

# **TC8520**

## **4 CHANNEL TELEPHONE, 1 CHANNEL 10/100 BASE-T & (Optional 4 Channels Data) FIBER OPTIC MULTIPLEXER**

# **User's Manual**

**MODEL:** \_\_\_\_\_

**S/N:** \_\_\_\_\_

**DATE:** \_\_\_\_\_

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# Chapter 1 - Overview

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## Features

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- ☐ **Multiplexes 10/100 Ethernet, 2-Wire Analog POTs or 2/4-Wire 600 Ohm Analog and Optional RS-232, RS-422, TTL, or Dry Contact**
- ☐ **10/100 Auto-Negotiating and Bandwidth Control on the Ethernet Bridging Port (32Kbps increments up to 10Mbps)**
- ☐ **1 to 4 Channels of Telephone or combo, Replaceable Line Interface Module**
- ☐ **Web-Based & Telnet Configuration (Serial Configuration Only for Units Without Data)**
- ☐ **Hardened Temperature (optional), -40°C to 80°C Exceeds NEMA & CALTRANS Specs**
- ☐ **Optional Optical Redundancy**
- ☐ **Distances up to 100km, Multimode (1310nm) or Single Mode (1310nm/1550nm)**
- ☐ **Two-way "One Fiber" Communication (optional)**
- ☐ **Built-In Power Redundancy, Optional 24VDC, or 115/230VAC Power**
- ☐ **Local Dry Contact Alarm Relay**
- ☐ **Rackmount or Standalone**

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## Description

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The TC8520 Telephone, Ethernet & Data Fiber Multiplexer multiplexes various combinations of 2-wire Analog POTS or 2/4-wire 600 Ohm Analog, 1 Ch. 10/100 Ethernet and optional Serial Data channels over single mode or multimode fiber.

The TC8520 supports distances to more than 100 km and offers a two-way, "one fiber" communication option to maximize fiber cable usage. Optional redundant power and optics include automatic switchover for maximum reliability.

Setup, diagnostics and control is accessed via Serial Terminal, Telnet management ports. Diagnostics include LED indicators, dry contact alarms and local and remote loopback.

The Ethernet port auto-negotiates at 10/100 with full 10Mbps throughput and rate control in increments of 32Kbps. It is IEEE 802.3/802.3u/802.3x compliant.

The TC8520 converts 2-wire FXS to fiber optics on the telephone side with ring down capability and FXO on the PBX side. Because the TC8520 digitizes the analog signals (PCM), voice quality does not degrade over extended distances. Serial interface options are RS-232, RS-422, TTL, Dry Contact.

The TC8520 is available in basic standalone unit or optional, 1U high rackmount card "pizza box." The rackmount card fits into a 19" Rackmount Card Cage. Fiber optic connectors are ST, FC or SC. Standard power is 12VDC and includes built-in redundancy. Optional power sources include 24VDC or 115/230VAC with an external power cube. High temperature (-20°C to 70°C) and extreme temperature (-40°C to 80°C) versions are also available.

## Typical Application Using the TC8520's

Typical applications include extending multiple Telephone lines, Analog, Data and Ethernet channels to remote site such as campus networks, substations, etc. The two-way "one fiber," option can double usage of existing fiber optic cable plants.

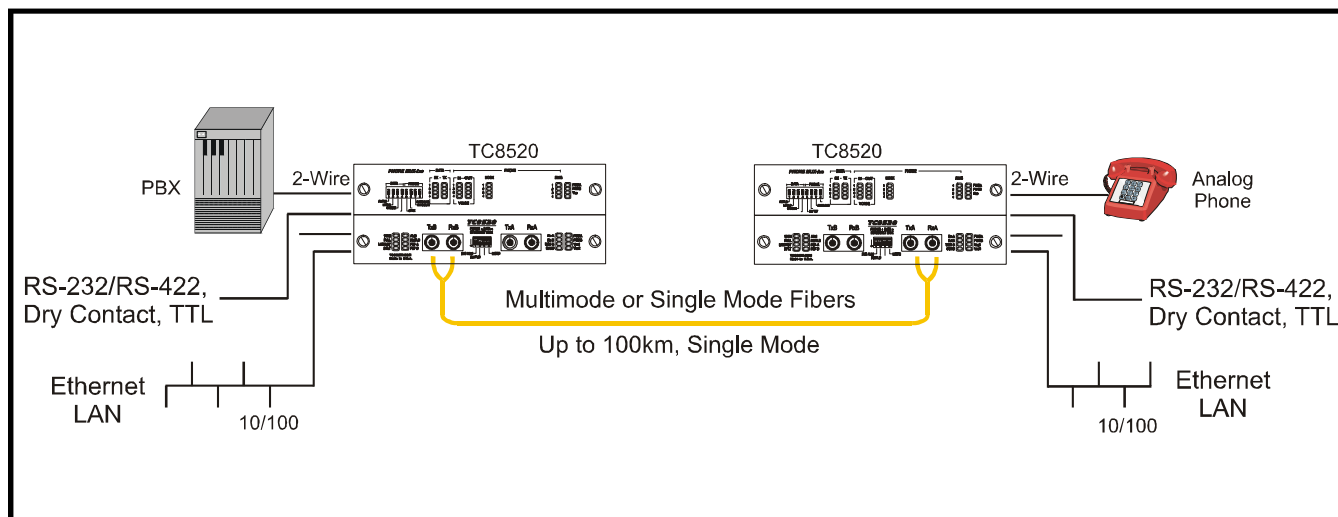
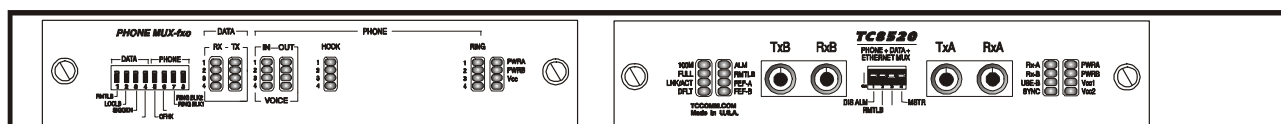


Figure 1. Typical Application Using the Standalone TC8520 Fiber Optic Multiplexers

## TC8520 Pizza Box Rackmount Unit

The optional variation is so called "pizza box" (TCRM195) which is a 19" rackmountable with one U high horizontal box. The pizza box version of TC8520 has the same PC cards installed except the sheet metal packaging.

The DIP switches and LEDs are all the same as stand-alone version of the TC8510.



Pizza Box Version

## Optical Specifications

### Multimode Model

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

### Single Mode 1310nm, 20km Model

<b>Transmitter:</b>	FP Laser; typical Launch Power:	-14 to -7 dBm* (1310nm, @9/125 $\mu$ m)
<b>Receiver:</b>	PIN Diode; typical Sensitivity: Optic saturation level:	-34.0 dBm* (1310nm, @9/125 $\mu$ m) -3 dBm* (1310nm, @9/125 $\mu$ m)
<b>Loss Budget:</b>	1310nm Single Mode, @9/125 $\mu$ m:	20 dB
<b>Distance:</b>	1310nm Single Mode, @9/125 $\mu$ m:	up to 20 km distance
<b>Wavelength:</b>	1310nm Single Mode (LASER):	
<b>Connector:</b>	ST FC SC	

### Single Mode 1310nm, 75km Model

<b>Transmitter:</b>	FP Laser; typical Launch Power:	-3 to 0dBm* (1310nm, @9/125 $\mu$ m)
<b>Receiver:</b>	PIN Diode; typical Sensitivity: Optic saturation level:	-36.0 dBm* (1310nm, @9/125 $\mu$ m) -3 dBm* (1310nm, @9/125 $\mu$ m)
<b>Loss Budget:</b>	1310nm Single Mode, @9/125 $\mu$ m:	33dB
<b>Distance:</b>	1310nm Single Mode, @9/125 $\mu$ m:	up to 75km distance
<b>Wavelength:</b>	1310nm Single Mode (LASER)	
<b>Connector:</b>	ST FC SC	

### Single Mode 1550nm, 75km Model

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

### Single Fiber, 50km Model

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

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

## Theory of Operation

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The TC8520 is designed to provide users with maximum flexibility, ease of use, simplicity and functionality. The unit consists of two printed circuit boards (PCBs): one for telephone multiplexing and a second for 10/100Base-T Ethernet signal and Data. The Telephone interface PCB (board with no optics) provides for the telephone lines.

The optical PCB (board with optics) provides for the one channel 10/100Base-T Ethernet and up to four optional channels of data, optic transmitter/receiver operations and data serialization. It converts electrical signals to optic signals and converts the parallel data bits to serial format for data transmission across the fiber link. The reverse process occurs at the opposite end, where the serial data is converted into parallel format for the electrical signals, which is then transmitted to another device.

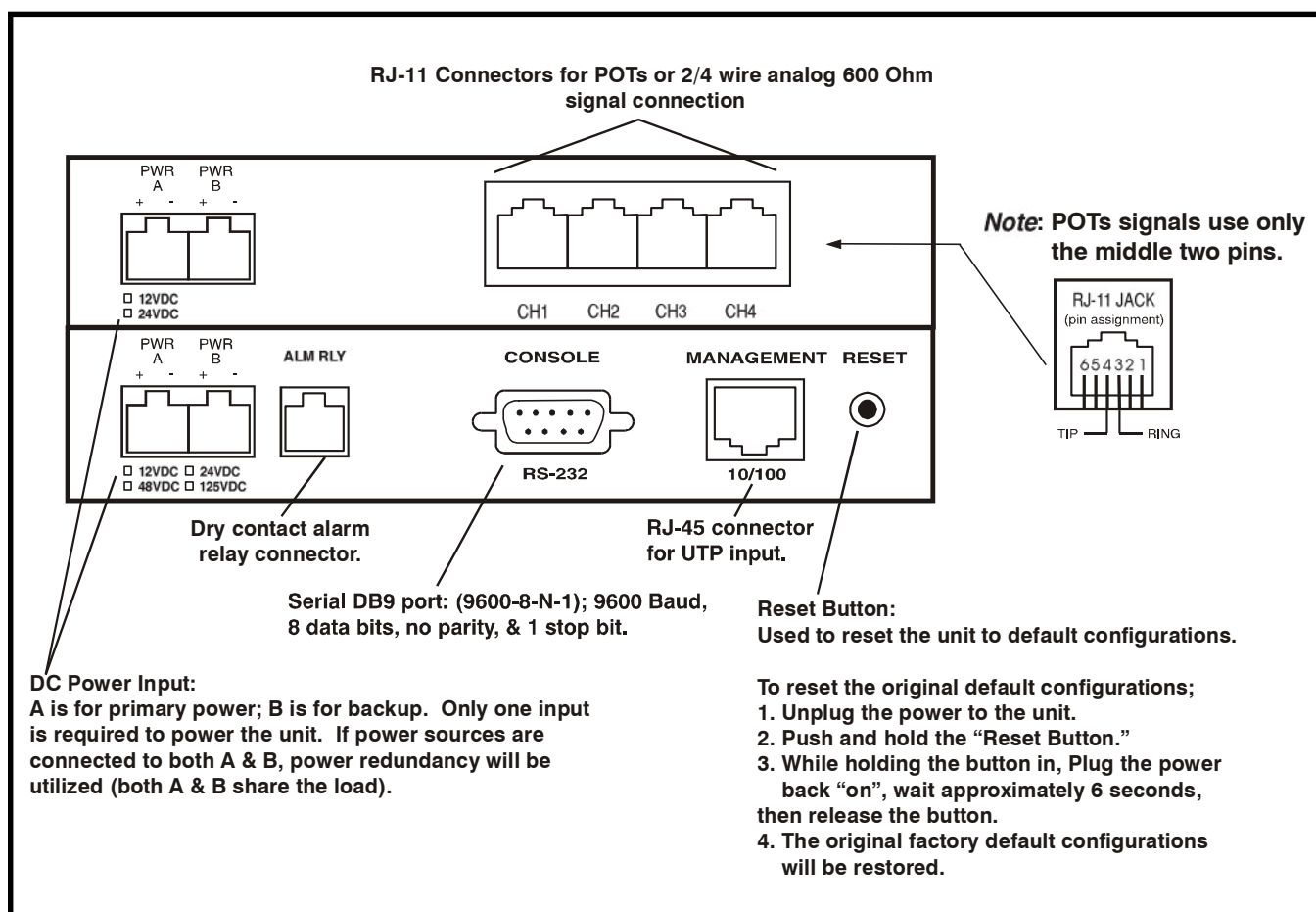
Any loss of optical signal on the primary or secondary port will trigger the major alarm. The major alarm LED is located at the bottom left of the front panel on the optical board (see Figure 2). Once activated, the major alarm will set off an audio buzzer and the Dry Contact Relay will be released (set to the "CLOSED" condition).

The "DIS ALM" DIP switch on the optical board is provided to disable the audio buzzer and the dry contact relay.

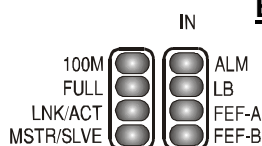
At the heart of the TC8520s are FPGA (Field Programmable Gate Array) integrated chips. These modern chips allow for desirable benefits such as low power consumption, configuration flexibility, high reliability, and long MTBFs.







**Figure 4. TC8520 Rear Panel with Serial DB9 Connector**



## Ethernet, Data, Alarm, and Optical Status LEDs

**Note:** The second column of LEDs have a second function. It monitors the electrical input signal for the optical board data channels 1-4 (AUX1...AUX4). The "IN" (Input) of each channel 1 through 4 is monitored by the following LEDs: ALM=CH1 , LB=CH2, FEF-A=CH3, & FEF-B=CH4 respectively.

To enable this second function for data monitoring, set the optical board DIP switch #4 (LED-DATA) to the down "On" position.

The primary functions are stated below. To monitor the primary functions, the SW#4 (LED-DATA) on the optical board must be to the up "Off" position.

**100M:** When illuminated, this LED indicates that the Ethernet Port is 100Mbps.  
When Off, it indicates that the Ethernet Port is 10Mbps.

**FULL:** When illuminated, this LED indicates that the Ethernet Port is Full Duplex.  
When Off, it indicates that the Ethernet Port is Half Duplex.

**LNK/ACT:** When illuminated, this LED indicates that an Ethernet Signal is detected.  
When Flashing, it indicates that Ethernet activity is detected.

**MSTR/SLVE:** When illuminated, this LED indicates that the unit is set as a Master.  
When Off, this LED indicates that the unit is set as a Slave.

**ALM:** Lit, when triggered by the following alarm conditions:

1. Optic signal lost or invalid on Primary or Secondary optical fiber receiver.
2. Any of the voice modules is malfunctioning.
3. Loss of power on a unit (local or remote) - this alarm will automatically reset (cancel) on both units when power is restored.

When flashing, it indicates that the unit is in diagnostic mode: Local or Remote Loopback tests are active or the SIGGEN function is active.

The alarm also activates the dry contact relay (normally in the OPEN position). The local unit's alarm can be cleared by enabling the "DIS ALM" dip switch SW1 on the front panel of the optical board to the down (on) position.

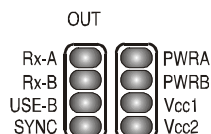
**LB:** When flashing, it indicates that either the remote loopback or local loopback diagnostic function is enabled.

For normal operation, both the remote loopback and local loopback DIP switches should be in the up "Off" position. When both diagnostic modes are off, the LED will be off.

**FEF-A:** When illuminated, this LED indicates that the Primary link (optical side "A"), far end, has detected a fault condition. (Either the Local Tx A or Remote Rx A is bad.)

**FEF-B:** When illuminated, this LED indicates that the Secondary link (optical side "B"), far end, has detected a fault condition. (Either the Local Tx B or Remote Rx B is bad.)

**Note:** By default, Far End Fault Detection will only be enabled on units with optical redundancy.



## **Data, Optical & Power Status LED Indicators**

**Note:** The first column of LEDs have a second function. It monitors the electrical output signal for the optical board data channels 1-4 (AUX1...AUX4). The "OUT" (Output) of each channel 1 through 4 is monitored by the following LEDs: Rx-A=CH1, Rx-B=CH2, USE-B=CH3, & SYNC=CH4 respectively.

To enable this second function for data monitoring, set the optical board DIP switch #4 (LED-DATA) to the down "On" position.

The primary functions are stated below. To monitor the primary functions, the SW#4 (LED-DATA) on the optical board must be to the up "Off" position.

**PWR A & B:** Indicate the status of dual power sources at the power jacks on the rear panel (9V to 12V DC). Note: when power redundancy is utilized, both "A" and "B" LEDs will be lit. Normally, both "A" and "B" share the load; if either power source fails, the other assumes the full load.

**Vcc1 & 2:** +5V DC status. There are two separate voltages derived from the power source on the Optic Board. These LEDs indicate the presence of these voltages. Both should be lit whenever power is connected to the unit.

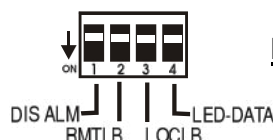
**Rx-A:** When illuminated, this LED indicates that the Primary Optical Receiver (side "A") is receiving the signal above minimum sensitivity threshold.

**Rx-B:** When illuminated, this LED indicates that the Secondary Optical Receiver (side "B") is receiving the signal above minimum sensitivity threshold.

**USE-B:** When Off, it indicates that the active link is the Primary optical side (side "A"). When illuminated (On), it indicates that the active link is the Secondary optical side (side "B").

**SYNC:** When illuminated, this LED indicates that the fiber link has been established between the local and remote units.

When flashing, it indicates that the fiber link is broken between the local and remote units. If the units are ordered with optional, optical redundancy, then it would take both the primary and secondary optical port A and B to be broken for the SYNC LED to flash.



## **DIP Switch Functions**

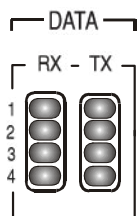
**DIS ALM:** Disables the alarm buzzer and the dry contact relay when enabled to the down (on) position.

**RMTLB:** Used to enable the RMTLB function for testing the data channels. All four data channels on the optical board will be in remote loopback mode at the same time.

**LOCLB:** Used to enable the LOCLB function for testing the data channels. All four data channels on the optical board will be in local loopback mode at the same time.

**LED-DATA:** Used to monitor the default functions of the dual function LEDs or the Input/Output status of the electrical channels on the optical board, see notes on pages 11 & 12.

## Interface (Telephone) Board LEDs and Functions

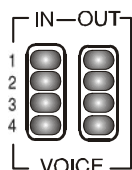


### Data Signal Status LED Indicators

**RX:** Rx (input to the Optical Card) status indicators for each data channel. Solidly lit, it indicates that the data signal is received from the local user's equipment. For dry contact, it indicates that the detector side has been closed.

Off when, data signal is not received from user's equipment. For dry contact, it indicates that the detector side is open.

**TX:** Tx (output from the Optical Card) status indicators for each data channel. Solidly lit, it indicates that the data signal is transmitted to the local user's equipment. For dry contact, it indicates that the closure side is closed (ready to transmit).

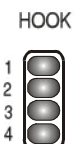


### Telephone Signal Status LED Indicators

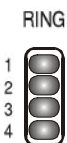
Volume LED indicators for the RJ-11 connections for each phone channel:

**IN:** "IN" electrical signal input to the Telephone Card from the user's device.

**OUT:** "OUT" electrical signal output from the Telephone Card to the user's device.



**HOOK:** Hook status indicators (for each phone channel). This LED will light up when the phone is off hook.



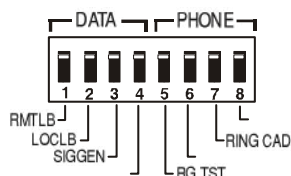
**RING:** Ring status indicators (for each phone channel). This LED will flash when the "ring signal" (from the remote FXO unit) is detected.



## Power Status LEDs

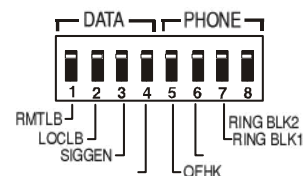
- PWR A & B:** Indicate the status of dual power sources at the power jacks on the rear panel (9V to 12V DC). Note: when power redundancy is utilized, both "A" and "B" LEDs will be lit. Normally, both "A" and "B" share the load; if either power source fails, the other assumes the full load.
- Vcc:** +5VDC LED status indicator. Indicates the voltage is derived from the power source on the Interface Board. It should be lit whenever power is connected to the unit.
- Not Used:** The LED indicator below the Vcc, is not used. It should be off at all times.

### DIP Switches on FXS Card



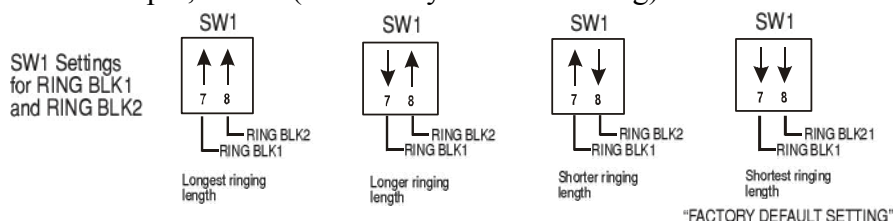
### FXS & FXO Card's DIP Switch Functions

### DIP Switches on FXO Card



**Note:** DIP Switches #4, 6, & 8 on FXS card and DIP Switches #4 & 6 on FXO card are not used.

- RMTLB:** Initiates a Remote Loopback for testing data. It loops back the data at the remote unit back to the user's equipment. When done with the test, return SW1\_1 to the up "Off" position.
- LOCLB:** Initiates a Local Loopback for testing the incoming electrical data signal on the local unit. The incoming data signal is looped back to the device connected to the RJ-11. When done with the test, return SW1\_2 to the up "Off" position.
- SIGGEN:** Signal Generator, used for validating fiber optic links. (see page 22 for SIGGEN test).
- RG TST:** Ring Tester (On FXS Card), it will ring every phone channel on the card simultaneously.
- RING CAD:** Ring Cadence (On FXS Card), is used to change the ring sound: Must be in the up "Off" position on both units when using the FXO to FXS setup. (For future release)
- OFHK:** Off Hook (On FXO Card), (for factory test only, not for user).
- RING BLK1 & RING BLK2:** (On FXO Card), these DIP switches are used to set the ringing length of the phone set. However, any change selected by the user, will be done internally within the board, user will not note the difference in ringing length. Please keep at factory default setting. See example, below. (For factory troubleshooting)



## **Base (Optical) Card Internal DIP Switch (SW2)**

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These DIP switches have been set by factory. If any changes need to be made, contact the Technical Support Department before doing any changes to not void the warranty.

SW2\_1: Not used.

SW2\_2: Enable data port.

SW2\_3: Enable optical redundancy (RxB).

SW2\_4: Not used. (For factory test only)

## **Expansion (Telephone) Card Internal DIP Switch (SW2)**

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These DIP switches have been preset by factory. If any changes need to be made, contact the Technical Support Department before doing any changes to not void the warranty.

SW2\_1: FXS/FXO selection for channel 1.      On: for FXO,   Off: for FXS (Not for user use)

SW2\_2: FXS/FXO selection for channel 2.      On: for FXO,   Off: for FXS (Not for user use)

SW2\_3: FXS/FXO selection for channel 3.      On: for FXO,   Off: for FXS (Not for user use)

SW2\_4: FXS/FXO selection for channel 4.      On: for FXO,   Off: for FXS (Not for user use)

SW2\_5: Disable channel 2.      (default position: Left "Off", unless less than four channels ordered)

SW2\_6: Disable channel 3.      (default position: Left "Off", unless less than four channels ordered)

SW2\_7: Not used.

SW2\_8: Disable channel 4.      (default position: Left "Off", unless less than four channels ordered)

## Optical Redundancy (optional)

If optic redundancy was ordered with the unit, Figure 5 below applies to its operation. Optic redundancy is used to prevent the loss of data transmission in the event an optic cable, transmitter, or receiver is broken or degraded. Should this occur, the secondary optic link & receiver "B" is enabled automatically, thereby preserving the integrity of the communication. In the meantime, the "Alarm" LED will flash and the buzzer will sound to indicate a cable breakage.

When the unit is equipped with optic redundancy, the optic transmitter "TxA" and "TxB" both transmit the same signal to the remote unit. It is up to the remote unit to decide whether "RxA" or "RxB" should be used as the valid incoming optic signal. By default, "RxA" is the primary receiver; "RxB" is the standby backup.

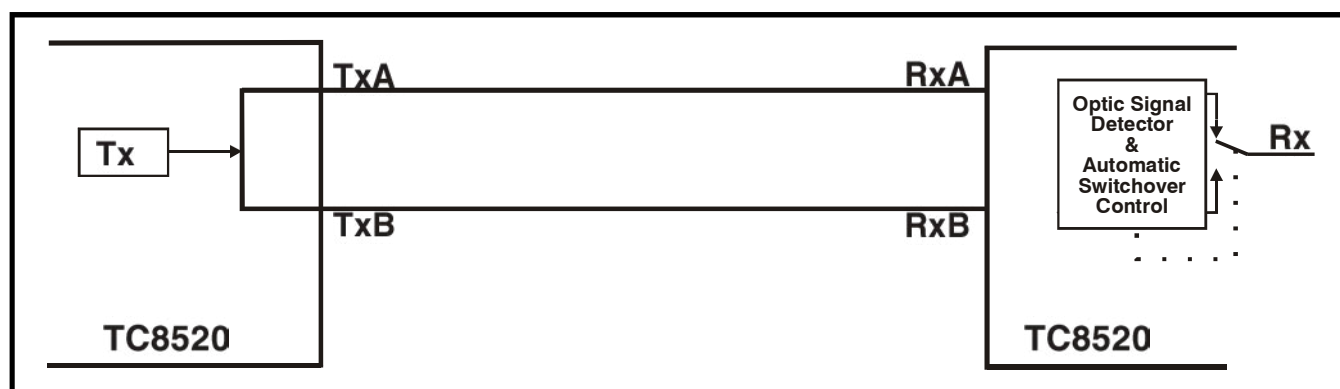


Figure 5. TC8520 (with Dual Optics) Logic Diagram

## Two-way "Single Fiber" (optional)

As an option, the TC8520 supports two-way "Single Fiber" communication to distances up to 100km over single mode fiber.

It is ideal for situations where existing fiber optic cable capacity is limited. Because it doubles existing cable capacity by transmitting bi-directional signals over a single fiber, it eliminates the need to install additional fiber optic cable.

The TC8520 "Single Fiber" uses a Fiber Optic Wavelength Division Multiplexer (WDM) which enables 1310nm and 1550nm wavelengths to be transmitted simultaneously on the same fiber optic cable. The direction of the optical signals can be in the same direction or opposite directions.

Transparent to incoming data, the "Single Fiber" WDM option, effectively doubles existing cable capacity by multiplexing two separate channels over one single mode fiber.

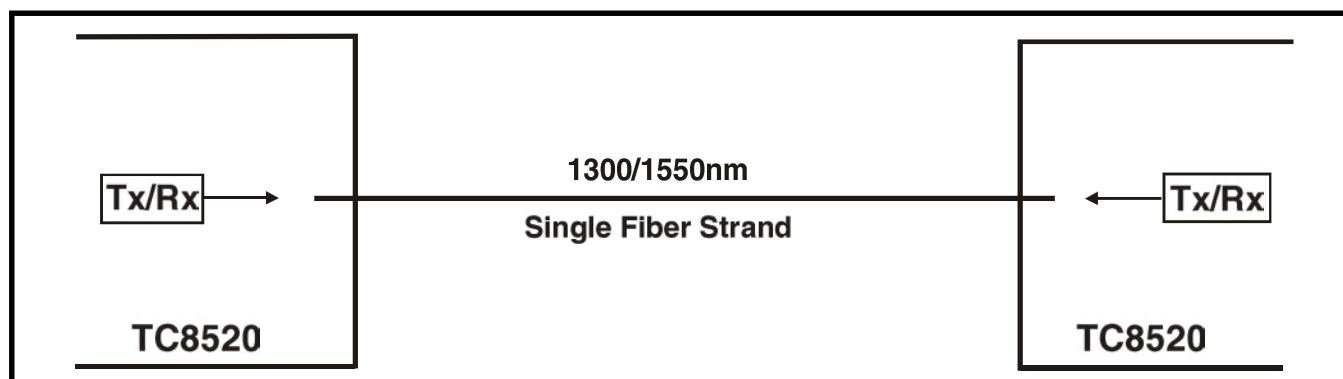


Figure 6. TC8520 (with "Single Fiber" Option) Logic Diagram



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## 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 @ (949) 852-1973.

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## Equipment Location

The TC8520 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 or heavy duty power supplies. As with any electronic equipment, keep the unit from excessive moisture, heat, vibration, and freezing temperatures.

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## Dry Contact Alarm Relay

A terminal block connector labeled "ALM RLY" at the rear panel of the optical board provides for the Dry Contact Alarm Relay. Normally in the OPEN position, any alarm condition will force the relay switch to the CLOSED position (the "Alarm" LED will light and the audio buzzer will sound). This relay can be used in conjunction with an external device to monitor the TC8520's operation. The alarm switch will only be activated when the TC8520 is under a true alarm condition; it will not be activated when the unit is in a diagnostic (test) mode.

This function can be disabled by setting the front panel switch 1 "DIS ALM" to "down" (on) position on the optical card.

---

## Power Supply

The TC8520 unit is powered via rear panel's connector. There are two pairs of connectors ( "PWR A" and "PWR B" ) for power redundancy. Depending on the power option ordered, it could be one of following: 12VDC standard or optional 24VDC power supply. When AC power is ordered, a universal external power adapter is supplied which can support AC 90 VAC to 240 VAC and 50 Hz to 60 Hz. When unit contains more than one card, only one pair of power connectors needed to connect to a power source.

Alternate power sources are available as an option (see Chapter 8 - Specifications).

---

## Telephone or 2/4 Wire Analog 600 Ohm Signal Connections

As Figure 3 on page 9 illustrates on the upper (phone) board, four RJ-11 connectors are provided to connect two wire telephone (POTs) or 2/4 wire analog 600 Ohm signals (depending on what is ordered).

---

## Ethernet 10/100Base-T Signal & Electrical Signal Interface Connections

The lower (optical) board as illustrated on Figure 3 on page 9 an RJ-45 female connector provides for the electrical connection for the 10/100Base-T signal.

The four RJ-45 connectors (AUX1 - AUX4) for channels 1 through 4 are provided for electrical connections for data. For RJ-45 pin assignment connections on the optical board connectors (AUX1-AUX4), refer to Chapter 5.

The type of data interface will be dependent on what the customer orders such as RS-232, RS-422, TTL, or Dry Contact.

**Note:** The DB9 connector (Console port connector), as in Figure 4, is only used to set the IP address, user name, and password. Please refer to page 44 for Console Settings.

---

## System Start Up

---

When power is initially connected to the TC8520, all LEDs will flash for a few seconds and the audio buzzer will sound. Once the unit passes its power up diagnostic phase, the following LED status should be observed from the front panel:

### **Interface Board:**

1. The POWER "A" and/or "B" LED should be lit (depending on which power jacks are connected).
2. The "Vcc" LED should be lit (indicating +5V voltage is derived from Power "A" and/or "B").
3. All other LEDs can be in a random state (either On or Off) as the TC8520 will set its LEDs accordingly once valid electrical and optical connections are present.

### **Optical Board:**

1. The "Rx-A," ("Rx-B," on dual optic models) and "SYNC" LEDs will flash (indicating no optic signal connections).
2. The "ALM" major alarm will be lit (indicating no electrical or optic signal connections).
3. The "MSTR/SLVE" LED will be lit if the unit is set as Master unit. When Off, it indicates that the unit has been set as a Slave.
4. The "Vcc1" & "Vcc2" LEDs should be lit (indicating +5V voltage is derived from the power supply).
5. All other LEDs can be in a random state (either On or Off) as the TC8520 will set its LEDs accordingly once valid Ethernet and optical connections are present.

***Note:** The TC8520 (FXS) unit will ring each phone channel during initialization, and the phone on the first channel should ring 10 seconds after power up. Phones on subsequent channels should ring one after the other with 2 seconds between them.*

## Installation Procedure Summary

---

The TC8520 is designed for quick and easy installation. Before installing, however, double-check the LED settings on each of the channels on the interface board and the DIP switches on the optical board to verify that they are in the correct positions.

1. By factory default all units will be set as Master units. Before connecting two units via fiber cable, the user must configure one of the TC8520 units to be a Slave unit. Please refer to the "Read Me First" instructions sheet included and/or refer to the Web configuration section, page 28.
2. Connect fiber optic cables between the local & remote units; the local unit's optic "TxA" connects to the remote unit's optic "RxA" (and "TxB" to "RxB" on dual optic models). Observe that the "SYNC" (and "USE-B" on dual optic models) LEDs lights solid when a good optic connection is present.
3. The FXO unit should be connected to a PBX and the FXS unit connects to analog telephone sets.
4. For Ethernet (10/100Base-T) signals, connect the Cat5 or Cat5E cable providing the Ethernet signal to the RJ-45 connector on the rear panel on the optical board on the TC8520. Observe that the 100M, FULL LEDs are lit, and the LNK/ACT LED is flashing.

If the Ethernet signal is 10Base-T and half duplex, the 100M and FULL LEDs should be off. If the Ethernet signal is 100Mbps and full duplex, the 100M and FULL LEDs should be lit.

5. For serial data signals (RS-232, RS-422, TTL, or Dry Contact) connect the electrical signals to AUX1-AUX4 on the optical card, refer to page 9 Figure 3 & Chapter 5 for electrical connections & pin assignments.

To monitor the input/output status of the data signals, please refer to the notes on pages 11 and 12.

5. For 2/4 wire 600 Ohm signals, use the RJ-11 connectors on the phone card to connect the electrical signals. Refer to Chapter 5 for virtual pin connections & assignments.
6. Verify System Integrity:

At each unit, check that the "SYNC" and Rx-A ("Rx-B" and "USE-B" on dual optic models) LEDs lights solid indicating good optical connections.

Verify and record the optical cable loss for each link in the application after installation is complete. This reading will both verify the integrity of the circuit and provide a benchmark for future troubleshooting efforts (see Chapter 3 - Troubleshooting).

### **Lightning/Surge Warning Note:**

If copper cable(s) connected to TC8520 unit(s) are located outside buildings or enclosures (even at minimal distances), TC8520 units may be damaged by lightning and/or electrical power surges.

Adding protective devices (surge suppressors/lighting protectors) to each copper cable that is exposed to potential lightning strikes or power surges is highly recommended. Please be aware that adding such protective devices can't guarantee 100 percent protection for connected electronic equipment. You should contact a professional lightning/surge protection consultant for specific questions regarding your application.

## Standard Application to Extend Analog Telephone Lines

### Phone Line Extension

The TC8520 can be used to extend regular analog phone lines from a PBX to remote location via fiber optic cable. Because the TC8520 digitizes the analog signals (PCM), voice quality does not degrade over extended distances.

The TC8520 FXO connects to the phone line(s), while TC8520 FXS connects to traditional analog telephone set(s) for POTS (plain old telephones).

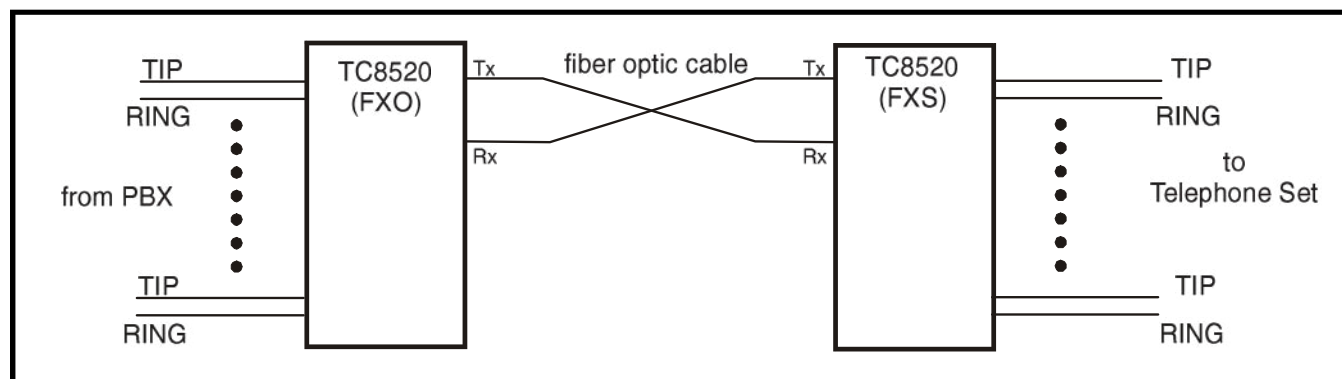


Figure 7. TC8520 FXO to FXS Connection Diagram

## General

Alarm conditions occur whenever an optical or electrical problem or "fault" conditions are detected by the TC8520.

The Ethernet 100M, & FULL LEDs on the optical board should be Off, if the Ethernet signal is 10Base-T and half duplex. If the Ethernet signal is 100Mbps and full duplex, the 100M and FULL LEDs should be lit and the LNK/ACT LED should be flashing as it detects Ethernet activity.

## All LEDs are Off

If no LEDs are lit on the unit, check the DC power supply, connector plug, and/or the power source. If the problem persists, contact the Technical Support Department at TC Communications, Inc @ (949) 852-1973.

## "ALM" LED on the Optical Board

When an alarm condition is detected, the "ALM" LED will light, the audio buzzers will sound, the dry contact relay will close, and one or more additional LED will light or flash. The following fault conditions will cause the alarm to be triggered on the optical board:

1. Optic signal lost from "RxA" (or "RxB" on dual optic models).
2. Optic signal is marginal, which causes invalid data packets to be received; the "Rx-A" (or "Rx-B") LED will be flashing.
3. The remote unit lost power.

## 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 Loss on the Fiber

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.

**These are the reference values we use to calculate the loss on the fiber:**

<b>Multimode 850nm</b>	<b>:</b>	<b>3 dB loss per km on 62.5/125µm cable*</b>
<b>Multimode 1310nm</b>	<b>:</b>	<b>2 dB loss per km on 62.5/125µm cable*</b>
<b>Single Mode 1310nm</b>	<b>:</b>	<b>0.5 dB loss per km on 9/125µm cable*</b>
<b>Single Mode 1550nm</b>	<b>:</b>	<b>0.25 dB loss per km on 9/125µm cable*</b>

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

---

## Ethernet/Web Page Test

---

The purpose of this test is to verify Ethernet channel and accessibility to the web page using a PC.

1. Power on the units and configure the IP address on the units, refer to Chapter 6.
2. Connect the fiber optical cables from the local to remote unit and vice versa.
3. Verify that the Sync LED is lit.
4. Connect one of the TC8520 units to a PC to access the web page using the a web browser (enter the IP address configured in step 1).
5. You should be able to access the local and remote TC8520 unit's web page while connected to the local unit.

---

## Conducting a Signal Generator Test (On Units With Data Only)

---

The purpose of the Signal Generator Test is to verify the optical connections between the Master and Slave units (each unit has its own built-in channel-scanning optic signal generator) and the clock signal of each unit. Alarm conditions occur whenever an optical problem or "fault" condition is detected by the TC8520s.

1. Set one of the TC8520 units as a Slave unit. (Refer to TC8520 Slave Configuration section, page 33)
2. Connect power to both Master and Slave units to be tested.
3. Conducting a Signal Generator test on the TC8520 Master unit.
  - a. Connect short fiber optic patch cords, using the correct type of fiber corresponding to the wavelength of the units, between the Master and Slave units.
  - b. Connect the optic Tx of the Master to the optic Rx of the Slave and optic Tx of the Slave to optic Rx of the Master.
  - c. All the front DIP switches on the TC8520s must be set to the up "off" position.
  - d. Enable the Signal Generator by flipping DIP switch SW3 (SIGGEN) down on the front panel of the phone card also enable DIP switch SW4 (LED-DATA) on the optical card. (card with optics)

### On Master unit:

The "IN" channel LEDs on the Optical Card and "Rx" channel LEDs on the phone card should light sequentially from CH1 to CH4.

### On Slave unit:

Likewise, the "OUT" channel LEDs on the Optical card and "Tx" channel LEDs on the phone card should light sequentially, indicating receipt of the transmitted clock signal.

4. Completing the Signal Generator test.
  - a. Enable DIP switch SW1 (RMTLB) on the phone card of the Master unit while the SIGGEN is enabled.

### On Master unit:

The "IN" and "OUT" channel LEDs on the Optical Card should light sequentially from CH1 to CH4. Likewise, the "Rx" and "Tx" channel LEDs on the Phone Card should light sequentially, indicating receipt of the transmitted clock signal.

### On Slave unit:

The LED indications will be the same as on the Master unit as described on step #4 above.

5. When testing is complete, return SW1 (RMTLB) and SW3 (SIGGEN) to the up position on all units tested.

All "other" channel LEDs are not used for this test.

---

## **Ring Test (FXS unit only)**

---

When SW5 "RG TST" switch is in the down ("On") position, the FXS Card will try to ring every channel simultaneously to verify the integrity of the ring signal.

## **Local Electrical Loopback Test on the TC8520s (On Units With Data Only)**

---

The purpose of this test is to verify the interface's input and output connections, signal receiver and signal output driver.

This test can be enabled by either DIP switch SW3 (LOCLB) on the optical card or DIP switch SW2 (LOCLB) on the phone card.

1. Set the front panel DIP switch SW3 to the "On" (down position) on the optical card.
2. Enable DIP switch SW4 (LED-DATA) to the "On" (down position) to monitor the data status.
3. Connect a Bert Tester to CH1 through CH4 to monitor the data status on each channel respectively. The incoming electrical signal is looped back to the device connected to the RJ-11.

This verifies good electrical signal connections.

4. When done with the test, return SW3 or SW2 as well as SW4 to the up "Off" position.

## **Local Optical Loopback Test on TC8520 "Slave Units" Only (On Units With Data Only)**

---

The purpose of this test is to verify the transmitted and received optical signal.

To perform this test, the TC8520 unit must be configured as a Slave unit first. Refer to TC8520 Slave Configuration section, page 33 to set the TC8520 as a Slave unit.

1. Enable DIP switch SW4 (LED-DATA) to the On ("down" position) to monitor the data status.
2. Use a short fiber optic jumper to connect from optic Tx to optic Rx to form a self-loopback on the same unit.
3. Connect a Bert Tester to CH1 through CH4 to monitor the data status on each channel respectively.
4. The incoming signal from the user's equipment should be looped back through the optical fiber back to the user's equipment.

Note, the channel 1 through 4 "IN" and "OUT" LEDs will light according to which channel is being tested.

5. When done with the test, return SW4 (LED-DATA) to the up "Off" position.

Note, you may leave SW4 (LED-DATA) to the down "On" position if for monitoring the data status of each channel.

## Chapter 5 - Electrical Interfaces & Pin Assignments

### Electrical Signal Interface Connection & Pin Assignments

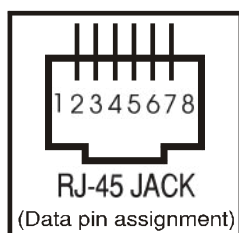
- Four RJ-45 connectors, located at the rear panel of the Optical board, provide for the connection of the optional data channels for RS-232, RS-422, or dry contact closure electrical signals. Channels 1 through 4 (AUX1 - AUX4) are assigned to the interface option. The electrical interface will accept the following data rates: Async - up to 128 Kbps & Sync - up to 64 Kbps. (Consult factory for higher data rates).

Note, there are eight pins in an RJ-45 Jack. The pin numbers are assigned as follows:

When you look into the jack, the copper contact pins are at the upper side, pin "1" is on your left side.

Note: Pins 1 & 8 are not used for the RJ-45 connectors.

- The four RJ-11 connectors on the Phone board, are provided to connect two wire telephone (POTs) or two/four wire Analog signals (refer to page 27), depending on what is ordered.



RJ-45 Female

### RS-232 Async and Sync Connections

For the RS-232 Async and Sync interfaces, the pin assignments are as follow:

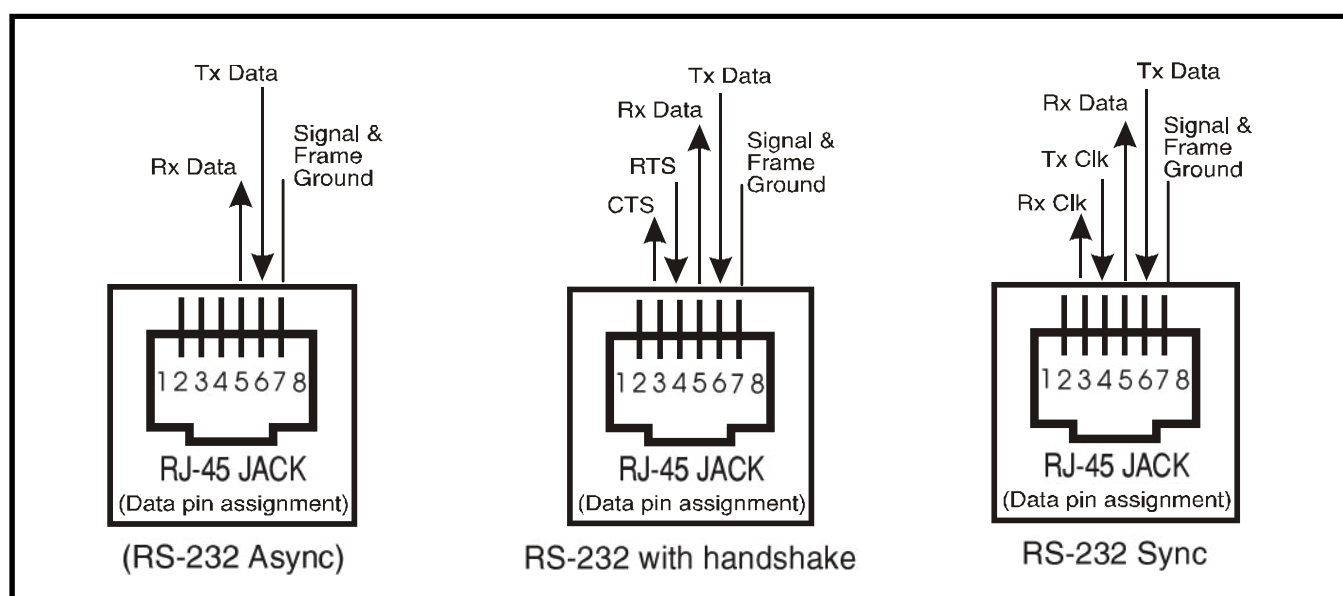


Figure 8. RS-232 Async and Sync Pin Assignments & Virtual Connection Diagrams



## RS-422 (Async) Connection

For the RS-422 Async interface, pins 3 and 6 are balanced input pins. Pin 3 is the positive input (TxData+) and pin 6 is the negative input (TxData-). Likewise, Pins 4 and 5 are balanced output pins. Pin 5 is the positive output (RxData+) and pin 4 is the negative output (RxData-). Either pin 7 or pin 2 can be used as the signal ground. Only RS-422 asynchronous communications can be used on the TC8520.

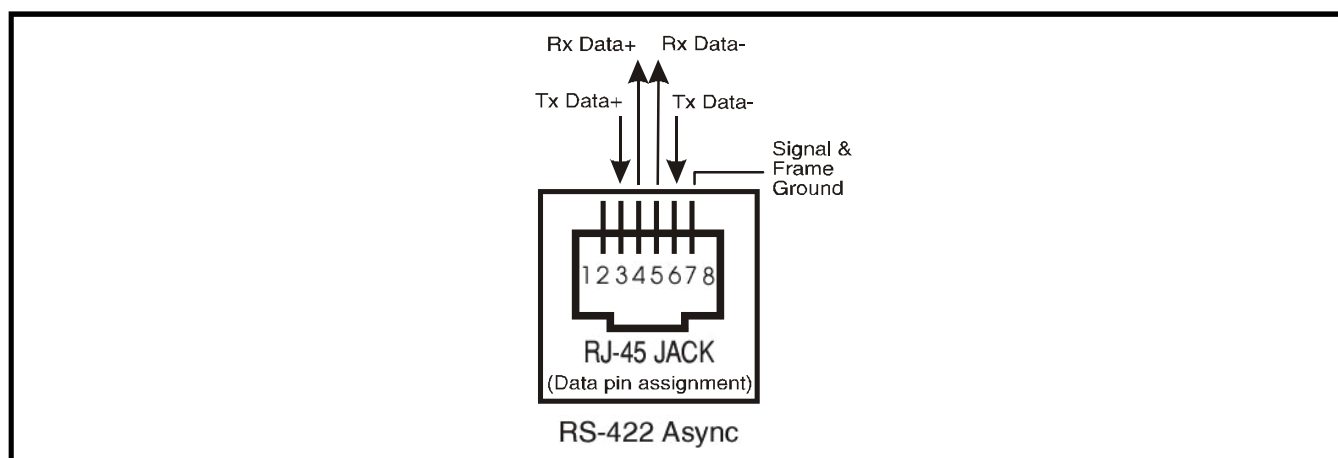


Figure 9. RS-422 (Async) Pin Assignments & Virtual Connection Diagram

## Single Direction Dry Contact Closure Detector & Relay Switch

For Single direction dry contact closure applications, only uni-direction transmission is allowed. The transmitter side has a dry-contact closure detector as shown in the diagram below. The receiver side has a dry-contact closure relay switch. The "close" and "open" status is controlled by a relay switch inside the TC8520. It reflects the remote detector's "on" and "off" status.

As illustrated below, when the RJ-45's pins 5 and 6 are closed at the transmitter side, the status is reflected at the remote receiver's side. The relay switch on the receiver's side is rated 0.5A DC switching current, with a max load rating of 10VA.

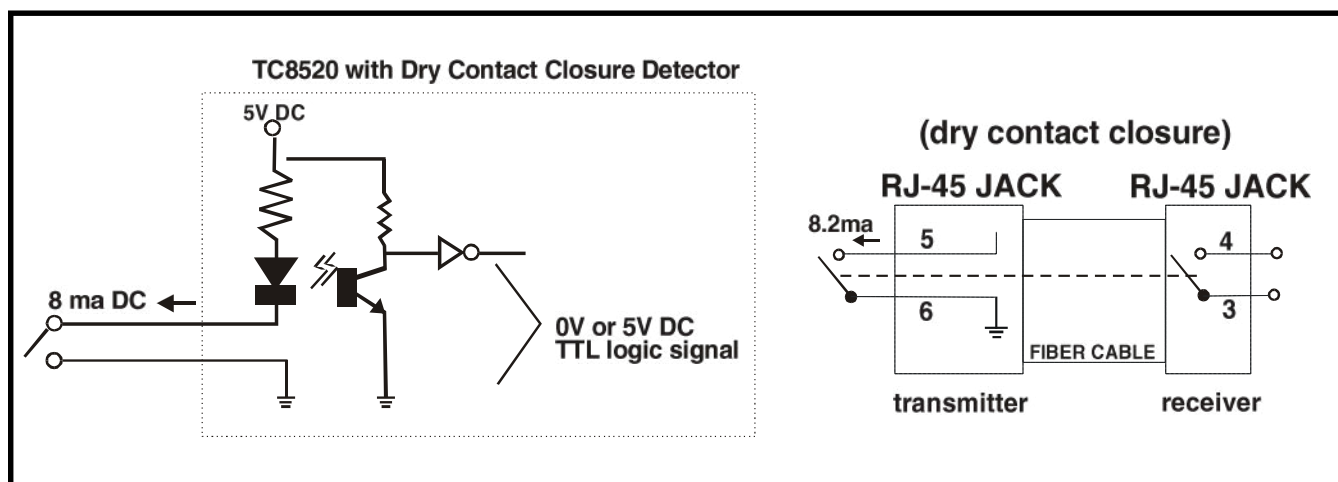


Figure 10. Single Direction Dry Contact Detector and Closure Logic Diagrams

## Bi-Directional Dry Contact Closure Detector & Relay Switch (optional)

For Bi-directional dry contact closure applications, the TC8520 can be used as either the Closure or Detector depending on which pins are used. The transmitter side has a dry-contact closure detector as shown in the diagram below. The receiver side has a dry-contact closure relay switch. The "close" and "open" status is controlled by a relay switch inside the TC8520. It reflects the remote detector's "on" and "off" status.

The diagram below, illustrates the virtual pin connections for using the TC8520 as either a dry contact Detector (Transmitter) or a dry contact Closure (Receiver). The RJ-45's pins 5 and 6 are closed at the transmitter side, the status is reflected at the remote receiver's side RJ-45's pins 3 and 4. The relay switch on the receiver's side is rated 0.4A DC switching current, with a max load rating of 24VA.

As an option, the relay switch on the receiver's side can be rated 1.8A DC switching current, and a load rating of 108VA.

(**Note:** All units will be factory configured for the 0.4A DC current rating, unless otherwise specified and ordered)

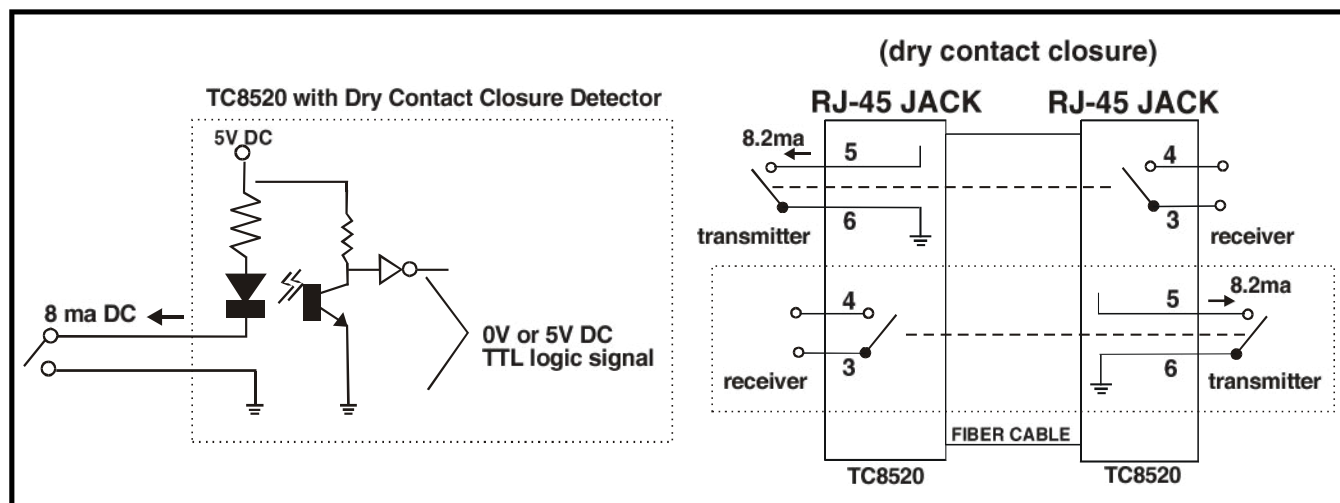
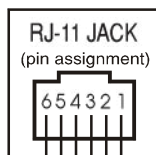


Figure 11. Bi-Directional Dry Contact Detector and Closure Logic Diagrams

## Phone Card RJ-11 Pin assignments

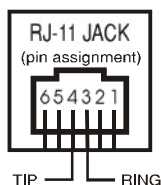
The 4 x RJ-11 connectors on the rear panel can be used for two wire telephone (POTs) or 600 Ohm analog signals (dependig on the type of interface that the customer has ordered).



The first pin is on the right side when you look into the jack with all the metal contacts at lower side

## Telephone Connection

Only the middle two pins are used to connet phone lines.



## Four Wire Analog Connection

For four wire analog audio signals:

Pin 5 is transmit TIP & pin 2 is transmit RING. Pin 4 is receive TIP & pin 3 is receive RING.

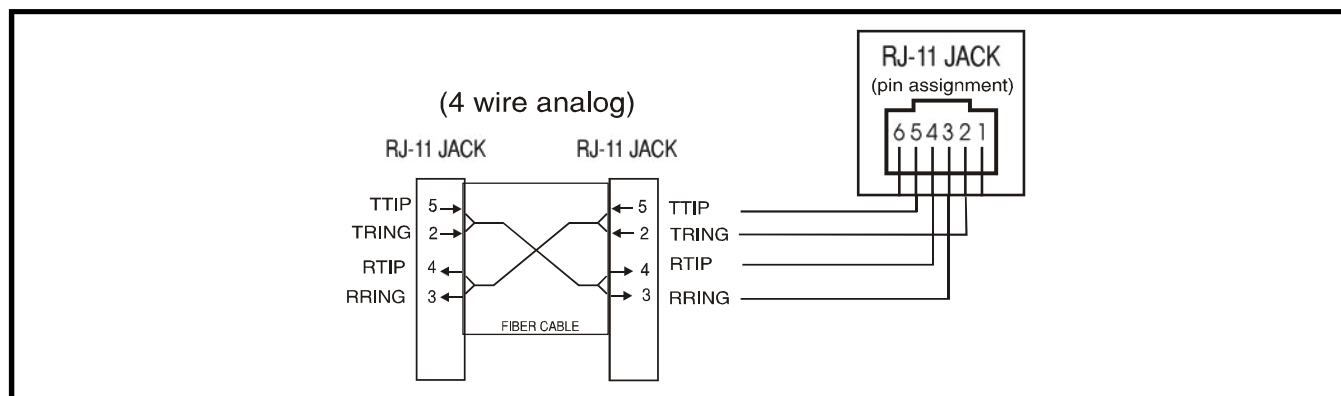


Figure 12. Four Wire Analog Pin Assignments & Connection Diagram

## Two Wire Analog Connection

For two wire analog audio signals:

Pin 4 is transmit/receive TIP & pin 3 is transmit/receive RING.

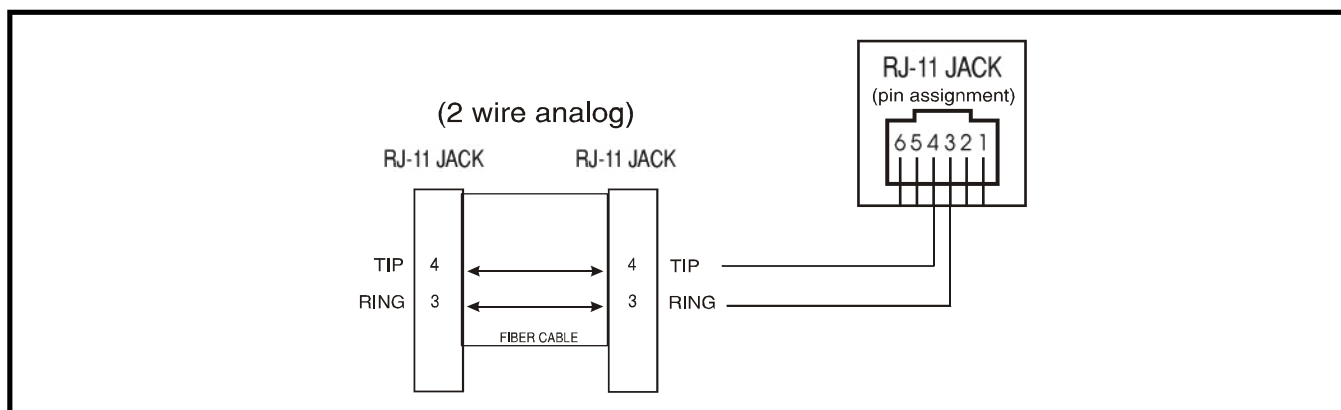


Figure 13. Two Wire Analog Pin Assignments & Connection Diagram

## Configure your TC8520

Software configuration is done through the management web page by connecting to the RJ-45 Port on the rear. Configuring the TC8520 using the web page will overwrite the current hardware settings. The new settings will be reflected on the front LED's.

In order to configure the TC8520 set to default, the user needs to use a PC with a web browser installed. The default IP address is: 192.168.254.123. The PC's IP address must be set within the range of 192.168.254.1 to 192.168.254.254, and with a Network Mask of 255.255.255.0. 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 48 for more detail. You can also change the IP address of the TC8520 by matching it up with that of your PC, refer to Console settings on page 44.

To configure the TC8520, simply enter the IP address of the TC8520 in the Web browser's address box. For Example, <http://192.168.254.123>.

**(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 **admin** under User Name and enter **password** under Password and click "OK."

You will then see the following window as in Figure 14, below. This summary page will show you the current configuration and the status of the TC8520 media converter.

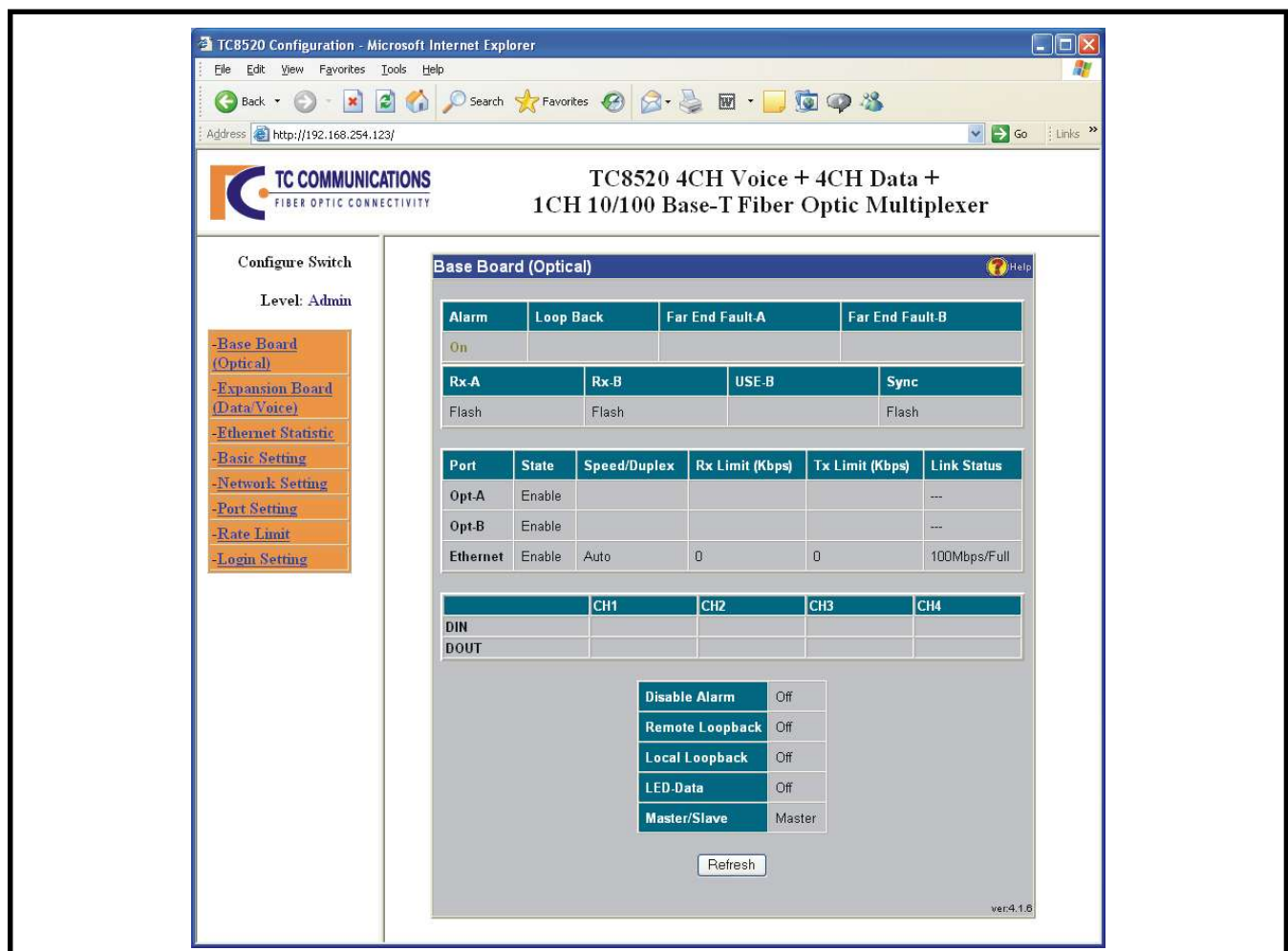


Figure 14. TC8520's Summary

## Data/Voice Status

Use the links at the left of the page to navigate to the desired section.

The "Expansion Board (Data/Voice)" status page shows the status of the LED's and dip switches corresponding to those on the front panel of the expansion (phone) board.

The 'Channel' column display for voice also shows the interface configured on that channel (either FXS/FXO)

**TC8520 Configuration - Microsoft Internet Explorer**

Address: <http://192.168.254.123/>

**TC COMMUNICATIONS**  
FIBER OPTIC CONNECTIVITY

**TC8520 4CH Voice + 4CH Data +  
1CH 10/100 Base-T Fiber Optic Multiplexer**

**Configure Switch**  
Level: Admin

- Base Board (Optical)
- Expansion Board (Data/Voice)
- Ethernet Statistic
- Basic Setting
- Network Setting
- Port Setting
- Rate Limit
- Login Setting

**Expansion Board (Data/Voice)**

DRX: Data Receive  
Voice IN: Voice Input  
HOOK: Phone Hook Status

DTX: Data Transmit  
Voice OUT: Voice Output  
RING: Ringing Status

Data			Voice				
Channel	DRX	DTX	Channel	Voice IN	Voice OUT	HOOK	RING
1:			1:FXO				
2:			2:FXO				
3:			3:FXO				
4:			4:FXO				

RMTLB: Remote Loopback  
SIGGEN: Signal Generator  
RCAD: Ring Cadence (FXS)  
RBLK1: Ring Block1 (FX0)

LOCLB: Local Loopback  
RTST: Ring Test (FXS)  
OFHK: Off Hook (FX0)  
RBLK2: Ring Block2 (FX0)

RMTLB	LOCLB	SIGGEN	OFHK	RBLK1	RBLK2
Off	Off	Off	Off	Off	Off

Refresh

**Figure 15. TC8520's Data/Voice Status Indicators**

## Ethernet History Statistics

The "Ethernet Statistic" link on the left side of the page is used to monitor the status of the bandwidth usage of the Ethernet Port of the media converter.

### For example:

Click the "Ethernet Statistic" link on the left side of the page. You will see the page as in Figure 16 below. It will show the bandwidth status and history and/or event of the Ethernet port.

1. On the "Current Rate" section, you can monitor the current Rx Frames/sec, Rx Bytes/sec, Rx BU %, Tx Frames/sec, Tx Bytes/sec, and Tx BU %.
2. On the center of the window you will see "History counter record every "30" minute(s)." You can set up your own preferred time intervals specified in the Basic Configuration window Figure 17, on page 31.
3. The counters 1 through 24, each account for every 30 minutes that have been logged into the history. For example: Counter 1 = past 30 min, Counter 2 = past 2x30 min, Counter 3 = past 3x30 minutes...Counter 24 = past 24x30 minutes.
4. Use the "Refresh" link to update the new status of the port statistics.
5. You can use the "Clear History" button to clear the recorded counters. It will clear all the counters and start over again.

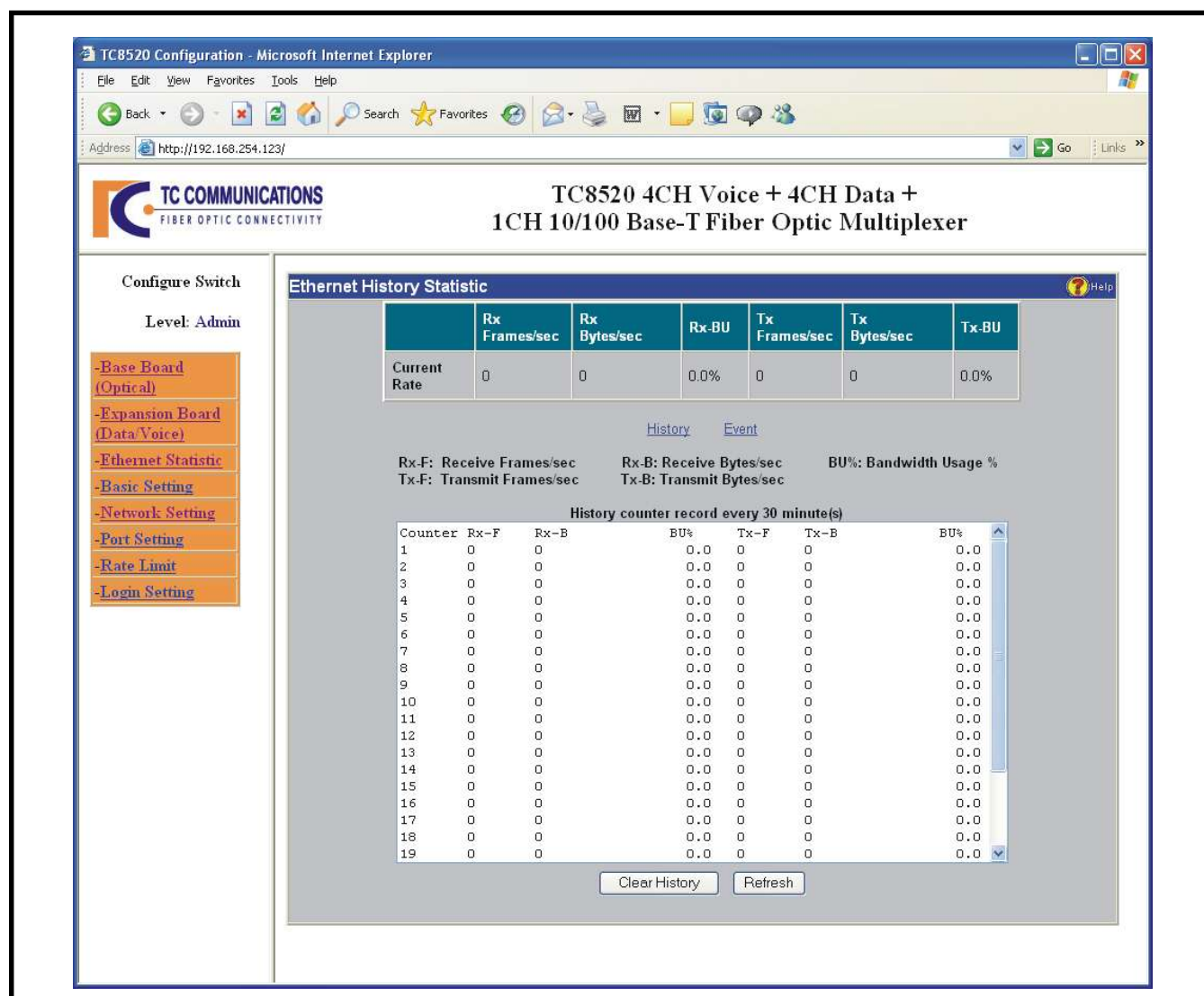


Figure 16. TC8520's Ethernet History Statistics



## Ethernet Event Statistics

Click the "Ethernet Statistic" link on the left side of the page. You will see the window as in Figure 16 on page 30. It shows the bandwidth status and history and/or event of the Ethernet port. Click on the "Event" link on the middle of the page and you should see the window as in Figure 17 below.

It will show all the statistics of the Ethernet port activities.

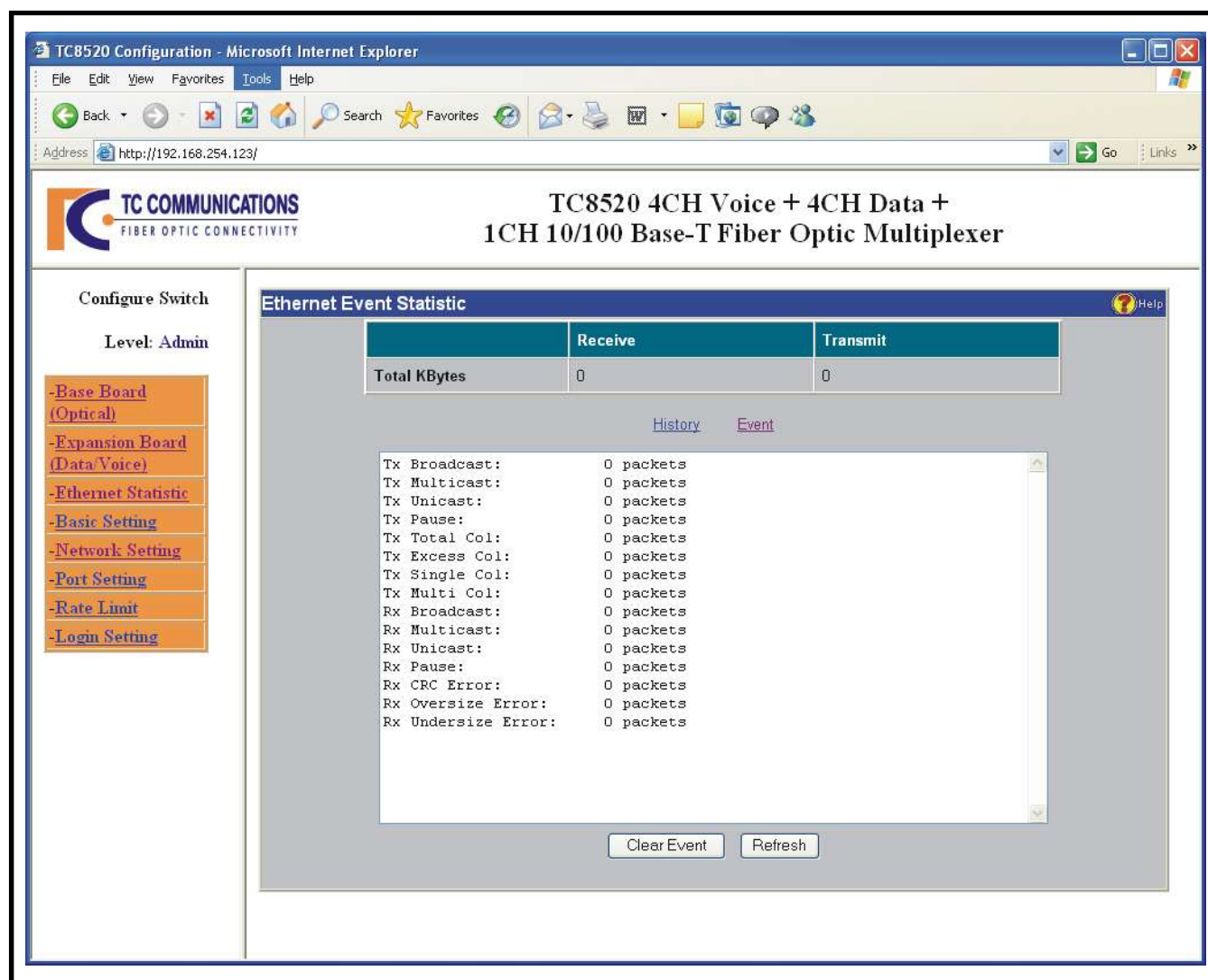


Figure 17. TC8520's Ethernet Port Event Statistics

## Configure Basic Switch Settings

Click the "Basic Setting" link on the left side of the page and you will see the window as in Figure 18, below and you can begin the configurations. You may change the values of the fields as you like.

The "Record Period" field is used to set the time intervals for history status purposes. You can set the time intervals anywhere from 1 minute to 120 minutes. The default interval is 30 minutes. There are 24 counters to record the BU% history. (See the "History counter record" example on Figure 16, page 30).

Note: After you apply the new time interval setting, all the counters will be reset.

When done, click Apply to apply the new settings.

Basic Settings	
Name	TC8520
Location	Location
Contact	Operator
Description 1	Multiplexer
Description 2	
Description 3	
Record Period	30 minutes (MAX: 120)

Apply

Figure 18. TC8520's Basic Configuration

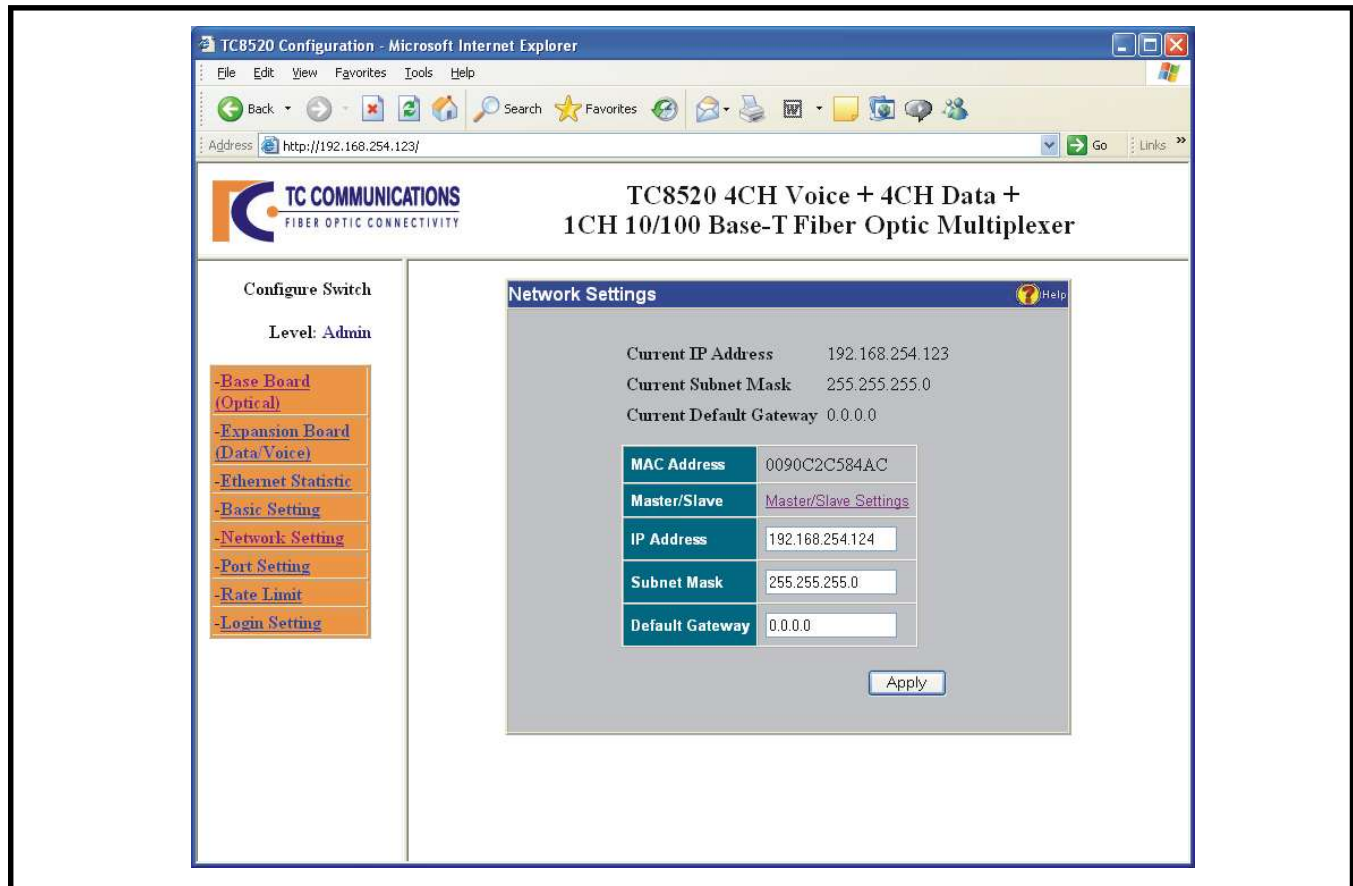


Use the links at the left of the page to navigate to the desired section.

To configure the network settings, click the "Network Setting" link on the left side of the page. On the IP settings window, enter the IP address, Subnet Mask and Default Gateway as shown on Figure 19, below.

**Note 1:** The TC8520 and the monitoring computer should be on the same network ( Contact your network administrator for valid network settings). When done, click Apply to apply the new settings.

After you have applied the new IP settings on the TC8520, you must change your PC IP settings to be compatible with the new settings of the TC8520 unit and to be able to continue the configurations.



**Figure 19. TC8520's IP Configuration**

## TC8520 Slave Configuration

By factory default, all units will be set as Master units with default IPs of 192.168.254.123. The TC8520's work in pairs (one Master & one Slave unit). The user must configure one of the TC8520 units to be a Slave unit. Please refer to Figure 19, above and/or instructions on the "Read Me First" page included, to configure one of the units to a Slave unit.

1. One of the units must have a different IP address than that of the Master. To change it, enter the new IP address (for example, 192.168.254.124) in the "IP Address" field as in Figure 19 and click Apply to apply the new settings. The Master and Slave units **MUST** have different IP addresses.

**Note:** Please make note of the new IP address you give the Slave unit and keep in a safe place or make a label and place it on the unit.

a) After you click Apply, a dialog box as in Figure 20 will appear asking you to reset the unit by clicking the "reset button" on that dialog box.

(Continue next page)

## TC8520 Slave Configuration (Continue)

---

- 1b) A second dialog box will prompt you to refresh the browser as in Figure 21 for the new IP address to save the new settings.
- 1c) Use the new IP or 192.168.254.124 to log in with the new saved settings.
2. From the Network Settings dialog box as in Figure 19, use the "Master/Slave Settings" link to change the unit to be a Slave unit. After you click the "Master/Slave Settings" link, you will see a dialog box as in Figure 22. Select the "Slave" setting from the pull down menu and click Apply.
  - a) A dialog box as in Figure 23 will prompt you to save the settings. Click the "save" button to save the settings.

**Note:** The *warning* statement is to advise you that if you connect two Master units or two Slave units together, they may fail to operate in the application.

Important:

- b) After you click the "Save" button, you will be prompted to cycle power to the unit to apply the new settings as in Figure 24.
- c) When the power is connected back to the unit, you can log in with the new IP address for the Slave unit.
3. You can monitor the applied change by noting the MSTR/SLVE LED on the front panel of the unit (When lit, means unit is set as a Master and Off, means unit is set a Slave unit).

You can also click on the "Base Board" link on the left hand side of the page and observe the "Master Slave" field on the bottom of the dialog box as in Figure 14.

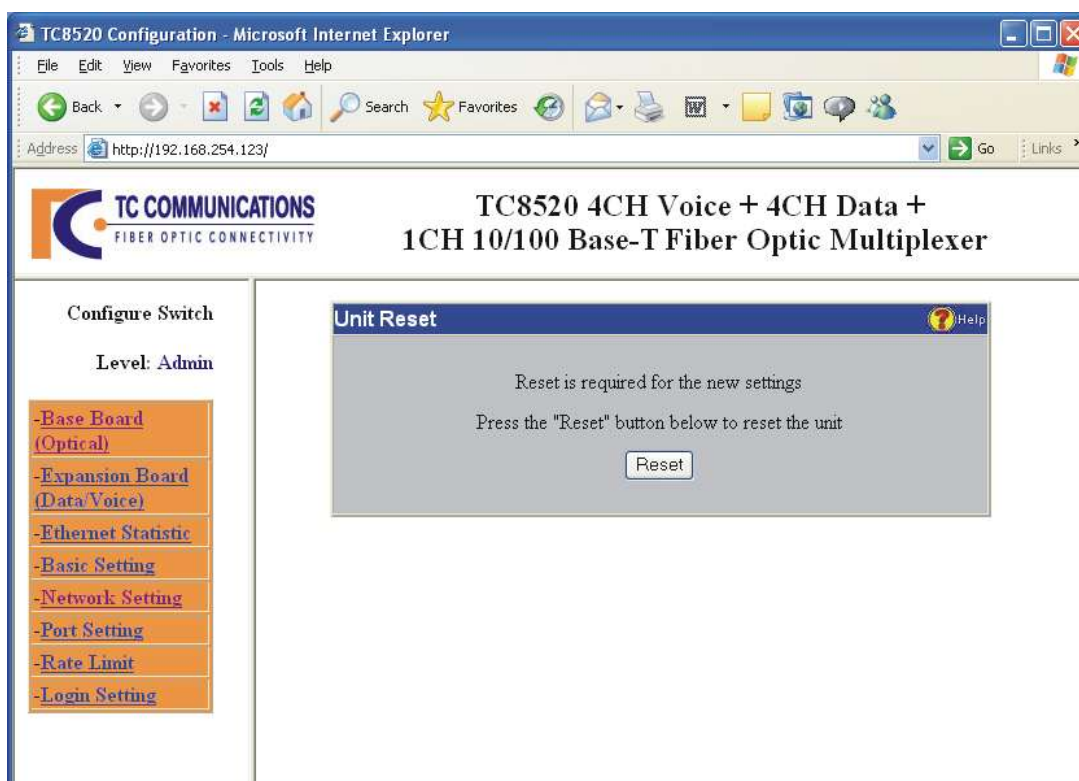


Figure 20. TC8520 Slave Configuration

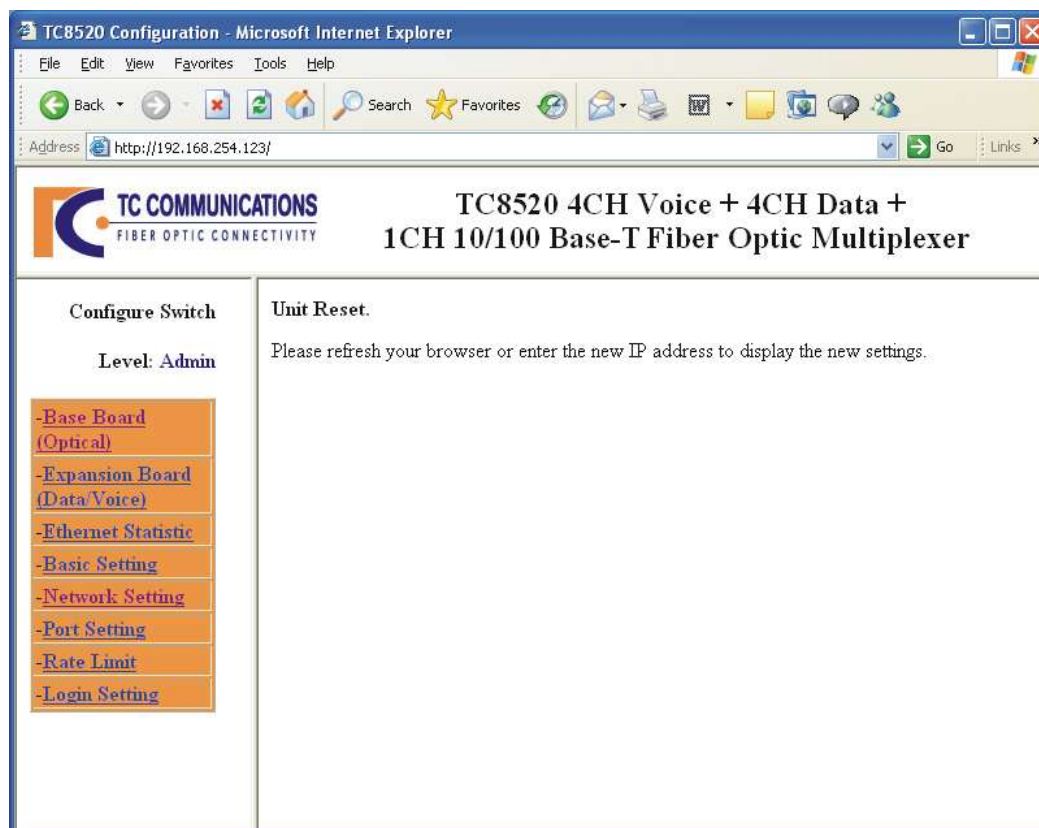


Figure 21. TC8520 Slave Configuration

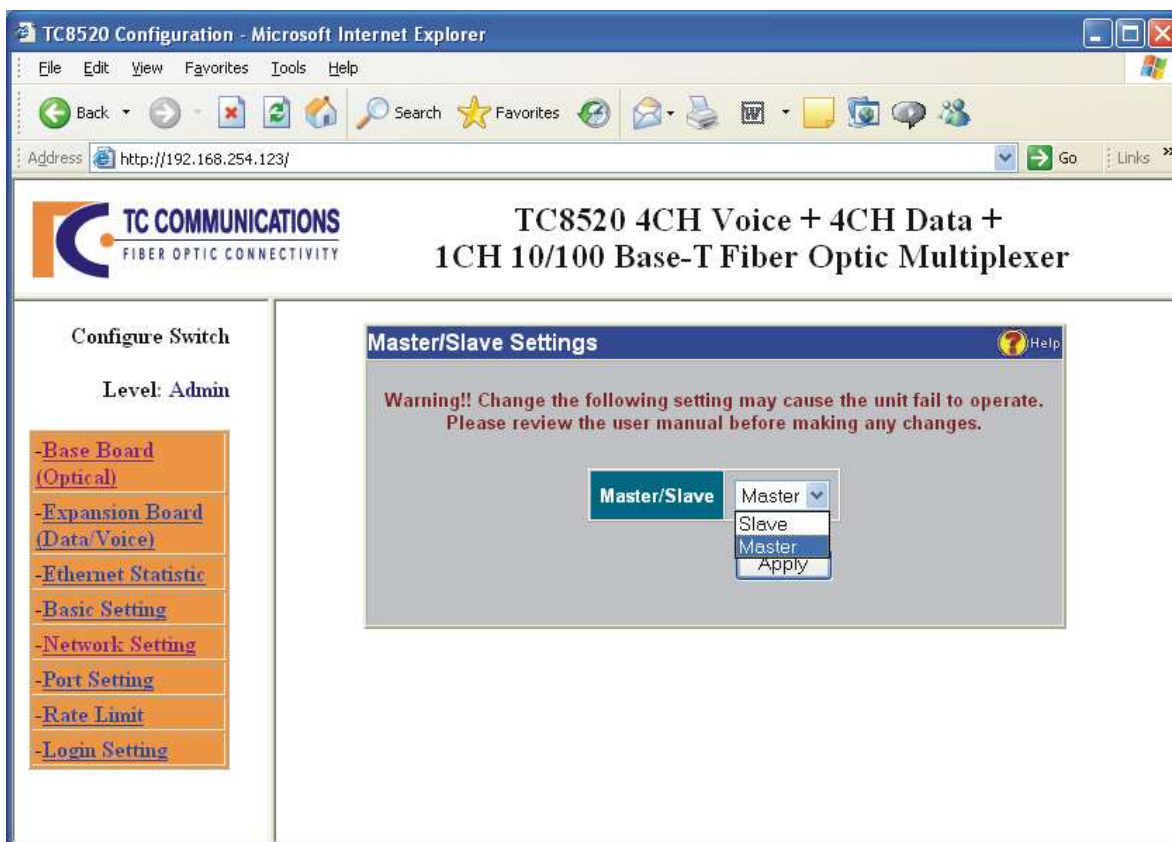


Figure 22. TC8520 Slave Configuration

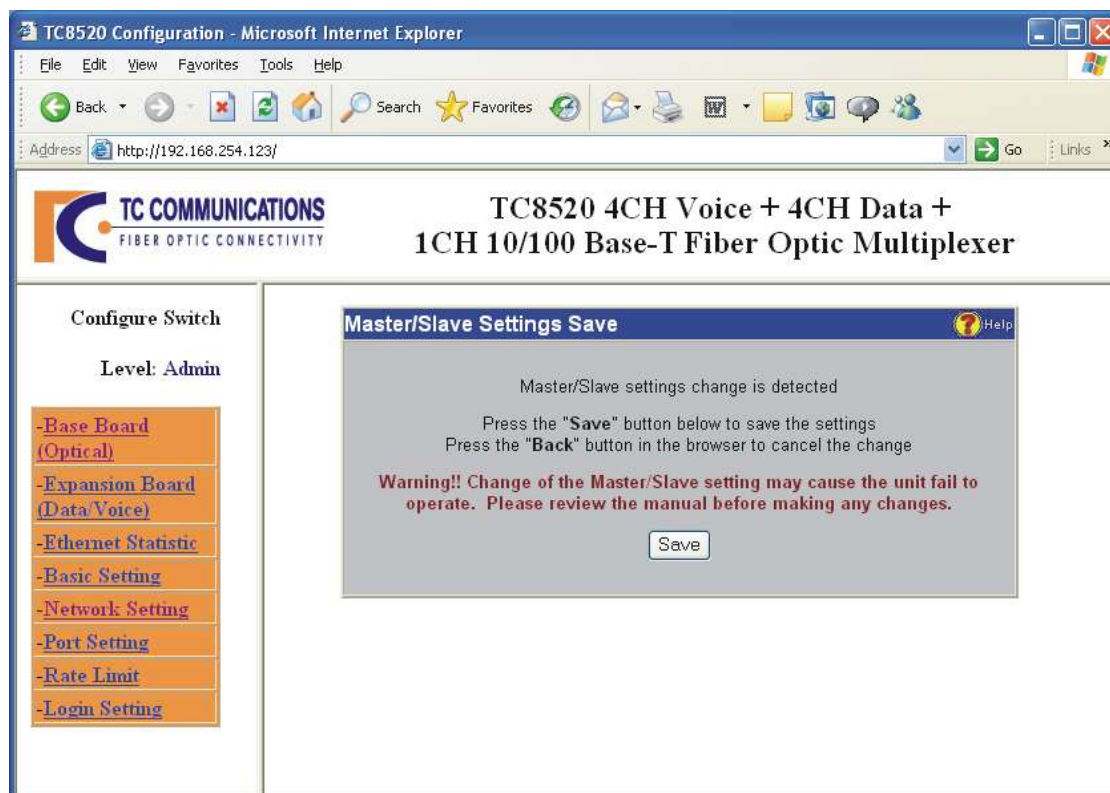


Figure 23. TC8520 Slave Configuration

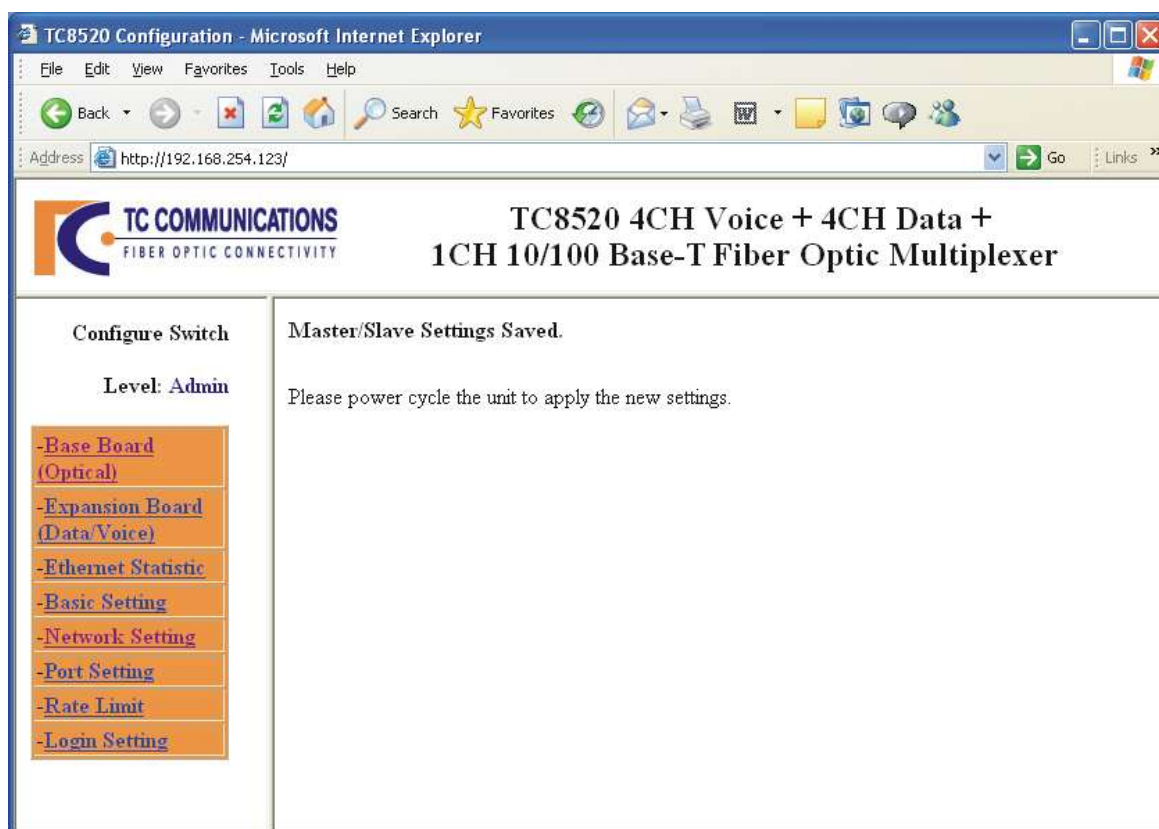
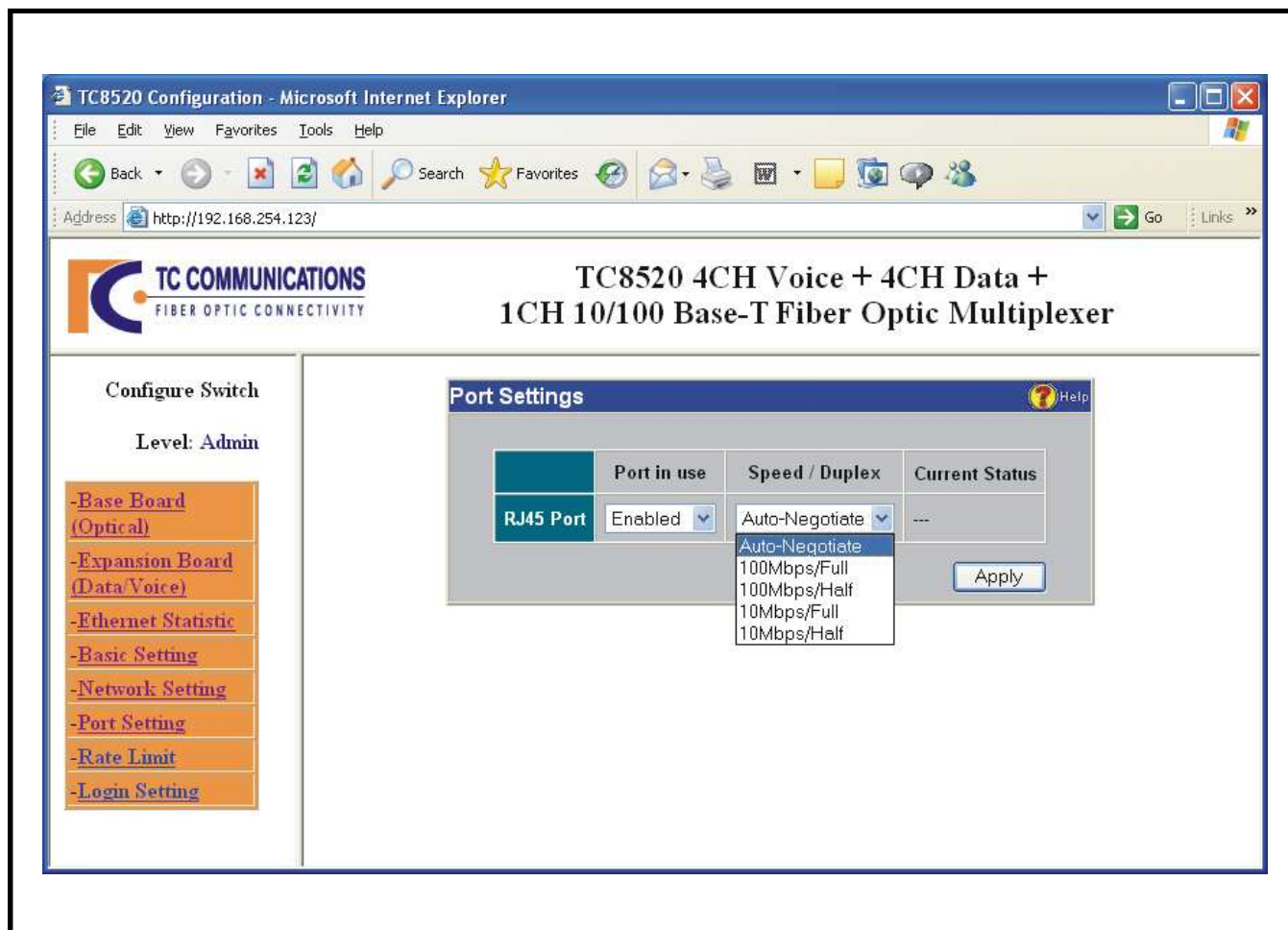


Figure 24. TC8520 Slave Configuration

## Configure Ethernet Settings

Click the "Port Setting" link on the left side of the page to configure the Ethernet Port Settings. After clicking the "Port Setting" link, you will see the following window shown on Figure 25, below.

- Port In Use:** Enable or disable either the Ethernet port.
- 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 Ethernet port as follows:  
Auto-Negotiating, 100Mbps/Full Duplex, 100Mbps/Half Duplex, 10Mbps/Full Duplex, or 10Mbps/Half Duplex.
- Current Status:** It shows the current port status for the Ethernet Port.



**Figure 25. TC8520's Ethernet Port Settings**

Note: When you disable the Ethernet port, you will see that the port is still connected on "Current Status", however all packets that have been sent through that port will be dropped.

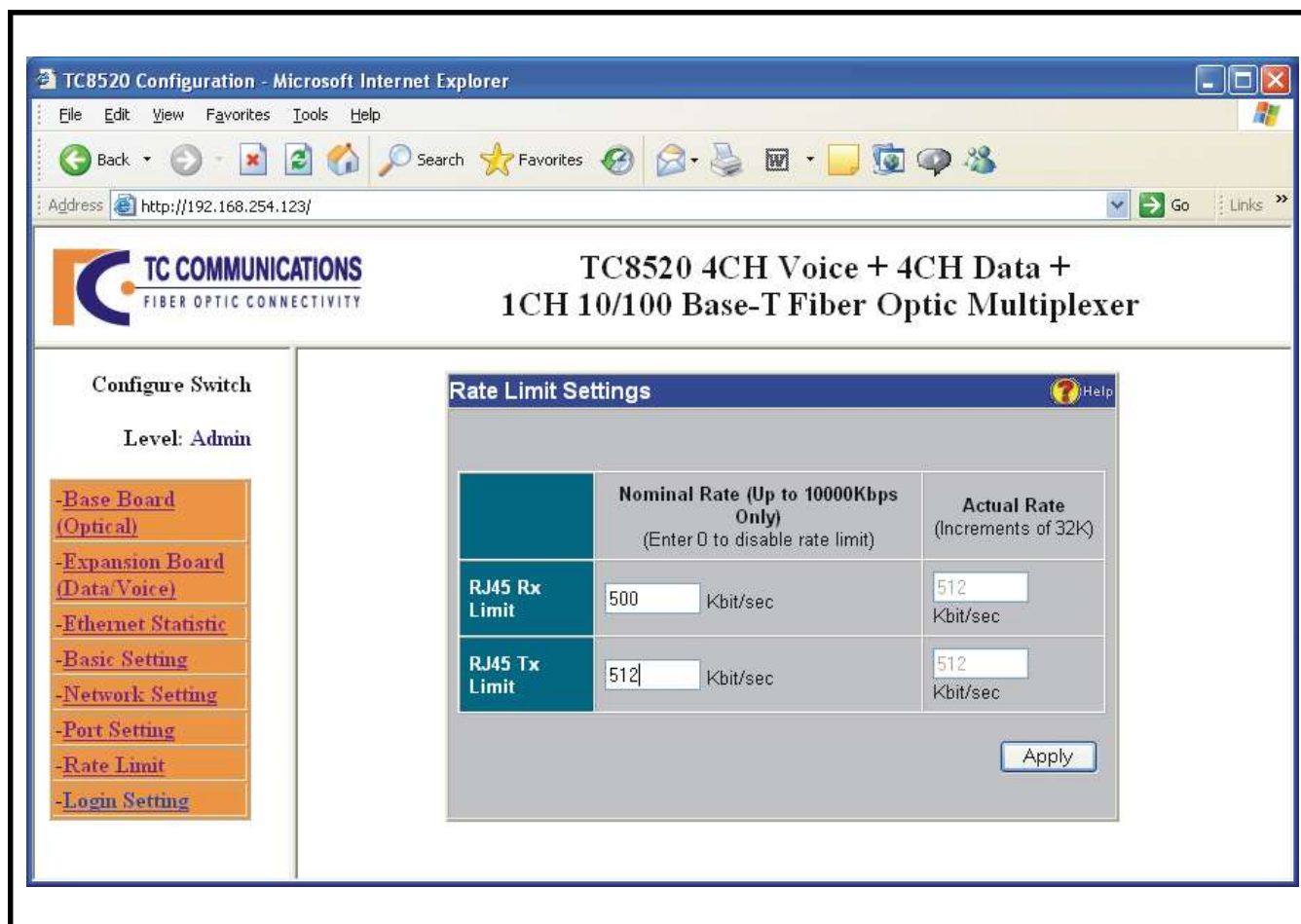


**Rx (Ingress) Limit:** Rate limiting for inbound traffic (data going into the TC8520 port). The default value of the rate limit is zero (no limit on the inbound traffic). The rate limit can be set from 32Kbps and up to 10Mbps in the "Rx Limit" field in increments of 32Kbps. If the rate limit is set in any increment of 32Kbps, then the "Actual Rate" limit field will automatically display the same value. Otherwise, the "Actual Rate" field will automatically display the next higher increment of the rate limit.

**Tx (Egress) Limit:** Rate limiting for outbound traffic (data going out from the TC8520 port). The default value of the rate limit is zero (no limit on the outbound traffic). The rate limit can be set from 32Kbps and up to 10Mbps in the "Tx Limit" field in increments of 32Kbps. If the rate limit is set in any increment of 32Kbps, then the "Actual Rate" limit field will automatically display the same value. Otherwise, the "Actual Rate" field will automatically display the next higher increment of the rate limit.

**Example:** Figure 26 below, shows how to set the Rx (Ingress) and Tx (Egress) rate limiting settings for the Ethernet port. Note that for the Rx Limit setting under "Nominal Rate," 500Kbps was entered, and the Rx Limit under the "Actual Rate" field automatically displays the next higher increment on the rate limit which is 512Kbps. On the other hand, the Tx Limit setting under the "Nominal Rate," 512Kbps was entered, and the Tx Limit under the "Actual Rate" field automatically displays 512Kbps.

When done, click Apply to apply the new settings. Click on the "Summary" link on the left side of the page to go to the summary page to check the settings applied, see Figure 27 on next page.



**Figure 26. TC8520's Rate Limit Settings**

The following diagram shows the Board Status for "Alarm," "Remote Loopback," "Far End Fault-A," "Far End Fault-A," and "Sync".

It also shows the Optical Status for Opt-A and Opt-B and the rate limit settings for ethernet port "Speed Duplex," "Rx Limit (Kpbs)," "Tx Limit (Kpbs)," "Link Status," "Alarm," rate limit settings applied on previous steps on last page.

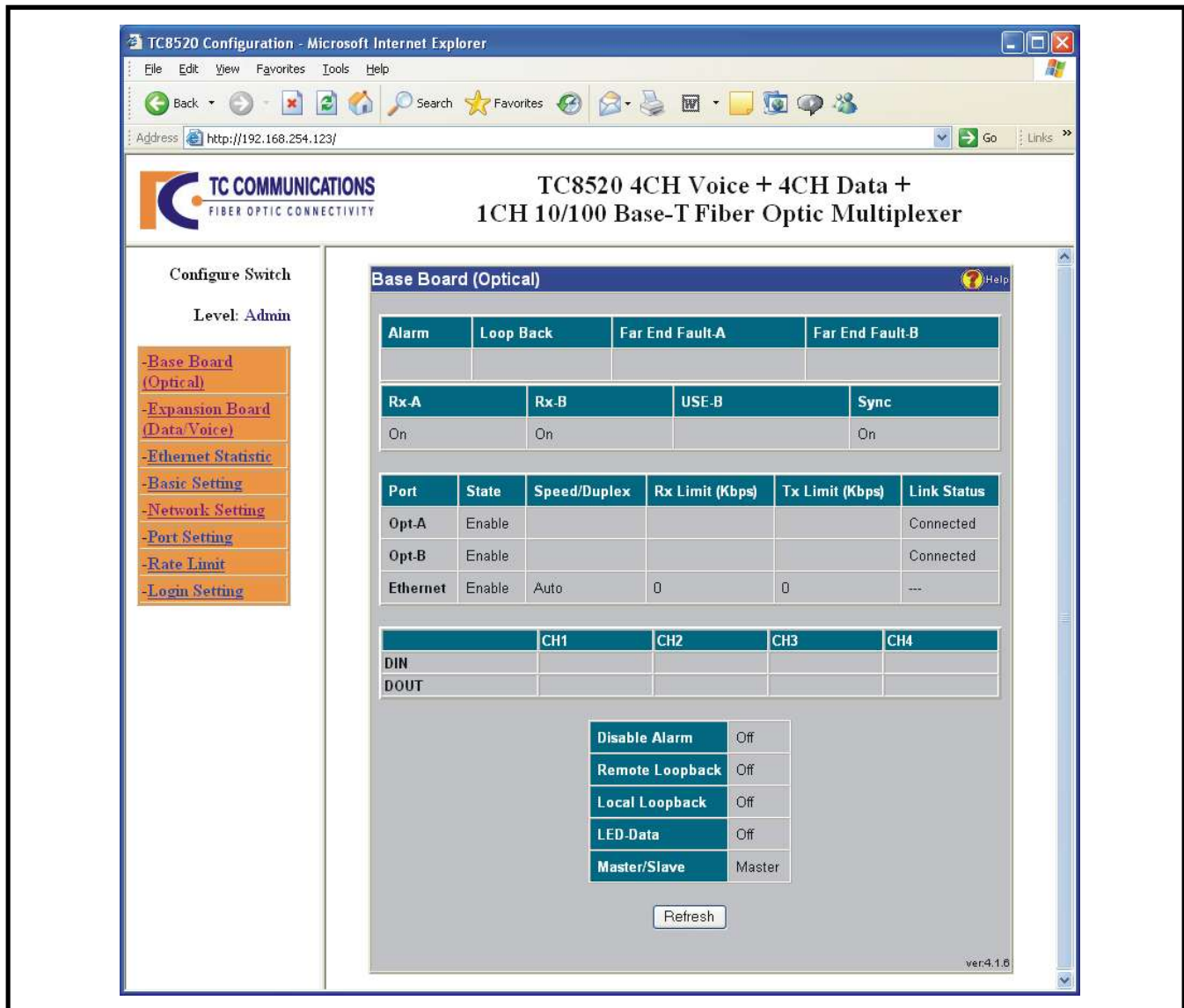


Figure 27. TC8520's Switch Summary

## Link Status for Primary and Secondary Optical Links

You can monitor the status of both Primary optical side "A" (Opt-A) and Optional, Secondary optical side "B" (Opt-B) on the web browser. The connectivity status for each link will be shown under the "Link Status" fields as illustrated on Figure 27, above.

For example, if both optical sides "A" and "B" are connected for optical redundancy, you will see "Connected" under the "Link Status" fields. If there are no optical connections on neither optical side, nothing will be shown in Figure 27 under the "Link Status" fields.

The state status of each Opt-A & Opt-B ports can also be monitored under the "State" fields as on Figure 27, above. By default the "Opt-A" will be enabled. If optional optical redundancy is ordered, the "Opt-B" will be shown as enabled in Figure 27 above.



## Configure Login Settings and Levels of Privilege

Click the "Login Setting" link on the left side of the page. You will see the page as in Figure 28, below.

TC8520 Configuration - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Refresh Print View Source Help

Address http://192.168.254.123/ Go Links >>

**TC COMMUNICATIONS**  
FIBER OPTIC CONNECTIVITY

**TC8520 4CH Voice + 4CH Data +  
1CH 10/100 Base-T Fiber Optic Multiplexer**

**Configure Switch**

Level: Admin

- Base Board (Optical)
- Expansion Board (Data/Voice)
- Ethernet Statistic
- Basic Setting
- Network Setting
- Port Setting
- Rate Limit
- Login Setting

**Login Settings**

	Name	Password	Confirm Password	
User 1	guest	.....		Apply
User 2	user	.....		Apply
Admin	admin	.....		Apply

	User 1	User 2	Admin
Basic Setting Access	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Network Setting Access	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Port Setting Access	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Rate Limit Access	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Login Setting Access	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Apply

Figure 28. TC8520's Configure Login

## Levels of Privilege

---

There are three levels of privileges based on users (User 1, User 2, and Admin).

**User 1:** This user has the lowest privilege of all three levels.

The default username is **guest**, default password is **password** and default privilege is to only view the "Summary," and "Ethernet Statistic" links on the left side of the page as seen on page 41.

**User 2:** This user has intermediate privilege of all three levels.

The default username is **user**, default password is **password** and default privilege is to view the "Summary," "Ethernet Statistic," "Basic Setting," "IP Setting," and "Port Setting" links on the left side of the page as seen on page 41.

**Admin:** This user has the highest privilege of all three levels.

The default username is **admin**, default password is **password** and default privilege is to view all links as seen on the left side of page 41 such as, "Summary," "Ethernet Statistic," "Basic Setting," "IP Setting," "Port Setting," "Rate Limit Setting," and "Login Setting."

**Note:** Only Admin has access to Telnet and/or Console settings.

Figure 28 depicts the Login Settings, there are two sections for changing the usernames, passwords and user privileges.

The top section of the window is used to change the usernames and passwords of User 1, User 2, and Admin. After any change to a user, you must click "Apply" on that particular user to apply the new settings. If you change the username and password of the current Admin, you will see the new authentication windows as on next page.

The lower section of the window is used to assign the User 1 and User 2 privileges (note: Admin privileges cannot be changed) . After you make any change, you must click "Apply" on that section to apply the new settings.

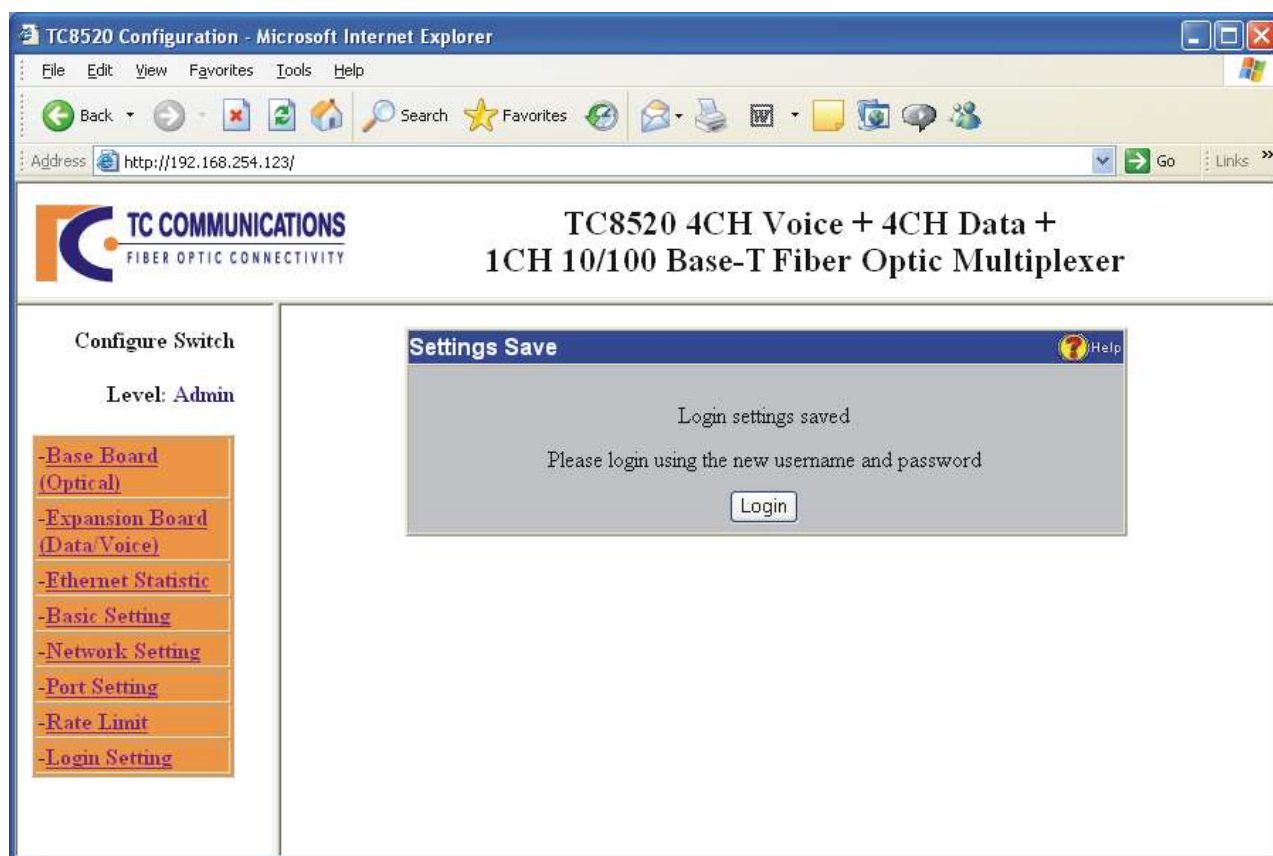


Figure 29. New Settings Saved



Figure 30. Login with New Settings

## Console Settings (On Units With Data Only)

The Console Settings are only used to set the "IP address," "user name," and "password".

User Name: Default is **admin** (you can change it as you wish).

Password: Default is **password** (you can change it as you wish).

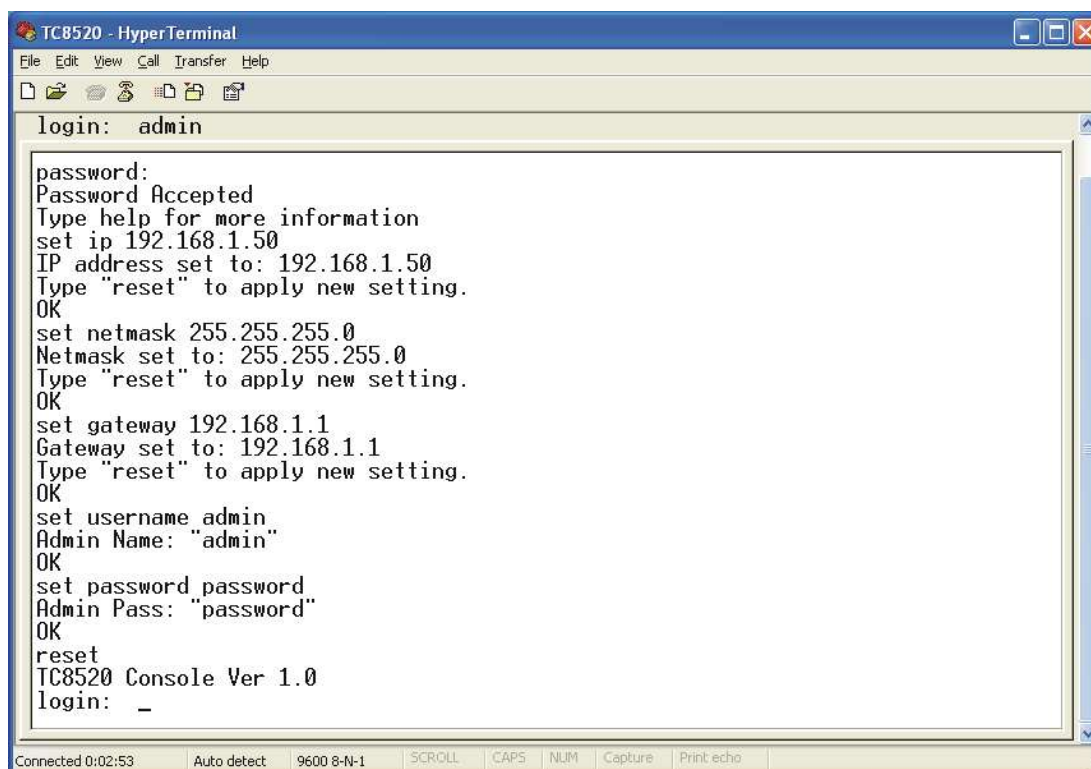
*Initial IP setting using the Console:*

1. Connect the computer and the TC8520 via a DB9 serial cable.
2. Power up the TC8520 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 **admin** 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 31 below.
10. Enter **set ip 192.168.1.50** 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 192.168.1.1** and press "Enter,"
13. Enter **set username admin** and press "Enter,"
14. Enter **set password password** and press "Enter,"
15. Type "reset" to apply all the settings.

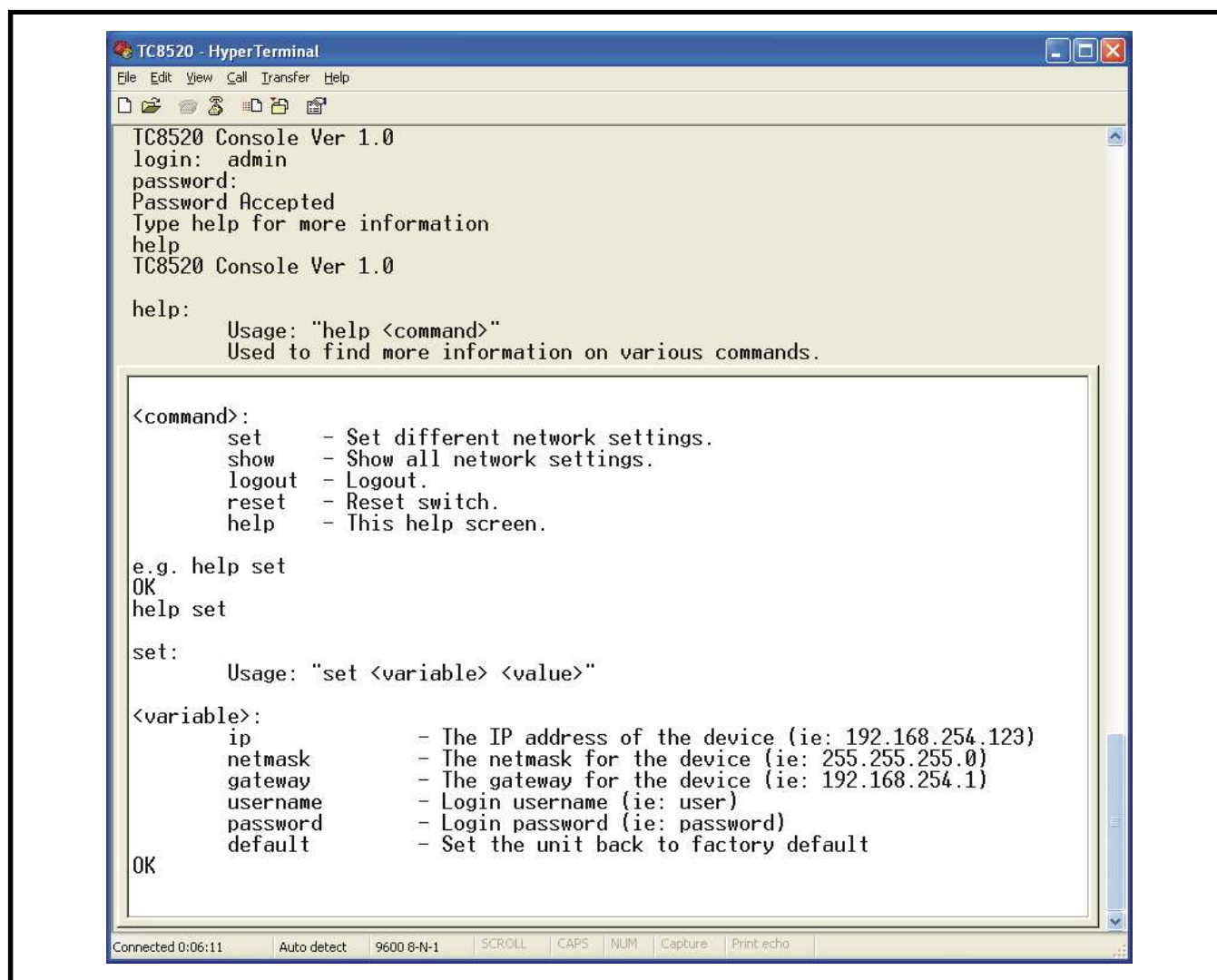
When you see the "TC8520 Console Ver1.0" prompt, you have successfully configured your TC8520 unit.



**Figure 31. TC8520'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 32, below.



**Figure 32. TC8520's Console Help**

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

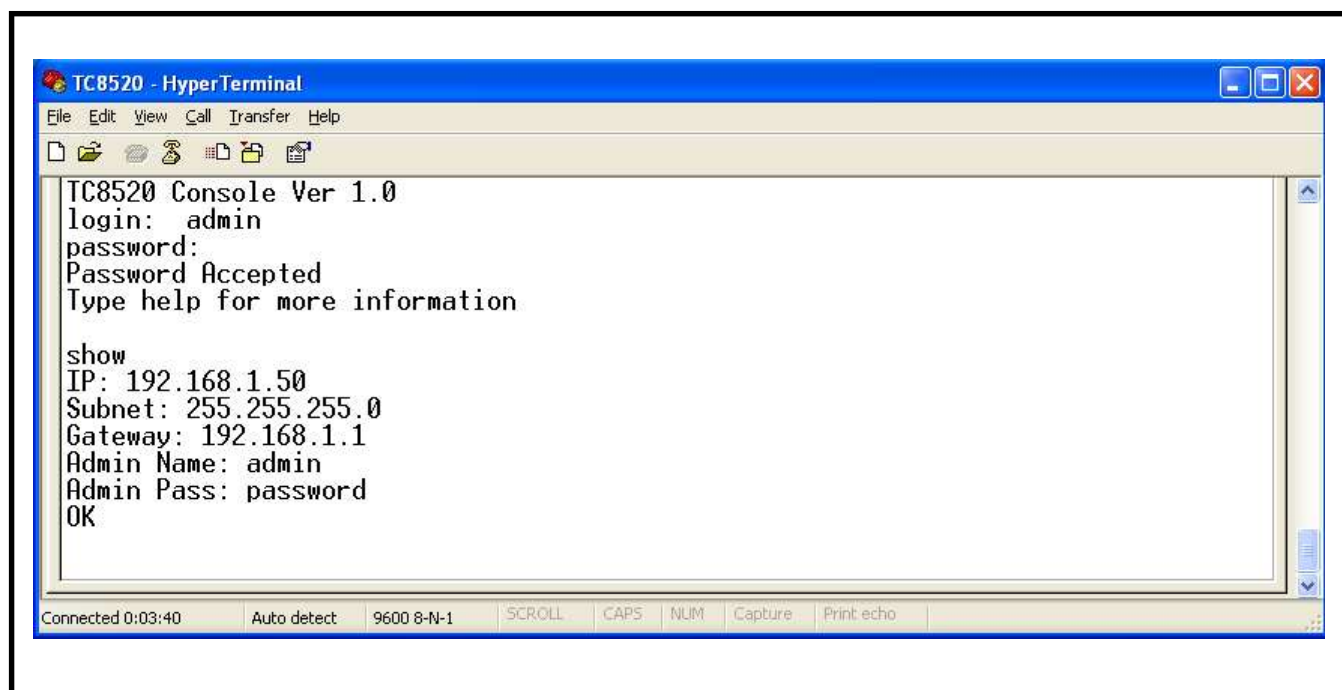
Note1: All set commands required reset to apply new settings

Note2: The default "timeout" value for console setting is two minutes.

## "Show" Command

---

The "show" command will show the current IP settings of the TC8520 unit.



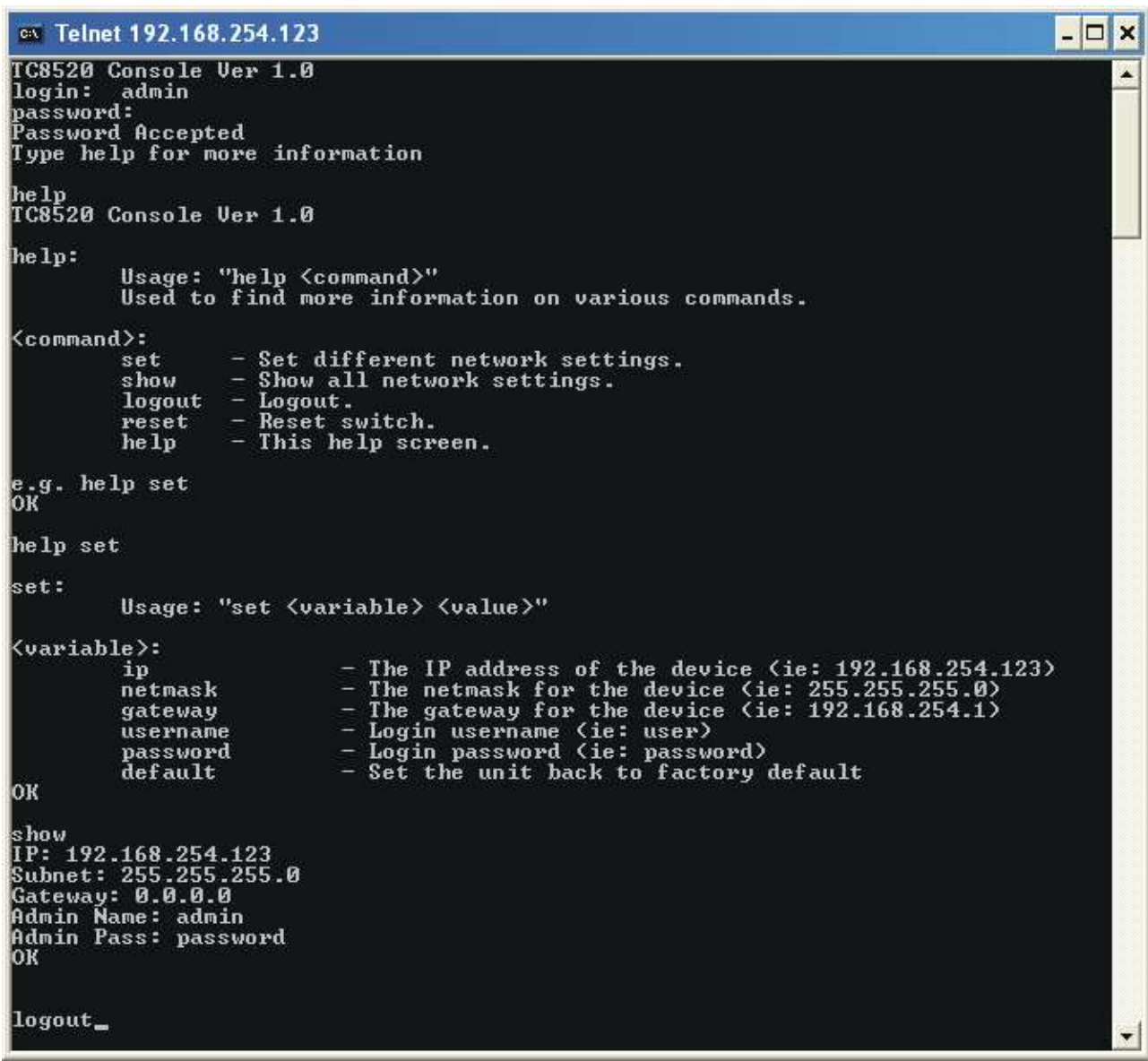
**Figure 33. TC8520's "Show" Command**



## Telnet Settings

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

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



```
C:\> Telnet 192.168.254.123
TC8520 Console Ver 1.0
login: admin
password:
Password Accepted
Type help for more information

help
TC8520 Console Ver 1.0

help:
Usage: "help <command>"
Used to find more information on various commands.

<command>:
set      - Set different network settings.
show     - Show all network settings.
logout   - Logout.
reset    - Reset switch.
help     - This help screen.

e.g. help set
OK

help set

set:
Usage: "set <variable> <value>"

<variable>:
ip        - The IP address of the device <ie: 192.168.254.123>
netmask   - The netmask for the device <ie: 255.255.255.0>
gateway   - The gateway for the device <ie: 192.168.254.1>
username  - Login username <ie: user>
password  - Login password <ie: password>
default   - Set the unit back to factory default

OK

show
IP: 192.168.254.123
Subnet: 255.255.255.0
Gateway: 0.0.0.0
Admin Name: admin
Admin Pass: password
OK

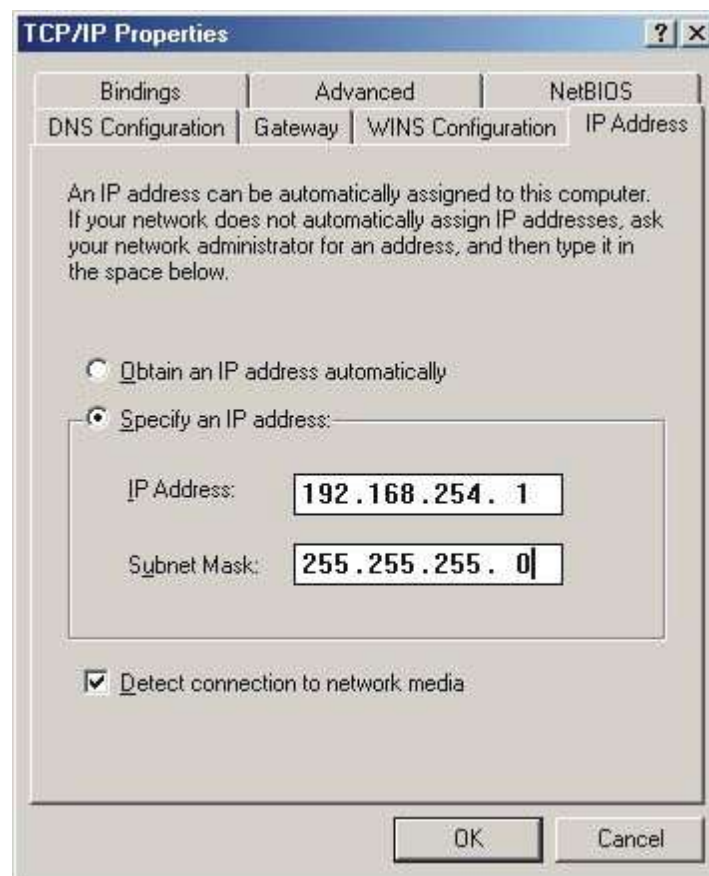
logout_
```

Figure 34. TC8520's Telnet Settings

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 35. 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.



## Audio Bandwidth

Telephone ..... 300 Hz to 3.4Khz

## Channel Capacity

..... 4 Telephone Channels, 1 Channel Ethernet, and up to four optional data channels

## Data Rates

Ethernet ..... 10/100 Mbps

RS-232 Async (per channel) ..... 128 Kbps\*\*

..... Sync (per channel) 64 Kbps\*\*

RS-422, TTL (per channel)..... 19.2 Kbps\*\*

## Electrical

Connectors ..... RJ-11 Female

Telephone..... RJ-45 Female

Data (AUX1 - AUX4) ..... RJ-45 Female

10/100Mbps Ethernet..... RJ-45 Female

Data Interface (Optional)..... RS-232, RS-422\*\*, TTL\*\* or Dry Contact\*\*

Ring Frequency ..... 20Hz

Nominal Ringing Voltage ..... 70VRMS

2-Wire Impedance ..... 600 ohm

Ringer Load(Max REN to drive) ..... 3 REN

Voltage between Tip and Ring ..... 48V

Max copper length between phone and the TC8520 ..... 1000 ft(300meters) for 3 REN

Loop current ..... 20mA

Dial ..... Tone only DTMF(Dial Tone Multiple Frequency), not Pulse

## Factory Default Settings

IP Address ..... 192.168.254.123

## Optical

Transmitter ..... LED/ELED

Wavelength ..... 850/1310nm Multimode

..... 1310/1550nm Single Mode

Connector ..... ST\* (FC optional)

Loss Budget..... 15dB Multimode 850/1310nm @62.5/125μm

..... 20dB Single Mode 1310/1550nm @9/125μm

## System

Bit Error Rate ..... 1 in 10<sup>10</sup> or better

## Indicators

System ..... Power A (2 ea.), Power B (2 ea.), Vcc1, Vcc2, Alarm

Optic ..... Sync, Rx-A, Rx-B, USE-B

Channel Status..... Alarm, FEF-A, FEF-B, RX, TX, IN, OUT, HOOK, RING

Ethernet Signal Status ..... 100M, FULL/COL, LNK/ACT

## Power Source

Standard ..... 12VDC @1.2 Amp

Optional ..... 24VDC @600mA or 115/230VAC w/external power cube

## Temperature

Operating (standard version) ..... -10°C to 50°C

..... Hi-Temp "T" version (optional) -20°C to 70°C

Storage ..... -40°C to 90°C

Humidity ..... 95% non-condensing

## Physical

Height ..... (6.5 cm) 2.60"

Width ..... (18 cm) 7.20"

Depth ..... (25 cm) 9.75"

Weight ..... (1.36 kg) 3 lbs

\*ST is a trademark of AT&T

\*\*Consult factory for availability or higher data rates

## Chapter 9 - 19" Card Cage

### Features

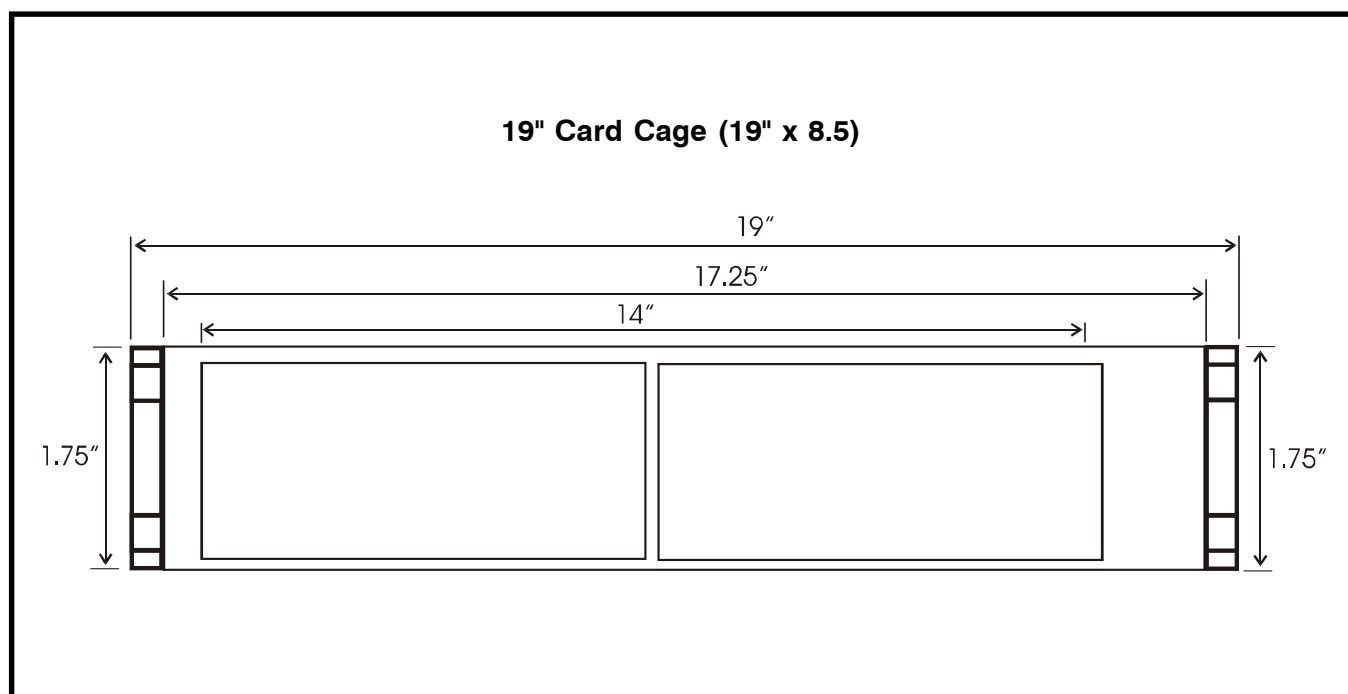
- ☐ 1 U height (1.75")
- ☐ Universal Power Supply Accepts 90V to 264V AC and 47 to 63 Hz AC
- ☐ Standard Power Supply is 12VDC, Optional 24VDC Power Supply Available
- ☐ Over Load & Short Circuit Protection

### Description

The TCRM195 "Pizza Box" Rack Mount Card Cages hold up to 2 single multiplexer type cards.

It operates with one power supply. The AC power supply automatically adjusts for 90V to 264V AC input and 47 to 63 Hz operation. The DC power supply accepts 24VDC input (Optional).

The rack assemblies are 19" wide by 1.75" high. The TCRM195 is 9" deep.



**Figure 36. TCRM195 " Pizza Box" Rack Mount Card Cage**

## Chapter 10 - Return Policy and Warranty

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### Return Policy

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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).

### Limitation of Liability

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1. In no event shall the total liability of TC Communications, Inc. to purchaser and/or end user for all damages including but not limited to compensatory, consequential and punitive damages, exceed the total amount paid to TC Communications, Inc. by purchaser for the goods from which the claim arose, in no event shall TC Communications, Inc. be responsible for indirect and consequential damages.

*Continue on next page.*

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## **Limitation of Liability (Cont.)**

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2. In no event shall liability attached to TC Communications, Inc. unless notice in writing is given to TC Communications, Inc. within ten days of the occurrence of the event giving rise to such claim.
3. TC Communications, Inc. shall not be responsible for delays or non-deliveries directly or indirectly resulting from or contributed to by foreign or domestic embargoes, seizure, fire, flood, explosion, strike, act of God, vandalism, insurrection, riot, war, or the adoption or enactment of any law, ordinances, regulation, or ruling or order or any other cause beyond the control of TC Communications, Inc.
4. TC Communications, Inc. shall not be responsible for loss or damage in transit and any claims for such loss or damage shall be filed by the purchaser with the carrier.