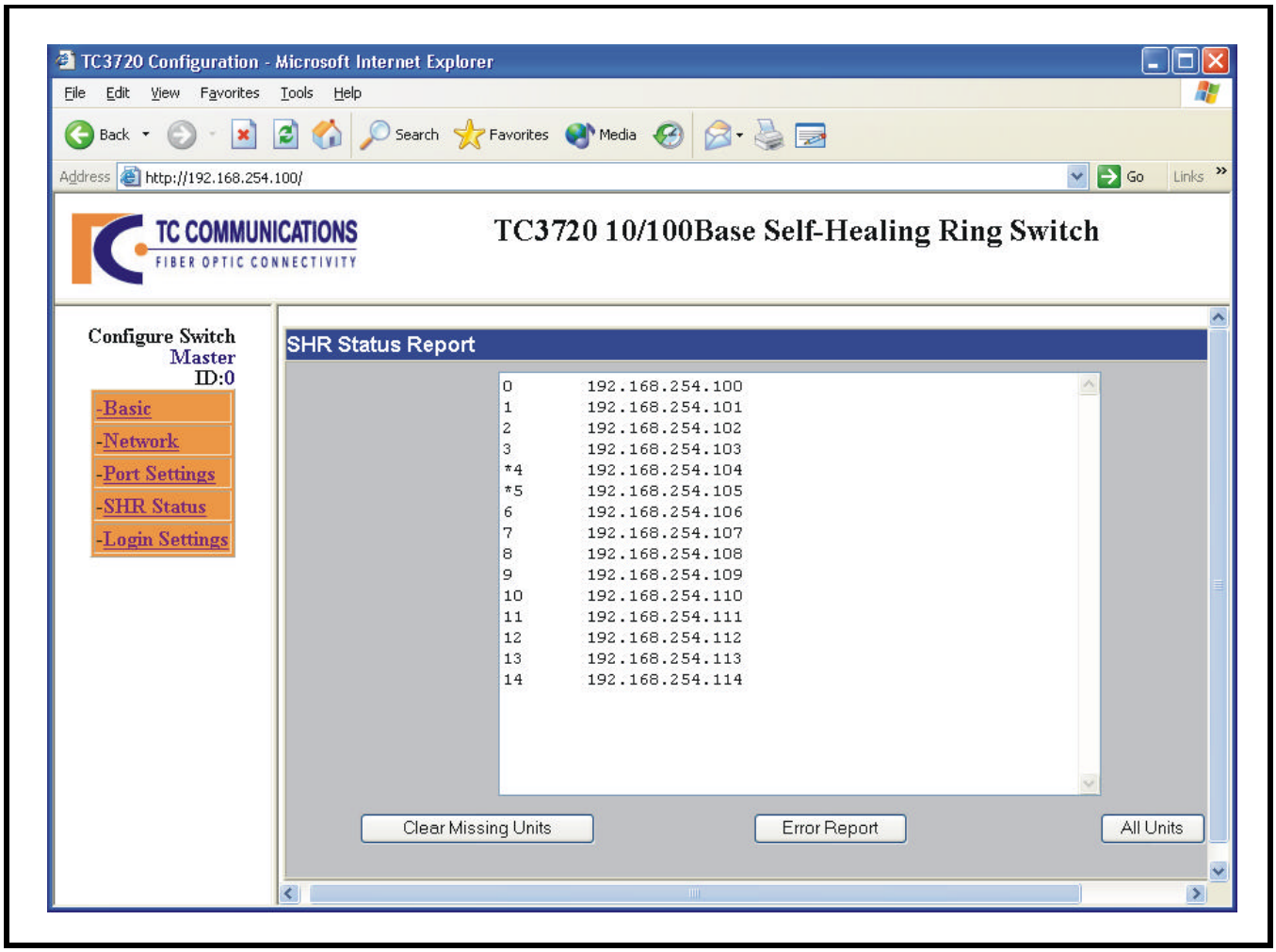


Figure 11. TC3720 SHR Status Report Window

Software Configuration Continue

Error Status Report: Figure12, "Error Status Report" will only display those switches that have a broken fiber link in the self-healing ring. It will show the switch ID, related fiber port, IP address, and Location Field, where the fiber breakage occurs (two units will be displayed for each broken link). The Master will display information on all the units, while the Slave units will display only the master and itself.

Warning: The error report viewed on a Slave unit will not show breakages not involving the Master or itself.

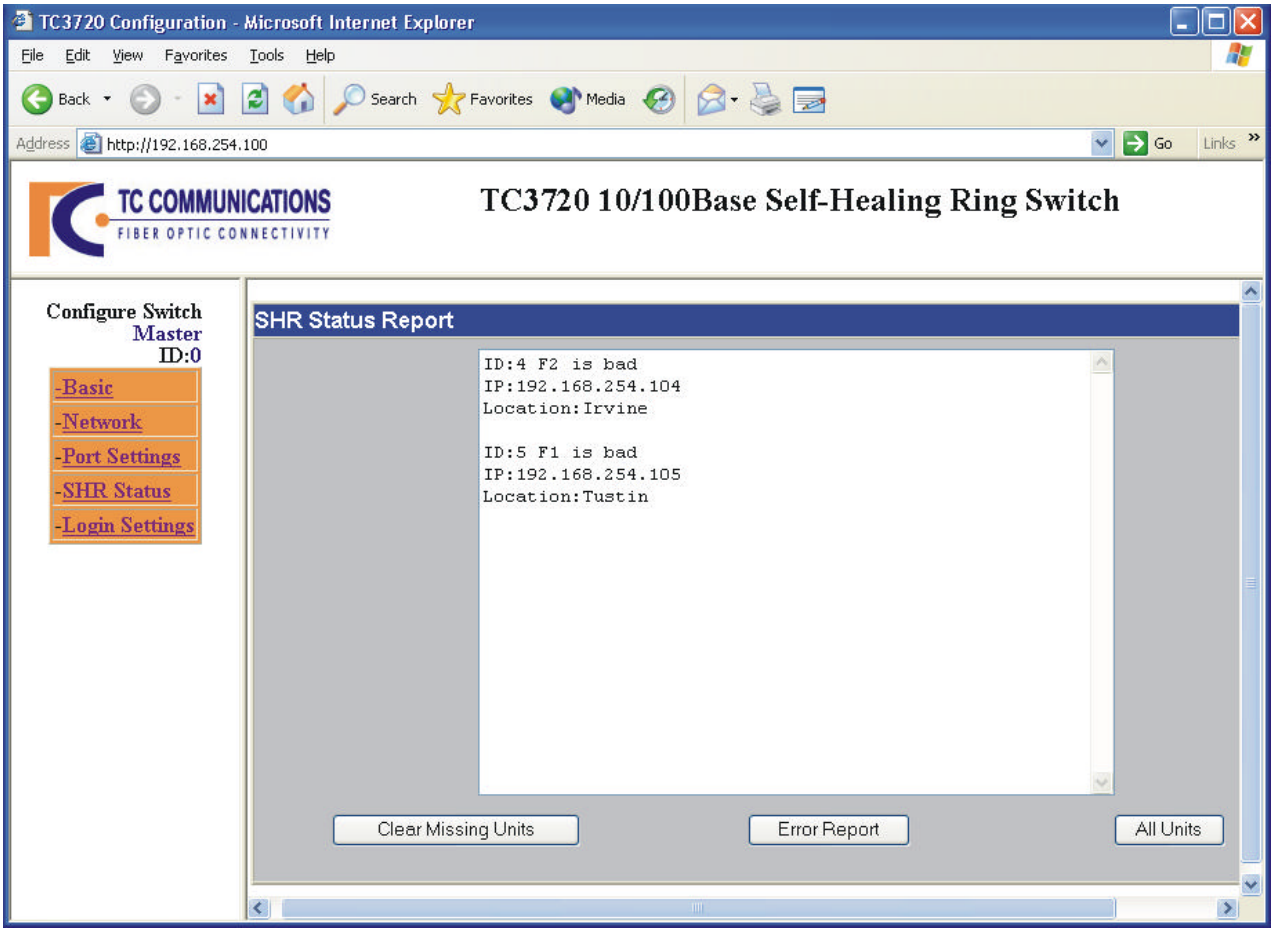


Figure 12. TC3720 SHR Error Report Window

Software Configuration Continue

Login Settings:

Displays current Username and Password.

Default Username: ***user***

Default Password: ***password***

When done, click Apply to save the settings.

Note: If you need to change the username and/or password, you can do so by following the steps below.

1. Enter the new username and/or password and click Apply. You will then see a window as in figure 14 on page 25. Click "reset" to save all the changes.
2. Then you will see a window asking you to refresh your browser or enter the new IP to continue. Please refresh your web browser and then login with the new user name or password when the authentication window (as in figure 15) pops up to continue the software configurations.

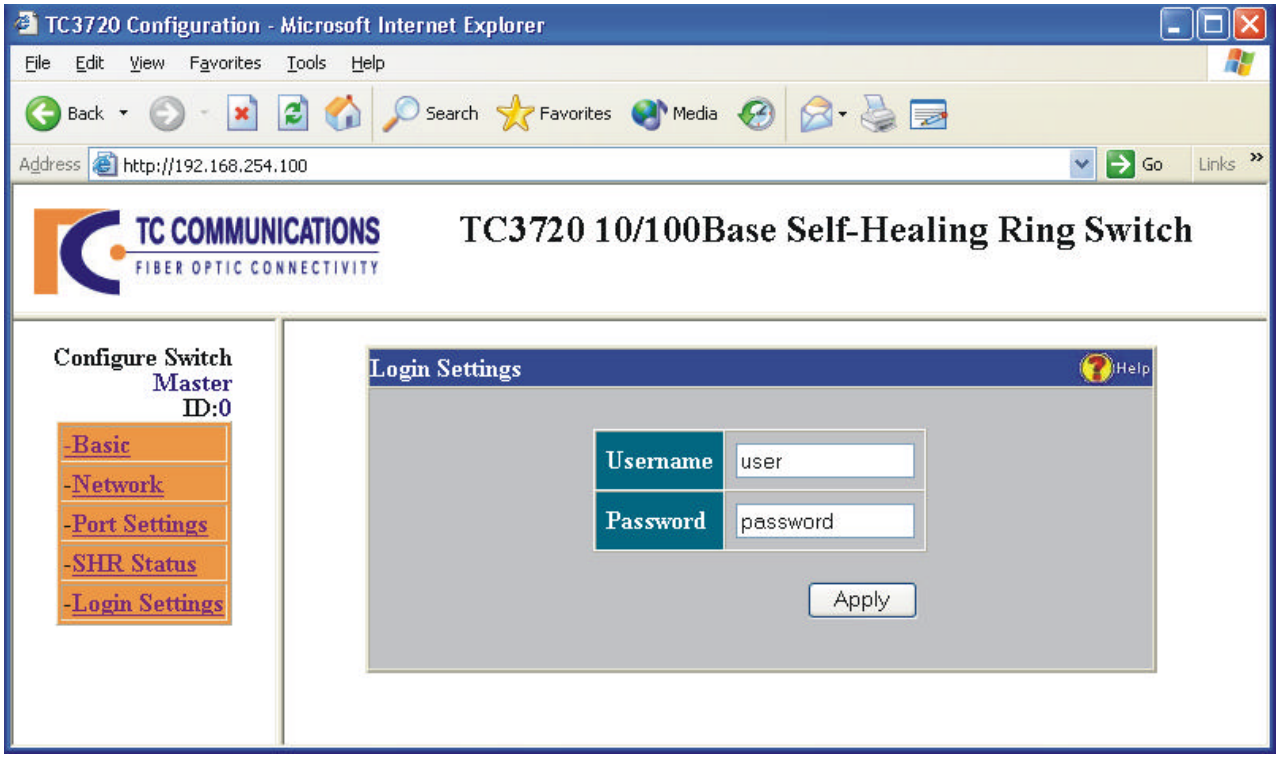


Figure 13. TC3720 Login Settings Window

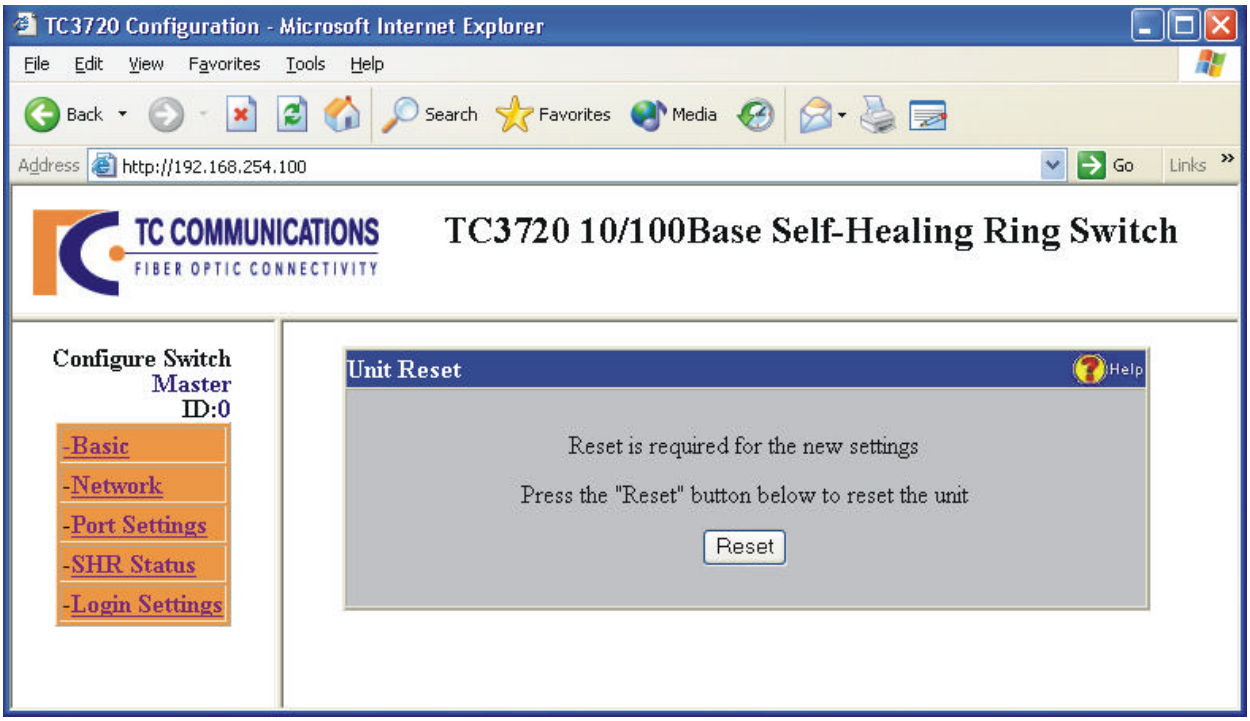


Figure 14. TC3720 New Settings Saved Window

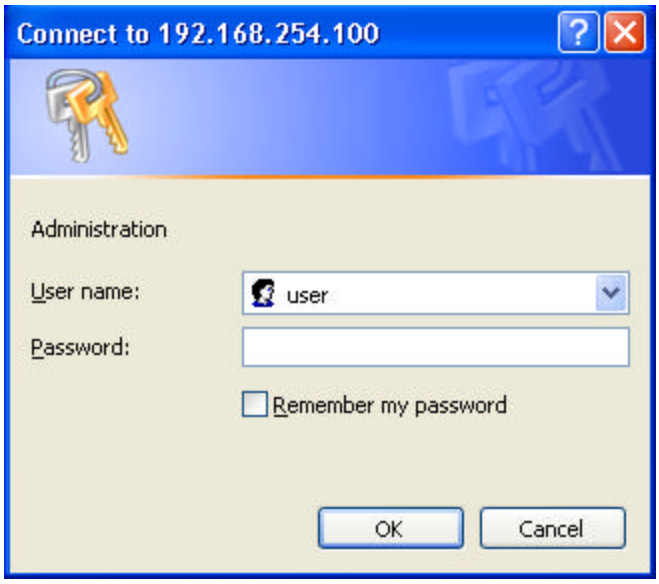
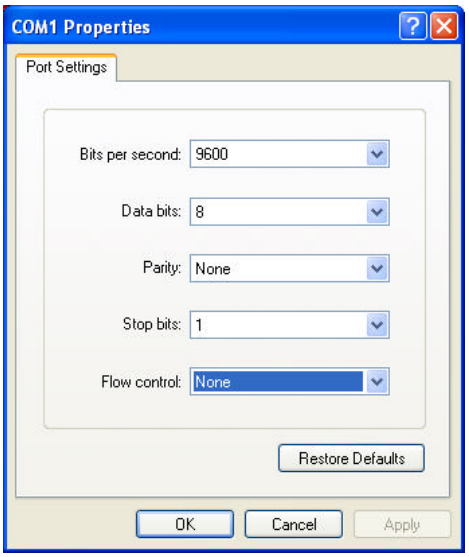


Figure 15. TC3720 Login with New Settings

Console Port Settings

User Name: Default is **user** (you can change it as you wish).
Password: Default is **password** (you can change it as you wish).
(***Note:*** The Console Settings are only used to set the "IP address," "username," and "password.")



Initial IP setting using the Console:

1. Connect the computer and the TC3720 via a DB9 serial cable.
2. Power up the TC3720 unit.
3. Open the HyperTerminal of your computer and under properties select the following settings: 9600 Baud, 8 data bits, No parity, 1 stop bit, and None for flow control. See diagram on the right.
4. Click "OK" or press Enter, when done.
5. Press the "Enter" key until you see a "Login" prompt.
6. Type **user** after the Login prompt and press "Enter."
7. Type **password** after the "Password" prompt.

Note: You will not see the password characters when typed.

8. When **password** has being entered correctly, you will see: Password Accepted.
9. At this point, you can continue to enter all the settings, as shown on figure 16 below.
10. Enter **set ip *192.168.254.100*** and press "Enter," the IP address will be set and you will be prompted to type "reset" to apply the new setting. We recommend you reset the settings at the end.
11. Enter **set netmask *255.255.255.0*** and press "Enter,"
12. Enter **set gateway *192.168.254.1*** and press "Enter,"
13. Enter **set username *user*** and press "Enter,"
14. Enter **set password *password*** and press "Enter,"
15. Type "**reset**" to apply all the settings.

Note: After completing the Console Settings, enter "Logout" & press "Enter" to log out of Console Settings.

When you see the "TC3720 Console Ver1.0" prompt, you have successfully configured your TC3720 unit.

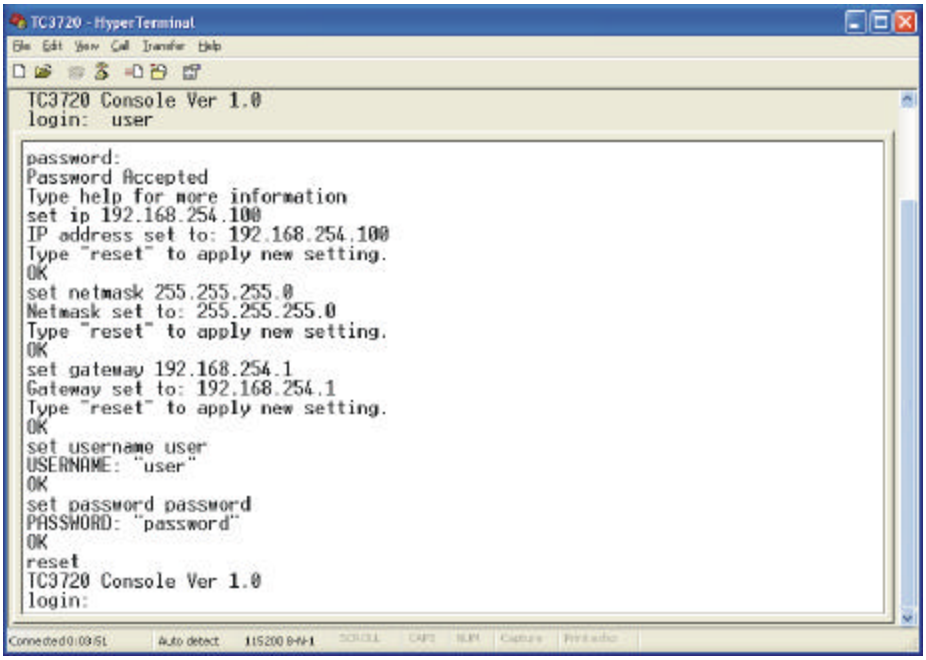


Figure 16. TC3720's Console Settings

Console Help

The console **"help"** and **"help set"** commands will assist you with information about various command descriptions as shown on figure 17, below.

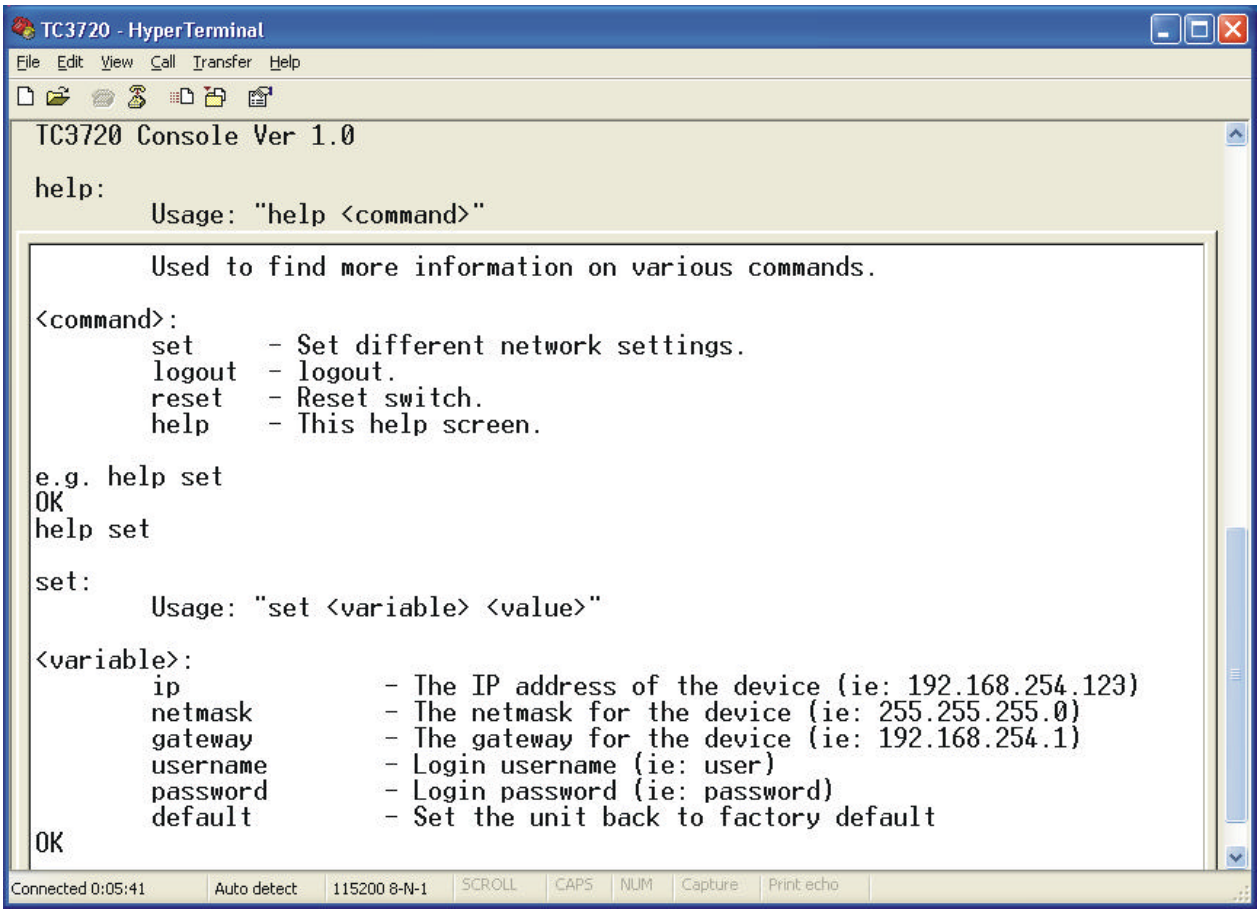


Figure 17. TC3720's Console Help

Set ip:	Set Unit's IP Address.	E.g. Set ip 192.168.254.123
Set netmask:	Set Unit's Netmask.	E.g. Set netmask 255.255.255.0
Set gateway:	Set Unit's Gateway IP	E.g. Set gateway 192.168.254.1
Set username:	Set login username	E.g. Set username john123
Set password:	Set login password	E.g. Set password 123456
Set default:	Set unit back to factory default	E.g. Set default

Note 1: All set commands required reset to apply new settings

Note 2: The default "timeout" value for console setting is two minutes.

"Show" Command

The "show" command will show the current IP settings of the TC3720 unit.

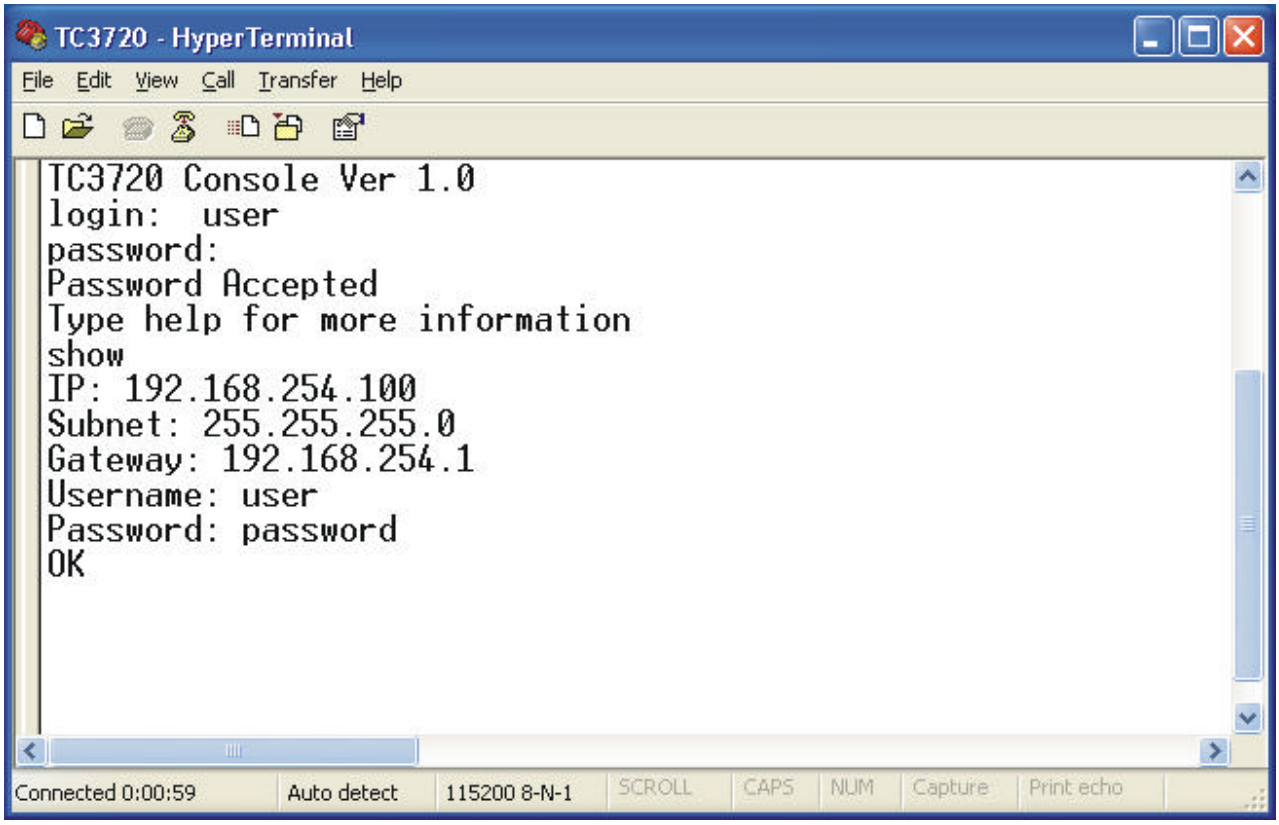


Figure 18. TC3720's "Show" Command

Telnet Settings

You can also use Telnet to set the IP configuration, username, and password.

Note: The Telnet default "timeout" is two minutes.

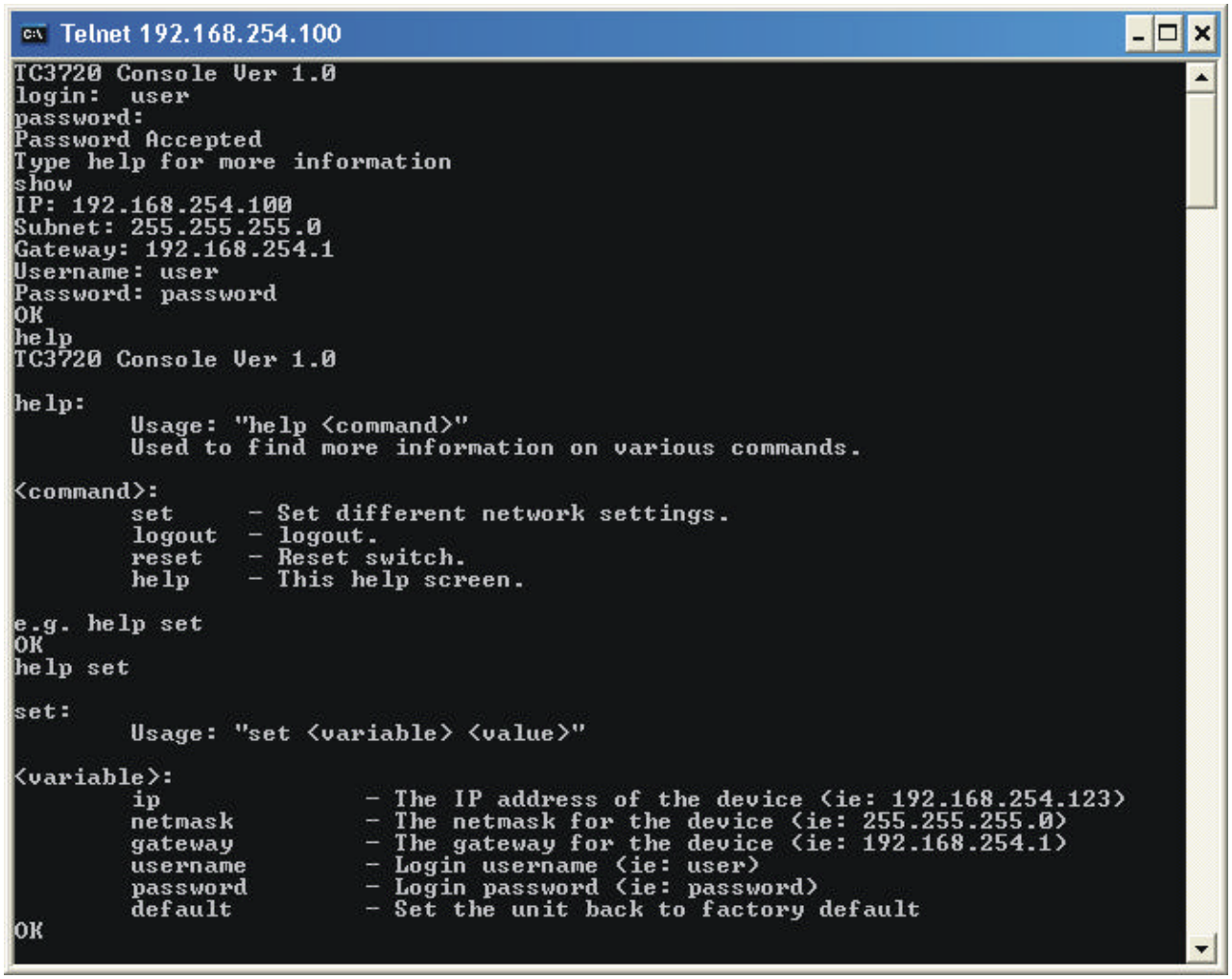


Figure 19. TC3720's Telnet Settings

Chapter 5 - PC IP Configuration

To check your PC's IP Address and Network Mask. (Windows 98/ME)

1. Open “Control Panel”
2. Open “Network”
3. Click on the TCP/IP for the network card
4. Click “Properties”

(**Attention**: Please copy down the existing setting before making any changes. Contact your network administrator if you are unsure about the settings. Improper settings may result in disruption of the existing network.)

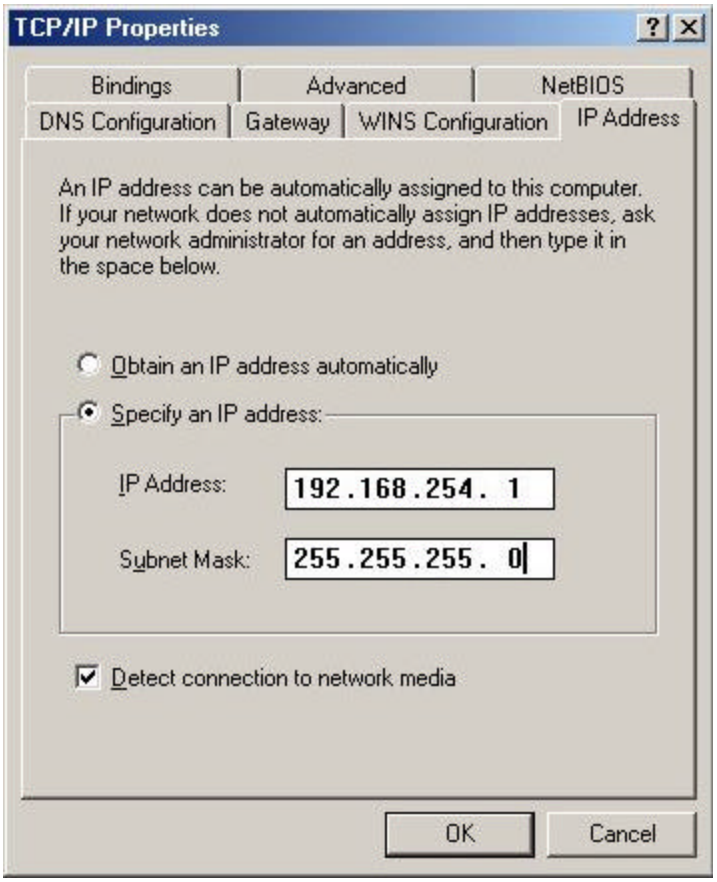


Figure 20. TCP/IP Properties

Under the TCP/IP Properties

Select the “Specify an IP address” option and type in the following

IP Address: 192.168.254.1 (Please make sure no other network device are using the same IP address.)

Subnet Mask: 255.255.255.0

Click OK and reboot the computer.

Chapter 6 - Troubleshooting

General

Alarm conditions occur whenever an optical problem or "fault" condition is detected by the TC3720's.

All LEDs are Off

If no LEDs are lit on the unit, check the DC power supply, terminal block connector plug, and/or the power source. If the problem persists, contact the Technical Support Department at TC Communications, Inc.

Alarm LED

When an alarm condition is detected, the ALARM LED will flash. The following fault conditions will cause the alarm to be triggered:

1. Power is lost to any unit in the SHR. This will cause adjacent units to go into alarm, indicating a fault in the SHR.
2. Fiber optic cable breakage in the SHR will also trigger an alarm condition.

Other LEDs

1. Any fiber optic cable breakage in the SHR will trigger an alarm condition between any two adjacent units as well as on the Master. Depending on which fiber port F1 or F2 the breakage occurs, the corresponding F1/1X or F2/X2 LEDs will also flash.

Optic Cable Types

Conventionally, fiber optic cable with yellow-colored insulation is used for Single Mode applications; gray or orange-colored insulated cable is for Multimode use. If Multimode cable is used in a Single Mode application, the test results could be erroneous and confusing.

Calculating the Fiber Optic Loss Budget

The fiber optic link and/or connectors are frequently the source of various problems. Check out the connectors and the integrity of the link first. Ideally, the link should be calibrated for total loss after the installation has been completed. This will accomplish two things: (1) it will verify that the total loss of the link is within the loss budget of the device and (2) it will provide a benchmark for future testing. For example, a system that has been tested as having 6dB total loss when installed and suddenly tests out as having a loss of 10dB probably has a connector or link problem.

To calculate the loss budget:

Multimode 850nm	**:**	**3 dB loss per km on 62.5/125µm cable***
Multimode 1310nm	**:**	**2 dB loss per km on 62.5/125µm cable***
Single Mode 1310nm	**:**	**0.5 dB loss per km on 9/125µm cable***
Single Mode 1550nm	**:**	**0.4 dB loss per km on 9/125µm cable***

**These numbers are listed for reference only. We recommend an OTDR reading be used to determine actual link loss.*

Chapter 7 - Specifications

Electrical

Data Rates 10Mbps/100Mbps
Connectors ..... RJ-45 Female, DB9 Serial Port

Optical

Refer to pages 5 and 6

Visual Indicators

System status ..... PWR A, PWR B, Vcc1, Vcc2, ALARM, MSTR/SLVE,
..... F1/1X,F2/2X
Ethernet Signal Status ..... 100M, FULL/COL, LINK/ACT(each port)
Optical Signal Status ..... 100M, FULL/COL, LINK/ACT (each port)

Alarm

Dry Contact ..... Normal Open

Power Source

Standard ..... 12VDC @500mA
Optional ..... 24VDC, -48VDC, 125VDC, or
..... 115/230VAC with an external power adapter

Temperature

Operating ..... -10ºC to 50ºC
..... Hi-Temp (Optional) -20ºC to 70ºC
..... Hardened Temperature (Optional) -40ºC to 80ºC
Humidity ..... 95% non-condensing

Physical (Standalone/Rackmount unit)

Height ..... (3.53 cm) 1.75"
Width ..... (48.26 cm) 19.0"
Depth ..... (16.57 cm) 6.5"
Weight ..... (544 gm) 1.2 Lbs

Appendix - A

Return Policy

To return a product, you must first obtain a Return Material Authorization number from the Customer Service Department. If the product's warranty has expired, you will need to provide a purchase order to authorize the repair. When returning a product for a suspected failure, please provide a description of the problem and any results of diagnostic tests that have been conducted.

Warranty

Damages by lightning or power surges are not covered under this warranty.

All products manufactured by TC Communications, Inc. come with a five year (beginning 1-1-02) warranty. TC Communications, Inc. warrants to the Buyer that all goods sold will perform in accordance with the applicable data sheets, drawings or written specifications. It also warrants that, at the time of sale, the goods will be free from defects in material or workmanship. This warranty shall apply for a period of five years from the date of shipment, unless goods have been subject to misuse, neglect, altered or destroyed serial number labels, accidents (damages caused in whole or in part to accident, lightning, power surge, floods, fires, earthquakes, natural disasters, or Acts of God.), improper installation or maintenance, or alteration or repair by anyone other than Seller or its authorized representative.

Buyer should notify TC Communications, Inc. promptly in writing of any claim based upon warranty, and TC Communications, Inc., at its option, may first inspect such goods at the premises of the Buyer, or may give written authorization to Buyer to return the goods to TC Communications, Inc., transportation charges prepaid, for examination by TC Communications, Inc. Buyer shall bear the risk of loss until all goods authorized to be returned are delivered to TC Communications, Inc. TC Communications, Inc. shall not be liable for any inspection, packing or labor costs in connection with the return of goods.

In the event that TC Communications, Inc. breaches its obligation of warranty, the sole and exclusive remedy of the Buyer is limited to replacement, repair or credit of the purchase price, at TC Communications, Inc.'s option.

To return a product, you must first obtain a Return Material Authorization (RMA) number and RMA form from the Customer Service Department. If the product's warranty has expired, you will need to provide a purchase order to authorize the repair. When returning a product for a suspected failure, please fill out RMA form provided with a description of the problem(s) and any results of diagnostic tests that have been conducted. The shipping expense to TC Communications should be prepaid. The product should be properly packaged and insured. After the product is repaired, TC Communications will ship the product back to the shipper at TC's cost to U.S. domestic destinations. (Foreign customers are responsible for all shipping costs, duties and taxes [both ways]. We will reject any packages with airway bill indicating TC communications is responsible for Duties and Taxes. To avoid Customs Duties and Taxes, please include proper documents indicating the product(s) are returned for repair/retest).

Appendix - B

Setting the Self Healing Ring IDs on the TC3720's:

Using the rear panel DIP switches 1- 7, you can set the SHR ID. DIP switch #8 is used to set the unit as a Slave or Master.

There are 127 settings for the SHR ID on the TC3720's, each unit in the ring must have a different SHR ID

SHR ID Setting (1)

Dipswitch / Value	1	2	3	4	5	6	7
	$2^0=1$	$2^1=2$	$2^2=4$	$2^3=8$	$2^4=16$	$2^5=32$	$2^6=64$
1	Down	Up	Up	Up	Up	Up	Up
2	Up	Down	Up	Up	Up	Up	Up
3	Down	Down	Up	Up	Up	Up	Up
4	Up	Up	Down	Up	Up	Up	Up
5	Down	Up	Down	Up	Up	Up	Up
6	Up	Down	Down	Up	Up	Up	Up
7	Down	Down	Down	Up	Up	Up	Up
8	Up	Up	Up	Down	Up	Up	Up
9	Down	Up	Up	Down	Up	Up	Up
10	Up	Down	Up	Down	Up	Up	Up
11	Down	Down	Up	Down	Up	Up	Up
12	Up	Up	Down	Down	Up	Up	Up
13	Down	Up	Down	Down	Up	Up	Up
14	Up	Down	Down	Down	Up	Up	Up
15	Down	Down	Down	Down	Up	Up	Up
16	Up	Up	Up	Up	Down	Up	Up
17	Down	Up	Up	Up	Down	Up	Up
18	Up	Down	Up	Up	Down	Up	Up
19	Down	Down	Up	Up	Down	Up	Up
20	Up	Up	Down	Up	Down	Up	Up
21	Down	Up	Down	Up	Down	Up	Up
22	Up	Down	Down	Up	Down	Up	Up
23	Down	Down	Down	Up	Down	Up	Up
24	Up	Up	Up	Down	Down	Up	Up
25	Down	Up	Up	Down	Down	Up	Up
26	Up	Down	Up	Down	Down	Up	Up
27	Down	Down	Up	Down	Down	Up	Up
28	Up	Up	Down	Down	Down	Up	Up
29	Down	Up	Down	Down	Down	Up	Up
30	Up	Down	Down	Down	Down	Up	Up

31	Down	Down	Down	Down	Down	Up	Up
32	Up	Up	Up	Up	Up	Down	Up
33	Down	Up	Up	Up	Up	Down	Up
34	Up	Down	Up	Up	Up	Down	Up
35	Down	Down	Up	Up	Up	Down	Up
36	Up	Up	Down	Up	Up	Down	Up
37	Down	Up	Down	Up	Up	Down	Up
38	Up	Down	Down	Up	Up	Down	Up
39	Down	Down	Down	Up	Up	Down	Up
40	Up	Up	Up	Down	Up	Down	Up
41	Down	Up	Up	Down	Up	Down	Up
42	Up	Down	Up	Down	Up	Down	Up
43	Down	Down	Up	Down	Up	Down	Up
44	Up	Up	Down	Down	Up	Down	Up
45	Down	Up	Down	Down	Up	Down	Up

SHR ID Setting (2)

Dipswitch / Value	1	2	3	4	5	6	7
	2^0=1	2^1=2	2^2=4	2^3=8	2^4=16	2^5=32	2^6=64
46	Up	Down	Down	Down	Up	Down	Up
47	Down	Down	Down	Down	Up	Down	Up
48	Up	Up	Up	Up	Down	Down	Up
49	Down	Up	Up	Up	Down	Down	Up
50	Up	Down	Up	Up	Down	Down	Up
51	Down	Down	Up	Up	Down	Down	Up
52	Up	Up	Down	Up	Down	Down	Up
53	Down	Up	Down	Up	Down	Down	Up
54	Up	Down	Down	Up	Down	Down	Up
55	Down	Down	Down	Up	Down	Down	Up
56	Up	Up	Up	Down	Down	Down	Up
57	Down	Up	Up	Down	Down	Down	Up
58	Up	Down	Up	Down	Down	Down	Up
59	Down	Down	Up	Down	Down	Down	Up
60	Up	Up	Down	Down	Down	Down	Up
61	Down	Up	Down	Down	Down	Down	Up
62	Up	Down	Down	Down	Down	Down	Up
63	Down	Down	Down	Down	Down	Down	Up
64	Up	Up	Up	Up	Up	Up	Down
65	Down	Up	Up	Up	Up	Up	Down
66	Up	Down	Up	Up	Up	Up	Down
67	Down	Down	Up	Up	Up	Up	Down
68	Up	Up	Down	Up	Up	Up	Down
69	Down	Up	Down	Up	Up	Up	Down
70	Up	Down	Down	Up	Up	Up	Down

71	Down	Down	Down	Up	Up	Up	Down
72	Up	Up	Up	Down	Up	Up	Down
73	Down	Up	Up	Down	Up	Up	Down
74	Up	Down	Up	Down	Up	Up	Down
75	Down	Down	Up	Down	Up	Up	Down
76	Up	Up	Down	Down	Up	Up	Down
77	Down	Up	Down	Down	Up	Up	Down
78	Up	Down	Down	Down	Up	Up	Down
79	Down	Down	Down	Down	Up	Up	Down
80	Up	Up	Up	Up	Down	Up	Down
81	Down	Up	Up	Up	Down	Up	Down
82	Up	Down	Up	Up	Down	Up	Down
83	Down	Down	Up	Up	Down	Up	Down
84	Up	Up	Down	Up	Down	Up	Down
85	Down	Up	Down	Up	Down	Up	Down
86	Up	Down	Down	Up	Down	Up	Down
87	Down	Down	Down	Up	Down	Up	Down
88	Up	Up	Up	Down	Down	Up	Down
89	Down	Up	Up	Down	Down	Up	Down
90	Up	Down	Up	Down	Down	Up	Down
91	Down	Down	Up	Down	Down	Up	Down
92	Up	Up	Down	Down	Down	Up	Down

SHR ID Setting (3)

Dipswitch / Value	1	2	3	4	5	6	7
	$2^0=1$	$2^1=2$	$2^2=4$	$2^3=8$	$2^4=16$	$2^5=32$	$2^6=64$
93	Down	Up	Down	Down	Down	Up	Down
94	Up	Down	Down	Down	Down	Up	Down
95	Down	Down	Down	Down	Down	Up	Down
96	Up	Up	Up	Up	Up	Down	Down
97	Down	Up	Up	Up	Up	Down	Down
98	Up	Down	Up	Up	Up	Down	Down
99	Down	Down	Up	Up	Up	Down	Down
100	Up	Up	Down	Up	Up	Down	Down
101	Down	Up	Down	Up	Up	Down	Down
102	Up	Down	Down	Up	Up	Down	Down
103	Down	Down	Down	Up	Up	Down	Down
104	Up	Up	Up	Down	Up	Down	Down
105	Down	Up	Up	Down	Up	Down	Down
106	Up	Down	Up	Down	Up	Down	Down
107	Down	Down	Up	Down	Up	Down	Down
108	Up	Up	Down	Down	Up	Down	Down
109	Down	Up	Down	Down	Up	Down	Down
110	Up	Down	Down	Down	Up	Down	Down

111	Down	Down	Down	Down	Up	Down	Down
112	Up	Up	Up	Up	Down	Down	Down
113	Down	Up	Up	Up	Down	Down	Down
114	Up	Down	Up	Up	Down	Down	Down
115	Down	Down	Up	Up	Down	Down	Down
116	Up	Up	Down	Up	Down	Down	Down
117	Down	Up	Down	Up	Down	Down	Down
118	Up	Down	Down	Up	Down	Down	Down
119	Down	Down	Down	Up	Down	Down	Down
120	Up	Up	Up	Down	Down	Down	Down
121	Down	Up	Up	Down	Down	Down	Down
122	Up	Down	Up	Down	Down	Down	Down
123	Down	Down	Up	Down	Down	Down	Down
124	Up	Up	Down	Down	Down	Down	Down
125	Down	Up	Down	Down	Down	Down	Down
126	Up	Down	Down	Down	Down	Down	Down
127	Down	Down	Down	Down	Down	Down	Down