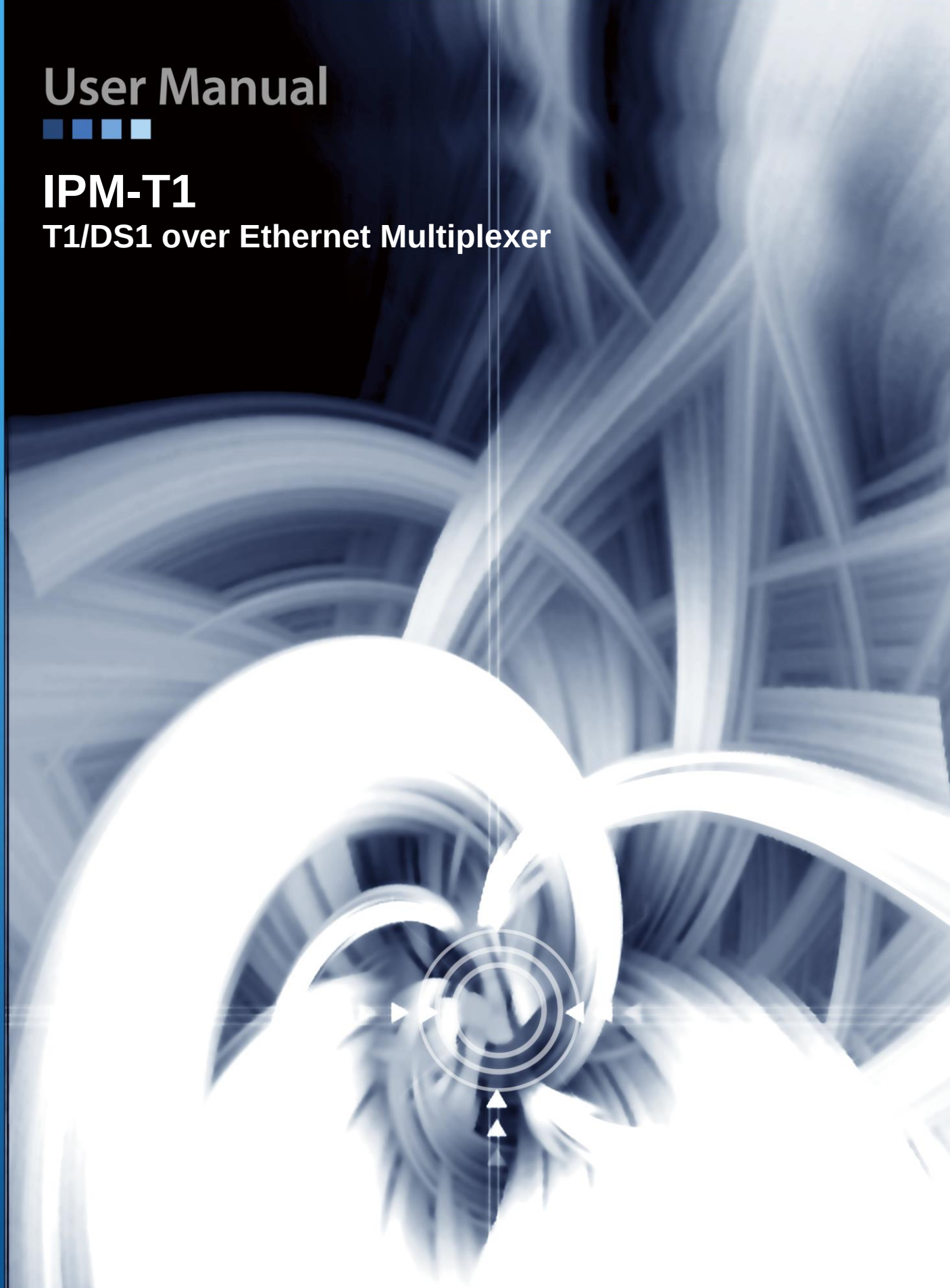
User Manual

IPM-T1

T1/DS1 over Ethernet Multiplexer



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IPM-T1

1, 2, or 4 T1/DS1 over IP Multiplexer

User Manual
Version 1.1 March 3, 2016

This manual supports the following models:
IPM-1T1
IPM-2T1
IPM-4T1

This document is the current official release manual. Please check CTC Union's website for any updated manual or contact us by E-mail at sales@ctcu.com. Please address any comments for improving this manual or to point out omissions or errors to marketing@ctcu.com. Thank you.

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Chapter 1 Introduction

1.1 Functional Description

The IPM series is a "Multi-service (TDM and Ethernet) over Ethernet" bridge, which transports one, two or four ports of T1/DS1 and one LAN into Ethernet packets. Its target application shown in Figure 1.4-1 is the transparent T1 port interconnection via the IP networks (using Ethernet packets). IPM series implements the newest Circuit Emulation System over IP technology (MEF 8).

The T1 over IP of IPM is compliant with IETF "CES over IP" standard. Versatile LEDs are provided for alarms and status indication.

1.2 Features

- Supports 1, 1~2, or 1~4 T1 over 10/100M electrical Ethernet (WAN).
- Provides 1-port 10/100M electrical Ethernet LAN for Ethernet access.
- User side has standard TDM (T1) interfaces (USOC RJ48C).
- Full-duplex 10/100Mbps Ethernet Interface.
- Provides auto-negotiation which can auto configure IPM to 100M depending on the speed of Ethernet port.
- Supports "T1" clock source with selectable "T1 line recovered clock", "adaptive clock" or "internal clock".
- Provide "ACT" and "ALM" LED indicators for each TDM interface.
- Provide "Link/Activity" and "Link Speed" LED indicators for Ethernet interface.
- Stand–alone desktop unit, optional 19" rack mountable.
- Support AC 85 ~ 264V input and DC -36 ~ -72V input for redundancy.

1.3 IPM Outlook

Figure 1.3-1 IPM 4-Port T1 Outlook

1.3.1 LAN Port

The LAN port is a 10/100M (100Base-TX) port which supports auto-negotiation, compliant with IEEE 802.3u, and auto-MDIX. This port can be connected to the customer's side and is multiplexed with the TDM traffic towards the WAN port. The local LAN port supports bandwidth grooming in order to prevent any packet starvation for the CES. Packet starvation will result in errors in the TDM transmission. When the IPM-T1 is used in an existing network, this LAN port will probably not be of any use.

1.3.2 T1 Port(s)

Depending on the model, there will be 1, 4, 8 or 16 T1 ports. These short haul ports provide the twisted pairs connections for T1/DS1 and follow the connection pin assignment defined in USOC RJ48C (Pair 1&2 Rx, pair 4&5 Tx).

1.3.3 NMS Port

This 10/100M (100Base-TX) port which supports auto-negotiation, compliant with IEEE 802.3u, and auto-MDIX, is an "outband" management port which must be configured on a subnet different from the WAN CES traffic port. This management port supports Telnet (on port 8888) for remote CLI and HTTP (on port 6868) for Web based management.

1.3.4 Console Port

This DB9 female connector provides a DCE RS-232 async interface for terminal managament via CLI (command line). The interface can connect directly to a terminal (or PC) using a 1:1 cable with terminal configured for 115,200 baud, 8 bits, no parity, 1 stop bit and no flow control. The default login password is 'admin' (with no quotes).

1.3.5 WAN Port (Rear Panel)

This 10/100M (100Base-TX) port which supports auto-negotiation, compliant with IEEE 802.3u, and auto-MDIX, is the Ethernet link to the remote IPM multiplexer.

1.4 Applications of IPM

The IPM is mainly applied for the solution of wireline usage connected with PSTN via T1 and Router over 100BaseTx and for integrating various legacy TDM equipment and popular IP services.

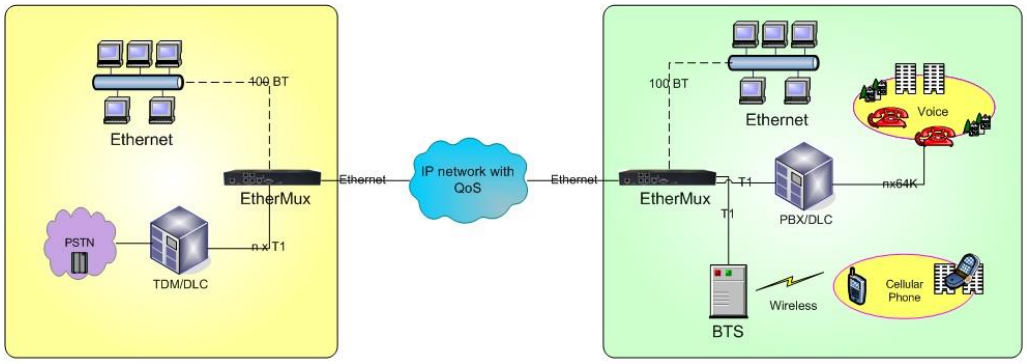

Figure 1.4-1 Application of IPM Multiplexer

1.5 Technical Specifications

(1) Construction

- **Physical Dimensions**
  Height: 44 mm (1U)
  Width: 320 mm
  Depth: 125 mm
  Weight: 1.2 Kg ~ 1.3kg (depending on which model is purchased)

(2) 100M Ethernet Interfaces

a. Compliant with 802.3/802.3u standards
b. 100-BaseTX with RJ45 physical connector
c. Full-duplex
d. Supports Auto-negotiation
e. LED indicators for Ethernet: Link status and Act activity

(3) TDM Interfaces : T1/DS1 Interface

a. Data Rate: 1.544 Mbit/s ± 32 ppm
b. Line Code: Bipolar with B8ZS
c. Test Load Impedance: 100 ohms± 5% resistive, balanced.
d. LED indications for T1: ACT, ALM
e. Connector Type: RJ-45 physical wired as RJ48C

(4) Power Supply

a. AC: 85~264V, 47~63Hz or
   DC: -36 ~ -72 V
b. Maximum Power Consumption: < 10 watts

(5) Operating Environment

a. Ambient temperature: 0 ~ 40 °C for indoor application
   (Optional): 0 ~ 55 °C
b. Storage temperature: 0 ~ 85 °C
c. Relative humidity: 5 ~ 95% non condensing

1.6 Ordering Information

Feature Options:

IPM-T1-AD - 1 T1/DS1 Port Multiplexer with AC+DC Redundant Power
IPM-2T1-AD - 2 T1/DS1 Port Multiplexer with AC+DC Redundant Power
IPM-4T1-AD - 4 T1/DS1 Port Multiplexer with AC+DC Redundant Power

Chapter 2 Installation

2.1 Description

This chapter provides the information needed to install IPM series. It is important to follow the installation instructions to ensure normal operation of the system and to prevent damage from human error.

2.2 Unpacking

If there is a possibility for future relocation of the IPM unit, please keep the packing cartons and protection packaging material.
Please carefully unpack and inspect the unit and accessories for potentially damaged and missing parts. Contact our nearest sales representative or our company directly if you detect any damaged or missing parts. Improper handling during shipment may cause early failure.

2.3 Site Requirements

Users should follow the precautions below to insure the safety and to minimize the risk of damage to the equipment:

Make sure that the power outlet is properly grounded. Please refer to article 250 of the National Electrical Code (NEC) Handbook. Proper grounding should include a minimum of:

- A grounded rod buried outside the building at least 8 feet (2.44 meters) deep.

2.4 Site Selection

For best performance, a maximum distance of 6 feet (1.83 meters) from the AC power outlet to IPM series is preferred. To allow easy access to the equipment, leave at least 18 inches (45 cm) clearance at the rear and at least 4 inches (10.2 cm) at the front.

Caution: To avoid overheating, leave at least 1 inch (2.5 cm) on either side of the IPM series. Also, DO NOT stack other equipment on top of the IPM unit in order to ventilate the system normally.

2.5 AC or DC Electrical Outlet Connection

For safety and to prevent damage to IPM series, make sure that the power requirement matches the appearance of user electric outlets. Connect power source to IPM unit and power on the equipment.

Caution: **Damage to compact key components may occur if the output voltage applied to device is not within the specified range.**

2.6 Rack Installation Configuration

There are 3 common parts for each IPM pack, including 1 set of TDM over IP multiplexer, 1 piece of AC power cable. If IPM intends to be mounted into a rack, a pair of L-shaped brackets with 10 pieces of screws should be requested by user's order. The following Figure 2.6-1 as desktop mode and Figure 2.6-2 rack mount mode, and the procedures are to show the installation configuration.

Figure 2.6-1 IPM Series desktop

Figure 2.6-2 IPM series in rack

2.7 Getting Start

1. Place both CO and CPE IPM devices on a flat work surface.
2. Connect the Ethernet cable to the CO IPM device's WAN port and the other end of the Ethernet cable to the CPE IPM device's WAN port.
3. Ensure that CO and CPE IPM devices are both switched on.
4. Connect your computer to the LAN port of the IPM device.
5. Check LAN and WAN Ethernet ports LED status as shown in Table2-7.1.
6. You may need to set up further parameters via CLI, using the RS-232 console port or a Telnet session as described in section 3.9 "Command Line Interface for Setup". Examples to configure IPM can be found in the Appendix.

LED Name	State	Description
PWR	**Green**	Power is on.
	Off	No power present.
Ethernet Link/Activity	**Green**	Ethernet link is up.
	Blinking Green	Tx/Rx traffic is traversing the port.
	Off	Ethernet Link is down.
Ethernet Link Speed	**Yellow**	100 Mbps
	Off	10 Mbps
T1 ACT	**Green**	T1 port is enabled and traffic is traversing the port.
	Off	T1 port is disabled.
T1 ALM	**Yellow**	T1 link error has occurred.
	Off	No alarm present.
ALM	**Red**	Alarms raised from any of T1 link
	Off	No alarm present.

Table 2.7-1 LED Indications of IPM 1/2/4-Port T1

Chapter 3 Operation

3.1 Description

IPM series consists of the front panel and the rear panel. The views and description of front and rear panels are shown in Figure 3-2.1 and 3-3.1 for details.

3.2 Front Panel

Figure 3.2-1 IPM 1-Port T1 Front Panel

Figure 3.2-2 IPM 2-Port T1 Front Panel

Figure 3.2-3 IPM 4-Port T1 Front Panel

(1) System Indicators

PWR (Green Power On/Off LED)

ALM (Red failures/errors from any of T1 link)

(2) Reset (RST) Button

Use this button to reboot the system.

(3) LAN Ethernet Connector and Indicators

The Ethernet interface is a RJ45 connector with two LED indicators and its pin assignments are shown in Figure 3.2-4. Two LED indicators are described below.

- **GREEN LED**: Solid Green indicates Ethernet link is up; Blinking Green indicates Tx/Rx traffic is traversing the port.
- **YELLOW LED**: Solid Yellow indicates 100 Mbps link speed; Off indicates 10 Mbps link speed.

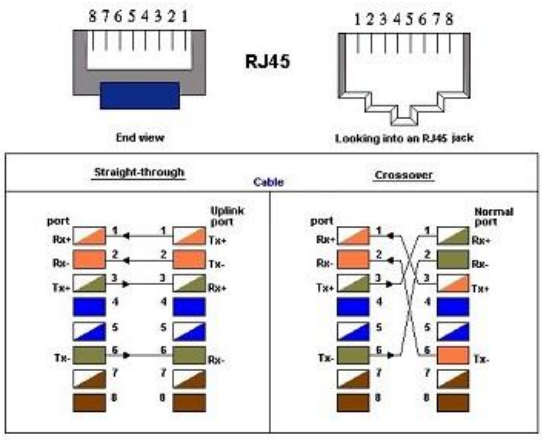

Figure 3.2-4 Ethernet Pin Assignment

(4) T1 Interface Connectors and Indicators

The T1 interface is a, RJ-45 physical connector with two LED indicators.

- **GREEN LED**: Solid Green indicates T1 port is enabled and traffic is traversing the port; Off indicates T1 port is disabled.
- **YELLOW LED**: Solid Yellow Indicates T1 link error has occurred; Off indicates no alarms or failures.

The "Yellow" LED indicates one of the following alarms occurred:

T1 LOS, LOF, AIS or L-bit received from the remote device.

T1 Pin Assignments are shown in Figure 3.2-5.

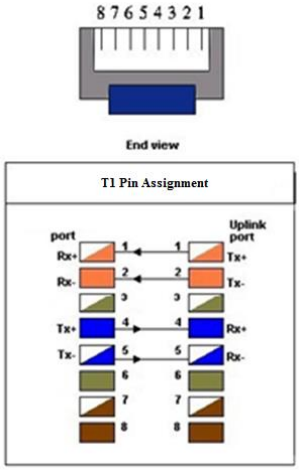

Figure 3.2-5 T1 Pin Assignment follows USOC RJ48C

(5) RS232 Console Connector

A RS232 interface with baud-rate 115200bps via DB9 (female)-to-DB9 (male) cable is provided for diagnostic. The user commands (CLI command) are listed in Table 3.9-1.

(6) NMS Ethernet port

It can be used for device management (local or remote access via Telnet or SNMP-based management). Provide a user-friendly interface for the management of IPM devices.

3.3 Rear Panel

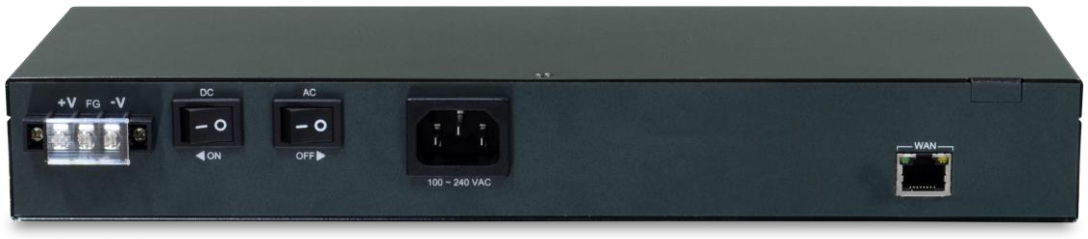

Figure 3.3-1 IPM Rear Panel

(1) WAN Ethernet Interface:

The Ethernet interface is a RJ45 connector with two LEDs and its pin assignments are shown in Figure 3-2.4. Two LED indicators are described below.

- **GREEN LED**: Solid Green indicates Ethernet link is Up; Blinking Green indicates Tx/Rx traffic is traversing the port.
- **YELLOW LED**: Solid Yellow indicates 100 Mbps link speed; Off indicates 10 Mbps link speed.

(2) AC Power Socket and Switch (On/Off switch for AC):

The built-in power operates at AC 110V/220V with the input voltage range of 85 to 264VAC (100~240 +10% / -15%).

(3) DC Power Socket and Switch (On/Off switch for DC):

The built-in DC power operates at nominal (+ or -) 48VDC with the input voltage range of 36 to 60VDC.

Both built-in AC power and built-in DC power are shipped with IPM.

3.4 Loopback Mode

The IPM provides two types of loopback: "T1 Remote Loopback" and "T1 Local Loopback". (Figure below.)

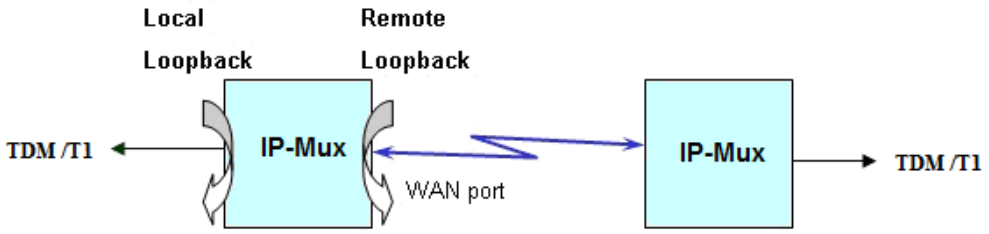

Figure 3.4-1 IPM T1 Loopback Mode

3.5 IP Configuration

The IP address, subnet mask, and default gateway address can be setup through RS232/Telnet.

3.6 Interface Configuration

LAN Ethernet port provides a bandwidth control. This feature allows users to limit the data rate from LAN to WAN port. Implementing this feature is to ensure the quality of service in TDM circuits. For different applications, there are 16 different bandwidth options available for users to choose (50K, 100K, 150K, 200K, 250K, 300K, 350K, 400K, 800K, 1.6M, 3.2M, 6.4M, 12.8M, 25.6M, 51.2M and 100M). In addition, setting a 100Mbps bandwidth option is to only utilize the rest of the available bandwidth of 100Mbps minus the bandwidth being reserved for all T1 traffic.

For the T1 interface, the LEDs will be lit after enabling the T1 channel and user can map to the remote different T1 channel for flexible selection. This allows for cross connection as well as for point to multi-point applications. The Jitter Buffer is also used to overcome the packet delay variations between two LAN devices, including 8 available options of 11, 23, 40, 75, 99, 145, 192 and 239 ms based on the standard Ethernet frame size of 1518 bytes.

3.7 Fault Report

T1 active alarms can be displayed by executing a CLI command "almall". This information is useful to a technical support person who performs diagnostic tasks. The alarms are interpreted as follows:

T1LOS: Loss of receiving signal of T1 from the upstream equipment connected to the T1 port.
T1AIS: AIS (Alarm Indication Signal, a message consisting of all "1"s) signal received from the upstream equipment connected to the T1 port.
PWLBIT: T1 LOS or AIS alarm has been raised at the remote T1 port**.**
PWRBIT: Packets loss occurred at remote Ethernet WAN port.
PWSEQNUMERR: Packets received out of sequence at local Ethernet WAN port.
JBUFEMP: Jitter buffer empty occurred at the T1 port. (Possible reasons could be due to WAN port Ethernet link down or pseudowire ID mismatched.)
JBUFOV: Jitter buffer overflow occurred at the T1 port.

3.8 Save Configuration

After changing any settings of the device, please execute **csave** command to save the new settings to the device. This can prevent all of your settings being lost if you reboot or power cycle the device.

3.9 Command Line Interface for Setup

a. Terminal Emulator as Local Console Terminal

When logging into the terminal, set up the console port as follows:

- Bit rate: 115200bps
- Data bit: 8
- Parity: none
- Stop bit: 1
- Flow control: none
- Login password: *admin*

b. Telnet as Remote Console Terminal

The IPM device supports a telnet service for remote configuration. Any host with telnet client enabled can access the command line interface of the IP-Mux device. The telnet port has been changed to port 8888 for security from the default port 23. Please follow instructions below to remotely login to a device via telnet connection. The illustration is based on IPM device default factory settings listed below. **WAN IP and NMS IP must be set in the different subnet**.

IPM Device Default Factory Settings

	CO device	**CPE device**
NMS port IP address	192.168.1.11	192.168.2.11
NMS port subnet mask	255.255.255.0	255.255.255.0
Default gateway	172.16.1.2	172.16.1.1
WAN port IP address	172.16.1.1	172.16.1.2
WAN port subnet mask	255.255.255.0	255.255.255.0
LAN to WAN port bandwidth	400Kbps	400Kbps

To telnet to an IPM CO device from your computer, connect your computer to the LAN port of CO device with an Ethernet cable, then follow these steps:
Step 1: Configure your computer IP address as 172.16.1.100 and subnet mask set to 255.255.255.0
Step 2: On the command terminal of your computer, type telnet 172.16.1.1 8888.
Step 3: When the device prompts a password, just enter the default password "admin".
Step 4: Type ? to display a list of commands available for a user.
Step 5: If want to see a full list of commands, type "passwd" command and input password "gciadmin" to enter administration mode**. (proceed with great care)**
Step 6: Type ? to display a full list of commands.

To telnet to an IPM CPE device from your computer, connect your computer to the LAN port of CPE device with an Ethernet cable, then follow same steps described above except **Step 2** type telnet 172.16.1.2 8888 instead, telnet to a CPE device's IP address.

The CLI commands are summarized as the following table:

Table 3-9.1 CLI Command Description

CLI Command	**Description**
System Command	
logout	Logout CLI System
cdisp	Display IPM current configurations.
csave	Save current configurations: IPM & relative setting.
cload	Load configuration setting from FLASH.
passwd	Enter password to change user-mode. (i.e. View/Setup/Admin mode) PS: If inputted password is not for "setup" or "admin", it will enter the "view" mode.
setpass mode	Modify password for user-mode. mode: 's' for setup mode, 'a' for admin mode, 'c' for CLI login
ipset ip_addr net_mask gw_addr	Set NMS port IP address, subnet mask and gateway address. ip_addr: NMS port IP address to be assigned. net_mask: subnet mask of IP address. gw_addr: gateway IP address. Example: ipset 192.168.1.11 255.255.255.0 192.168.1.254
ipget	Display NMS port current IP address.
trapset mode trap_ip_addr	Set SNMP Trap Mode & Host IP mode: 0 for disable SNMP trap, 1 for enable SNMP trap

CLI Command	Description
	Example: trapset 1 192.168.1.200 (enable SNMP trap function and set host 192.168.1.200 to receive the trap message)
trapget	Get SNMP Trap Mode & Host IP
ntpset mode server_ip_addr	Set NTP Enable Mode & NTP Server IP mode: 0 for disable NTP function, 1 for enable NTP function Example: ntpset 1 192.168.1.201 (enable NTP function and set NTP server address to192.168.1.201)
ntpget	Get NTP Enable Mode & NTP Server IP
upgrade tftp_server_ip file_name	Upgrade SW image file from TFTP server tftp_server_ip: TFTP server IP address file_name: the file name of software image to be upgraded EX: upgrade 172.16.1.101 IPM_v100_f110418.bin
backup tftp_server_ip file_name	Backup the system configuration to TFTP server tftp_server_ip: TFTP server IP address file_name: backup file name EX: backup 172.16.1.101 IPM_co_backup_1
restore tftp_server_ip file_name	Restore the backup system configuration from TFTP server tftp_server_ip: TFTP server IP address file_name: backup file name EX: restore 172.16.1.101 IPM_co_backup_1
timeset hour min sec	Set current time with 'hour', 'minute' and 'second'. Example: timeset 7 30 00 (set IPM's real time clock to 7:30AM)
dateset year month day	Set current date with 'year', 'mouth' and 'day' Example: dateset 2011 07 05 (set IPM's date to July 5, 2011)
timeget	Get current time and date
ping ip_addr	Use ICMP to check connection EX: ping 192.168.1.11
version	Display software version and related information
logout	Quit IPM CLI session and return to CLI login prompt
reboot	Perform a warm startup on IP-Mux. Ethernet data will be interrupted during this operation.
Provision Command	
gci	**G**lobal **C**hipset **I**nitialization at Middle Ware & CESoPSN chip Initial relative Tasks, Messages and Semaphores.
srcnet ip_addr net_mask [source_mac(AA:BB:CC)]	Set WAN port IP address, subnet mask, gateway IP address and its MAC address. If source_mac is omitted, the last three numbers of WAN port IP address will be used as its MAC address. ip_addr: WAN port IP address to be assigned. net_mask: subnet mask of IP address. [source_mac(AA:BB:CC)](OUI is fixed): WAN port MAC address. EX: srcnet 172.16.1.1 255.255.255.0 (WAN port MAC address will be set to OUI+10:01:01) EX: srcnet 172.16.1.1 255.255.255.0 0A:0B:0C (WAN port MAC address will be set to OUI+0A:0B:0C**)**
lanset enable bandwidth	Enable LAN port and set its bandwidth enable: 0:disable, 1:enable LAN port bandwidth: 0: 50Kbps, 1: 100Kbps, 2: 150Kbps, 3: 200Kbps, 4: 250Kbps, 5: 300Kbps, 6: 350Kbps, 7: 400Kbps, 8: 800Kbps, 9: 1.6Mbps, 10: 3.125Mbps, 11: 6.25Mbps, 12: 12.5Mbps, 13: 25Mbps, 14: 50Mbps, 15: 100Mbps. EX: lanset 1 7 (enable LAN port and limit its bandwidth to 400Kbps)
vlanset op_mode	Enable or disable T1 channel vlan mode op_mode: 0:disable, 1:enable EX: vlanset 1 (enable T1 channel vlan mode)
ceschset ch_no enable [dest_ip] [dest_mac]	Set CESoPSN Channel and its destination IP and MAC address of the remote device. ch_no: T1 channel number (1~4) enable: 0:disable, 1: enable.

CLI Command	Description
	[dest_ip]: destination IP address. Can be omitted if disable T1 channel. [dest_mac]: destination MAC address. Example 1: Enable T1 port #1, set the dest_ip, then automatically get the dest_mac address from the remote device only if the local device can communicate with the remote device via its WAN port. EX: ceschset 1 1 172.16.1.2 Example 2: Enable T1 port #1 and specifically set the destination ip and mac address of the remote device. EX: ceschset 1 1 172.16.1.2 AA:BB:CC:DD:EE:FF
cespwidset ch_no TrPWID PrPWID	Set CESoPSN Channel TrPWID and PrPWID. ch_no: T1 channel number (1~4) TrPWID: Transmit PW ID. PrPWID: Provision PW ID. EX: cespwidset 1 1 1
jitterbd ch_no depth	Set CESoPSN Channel Jitter Buffer Depth. ch_no: T1 channel number (1~4) depth(pktsize=0): jitter buffer depth 0~7 (0:11ms, 1:23ms, 2:40ms, 3:75ms, 4:99ms, 5:145ms, 6:192ms, 7:239ms) EX: jitterbd 1 1 (set jitter buffer to 23msec when pkt_size is set to 1518 Bytes)
pktsize ch_no pkt_size	Set CESoPSN Channel Packet Size ch_no: T1 channel number (1~4) Pkt_size: 0 ~ 3 (0: 1514 Byte, 1: 782 Byte, 2: 178 Byte, 3: 306 Byte) EX: pktsize 1 1
ceschclkset ch_no clksrc	Set Channel transmit clock source ch_no: T1 channel number (1~4) clksrc: 0:Adaptive, 1:Internal, 2:RxLine.
lpkset ch_no mode enable	Enable/Disable T1 channel loopback mode. ch_no: T1 channel number (1~4) mode: 0:Disable-All, 1:T1-Remote (FE), 2:T1-Local (NE) enable: 0:disable, 1:enable. EX: lpkset 1 1 1
lpkget	Get current loopback mode of T1 channel.
cesft1mode ch_no en(1/0)	Set TDM PW to Transparent T1 (SAToP) or Fractional T1 N x 64k mode (CESoPSN) ch_no: T1 channel number (1~4) enable: 0:disable, 1: enable. EX: cesft1mode 1 1 (Set T1 port #1 to Fractional T1 (CESoPSN) mode)
cesft1crc ch_no en(1/0)	T1 G.704 CRC6 generation/analyze control for Fractional T1 mode. This setting only affect T1 ports set to FT1 N x 64k mode, for T1 ports set to Transparent T1 mode this setting has no effect. ch_no: T1 channel number (1~4) enable: 0:disable, 1: enable. EX: cesft1crc 1 1 (Enable G.704 CRC6 generation/analyze on T1 port #1.)
cesft1tsmap ch_no TsMap	Set 64k PCM channel number to be transported over the TDM PW for FT1 (CESoPSN) mode. This setting only affect T1 ports set to FT1 N x 64k mode, for T1 ports set to Transparent T1 mode this setting has no effect. ch_no: T1 channel number (1~4) TsMap: bit mask for DS0, b23:TS23 ~ b0:TS0 EX: cesft1tsmap 1 x0003FF Timeslot #0 ~ 9 of T1 port #1 will be transported over the TDM PW. x0003FF (hexadecimal)=0000 0000 0000 0011 1111 1111 (binary) TS23: the most left bit, TS0: the most right bit.
cesft1framedsel ch_no framed_mode	Set CESoPSN Channel FT1 framing mode to SF or ESF. ch_no: T1 channel number (1~4) framed_mode: 0:SF, 1:ESF EX : cesft1framedsel 1 1 (set T1 port #1 framing mode to ESF)
cest1ecset ch_no mode	Set CESoPSN Channel T1 Encoder ch_no: T1 channel number (1~4) mode: 0:B8ZS, 1:AMI EX : cest1ecset 1 0 (set T1 port #1 encoder to B8ZS)

CLI Command	Description
ceschvlanvlpid ch_no vlp id	Set CESoPSN Channel vlan tag ch_no: T1 channel number (1~4) vlp: vlan priority, 0 ~ 7(highest priority) id: vlan id, 0 ~ 0xFFF Ex: ceschvlanvlpid 1 7 5 (set T1 port #1 traffic with vlan tag, set priority to 7 and set vlan ID to 5)
Alarm Command	
almall	Display all alarm status (CESoPSN)

3.10 Web Based Management

Web management is a convenient configuration method that does not require memorizing complex commands. It allows for quick configuration of TDM parameters by placing them all on one configuration page.

The web management of IPMux connects via non-standard port 6868 in an effort to detour hackers from accessing the IPMux.

After checking the management IP address via console, or resetting the address, log into the IPMux using the correct IP and the default 6868 port. In our example here, the default IP address is 192.168.1.11. The username and password are both 'IPMux' (case sensitive).

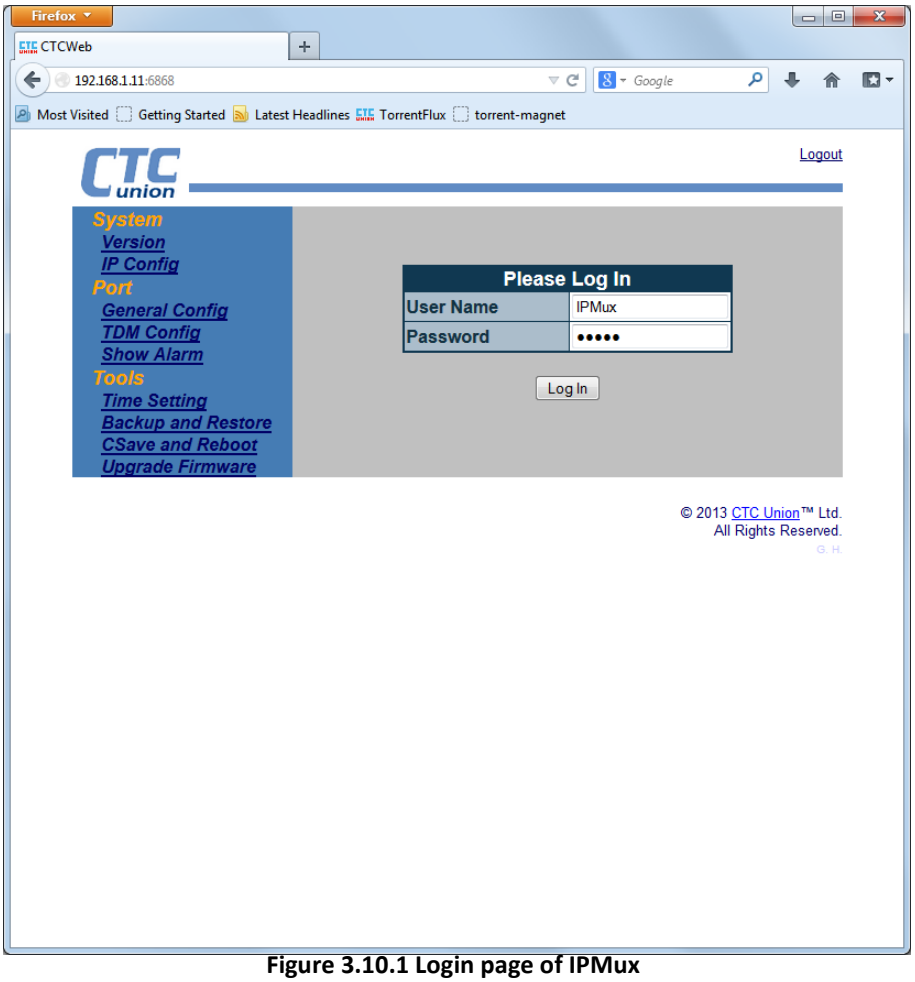

Figure 3.10.1 Login page of IPMux

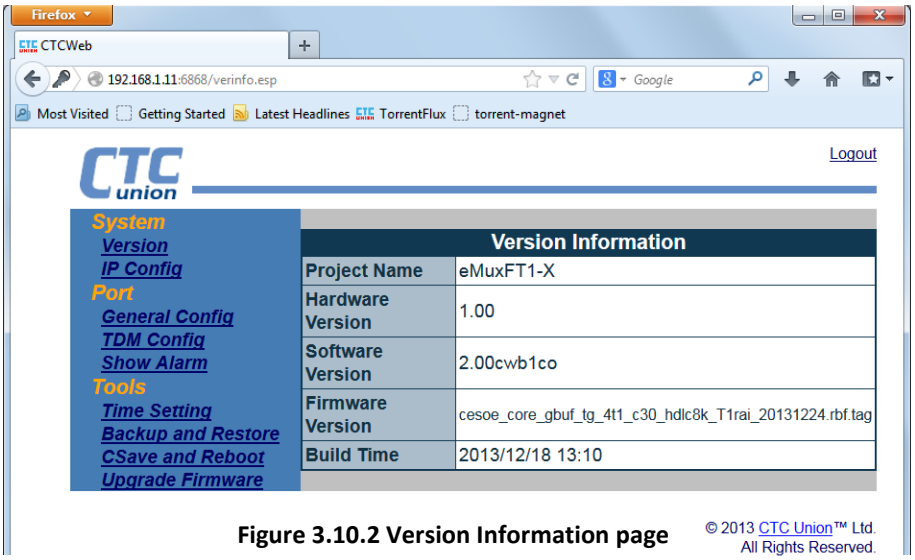

Figure 3.10.2 Version Information page

3.10.1 IP Address Configuration

Change the NMS management IP address, subnet mask and gateway as well as the WAN IP and subnet mask here. Remember, the NMS IP **must** be on a separate subnet from the WAN and Gateway.

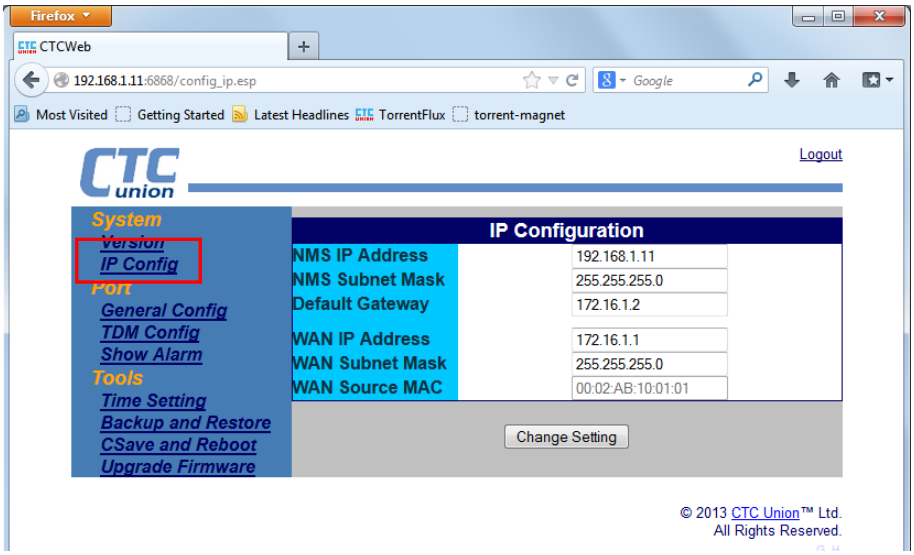

Figure 3.10.3 NMS and WAN IP configuration page

3.10.2 Port General Configuration

Configure the local LAN port here to enable or disable traffic. If enabled, configure the maximum allowed LAN traffic speed. Enable or disable the E1 VLAN function here. The actual VID settings are performed under the "TDM Config" screen.

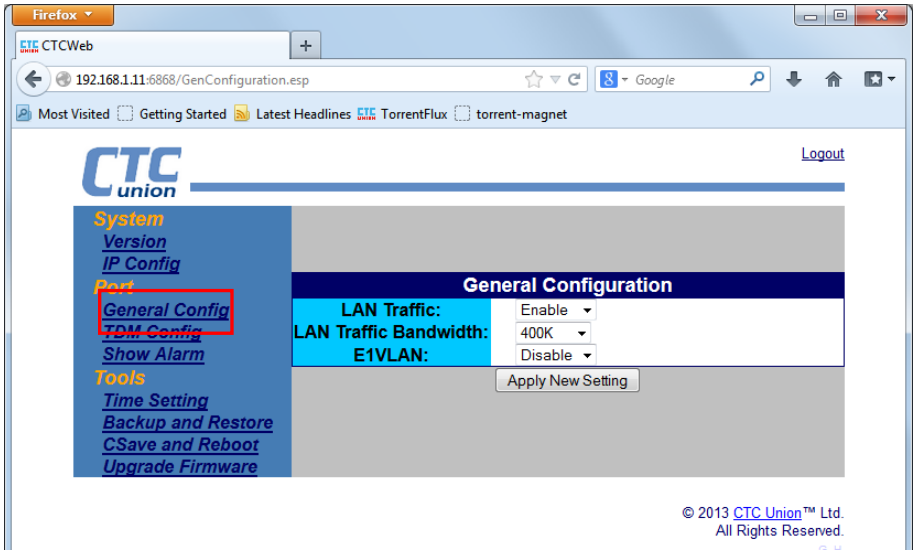

Figure 3.10.4 General configuration page

3.10.3 TDM Configuration

This page is the heart of the TDM configuration for the IPMux.

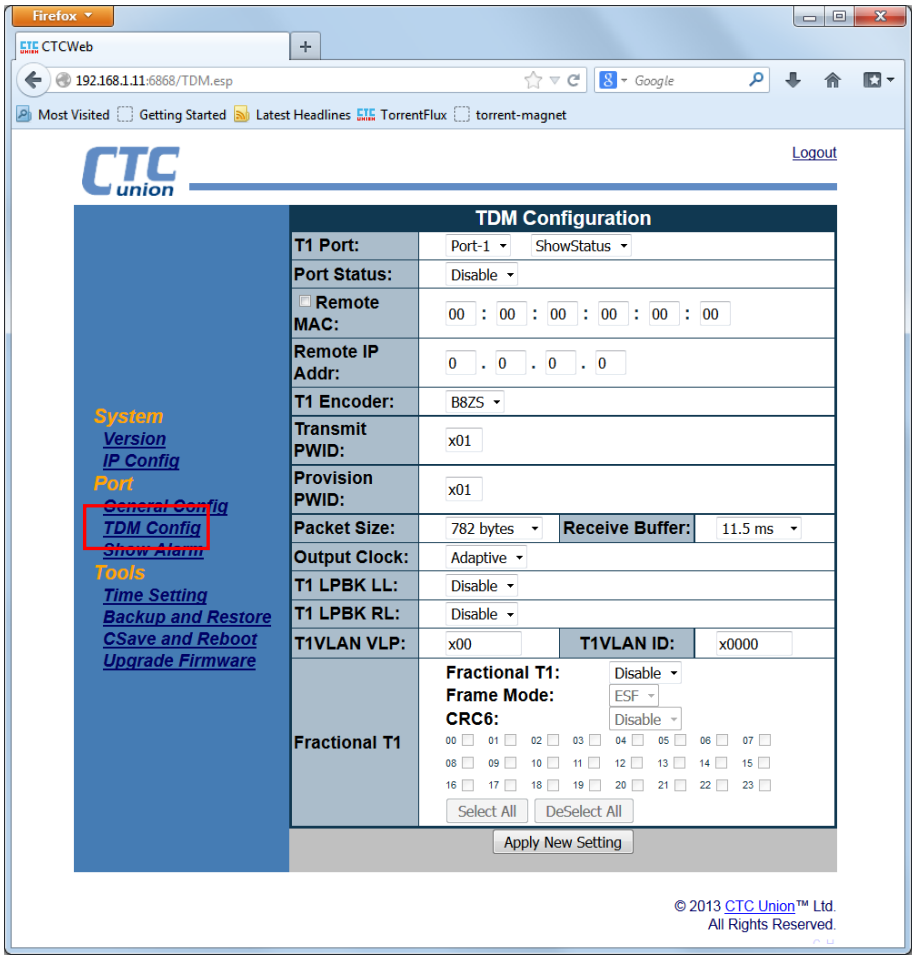

Figure 3.10.5 TDM configuration page

T1 Port : Choose the port to be configured from the pull-down
Port Status : Enable or Disable the T1 port
Remote MAC : Enter the MAC address of the remote T1 port for connection
Remote IP Addr : Enter the IP address of the remote WAN.
Transmit PWID : Enter the pseudo-wire ID.
Provision PWID : Enter the pseudo-wire ID for provisioning
Packet Size : Adjust the packet size of the TDMoIP packets. Larger packets have better utilization, smaller packets less latency. This setting is a trade-off that depends on the network quality.
Receive Buffer : Adjust the jitter buffer to compensate for network latency. (Buffer must be more than latency)
Output Clock : Select the T1 clock type (Adaptive=packet recovery, RxLine=T1 recovery, Internal=OSC timing).
T1 LPBK LL : Disable or Enable T1 local loop back
T1 LPBK RL : Disable or Enable T1 remote loop back
T1VLAN VLP : Sets the VLAN tag's priority bits (0~7)
T1VLAN ID : Configured the VLAN ID for CeS traffic
Fractional T1 : Configure fractional T1 with or without CRC to reduce packet traffic when only fractional T1 is required. When fractional T1 is enabled, individual timeslots are selected by checkboxes.

3.10.4 Alarm History Display

Alarm history is a read-only display. The screen supports refreshing, clearing or exporting the alarm log.

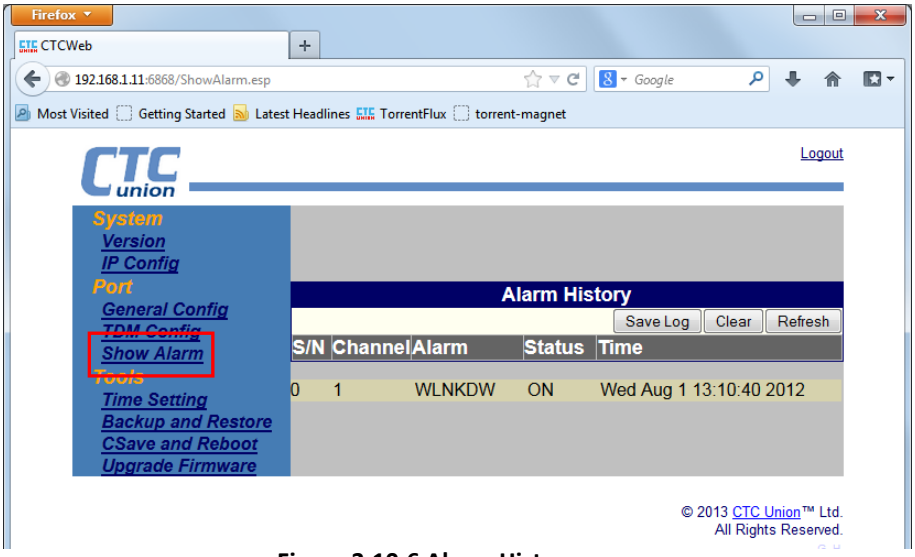

Figure 3.10.6 Alarm History page

3.10.5 Time Configuration

Select each parameter field, key in the correct value, press [Enter]. After finishing all fields, click "Setting".

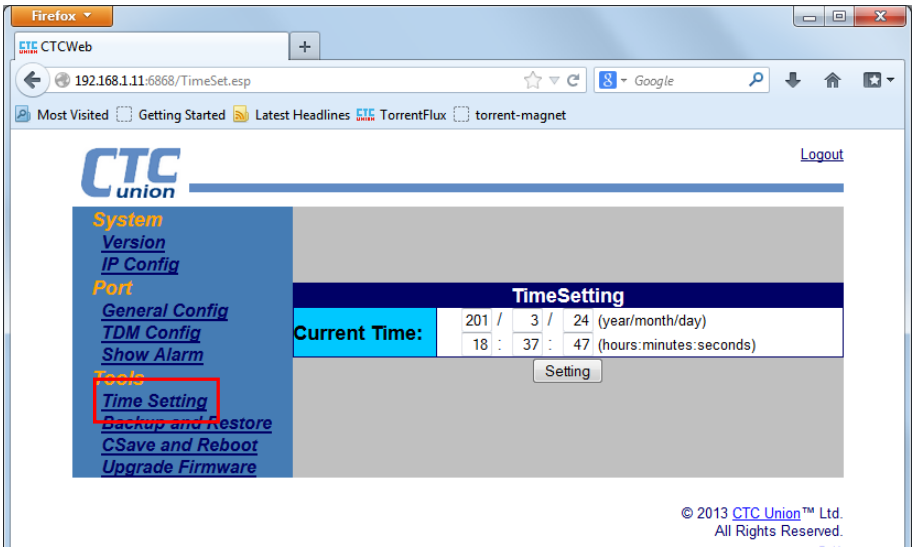

Figure 3.10.7 Time Setting page

3.10.6 Backup & Restore Configuration

The IPMux provides backup and restore of system configuration via TFTP server. Enter the TFTP server's IP address and the configuration filename (case sensitive), select the appropriate check box and function button.

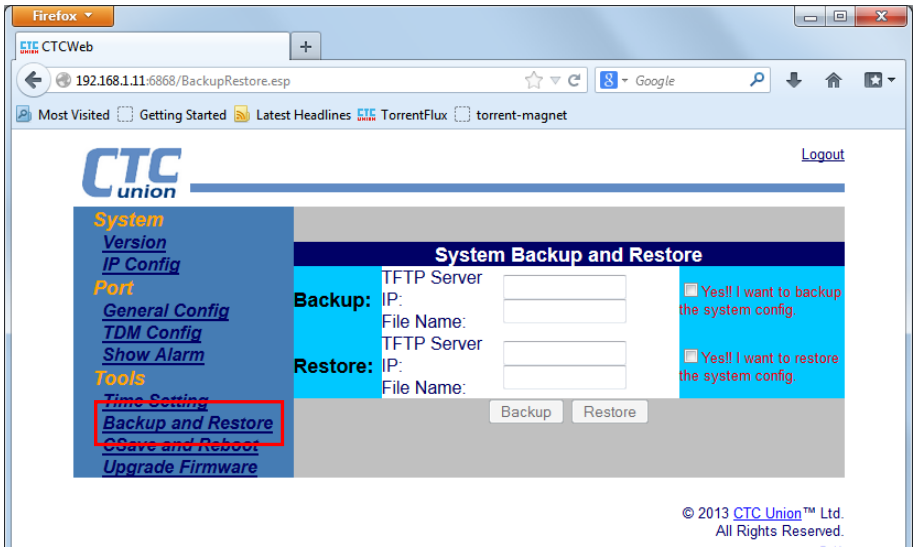

Figure 3.10.8 Backup and Restore page

3.10.7 Save and Reboot Configuration

The Csave and Reboot page lets the configuration changes be stored in non-volatile storage and lets the IPMux reboot with the new, saved configuration.

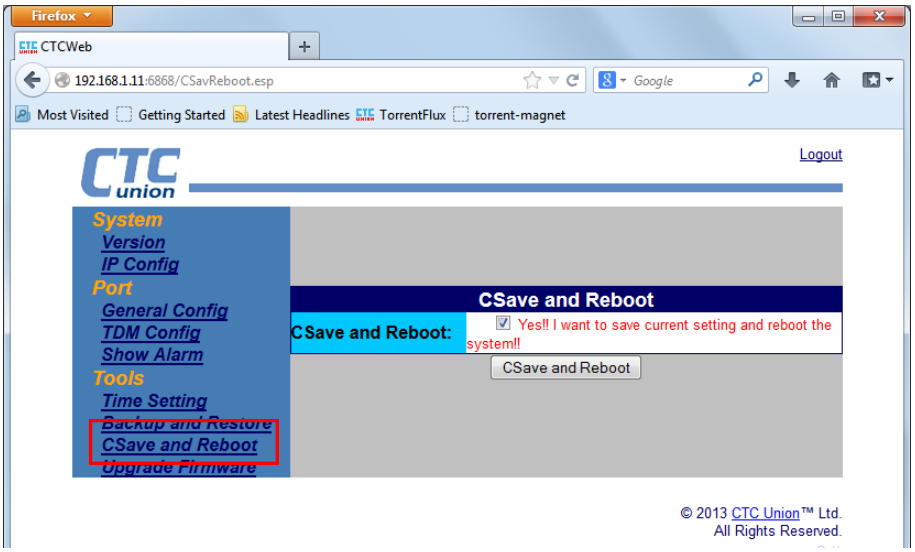

Figure 3.10.9 Save and Reboot page

3.10.8 Firmware Upgrade

Occasionally, updated firmware may become available to add features or fix previously unknown issues. The upgrade method uses TFTP server to transfer new image to the IPMux. The new image is then written to the flash and will be available at next reboot.

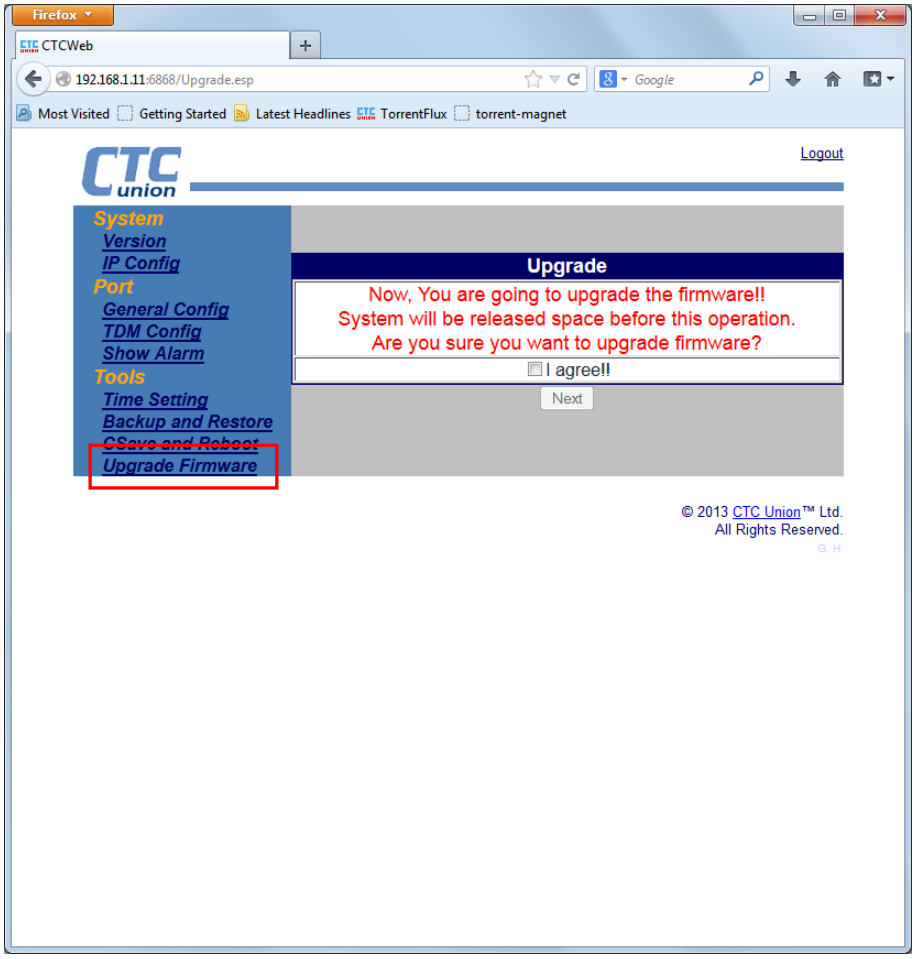

Figure 3.10.10 Firmware Upgrade page

Warning: During firmware upgrade the flash memory will be erased prior to being written with the new firmware image. Any interruption during this process will result in a 'bricked' device. Upgrading must be done with reliable power provided and should only be attempted when instructed by the manufacturer.

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Appendix

A) Script for resetting IPM to default I
Script for setting the device back to default I (LAN bandwidth is 400 kbps)

Script for setting CO site configuration back to default I
#Execute global chip initialization gci #Configure an ip address for the WAN port srcnet 172.16.1.1 255.255.255.0 #Configure an ip address and gateway for the NMS port ipset 192.168.1.11 255.255.255.0 172.16.1.2 #Enable LAN port and set the bandwidth to 400Kbps. lanset 1 7 #Save the configuration csave
Script for setting CPE site configuration back to default I
gci srcnet 172.16.1.2 255.255.255.0 ipset 192.168.2.11 255.255.255.0 172.16.1.1 lanset 1 7 csave

B) Script for resetting IPM to default II
Script for setting the device back to default II
(Enable T1 port#1 and set LAN bandwidth to 400 kbps)

Script for setting CO site configuration back to default II
gci srcnet 172.16.1.1 255.255.255.0 ipset 192.168.1.11 255.255.255.0 172.16.1.2 #Set T1 port#1 encoder to B8ZS #Usage: cest1ecset ch_no code(0:B8ZS, 1:AMI) cest1ecset 1 0 #Set both transmitting and receiving pseudowire ID to 1 for T1 port#1 cespwidset 1 1 1 #Set the transmit packet size to 782 byte for T1 port#1 #Usage: pktsize ch_no pkt_size(0~3) ! #pkt_size(total len)=> (0: 1514 Byte, 1:782 Byte, # 2: 178 Byte, 3: 306 Byte) pktsize 1 1 #Set the jitter buffer depth to 11.5 msec for T1 port#1 #Usage: jitterbd ch_no depth ! #depth(pktsize=0)(0: 11 ms, 1: 23 ms, 2: 40 ms, 3: 75 ms, # 4: 99 ms, 5: 145 ms, 6: 192 ms, 7: 239 ms). # since the packet size is set to 1 (782 Bytes) which is about half # length of 1514 Bytes, the jitter buffer depth for packet size of # 782 bytes will be 23msec/2 = 11.5msec jitterbd 1 1 #Set the transmit clock source to RxLine for T1 port#1 #Usage: ceschclkset ch_num clksrc(0:Adaptive/1:Internal/2:RxLine) ceschclkset 1 2 #Enable T1 port #1, and specifically set the destination IP and MAC

```
#address of the remote device (CPE).
ceschset 1 1 172.16.1.2 00:02:ab:10:01:02

lanset 1 7
csave
```

Script for setting CPE site configuration back to default II

```
gci
srcnet 172.16.1.2 255.255.255.0
ipset 192.168.2.11 255.255.255.0 172.16.1.1
cest1ecset 1 0
cespwidset 1 1 1
pktsize 1 1
jitterbd 1 1
ceschclkset 1 0
ceschset 1 1 172.16.1.1 00:02:ab:10:01:01
lanset 1 7
csave
```

C) Script for resetting IPM to default III
Script for setting the device back to default III
(Enable T1 port#1 and port#2 and set LAN bandwidth to 400 kbps)

Script for setting CO site configuration back to default III

```
gci
srcnet 172.16.1.1 255.255.255.0
ipset 192.168.1.11 255.255.255.0  172.16.1.2

#Set T1 port#1 and port#2 encoder to B8ZS
cest1ecset 1 0
cest1ecset 2 0

#Set both transmitting and receiving pseudowire ID to 1 for T1 port#1
#Set both transmitting and receiving pseudowire ID to 2 for T1 port#2
cespwidset 1 1 1
cespwidset 2 2 2

#Set the transmit packet size to 782 byte for both T1 port#1 and
# port#2.
pktsize 1 1
pktsize 2 1

#Set the jitter buffer depth to 11.5msec for both T1 port#1 and
# port#2.
jitterbd 1 1
jitterbd 2 1

#Set the transmit clock source to RxLine for both T1 port#1 and
# port#2.
ceschclkset 1 2
ceschclkset 2 2

#Enable both T1 port#1 and port#2, and specifically set the #destination IP and MAC address of the remote
device (CPE).
ceschset 1 1 172.16.1.2  00:02:ab:10:01:02
ceschset 2 1 172.16.1.2  00:02:ab:10:01:02

lanset 1 7
csave
```

Script for setting CPE site configuration back to default III

```
gci
srcnet 172.16.1.2 255.255.255.0
ipset 192.168.2.11 255.255.255.0 172.16.1.1
```

```
cest1ecset 1 0
cest1ecset 2 0
cespwidset 1 1 1
cespwidset 2 2 2
pktsize 1 1
pktsize 2 1
jitterbd 1 1
jitterbd 2 1
ceschclkset 1 0
ceschclkset 2 0
ceschset 1 1 172.16.1.1 00:02:ab:10:01:01
ceschset 2 1 172.16.1.1 00:02:ab:10:01:01
lanset 1 7
csave
```

D) Script for resetting IPM to default IV

Script for setting the device back to default IV (Enable T1 port #1 to #4 and set LAN bandwidth to 400kbps)

Script for setting CO site configuration back to default IV

```
gci
srcnet 172.16.1.1 255.255.255.0
ipset 192.168.1.11 255.255.255.0  172.16.1.2

#Set T1 port#1 to port#4 encoder to B8ZS
cest1ecset 1 0
cest1ecset 2 0
cest1ecset 3 0
cest1ecset 4 0

#Set both transmitting and receiving pseudowire ID to 1 for T1 port#1
#Set both transmitting and receiving pseudowire ID to 2 for T1 port#2
#Set both transmitting and receiving pseudowire ID to 3 for T1 port#3
#Set both transmitting and receiving pseudowire ID to 4 for T1 port#4

cespwidset 1 1 1
cespwidset 2 2 2
cespwidset 3 3 3
cespwidset 4 4 4

#Set the transmit packet size to 782 byte for T1 port#1 to
# port#4.
pktsize 1 1
pktsize 2 1
pktsize 3 1
pktsize 4 1

#Set the jitter buffer depth to 11.5msec for T1 port#1 to
# port#4.
jitterbd 1 1
jitterbd 2 1
jitterbd 3 1
jitterbd 4 1

#Set the transmit clock source to RxLine for T1 port#1 to
# port#4.
ceschclkset 1 2
ceschclkset 2 2
ceschclkset 3 2
ceschclkset 4 2

#Enable T1 port#1 to port#4, and specifically set the destination
#IP and MAC address of the remote device (CPE).
```

```
ceschset 1 1 172.16.1.2  00:02:ab:10:01:02
ceschset 2 1 172.16.1.2  00:02:ab:10:01:02
ceschset 3 1 172.16.1.2  00:02:ab:10:01:02
ceschset 4 1 172.16.1.2  00:02:ab:10:01:02

lanset 1 7
csave
```

Script for setting CPE site configuration back to default IV

```
gci
srcnet 172.16.1.2 255.255.255.0
ipset 192.168.2.11 255.255.255.0 172.16.1.1
cest1ecset 1 0
cest1ecset 2 0
cest1ecset 3 0
cest1ecset 4 0
cespwidset 1 1 1
cespwidset 2 2 2
cespwidset 3 3 3
cespwidset 4 4 4
pktsize 1 1
pktsize 2 1
pktsize 3 1
pktsize 4 1
jitterbd 1 1
jitterbd 2 1
jitterbd 3 1
jitterbd 4 1
ceschclkset 1 0
ceschclkset 2 0
ceschclkset 3 0
ceschclkset 4 0
ceschset 1 1 172.16.1.1 00:02:ab:10:01:01
ceschset 2 1 172.16.1.1 00:02:ab:10:01:01
ceschset 3 1 172.16.1.1 00:02:ab:10:01:01
ceschset 4 1 172.16.1.1 00:02:ab:10:01:01
lanset 1 7
csave
```

E) Script for resetting IPM to default V

Script for setting the device back to default V (Enable T1 port#1 as Fractional T1 [10 timeslots] and set LAN bandwidth to 400 Kbps)

Script for setting CO site configuration back to default V

```
gci
srcnet 172.16.1.1 255.255.255.0
ipset 192.168.1.11 255.255.255.0 172.16.1.2
cest1ecset 1 0
cespwidset 1 1 1
pktsize 1 1
jitterbd 1 1
ceschclkset 1 2

#Enable T1 port#1 to the fractional T1 mode
cesft1mode 1 1

#Set T1 port#1 framing mode to ESF
cesft1framedsel 1 1

#Configure 10 timeslots allocated to the fractional T1 port#1
cesft1tsmap 1 x3FF

ceschset 1 1 172.16.1.2 00:02:ab:10:01:02
```

lanset 1 7 csave
Script for setting CPE site configuration back to default V
gci srcnet 172.16.1.2 255.255.255.0 ipset 192.168.2.11 255.255.255.0 172.16.1.1 cest1ecset 1 0 cespwidset 1 1 1 pktsize 1 1 jitterbd 1 1 ceschclkset 1 0 cesft1mode 1 1 cesft1framedsel 1 1 cesft1tsmap 1 x3FF ceschset 1 1 172.16.1.1 00:02:ab:10:01:01 lanset 1 7 csave

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