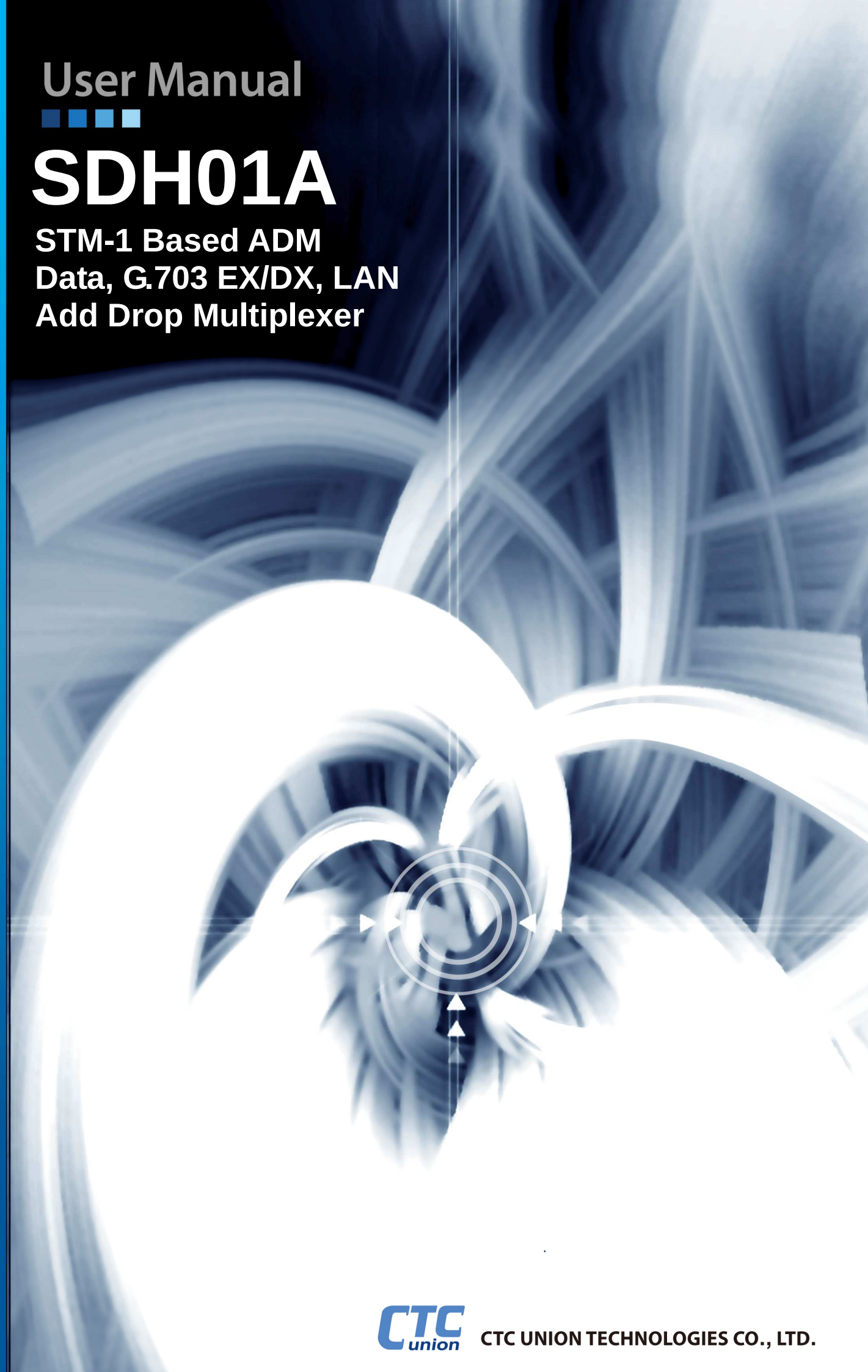
User Manual

SDH01A

STM-1 Based ADM
Data, G.703 EX/DX, LAN
Add Drop Multiplexer



CTC UNION TECHNOLOGIES CO., LTD.

CTC Union Technologies Co., Ltd.
Far Eastern Vienna Technology Center (Neihu Technology Park)
8F, No. 60 Zhouzi St.
Neihu District
Taipei 114
Taiwan
Tel: +886-2-26591021
Fax: +886-2-27991355
Email: info@ctcu.com
URL: http://www.ctcu.com

SDH01A User Manual

STM-1 Based ADM Multiplexer

Version 1.1 June 2009

CE

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Table of Contents

Chapter 1. Introduction

This chapter will introduce the SDH01A and describe its features, functions, and specifications.

1.1 Functional Description

CTC Union's SDH01A, STM-1 Based Multi-Service Provisioning Platform, is an advanced compact Add Drop Multiplexer which can transmit up to 63 E1 and/or data service such as E3/DS3, V35 and Ethernet. The optical interface complies with international telecommunication standards, such as ITU-T G.655, G.652, and G.653. By utilizing a modular design for aggregate and low speed tributaries, the SDH01A can meet your network demands with a flexible combination of services at a lower cost. All of the pluggable modules are designed to be hot swapped without any interruption to traffic when plugging in or out. In addition to the E1 tributaries (with G.704), other data interfaces are also provided for data communications such as V.35, E3/DS3 and 10/100M Ethernet. Users can select combinations of modules according to their requirements. With this full function and multi-access capability, the SDH01A is your best choice for optical SDH networks.

Figure.1-1 SDH01A Outlook

The SDH01A provides three interfaces to manage the equipment. The first is a local LCD with keypad on the left front panel. The user can control and read the status of the system by LCD and keypad without any PC or terminal. This provides a convenient method for in-field configuration or support. The second management interface is via serial console port with RS-232 interface. The user can access the menu-driven interface to manage the system by connecting the console port to a VT-100 compatible terminal or PC with terminal emulation program, such as Windows® HyperTerminal™ or free third party emulation software such as PuTTY or TeraTerm. This operational interface will guide the user step by step with pull-down menus and pop-up windows. The user will quickly become familiar with this easy to use interface. The last management method is via the NMS interface. The physical layer of NMS interface is Ethernet and the NMS port implements SNMP protocol. SNMP is a standard network management protocol based on UDP. Since the Ethernet and SNMP are used widely, network managers can build up their network management system (NMS) using the proprietary MIBs (Management Information Base) provided by equipment vendors. The user can get many helpful resources during building of the NMS due to the general and universal nature of SNMP. Using the MIB can save expense and time while building the NMS. The user can even integrate the SDH01A into existing SNMP NMS by importing the MIB. In addition to the user's NMS, there is also a GUI NMS developed by CTC Union, based of the open source program OpenNMS, that can help you to remotely manage many SDH01As.

All three management interfaces described above support single-ended operation. That is, the operator can manage both the equipments at the local and remote sites through the local site at the same time. The communication between local equipment and remote equipments uses the DCC (data communications channel) to send message to implement the far end management. SDH01A provides administrative security by setting of user names and passwords to prevent the illegal operations of unauthorized users.

SDH01A provides auto alarm reports and office alarm relay contacts to inform user of any unusual or abnormal conditions in the equipment and system. As such, the user can easily identify the problem and recover the transmission network as quickly as possible. The alarms of the SDH01A are divided into 3 groups by their alarm conditions: critical alarms, major alarms, and minor alarms. The user can set the severity of all alarms of the SDH01A independently through console port, NMS port or LCD. All alarms can be used to activate the office alarms to inform the user that intervention is required. There are also LED indicators on the front panel of SDH01A for visual identification for field maintenance purpose. The LED indicators include power, system alarms, optical alarms, tributary alarms, remote alarm, local alarms, ACO status, loopback indication, and so on.

In addition to alarm reporting, the SDH01A implements performance monitoring (PM Parameters) to monitor the transmission quality on both the optical and electrical interfaces. The user can collect and analyze the performance data to determine the transmission quality. All the parameters can be read and cleared through the console port, NMS port or LCD.

Optical interface protection is important for any optical transmission system. The SDH01A is equipped with two optical modules to provide 1+1 auto protection switching (APS) of optical interface. The system will switch the optical interface from the working line to the protection line automatically when the working line fails due to loss of signal (LOS) or poor quality. The user can also perform manual switching from console, NMS or LCD management interfaces.

Synchronization is another important concern in synchronous optical networks. The SDH01A synchronization is obtained with a digital phase-locked loop circuit (DPLL), which provides timing and synchronization for the network. This helps to ensure system reliability by monitoring its reference clock for accuracy and stability and by maintaining stable output clocks during reference switching operations and during short periods when a clock reference is unavailable.

The SDH01A is an add drop multiplexer which is an important element of SDH (Synchronous Digital Hierarchy) optical fiber networks. The SDH01A has the capability to add one or more lower-bandwidth signals to the fiber's high-bandwidth data stream, and can extract or drop other low-bandwidth signals, removing them from the fiber and redirecting them to some other network path at the same time.

For system maintenance purposes, the SDH01A provides two functions: Loopback and Self Diagnostics. The user can operate the different types of loopback functions on the optical and E1 interfaces through console, NMS or LCD management interfaces to debug and identify the transmission problems on the network. By using the loopback function and built-in E1 $PRBS^{-15}$ signal generator and detector working together, the SDH01A can perform diagnostic testing for each E1 channel and determine the BER (Bit Error Rate).

The SDH01A is designed for easy installation. It can be mounted in a standard 19 or 23 inch EIA or ETSI rack. It can also be placed on desktop or shelf as a stand-alone unit. The SDH01A complies with FCC Part 15 Subpart B Rules of U.S./CISPR 22 Class A for EMI and EN50082-1 for EMC. It also complies with lighting surge protection standards for IEC1000-4-5 class 2, FCC part 68 and ITU-T K.20 / K.21 standards for E1 and AC / DC power.

1.2 System Features

- Up to 63 E1 (4, 8, 12, 16… 63) optical multiplexer per main board.
- Flexible add drop multiplexer with 63 available VC-12 resources.
- Up to 4 tributary cards per unit.
- System configurations are stored in NVRAM. Configurations are reloaded automatically when the tributary card is replaced or due to any other circumstances.
- Hot swap for each module without any interference to other working traffic when plugging in or out any module.
- Backup configurations in flash for system restart or power failure.
- Various services, such as E1, E3, V.35 and 10/100M Ethernet. Ethernet traffic is encapsulated and transported over SDH using Generic Framing Procedure (GFP) & Virtual Concatenation (VCAT).
- E1 transparent transmission with HDB3/AMI line coding for E1. (The E1 parameters are field selectable through the management interface).
- E3 transparent transmission with HDB3/B3ZS line coding for E3. (The E3 parameters are field selectable through the management interface).
- EoS (Ethernet over SDH) for E-LAN. Supports Ethernet traffic in all nodes of rings.
- Single-ended network management.
- 1+1 APS for optical line and module (optional redundancy).
- Three timing synchronization modes.
- LED indicators: power, office alarm, optical alarm, tributary status, remote site alarm, loopback.
- LED indicator for remote site alarm.
- Office alarm relays.
- Many options for connectors, wavelength, and power budget for optical interface.
- Alarm auto report and performance monitoring.
- Administration security with login by username and password assigned by supervisor.
- Menu-driven and SNMP management interfaces.
- Provides summary report on menu-driven interface and LCD.
- Local and remote loop back functions for optical and E1 interfaces.
- Stand-alone and rack-mount in 19 or 23 inch EIA or ETSI rack.
- Two power sources: AC and DC. AC is the primary power supply.

1.3 System Functional Blocks

The block diagram of the SDH01A is as follows:

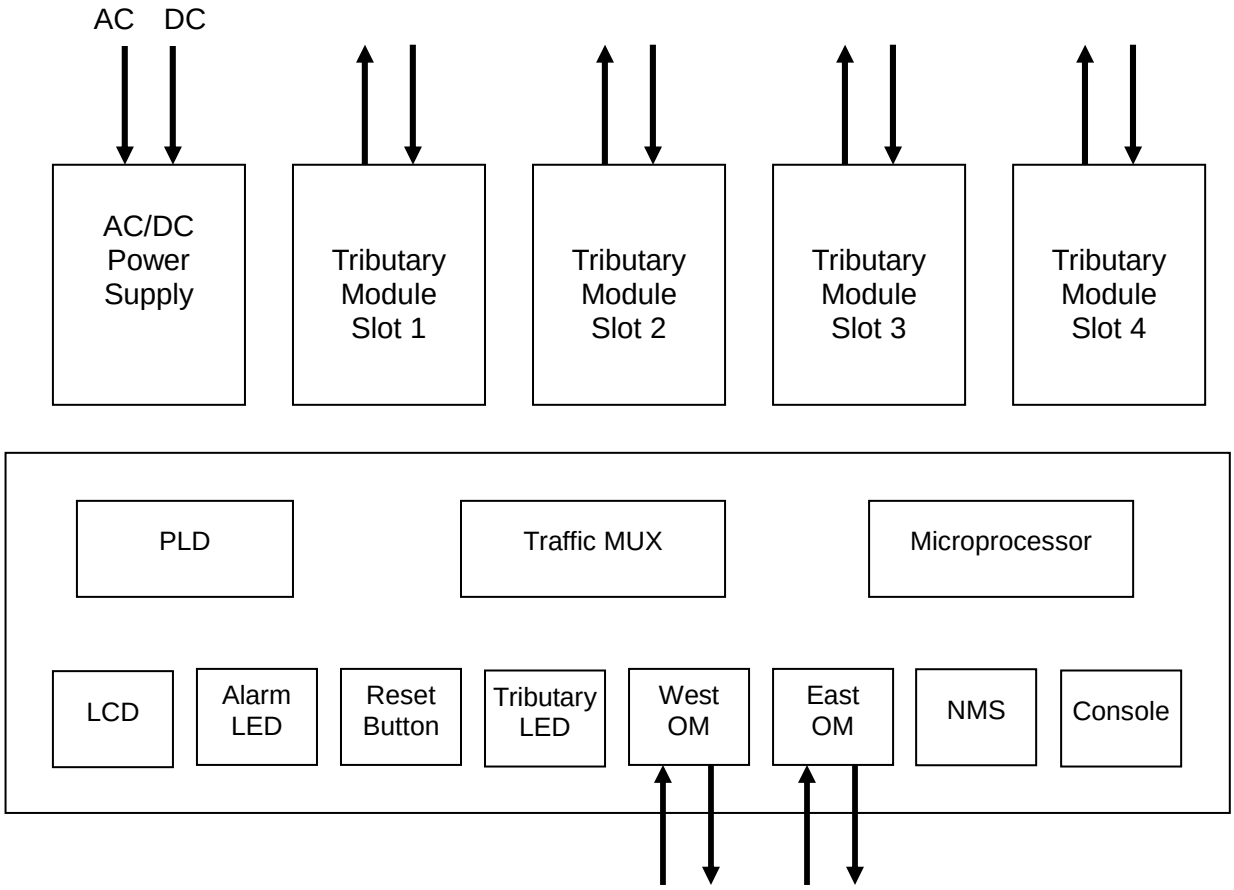

Figure 1-2 SDH01A Block diagram

The descriptions of the blocks presented in the Figure 1-2 are defined as follows:

- **LCD:** Manage system with 4 keypads and LCD panel.
- **Alarm LED:** Indicate the Alarm system status.
- **Reset Button:** Push to software reset the system.
- **Tributary LED:** Indicate status of the channels in the tributary modules.
- **OM:** optical signals convert for high speed aggregate, west and east sides.
- **NMS:** SNMP network management port with 10/100M Ethernet physical layer.
- **Console:** RS-232 port with menu-driven interface.
- **Microprocessor:** Provide OAM&P and control LED/LCD.
- **PLD:** This block provides the status of alarm and PM for microprocessor.
- **Traffic MUX:** This block implements the multiplexer/ de-multiplexer between low-speed and high-speed aggregate interfaces.
- **Tributary Module:** Each SDH01A provides 4 tributary slots for various types of modules, such as E1, E3, V.35 and Ethernet.
- **AC/DC Power Supply:** Convert the 110V/220V AC or -48V DC to 12V DC power.

1.4 Specifications

1.4.1 Optical Interface

Item	Detail
Bit rate	STM-1 155.52Mbps±20ppm
Compliance	ITU-T G.707, G.841, G.783, G.803, G.652
Source	1310nm/1550nm MM/SM
System gain	19dB (at 1 x 10^{-10} BER) with AGC control
Switching time	< 30ms
Receive sensitivity	<-34dBm
Connector type	FC / SC / SC-WDM (BiDi)
Optical safety	ALS, G.958, G.664
Protection (option)	1+1 APS
Fiber mode	Single mode fiber (G.652)

Wavelength	Laser	Output Power	Sensitivity	Distance	application
1310	FP	-15 ~ -8 (dBm)	-34 (dBm)	30 (km)	S1.1
1310	FP	-5 ~ + 0 (dBm)	-34 (dBm)	50 (km)	L1.1
1550	DFB	-5 ~ + 0 (dBm)	-34 (dBm)	80+ (km)	L1.2, L1.3

Table 1-1 Optical interface

1.4.2 E1 Interface

Item	Detail
Bit rate	2.048Mbps±50ppm
Line code	HDB3/AMI
Compliance	ITU-T G.703, G.704, G.706, G.732, G.823
Pulse Shape	Complies with ITU-T G.703
Jitter	Complies with ITU-T G.823
Impedance (connector)	75Ω± 5% (BNC/RJ-45)/ 120Ω± 5%(RJ-45)
Line loss tolerance	>6dB at 1024 KHz
Minimum return loss at input port	12dB for 51 to 102 KHz 18dB for 102 to 2048 KHz 14dB for 2048 to 3072 KHz
Performance	ITU G.821/G.826

Table 1-2 E1 Interface

1.4.3 Ethernet Interface

Item	Detail
Data rate	10/100 Mbps with auto negotiation
Mode	L2 Switch, 100Mbps throughput
Compliance	ITU-T G.7041 GFP-F, G.707 VCAT, IEEE 802.3x, 802.1d, 802.1w, 802.1p, 802.1q (Q-in-Q), 802.3ad
Connector	RJ-45 x 4

Table 1-3 Ethernet Interface

1.4.4 V.35 Interface

Item	Detail
Data rate	Nx64Kbps (N=1 to 32)
Clock Source	External, Internal or Recovery
Compliance	ITU-T V.35, ITU-T G.703
Connector	DB-44 (DB-44 to MB34 adapter cable)
Control Signal	DSR, CTS, DCD

Table 1-4 V.35 Interface

1.4.5 E3/DS3 Interface

Item	Detail
Bit rate	34.368/44.736 Mbps±20ppm
Line code	HDB3/B3ZS
Compliance	ITU-T G.703, G.824,G.823
Pulse Shape	Complied with ITU-T G.703
Jitter	Complied with ITU-T G.824,823
Impedance(connector)	75Ω ±5% (BNC)

Table 1-5 E3/DS3 Interface

1.4.6 Management Interfaces

Item	Detail
Protocol	VT-100 ANSI and SNMP (EMS)
Craft interface	RS-232 Async. (EIA561)
SNMP	10/100 Base-T (RFC 1406)
LCD	2 X 16 LCD display with key control

Table 1-6 Management Interfaces

1.4.7 Connectors

Item	Detail
Optic	SC/FC/SC-WDM (BiDi)
E1	BNC or RJ-45 (USOC RJ-48C)
V.35	DB-44 (DB-44 to 2*MB34 adapter cable)
E3/DS3	BNC
RS-232	D-type 9-pin female
LAN	RJ-45
Office alarm	D-type 9-pin male
AC power	IEC C14 type
DC power	Screw terminal
Frame Ground	Screw terminal

Table 1-7 Connectors

1.4.8 Electrical

Item	Detail
DC input	-36 ~ -72V
AC input	90~264Volt @ 44~63Hz
Power consumption	<15W

Table 1-8 Electrical Power Source

1.4.9 Physical

Item	Detail
Height	44mm (1.75 in.) (1U, Mount in19"/23"/ETSI rack)
Width	440mm (17 9/32 in.)
Depth	312mm, (12 21/64 in)
Weight	3.6Kg (~8 lb.)

Table 1-9 Physical Parameters

1.4.10 LED Indicators

Front panel

- WK-working line indicator for each optical module
- FLT-Fault indicator for each optical module
- Alarm indicator: CRT-critical, MJR-major , MNR-minor
- ACO-Alarm Cut Off indicator
- PWR-power indicator
- RDI-remote defect (alarm) indicator
- MNT-loopback status indicator
- Tributary Status-16 channels status indicators
- Ethernet status indicators (10/100 Mbps)
- V.35 status indicators

1.4.11 Push Buttons

- ESC/ENT+/←/→ LCD control keypads
- ACO-alarm cut off
- RST-reset system

1.4.12 LCD Display

- 2x16 liquid crystal display

1.4.13 Office Alarm

- Visible-critical, major, and minor alarms

1.4.14 Environmental

Item	Detail
Temperature	-10~65°C 15~150° F
Humidity	from 0% to 100% (100% at 30°C, non-condensing)
EMI	FCC part15 sub B /CISPR 22 class A
MTBF	>50, 000hrs
MTTR	7 days

Table 1-9 Environmental Conditions

Chapter 2. System Applications

This chapter describes the topology application of the SDH01A and its services on the network.

2.1 Applications

The basic applications for SDH01A are as a TM (terminal multiplexer) between two end points, such as central office and remote customer or as an ADM (add drop multiplexer), i.e. in an SDH ring structure.

Figure 2-1 Terminal Multiplexer (TM) application

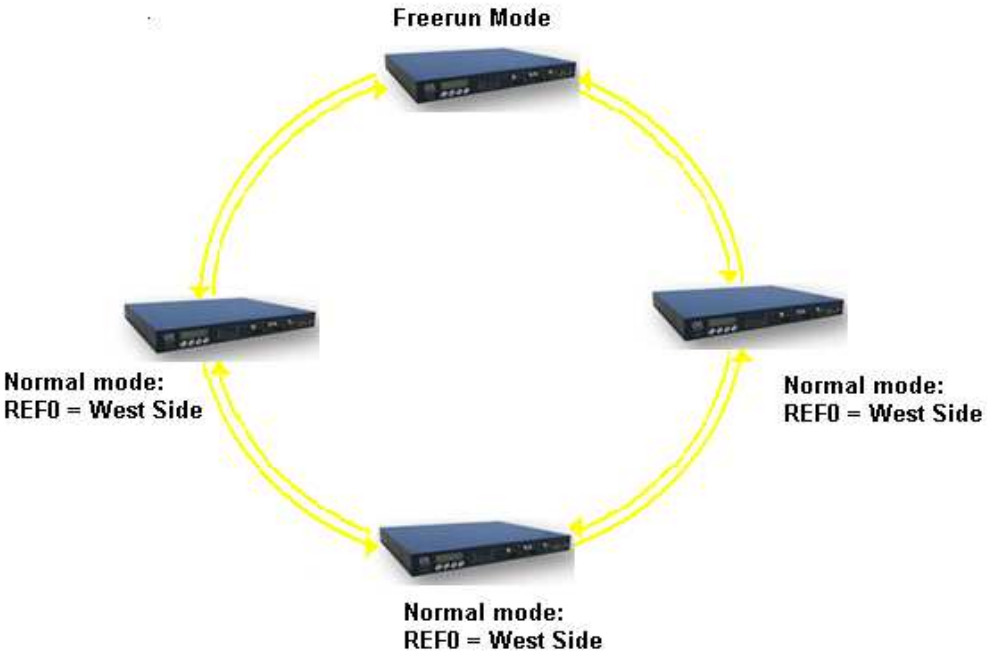

Figure 2-2 Add Drop Multiplexer (ADM) application

2.2 Services on Network

The SDH01A can transmit up to 63 E1 signals with another SDH01A (or other combinations with data services like E3/V.35/Ethernet) over fiber. It can be applied to various types of networks, such as optical network, MSTP network, mobile network, PSTN network, and leased line to provide voice, data, and video services for high quality and long transmission distance. It can be used either with one fiber link or two fiber links, utilizing one for a back up link. It is suitable for central office and customer premise/office for exchange data communications.

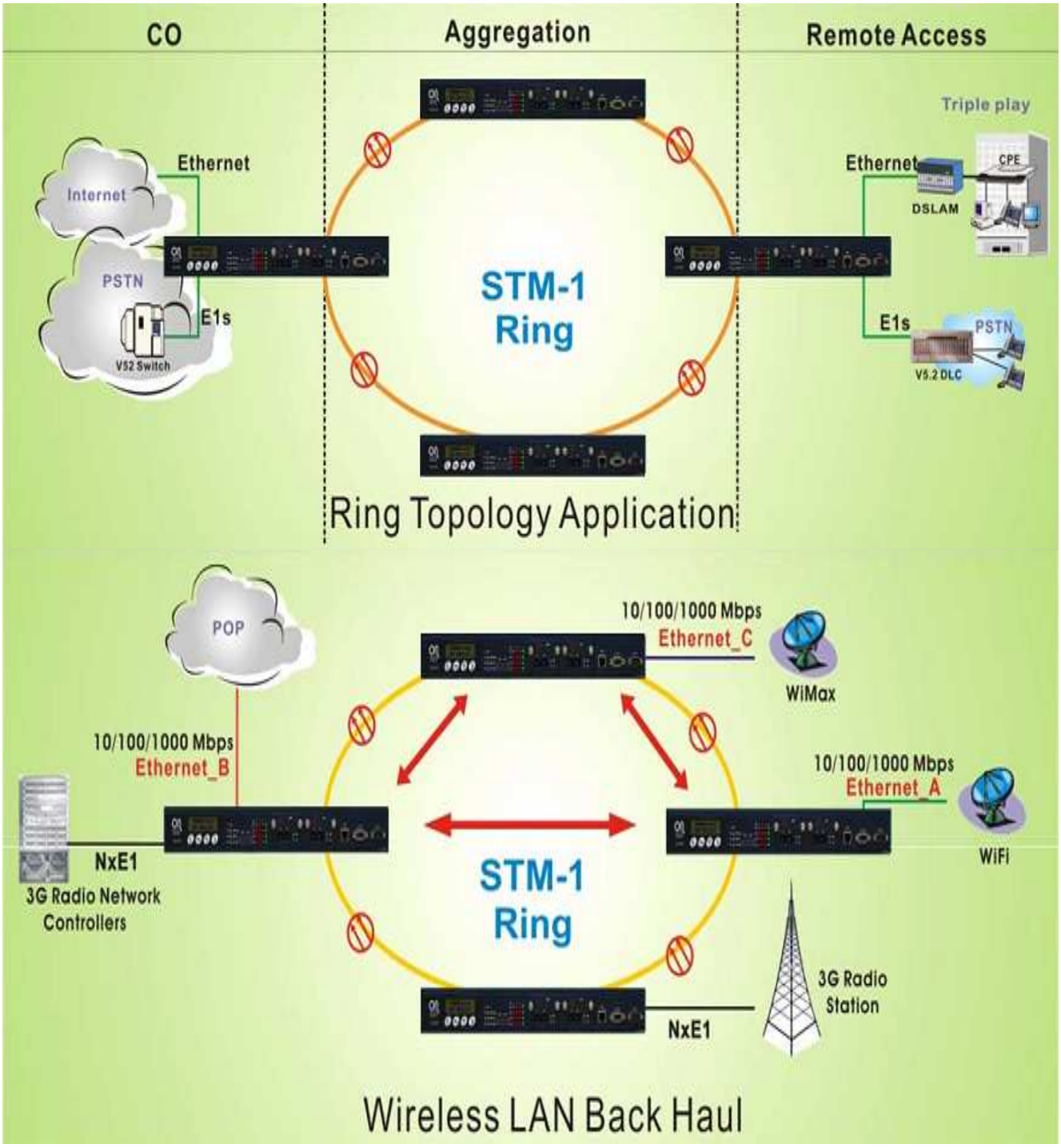

Figure 2-3 Network application

The SDH01A can provide cross connect for TDM services. It is easy to set up the 63x63 cross connection in the CLI to let V.35 map to E1, or any E1 channel map to the different E1 channel as follows.

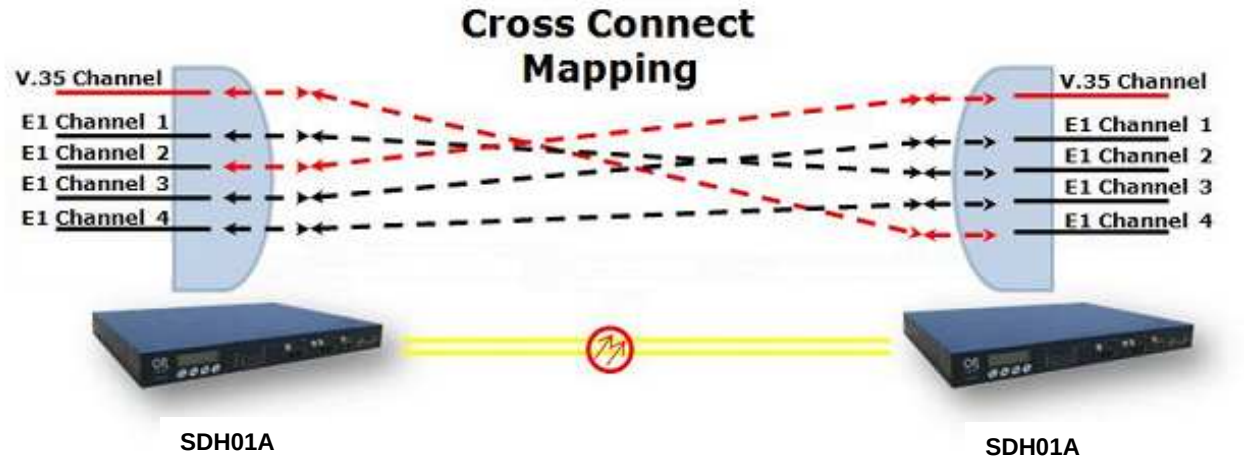

Figure 2-4 Cross Connect Mapping

2.3 EoS for E-LAN

With EoS (Ethernet over SDH) it is possible to have Ethernet communications between all nodes for E-LAN application. As the following figure shows, nodes A, B, C and D are able to communicate between each other freely.

Ethernet traffic and TDM traffic have different protection switching mechanism. TDM Traffic travels in both directions (UPSR), while Ethernet Traffic travels in one ring direction, e.g the case where outer ring (Black line) is primary path and inner ring is for protection (Gray line).

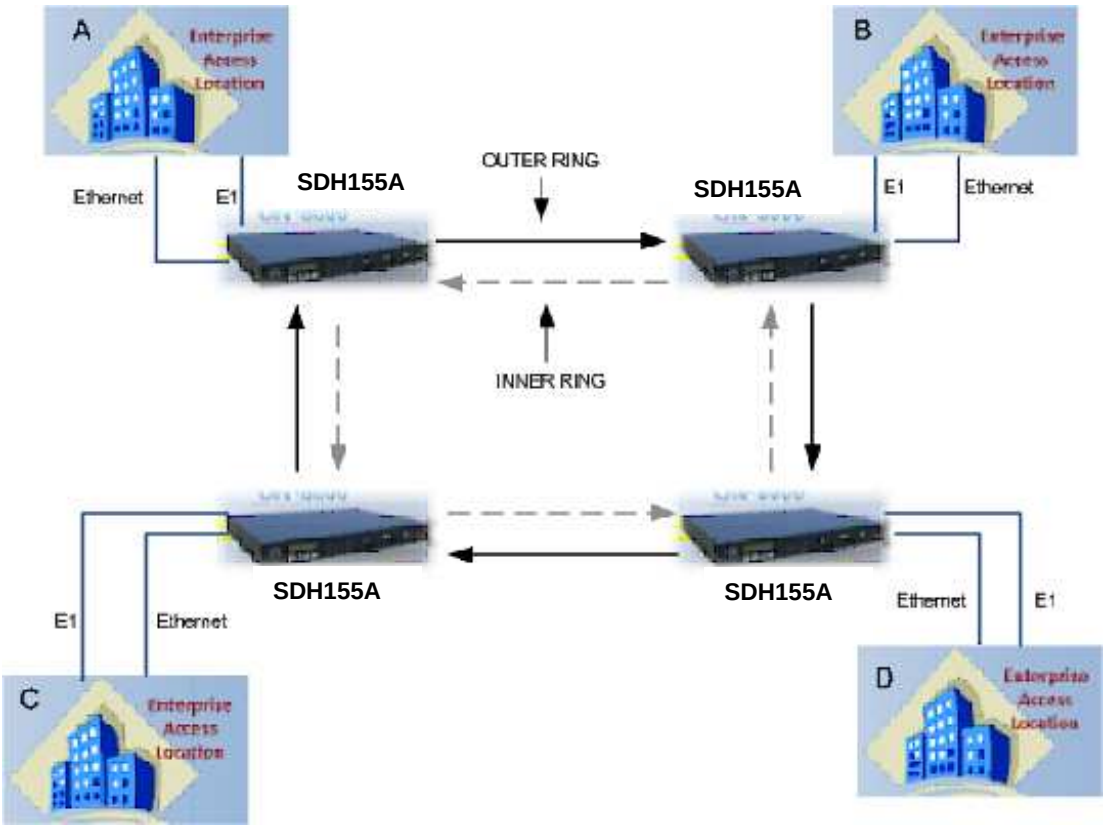

Figure 2-5 EoS (Ethernet over SDH) ring protection scheme

Referring to Figure 2-5, EoS configuration is done in the cross-connect table to assign the VC12s. GFP (Ethernet traffic) shares the same VC12s in all nodes. For example, let's configure a ring with 4 nodes sharing 100Mbps (47 VC12s) of Ethernet traffic and two TDM channels between node A and C (Ch 1 and 2), and two different TDM channels between node B and D (Ch 8 and 9).

Cross-connect table for node A and node C. Channels 1 & 2 connect 2x2M E1 while 47 VC12s are assigned to GFP from channel 17 to channel 63:

```
+-------------------------------------------------------------------------------+
|                 <<      Digital Cross Connect Table      >>                   |
+-------------------------------------------------------------------------------+
| CH: K L M          CH: K L M          CH: K L M          CH: K L M           |
|  1 [1 1 1] T-S1P1  17 [2 6 1] GFP-G1  33 [3 4 2] GFP-G1  49 [1 3 3] GFP-G1   |
|  2 [2 1 1] T-S1P2  18 [3 6 1] GFP-G1  34 [1 5 2] GFP-G1  50 [2 3 3] GFP-G1   |
|  3 [3 1 1] ------  19 [1 7 1] GFP-G1  35 [2 5 2] GFP-G1  51 [3 3 3] GFP-G1   |
|  4 [1 2 1] ------  20 [2 7 1] GFP-G1  36 [3 5 2] GFP-G1  52 [1 4 3] GFP-G1   |
|  5 [2 2 1] ------  21 [3 7 1] GFP-G1  37 [1 6 2] GFP-G1  53 [2 4 3] GFP-G1   |
|  6 [3 2 1] ------  22 [1 1 2] GFP-G1  38 [2 6 2] GFP-G1  54 [3 4 3] GFP-G1   |
|  7 [1 3 1] ------  23 [2 1 2] GFP-G1  39 [3 6 2] GFP-G1  55 [1 5 3] GFP-G1   |
|  8 [2 3 1] ------  24 [3 1 2] GFP-G1  40 [1 7 2] GFP-G1  56 [2 5 3] GFP-G1   |
|  9 [3 3 1] ------  25 [1 2 2] GFP-G1  41 [2 7 2] GFP-G1  57 [3 5 3] GFP-G1   |
| 10 [1 4 1] ------  26 [2 2 2] GFP-G1  42 [3 7 2] GFP-G1  58 [1 6 3] GFP-G1   |
| 11 [2 4 1] ------  27 [3 2 2] GFP-G1  43 [1 1 3] GFP-G1  59 [2 6 3] GFP-G1   |
| 12 [3 4 1] ------  28 [1 3 2] GFP-G1  44 [2 1 3] GFP-G1  60 [3 6 3] GFP-G1   |
| 13 [1 5 1] ------  29 [2 3 2] GFP-G1  45 [3 1 3] GFP-G1  61 [1 7 3] GFP-G1   |
| 14 [2 5 1] ------  30 [3 3 2] GFP-G1  46 [1 2 3] GFP-G1  62 [2 7 3] GFP-G1   |
| 15 [3 5 1] ------  31 [1 4 2] GFP-G1  47 [2 2 3] GFP-G1  63 [3 7 3] GFP-G1   |
| 16 [1 6 1] ------  32 [2 4 2] GFP-G1  48 [3 2 3] GFP-G1 T-S?P? TDM traffic   |
|                                                                               |
+-------------------------------------------------------------------------------+
 Press 'r': refresh, 'c/d': clean/remove, 'l': default, 's': save, 'Esc': exit
```

Cross-connect table for node B and node D. Channels 8 & 9 connect 2x2M E1 while 47 VC12s are assigned to GFP from channel 17 to channel 63:

```
+-------------------------------------------------------------------------------+
|                 <<      Digital Cross Connect Table      >>                   |
+-------------------------------------------------------------------------------+
| CH: K L M          CH: K L M          CH: K L M          CH: K L M           |
|  1 [1 1 1] ------  17 [2 6 1] GFP-G1  33 [3 4 2] GFP-G1  49 [1 3 3] GFP-G1   |
|  2 [2 1 1] ------  18 [3 6 1] GFP-G1  34 [1 5 2] GFP-G1  50 [2 3 3] GFP-G1   |
|  3 [3 1 1] ------  19 [1 7 1] GFP-G1  35 [2 5 2] GFP-G1  51 [3 3 3] GFP-G1   |
|  4 [1 2 1] ------  20 [2 7 1] GFP-G1  36 [3 5 2] GFP-G1  52 [1 4 3] GFP-G1   |
|  5 [2 2 1] ------  21 [3 7 1] GFP-G1  37 [1 6 2] GFP-G1  53 [2 4 3] GFP-G1   |
|  6 [3 2 1] ------  22 [1 1 2] GFP-G1  38 [2 6 2] GFP-G1  54 [3 4 3] GFP-G1   |
|  7 [1 3 1] ------  23 [2 1 2] GFP-G1  39 [3 6 2] GFP-G1  55 [1 5 3] GFP-G1   |
|  8 [2 3 1] T-S2P1  24 [3 1 2] GFP-G1  40 [1 7 2] GFP-G1  56 [2 5 3] GFP-G1   |
|  9 [3 3 1] T-S2P2  25 [1 2 2] GFP-G1  41 [2 7 2] GFP-G1  57 [3 5 3] GFP-G1   |
| 10 [1 4 1] ------  26 [2 2 2] GFP-G1  42 [3 7 2] GFP-G1  58 [1 6 3] GFP-G1   |
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| 16 [1 6 1] ------  32 [2 4 2] GFP-G1  48 [3 2 3] GFP-G1 T-S?P? TDM traffic   |
|                                                                               |
+-------------------------------------------------------------------------------+
 Press 'r': refresh, 'c/d': clean/remove, 'l': default, 's': save, 'Esc': exit
```
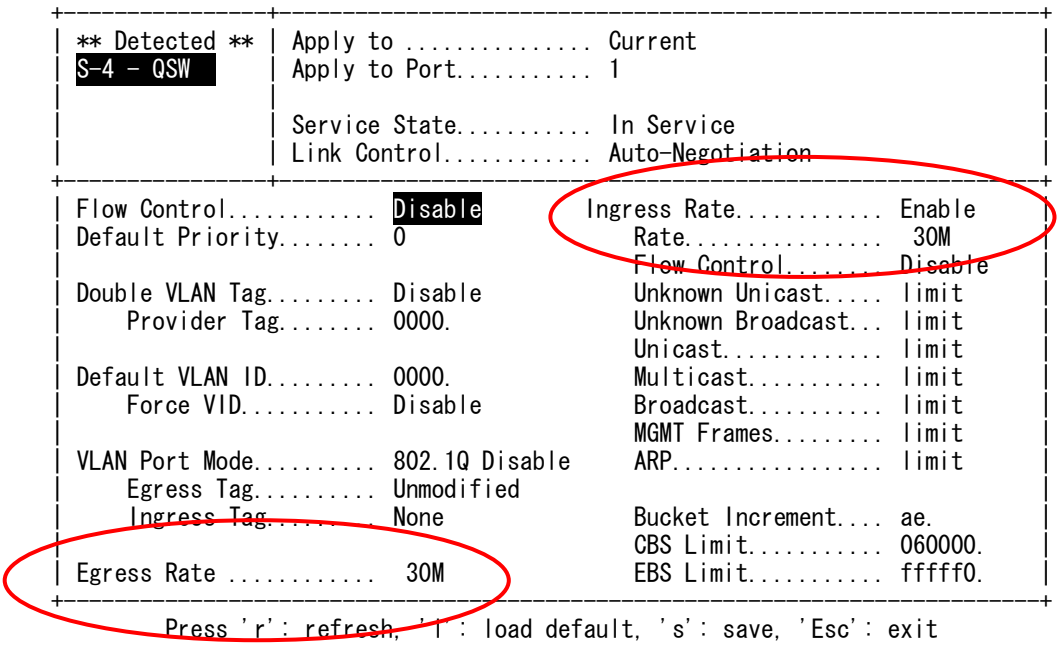

In this example, the 4 nodes share an Ethernet bandwidth of 100Mbps (47 VC12s).

It's still possible to have more control over the Ethernet bandwidth requirements for each node and port using "Egress rate" and "Ingress rate" configurations on the QSW (Quad Ethernet Switch) module.



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Chapter 3. Panels

This chapter will provide the details of the front and rear panels of the SDH01A main system along with the panels of each tributary module.

3.1 Front View

Figure 3-1 SDH01A front View

3.1.1 Tributary status LEDs

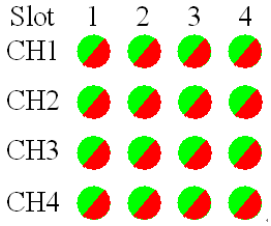

Figure 3-2 Tributary status LED

- **QE1 card**

  From 1 to 4: slot 1 to slot 4, CH1 to CH4: Channel 1 to Channel 4, status indicators for E1 channels. Four kinds of status, Green, Red, Flashing Red, and Off for these LED:

  - Green: normal status.
  - Red: LOS alarm.
  - Flashing Red: AIS alarms.
  - Flashing Green: RDI alarms.
  - Off: in OOS (Out Of Service) mode.

- **QSW card**

From 1 to 4: slot 1 to slot 4, CH1 to CH4: Channel 1 to Channel 4, status indicators for Ethernet channels. Three kinds of status, Green, Red, and Off for these LED:

  - Green: Link Up on corresponding Ethernet port.
  - Red: Link Down on corresponding Ethernet port.
  - Off: in OOS (Out Of Service) mode.

- **QV35 card**

From 1 to 4: slot 1 to slot 4, CH1 to CH4: Channel 1 to Channel 4, status indicators for V35 channels. Three kinds of status, Green, Red, and Off for these LED:

  - Green: normal status.
  - Red: LOS alarm.
  - Off: in OOS (Out Of Service) mode.

- **8xE1 card**

From 1 to 4: slot 1 to slot 4, CH1 to CH4: Channel 1/5 to Channel 4/8, status indicators for E1 channels. Four kinds of status, Green, Red, Flashing Red, and Off for these LED:

- Green: normal status.
- Red: LOS alarm.
- Flashing Red: AIS alarms.
- Flashing Green: RDI alarms.
- Off: in OOS (Out Of Service) mode.

- **E3 card**

From 1 to 4: slot 1 to slot 4, status indicators for E3/DS3 channel. Four kinds of status, Green, Red, Flashing Red, and Off for these LED:

- Green: normal status.
- Red: LOS alarm.
- Flashing Red: AIS alarms.
- Flashing Green: RDI alarms.
- Off: in OOS (Out Of Service) mode.

3.1.2 Alarm Indication LEDs

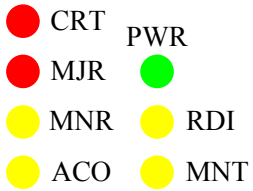

Figure 3-3 Alarm indication LED

- CRT LED: critical alarm indicator
  - Red：critical alarm is occurring in local system
  - Off：no critical alarm in local system
- MJR LED: major alarm indicator
  - Red：major alarm is occurring in local system
  - Off：no major alarm in local system
- MNR LED: minor alarm indicator
  - Yellow：minor alarm is occurring in local system
  - Off：no minor alarm in local system
- ACO LED：ACO status indicator
  - Yellow: the alarm cut off is enabled
  - Off: the alarm cut off is disabled
- PWR LED: System power indicator
  - Green: system power is normal
  - Off: system power loss
- RDI LED: Remote defect/alarm indicator
  - Yellow: remote system has alarm status
  - Off: remote system status is normal
- MNT LED: maintenance status indicator
  - Yellow: local system is under maintenance status (loop back or self diagnostic)
  - Off: local system is not under maintenance status

3.1.3 RJ-45 Ethernet Connector NMS

This is the NMS network management system interface for SNMP management by 10/100M Ethernet. The selection of 10 or 100M data rate is auto negotiable. LAN interface uses standard RJ-45 female connector. The pin assignment follows MDI standard as below.

Pin Number	Function
1	Tx+
2	Tx-
3	Rx+
4	NC
5	NC
6	Rx-
7	NC
8	NC

Table 3-1 RJ-45 pin assignments

3.1.4 Console Interface

Console interface provides a menu-driven user interface to manage the equipment. The connection is a 9 pin D-sub female connector. Please refer to Chapter 6 System Operation and Appendix B Menu-Driven Operations for details. The pin assignment for the DB9 is below. Only three wires are needed.

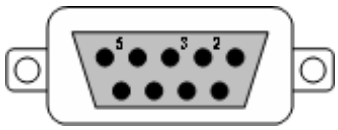

Figure 3-4 Console Pin Allocation (DB9)

Pin Number	Function
1	NC
2	Tx
3	Rx
4	NC
5	GND
6	NC
7	NC
8	NC

Table 3-2 CONSOLE pin assignment (DB9)

3.1.5 Optical interface LED Indication

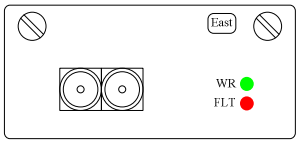

Figure 3-5 Optical interface LED Indicators

SDH01A provides 2 optical interfaces when install with optional 1+1 protection.

Please use the following table for an explanation of LED indications. If EAST is the working path, and WEST is the protection path, then the system will switch from EAST to WEST if it detects malfunction of EAST fiber link.

EAST/ WEST		Indication
WK	FLT(red)	● : green ◆ : orange ★ : light ☆ : off ☼ : flashing
☆	☆	This path is out-of-service.
●	☆	This path is working path; everything is fine.
●	★	This path is working path; critical defect is detected.
●	☼	This path is working path; remote defect is detected.
◆	☆	This path is protection path; everything is fine.
◆	★	This path is protection path; critical defect is detected.
◆	☼	This path is protection path; remote defect is detected.

3.1.6 RESET Push Button

Push this button to reset and restart the system without turning off and turning on system power.

3.1.7 ACO Push Button

ACO (Alarm Cut Off) is used to turn off the audible contact for the office alarm and stop any sound caused by the alarm. The system will activate the relay contact closures of the office alarm when there are alarms detected by system. This can also inform the people on duty in the office by enabling the visible LED on the alarm panel. The manager can push the ACO button to deactivate the alarm. The ACO LED will light on at the same time to indicate this cut off action and remain on until the disappearance of alarm. If a new alarm occurs again before the existing alarm recovers, the ACO LED will turn off.

3.1.7 LCD Panel and Keypads

The user can manage the equipment by using the LCD panel and 4 keypads. Please refer to Appendix C LCD Operations for details.

3.1.8 Alarm output Interface

The alarm relay outputs are provided by the DB9 connector and are defined as follows in the table.

Pin Number	Alarm Out
1	Alarm _Out0_A
2	Alarm _Out1_A
3	Alarm _Out2_A
4	Alarm _Out3_A
5	NC
6	Alarm _Out0_B
7	Alarm _Out1_B
8	Alarm _Out2_B
9	Alarm _Out3_B

Table 3-3 Alarm pin assignment (DB9)

3.2 Rear View

Figure 3-6 SDH01A rear view

3.2.1 Power Connection

See Figure 3-7 for AC module and 3-8 for DC module.

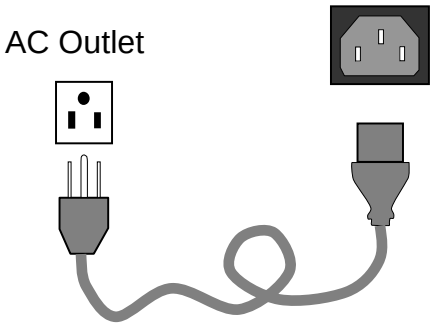

Figure 3-7 AC Module Connection

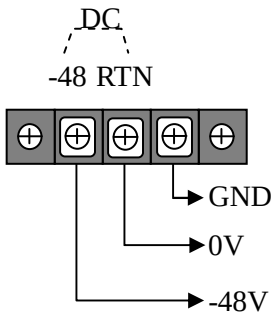

Figure 3-8 DC Modules Connection

- AC 90~264VAC, 44~63Hz
- Connector Type – IEC standard C14 AC Socket
- DC –36~-72V
- Connector Type – Terminal Block with Screws
- Use both AC and DC for power redundancy
- Max Power provided by power module : 40 Watts

3.2.2 Frame Ground

The "GND" terminal is provided to connect the Frame Ground when using DC and also for case protection. It is located on the DC terminal block and is marked as "GND". If you use AC, the frame ground is derived from the "third" pin of the AC jack.

3.2.3 Electrical Power Switch

On/off switch is used to turn on/off both AC/DC powers.

Figure 3-9 Electrical power switch

3.2.4 Tributaries Slots from 1 to 4

The SDH01A provides 4 low speed tributary slots on the rear panel for various interfaces and services according to user's requirements.

3.3 Tributary cards

3.3.1 EX - DX interface

QE1B:

- Channels from 1 to 4
- Connector type: BNC
- Impedance: 75Ω±5%
- Each channel includes Tx and Rx, besides there is a ground signal

8E1B:

- Channels from 1 to 8
- Connector type: RJ-45 (works with RJ-45 to 2*BNC adapter cables)
- Impedance: 75Ω±5%

8E1R:

- Channels from 1 to 8
- Connector type: RJ-45
- Impedance: 120Ω±5%

ET3:

- Channel 1 only
- Connector type: BNC
- Impedance: 75Ω±5%

3.3.2 Ethernet interface card

QSW:

- Channels from 1 to 4
- Connector type: RJ-45
- 10/100 Mbps with auto negotiation
- Each channel has Ethernet status LED indicators

3.3.3 V35 interface card

QV35:

- Channels from 1 to 4
- Connector type: DB-44 (DB-44 to M34 converter)
- Data rate: Nx64Kbps (N=1 to 32)

Chapter 4. Installation

This chapter will describe the procedures to install the equipment and other information that you need to know.

4.1 Install Equipment and Start the System

1. Mount the equipment in rack or place on table or shelf
2. Make sure the power switch is off
3. "GND" is provided to connect the Frame Ground and it is also required for lightening protection. It is located on the DC terminal block and marked as "GND". Before installation, please make sure you connect the GND terminal to frame ground.

4.1.1 Install AC Power

1. Mount the equipment in rack or place on table or shelf
2. Turn the power switch off
3. Connect AC power cord to AC power supply
4. Turn on the switch

4.1.2 Install DC Power

1. Set and check the power output of DC power supply for the proper range
2. Turn off the power supply before connecting power cable. Connect power cables. Please check the polarity of positive and negative carefully.
3. Connect GND terminal to frame ground
4. Turn on the power supply
5. Double check the power and polarity. Then turn on the power switch of the equipment.

4.1.3 Start the System

After the electrical power is applied, the system will start to initialize and set up. The LED indicators on the panel will flash while the unit initializes and stop flashing after the configuration upload is done. The configuration conditions in default mode have all transmissions in IS mode (in-service) when the unit leaves the factory.

4.2 Installation of Tributary Cards

The SDH01A utilizes a module design which allows users to insert modules one by one according to their specific needs. Users can also equip different service modules by application, such as E1 interface and/or data services like V.35 or Ethernet. Each channel can be configured or set independently.

4.3 Management Interface

4.3.1 Console Interface

The user can connect via the console port to any VT-100 compatible terminal or PC/Laptop with terminal emulation program and RS-232 cable. Please refer to chapter 3.1.4 for the RS-232 port pin definition and chapter 7.3 for parameters and settings.

4.3.2 NMS Interface

The NMS port is an RJ-45 Ethernet port with pin defined as MDI. Please refer to Chapter 3.1.3. After connecting to management center through LAN/DCN or Internet and provisioning, the NMS can manage SDH01A centrally.

The cable for Ethernet should be UTP-5 or better and the length should not exceed 100 meters.

4.4 Connect Cables

4.4.1 Connect Fiber Cable

The fiber cable/patch cord between SDH01A and the ODF should have the right type of connectors and be of suitable length. Please tighten the connector normally and do not bend the fiber cable itself, too avoid damaging the fiber while connecting. Be careful around laser light sources and never look directly into the end of a cable or into the connectors of fiber transceivers. This may cause permanent damage to your eyes.

4.4.2 Connect EX/DX Cable

Short haul E1/E3 connections are typically made with coaxial cable and connectors with BNC. On the QE1B module, the upper row of BNCs connectors are data output ports, while the lower row of connectors are data input ports. Make sure that the connection is correct. If E1 connection is RJ-45, a BALUN may be used to convert RJ-45 to BNC.

4.4.3 QSW Interface

The user can connect the CAT-5 UTP Cable to the RJ-45 connector. Since the Quad Switch supports auto-MDIX, there is no need to choose between Ethernet straight or crossover cables, just connect normally.

4.4.4 QV35 Interface

The user can connect DB-44 port to the DB-44 to 2xMB34 converter cables on the Quad V.35 card to connect to normal V.35 DTE interfaces.

4.5 Install Office Alarm

The office alarm relay ports as described in chapter 3.1.9. The SDH01A can connect alarms to the central alarm panel in office to inform the manager on duty by visible or audible indicators, when there is an alarm condition occurring. The office alarm relay limitations are described below.

Maximum voltage: 60V

Maximum current: 100mA (continuous) / 350mA (peak to peak)

Chapter 5. Module Description

SDH01A is equipped with four module tributary slots to provide flexible applications and full services. The modules are described below.

5.1 QE1B: 4 channel E1 module

Connector type: BNC

Impedance: 75Ω±5%

This ITU-T G.703 E1 (2.048 Mbps) transmission module provides 4 channels to transmit transparently. The E1 interfaces meet ITU-T (G.703) and ANSI standards. Each of the E1 channels may be configured through the management interface. The parameter settings, such as line code (HDB3/AMI), are field selectable. These functions can be provisioned via system console or LCD. While any one E1 channel is being provisioned, the other channels should not be affected during the provisioning process. The E1 interfaces are individually terminated.

5.2 8E1B: 8 channel E1 module

Connector type: RJ-45

Impedance: 75Ω±5%

This E1 (2.048 Mbps) transmission module provides 8 channels to transmit transparently. The E1 interfaces meet ITU-T (G.703) and ANSI standards. Each of the E1 channels may be configured through the management interface. The parameter settings, such as line code (HDB3/AMI), are field selectable. These functions can be provisioned via system console or LCD. While any one E1 channel is being provisioned, the other channels should not be affected during the provisioning process The E1 interfaces are individually terminated.

5.3 8E1R: 8 channel E1 module

Connector type: RJ-45

Impedance: 120Ω±5%

(Same as 8E1B)

5.4 ET3: 1 channel E3/DS3 module

Connector type: BNC

Impedance: 75Ω ±5%

This E3/DS3 (34.368/44.736 Mbps) transmission module provides 1 channel to transmit transparently.. The E3/DS3 interface meets ITU-T (G.703) and ANSI standards. The module can be configured as E3/DS3 by management. Additionally, parameter settings, such as line code (HDB3/B3ZS), are field selectable. These functions can be provisioned via system Console, LCD, Web Server or NMS, when an E3/DS3 channel is being provisioned, any other channels should not fail during the process. The E3/DS3 interfaces are individually terminated.

5.4 QSW: 4 Port 10/100M Ethernet Module

The QSW (Quad Switch) module provides up to 4 channels of 10/100M Ethernet transmission. The user can assign the Ethernet bandwidth in the high-speed optical signal for data communications between two ends by VC-12 assignment. The basic incremental unit of the bandwidth is one standard VC-12 (about 2.176 Mbps).

5.5 QV35: 4 channel V.35 Module

The QV35 (Quad V.35) module provides up to 4 channels of Nx64Kbps (where N=1 to 32) transmission. The V.35 interfaces meet the ITU-T V.35 standard. The user can assign the bandwidth and clock source through the management interface. DTR/RDL/LLB signals can be ignored since some V.35 DTE do not provide these signals currently.

QV35 Card, HDB44 to 2 x MB34 (Winchester) adapter cable pin assignment.

HDB44		V.35 CH 1		V.35 CH 2	
Pin No.		PIN No.	Signal	PIN No.	Signal
1					
2				V	RxCLK
3				X	RxCLK+
4				D	CTS
5				C	RTS
6				NN	undef
7				N	undef
8		B	SigGND		
9		L	undef		
10		E	DSR		
11		C	RTS		
12		D	CTS		
13		X	RxCLK+		
14		V	RxCLK		
15					
16				A	Shield
17				P	TxD
18				S	TxD+
19				U	ExtCLK
20				W	ExtCLK+
21				E	DSR
22				L	undef
23		N	undef		
24					
25		H	DTR		
26		W	ExtCLK+		
27		U	ExtCLK		
28		S	TxD+		
29		P	TxD		
30		A	Shield		
31					
32				Y	TxCLK
33				AA	TxCLK+
34				R	RxD
35				T	RxD+
36				F	DCD
37				H	DTR
38				B	SigGND
39		F	DCD		
40		T	RxD+		
41		R	RxD		
42		AA	TxCLK+		
43		Y	TxCLK		
44					

Table 5-1 QV35 Pin assignment

Chapter 6. System Operations

6.1 Start and Reset System

6.1.1 Power Supply

The SDH01A can be supplied by 110/220 AC or -48V DC power. The system will work with only one of the powers applied. When both are applied, the AC will work alone. The system will use the power from AC normally, and then switch to DC power when there is a fault with AC power. There will be no interruption to the system during the power switch. The user can turn on or turn off both the AC and DC powers by the switch on the rear. After power is applied normally, the SDH01A starts the POST (Power-On Self Test) and then initializes the system with the data in the non-volatile backup memory. After POST has passed, the system will work normally. The SDH01A can report the power loss alarm (PLS: Power Loss) of remote site to the management system when the power of remote equipment fails. AC power after completion of lightning surge immunity test, a temporary degradation of transmission performance or temporary loss of function might be acceptable, but the equipment and protection device must be self-recoverable and pass operationally within 10 minutes. To fulfill surge protection in easy-installation manner, the SDH01A is incorporated with chassis grounding mechanism on the exterior of device.

6.1.2 System Reset

The user can reset the SDH01A in different ways according to different conditions.

Push button reset: This will restart the microprocessor and clear the PM and alarm records. There is no change to system settings and no interruption in the working traffic.

Software reset by management systems: This will restart the microprocessor and clear the PM and alarm records. There is no change to system settings and no interruption in the working traffic.

Hardware reset by management systems: This will restart the microprocessor and clear the PM and alarm records. There is no change to system settings. However, traffic will be interrupted until the hardware recovers.

Reset back to previous version by management systems: After command executed, the software settings will revert back to the previous version in case that current settings are damaged.

6.1.3 System Provisioning

For convenience, the SDH01A is set to normal working state and the transmissions are enabled on the first system start. All the settings and parameters follow default values. The user can then set and provision the system according to the practical applications by NMS, console or LCD interfaces, including aggregate interfaces, tributary interfaces, and the main system.

All the settings will be kept in non-volatile backup memory after provisioning and used to initialize and set up the system when the user restarts the system again. The system can also be reset back to factory default conditions by command. SDH01A provides summary reports for the user to understand the status and conditions of the system, including service status, service type, frame format, line code, loopback, and alarm type. The default settings and values are listed on the next page.

Alarm Category	Default Severity
UEQ/EQU	Event
LOS	Critical
LOF	Major
AIS	Minor
RDI	Minor
Parameter	Default Setting
Protection Mode	Non-revertive
WTR Time	0 min
Switch Threshold	3 x 10-5
ALS Mode	Disable
Delay Time	300sec
Mode	E1
Impedance	75ohm
Line Code	HDB3/AMI
PM Category	Threshold

Threshold Value	Optical Line			Optical Path		
	15-min	1-hr	1-day	15-min	1-hr	1-day
CV	1400	5600	134400	1353	5412	129890
ES	180	720	17280	180	720	17280
SES	45	180	4320	45	180	4320
UAS	18	72	1728	18	72	1728
Threshold Value	E1 Line			E1 Path		
	15-min	1-hr	1-day	15-min	1-hr	1-day
CV	369	1475	35400	415	1659	39813
ES	180	720	17280	180	720	17280
SES	45	180	4320	45	180	4320
UAS	18	72	1728	18	72	1728

Table 6-1 System default settings and values

6.2 Performance Management

SDH01A provides performance-monitoring functions for optical and electrical interfaces to monitor the transmission quality. This monitoring includes line and path for both local and remote sites. Table 6-2 lists the details. (CV=Code Violation, ES= Errored Seconds, SES=Severely Errored Seconds, UAS=UnAvailable Seconds)

	Near-End	Far-End
Optical Line	CV, ES, SES, UAS	CV, ES, SES, UAS
Optical Path	CV, ES, SES, UAS	CV, ES, SES, UAS
E1 Line	CV, ES, SES, UAS	CV, ES, SES, UAS
E1 Path	CV, ES, SES, UAS	CV, ES, SES, UAS

Table 6-2 PM parameters

The PM time intervals are 15-minutes, one-hour and one-day. In addition to current 15-minute and one-day intervals, the previous 96 15-minute (24 hours) one-hour (24 hours) and 7 one-day (one week) intervals will be recorded in system memory for user to retrieve by NMS, CONSOLE or LCD. The SDH01A also provides the user with the threshold for each PM. The user can set the threshold value for each 15-minute, one-hour and one-day PM parameter. The system will report TCA (Threshold Crossing Alarm) alarm to management interfaces when the PM value monitored exceeds the threshold.

6.3 Optical Interface Operation

The SDH01A provides 1+1 auto protection switching for optical line protection with Optical modules in the system. The aggregate receiving signal will come from the working fiber line, and the other line will be standby for protection purposes. When the working line detects LOS, LOF, or AIS, the system will switch the fiber line from the working to the standby fiber. The switching time is less than 30ms. The optical protection mechanism is well designed to prevent any instability between working and protection optical lines.

There are two kinds of APS function: Revertive and Non-revertive. Under non-revertive mode, the optical line will not switch back to the original one even if it recovers to normal working state. When the setting it is under revertive mode, the system will define the primary slot/module to be working line. After APS implementation, the optical line will switch to protection line. If the working line is recovered, the fiber line will switch back to the primary/working line again.

The protection switch can be implemented by the management system. The user can operate the command manually through NMS, CONSOLE, or LCD. There are two ways for the manual switch: Normal and Lock. In normal mode, the switch will be implemented only if the protection line is in normal status. But in the lock mode, the user can make the switch no matter if the protection line is good or bad. The SDH01A will generate AIS signal on all E1 channel outputs during optical line failure.

The SDH01A provides ALS (Auto Laser Shutdown) function. The laser transmitter on local site will shut down the power output when it cannot receive remote site optical laser signal properly. The laser output will be turned on periodically to send out signal for testing whether the remote site can receive normally. The laser will work normally again after remote site recovers receiving. The user can also test and start laser manually. The parameters of optical module are in the next table.

Parameter	Settings
WTR Time	0~15min
ALS Mode	Enable/Disable
Delay Time	60~300sec
Protection Mode	Revertive/Non-revertive

Table 6-3 Optical module parameters

Warning DO NOT stare at the output of laser or fiber connector when the equipment is in a powered on state. The laser beam may cause damage to your eyes.

6.4 Cross Connect and Mapping Table

The SDH01A maps its channel resources from tributary interfaces to STM-1 using the ITU-T numbering system. For example, if you assign slot 2 port 1 to channel 5 in SDH01A system, the traffic from slot 2 port 1 will be added into the channel (K, L, M) = (2, 2, 1) in STM-1 pool. The data stream from the channel (K, L, M) = (2, 2, 1) in STM-1 pool will be dropped and inserted into slot 2 port 1.

The table below shows the ITU-T numbering system and their respective (K, L, M) number.

ITU-T	TUG3(K)	TUG2(L)	TU12(M)
1	1	1	1
2	2	1	1
3	3	1	1
4	1	2	1
5	2	2	1
6	3	2	1
7	1	3	1
8	2	3	1
9	3	3	1
10	1	4	1
11	2	4	1
12	3	4	1
13	1	5	1
14	2	5	1
15	3	5	1
16	1	6	1
17	2	6	1
18	3	6	1
19	1	7	1
20	2	7	1
21	3	7	1
22	1	1	2
23	2	1	2
24	3	1	2
25	1	2	2
26	2	2	2
27	3	2	2
28	1	3	2
29	2	3	2
30	3	3	2
31	1	4	2
32	2	4	2

ITU-T	TUG3(K)	TUG2(L)	TU12(M)
33	3	4	2
34	1	5	2
35	2	5	2
36	3	5	2
37	1	6	2
38	2	6	2
39	3	6	2
40	1	7	2
41	2	7	2
42	3	7	2
43	1	1	3
44	2	1	3
45	3	1	3
46	1	2	3
47	2	2	3
48	3	2	3
49	1	3	3
50	2	3	3
51	3	3	3
52	1	4	3
53	2	4	3
54	3	4	3
55	1	5	3
56	2	5	3
57	3	5	3
58	1	6	3
59	2	6	3
60	3	6	3
61	1	7	3
62	2	7	3
63	3	7	3

Table 6-4 Cross Connect and (K, L, M) mapping table

6.5 Timing Synchronization

The SDH01A accepts two simultaneous reference input signals, the primary reference (REF0) and the secondary reference (REF1). However, only one is selected as the active reference input. Each reference has 2 options for selection:

1. West Side STM-1 Recovery
2. East Side STM-1 Recovery

REF0 can be selected as West Side STM-1 Recovery and REF1 selected as East Side STM-1 Recovery, then a hitless reference switch can be done from West optical side to East optical side when the active reference input is changed from REF0 to REF1.

There are three modes for the active reference input selection:

Freerun mode:

Freerun mode is typically used when an independent clock source is required, or immediately following system power-up before network synchronization is achieved. In Freerun mode, the SDH01A provides timing and synchronization signals which are based on the master clock frequency only, and are not synchronized to any reference input signals.

Normal mode:

Normal mode is typically used when a system clock source, synchronized to the network is required. In Normal mode, the SDH01A provides timing and frame synchronization signals, which are synchronized to one of the two reference inputs (REF0 or REF1). If the SDH01A determines that its active selected reference is disrupted, it will change to Holdover mode until the selected reference is no longer disrupted or another reference is selected that is not disrupted.

Holdover mode:

Holdover mode is typically used for short durations while network synchronization is temporarily disrupted. In Holdover mode, the SDH01A provides timing and synchronization signals, which are not locked to any reference input signal, but are based on storage techniques. The storage value is determined while the device is in Normal Mode and locked to a reference input signal.

6.6 Alarm Management

While the system is working, the microprocessor scans and monitors every interface and channel to determine whether there are any alarms or not. Once an alarm is detected, the system will report the alarms to the management system. The SDH01A can keep 99 alarm records internally for analysis per system level. The information with the alarm includes date and time of occurrence, the managed object and location, the type and name of alarm, alarm severity, and so on.

The user can also retrieve the current alarms and the history. This alarm detection can be enabled or disabled for each interface and channel according to user requirements. Table 6-2 lists the alarm type and default severity of SDH01A. (E1 LOF and RDI are for E1 interface.) The severity of alarm can be assigned as Event, Minor, Major, or Critical. The critical, major, or minor office alarm and LED will be activated when the corresponding alarm occurs. While LOS, LOF, and AIS alarms of optical or E1 interface are detected, the AIS signal will be sent out on the downstream direction or remote output.

Alarm Category	Default Severity
UEQ/EQU	Event
LOS	Critical
LOF	Major
AIS	Minor
RDI	Minor

Table 6-5 Alarm type

6.7 Alarm Event Log

Our system has an internal memory capable of holding different events for alarm logs; this will hold up to 9999 different alarm log events that can be stored for user reference.

6.8 E1 Interface Operation

E1 interfaces are low speed tributary services of the SDH01A. The user can build the network capacity step by step according to the demands. The average traced frequency deviation at the output port of E1 is less than $\pm 1 \times 10^{-11}$ referenced to the frequency at the input port. (The measurement is after 30 minutes warm-up.) The interval of testing is 100s and the measurement data sampled is more than 180. The SDH01A and test equipment shall be connected as in Figure 6-1. The parameters of E1 are as follows.

Parameter	Settings
Mode	E1
Impedance	75 ohm
Line Code	HDB3/AMI

Table 6-6 E1 module parameters

6.9 Time Interval Error (TIE)

The SDH01A is used in synchronous applications. Two SDH01As can trace and lock their time precisely. Please see the following for detailed verifications.

The test was performed at a temperature of 25°C and 30 minutes after the system has been up and running. 180 samples at every 100 seconds are recorded. The results verify that the TIE of the SDH01A is less than 1×10^{-11} ns.

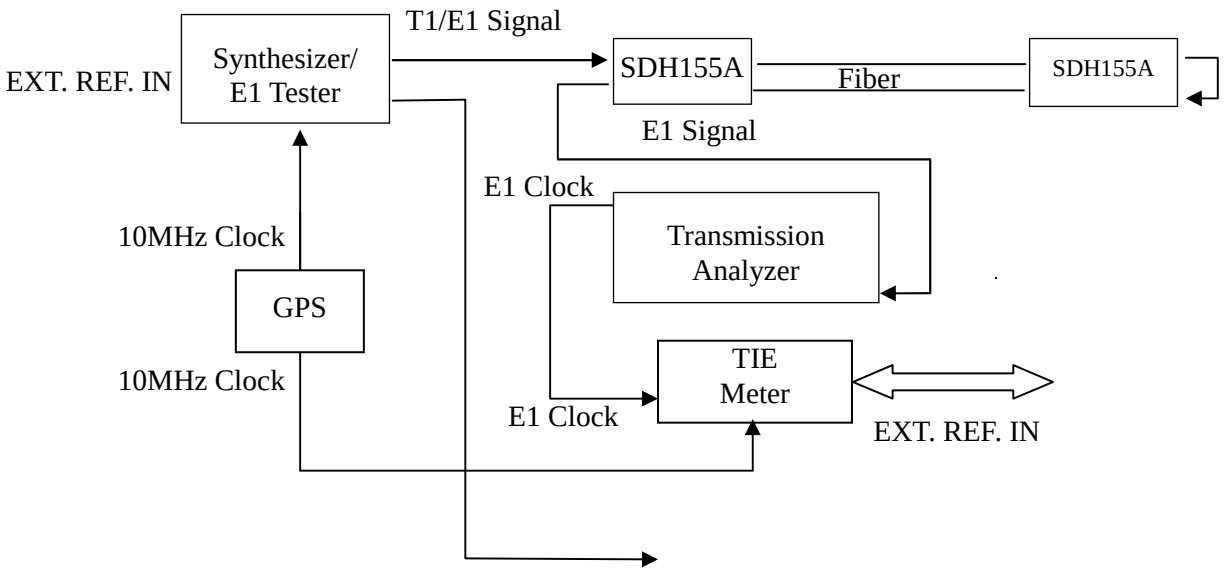

Figure 6-1 The frequency tractability connected

6.10 Ethernet Transmission

The bandwidth in the high-speed optical signal for each module or channel is adjustable and can be assigned by user according to the network applications. The size of this bandwidth is in steps of 2.048 Mbps. That is, the bandwidth is N x 2.048 Mbps, where N is from 1 to 63. Since all the Ethernet channels of QSW share this 100M, the sum of all the N values of Ethernet channels cannot be more than 63. The default value of N is 0. The user must be careful and assign the N value for each module/channel when the new QSW is inserted. The bandwidth for Ethernet transmission is independent of the E1.

6.11 Maintenance and Self-Diagnostic Testing

In order to help in solving transmission problems, the SDH01A provides loop back and self-diagnostic testing for maintenance people to debug and troubleshoot problems quickly.

6.11.1 Loop back function

There are loop back functions at different locations on the transmission path of each high-speed aggregate and low speed tributary, including line loop back and diagnostic loop back. The user can operate the loop back at both local and remote equipments; the MNT LED will be turn on. During loop back, the system will transmit the received signal to both loop back directions and up or down stream. The definitions of loopback are shown below.

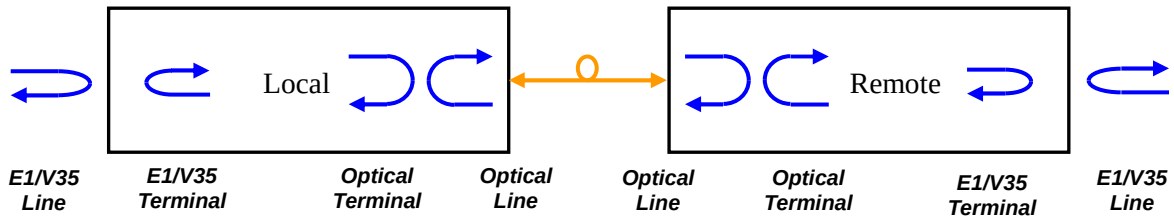

Figure 6-2 Loopback definitions

6.11.2 Self Diagnostic Testing

The SDH01A has a built-in signal generator with a 2^{15}-1 test pattern and detector for bit errors. These can test and check the transmission quality by working with loopback at different locations. The user can operate and get the testing results through Console, NMS or LCD.

6.12 Administration Security

In order to prevent operations from unauthorized users, the SDH01A provides security for administration via user login. The user must log in the system first by valid user name and correct password before operating. The new user needs to apply for the account from the supervisor.

6.13 System Management

During management of the equipment, the user can retrieve the version and set the date and time of the system through the management interfaces. There is no Y2K problem in the SDH01A system. In addition, the manager can set the IP address of NMS, trap IP address of the alarm report, and the community Read and Read-only strings for SNMP to build the network management system.

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Chapter 7. Network Management

The SDH01A provides LCD, Console and NMS interfaces for network management. For in the field support, the LCD is a convenient way to operate and debug. But it is limited by the small 16x2 row display. The Console can display many messages on the same page. This is good and quick for managers to manage after connecting a terminal or PC/Laptop with terminal program. The NMS is a standard management interface with Ethernet physical layer and SNMP protocol. All these three interfaces provide full functions of OAM&P. The management systems are single ended and the user can manage both local and remote systems from one unit through the DCC.

7.1 NMS Interface and SNMP

The SDH01A supports SNMP v2c, and follows RFC1406, RFC 2495, RFC 2493 (PM) and self defined parameters for SNMP MIB. The protocol layers of SDH01A's NMS interfaces are Ethernet, IP, UDP, and SNMP. The user can manage the equipment by a window's based management software, which uses a GUI (Graphical User Interface), making it friendly and easy to use. The user can also use other SNMP management software to manage the remote nodes, or develop their own management and integrate with other systems by importing the SNMP MIB provided, to manage the remote nodes.

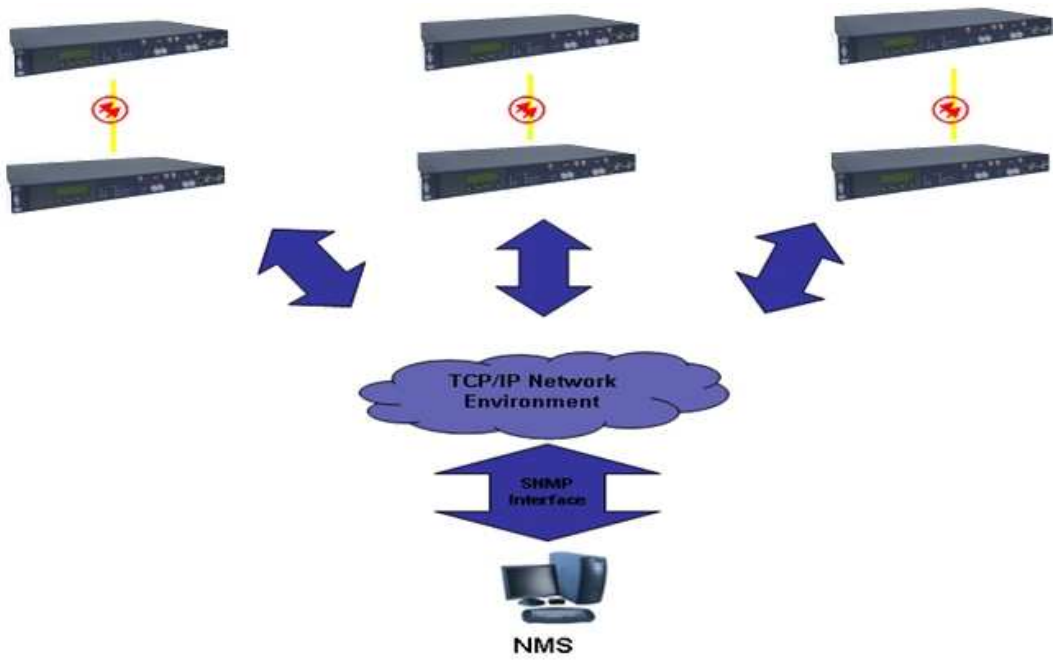


Figure 7-1 SNMP NMS structure

7.2 NMS Functions

The SDH01A provides full OAM&P (Operation, Administration, Maintenance, and Provisioning) functions. The management functions are as follows.

- Configuration
- Fault Management
- Performance Monitoring
- Security Management
- Operation
- System Setup

7.3 Console Interface

The SDH01A also reports the alarms to console port in addition to NMS. The user can manage local and remote SDH01A through the console interface. The console interface is operated by menu-driven interface. Please refer to Appendix B for details. The Console settings are as follows.

Baud Rate	Data Bits	Parity	Stop Bit
115, 200 bps	8	None	1

7.4 LCD Interface

The LCD is a convenient method for maintenance in the field. It uses a hierarchy menu and keypads to select and execute the commands. Please refer to Appendix C for details on operation of the LCD interface.

Appendix A. Ordering Information

In addition to the main chassis of the SDH01A, there are also modules for selection. Both aggregate and tributary modules provide many options. Please refer to details below to order.

I. System

- SDH01A/chassis x 1set
- Low speed tributary modules
- 19"/23" brackets and screws x 1set
- AC power cord x 1 pc.

II. Tributary Card

Name/parameters.....	Description
1. QE1B (BNC).....	4 ch. E1 tributary card with BNC interface panel connectors
2. QSW.....	Ethernet over SDH card, 4-channels 10/100, RJ-45
3. ET3	E3/DS3 tributary with BNC interface panel connectors
4. QV35.....	4 ch. V.35 tributary with DB-44 interface panel connectors
5. 8E1B(RJ-45) 75Ω.....	8 ch. E1 tributary card with BNC interface cable adapters
6. 8E1R(RJ-45) 120Ω.....	8 ch. E1 tributary card with RJ-45 interface panel connectors

Appendix B. Menu-Driven Operations

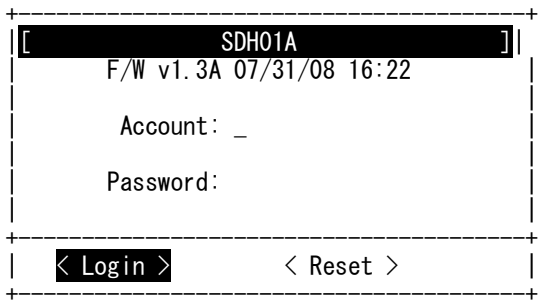
The Console provides a pull down menu, the Menu-Driven Interface, using the serial port to manage the equipment. The keys used are ←→↑↓ [Enter] [Tab] [Esc]. The program for Menu-Driven interface is any terminal emulation program that supports VT-100. The data rate and settings are 115, 200bps, N, 8, 1, and no flow control.

[Operating Rules]

In main menu and sub menu, the item is selected by arrow keys, ←→↑↓, and then pressing [Enter] to enter the selected function. After entering the sub menu, the [Tab], ←→↑↓ keys are used to move to the parameter to edit. The item selected will be highlighted. You can use ←→ to change the value of the highlighted item and then press [Enter] or [Tab] to move to the next window or item. After "OK" is executed, the action is completed. You can exit or return to main menu anytime by pressing [Esc] before the "OK" is pressed.

The network topology of SDH01A is TM/ADM. There is a DCC channel between local and remote units to communicate messages. Through this channel, the Menu-Driven interface can manage the remote equipment as well. The default site to manage is local. You can change the site to remote by local/remote option on the main menu. After the remote site is selected, the operations are done to the remote equipment.

To provide Security, there is log in window to key in the user name and password before entering the menu-driven management. The default settings are user name, root; and password, root123.



The first row in the screen shows brief information about menu driving, including login account name, model name, configuration target (local or remote) and current working path in menu driving. There are eight options in the main menu: "Alarm Management", "Performance Data", "Configuration", "Diagnosis Tools", "System Settings", "Account Management", "Node Access" and "Logout".

I. Alarm Management

Under Alarm Management there are "Alarm View", "Alarm Reset", and "Severity Setting" sub-functions.

```
  1. Alarm View
  2. Alarm Reset
  3. Severity Setting
  0. Previous Menu
```

1. Alarm View:

Select Alarm type (current or history) and Alarm Class as follows:

```
+--------------------------------+
|[  View Current/History Alarm  ]|
|                                |
|        Alarm:  Current         |
|                                |
|        Class:  ALL             |
|                                |
+--------------------------------+
|  < OK >          < Cancel >    |
+--------------------------------+
```

After [Enter] is pressed, the results window will display as follows:

Example (Class: All)

```
+-------------------------------------------------------------------------+
|          <<  View  Current  Alarm : ALL       (1-16/23)  >>             |
+-------------------------------------------------------------------------+
| Class  Type  Item  Port   Alarm    Severity        Date                  |
| -----  ----  ----  ----  --------  --------  -------------------        |
|  OPT   Line  West   1       LOS     Critical  08/22/2008 11:25:07        |
|  OPT   Line  East   1       LOS     Critical  08/22/2008 11:25:07        |
|  OPT   Intf  East   --    READY      Event    08/22/2008 11:25:05        |
|  OPT   Intf  West   --    READY      Event    08/22/2008 11:25:05        |
|  QSW   Line   S-4   1    LINK_DOWN  Critical  08/22/2008 11:25:04        |
|  QSW   Line   S-4   2    LINK_DOWN  Critical  08/22/2008 11:25:04        |
|  QSW   Line   S-4   3    LINK_DOWN  Critical  08/22/2008 11:25:04        |
|  QSW   Line   S-4   4    LINK_DOWN  Critical  08/22/2008 11:25:04        |
| QE1B   Line   S-3   1       LOS     Critical  08/22/2008 11:25:03        |
| QE1B   Line   S-3   2       LOS     Critical  08/22/2008 11:25:03        |
| QE1B   Line   S-3   3       LOS     Critical  08/22/2008 11:25:03        |
| QE1B   Line   S-3   4       LOS     Critical  08/22/2008 11:25:03        |
| QV35   Line   S-2   1       LOS     Critical  08/22/2008 11:25:03        |
| QV35   Line   S-2   2       LOS     Critical  08/22/2008 11:25:03        |
| QV35   Line   S-2   3       LOS     Critical  08/22/2008 11:25:03        |
| QV35   Line   S-2   4       LOS     Critical  08/22/2008 11:25:03        |
+-------------------------------------------------------------------------+
```

Press 'r': refresh, 'R': auto-refresh, Arrows: other page, 'ESC': exit

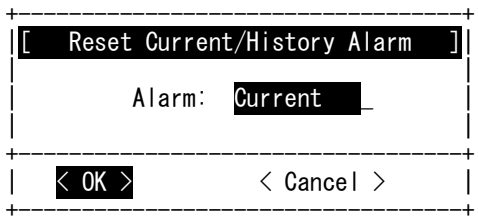
Please use ←→ to scroll the window for more records.

The alarm types include:

- ARRIVAL: module detected
- MISSING: module removed
- LOS: Loss of Signal
- LOF: Loss of Frame (optional);
- AIS: Alarm Indication Signal
- RDI: Remote Defect Indicator (optional for E1)

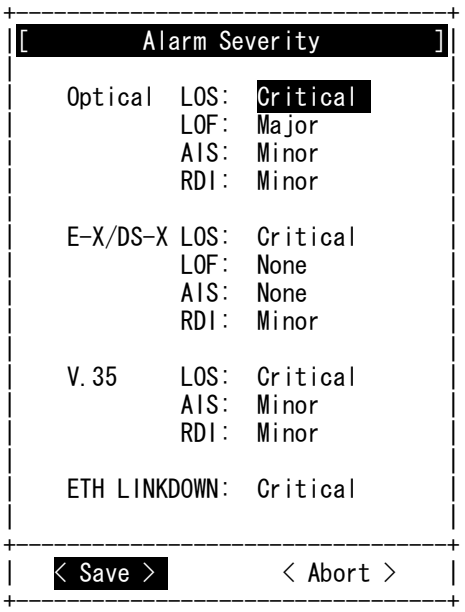
2. Alarm Reset:

This function is used to reset the current or history alarms. Once the user chooses <Ok>, the current or history log of alarms will be deleted.



3. Severity Setting:

This function is used to retrieve and set the severity of alarm. Enter through "Alarm Management" -> "Severity Setting".

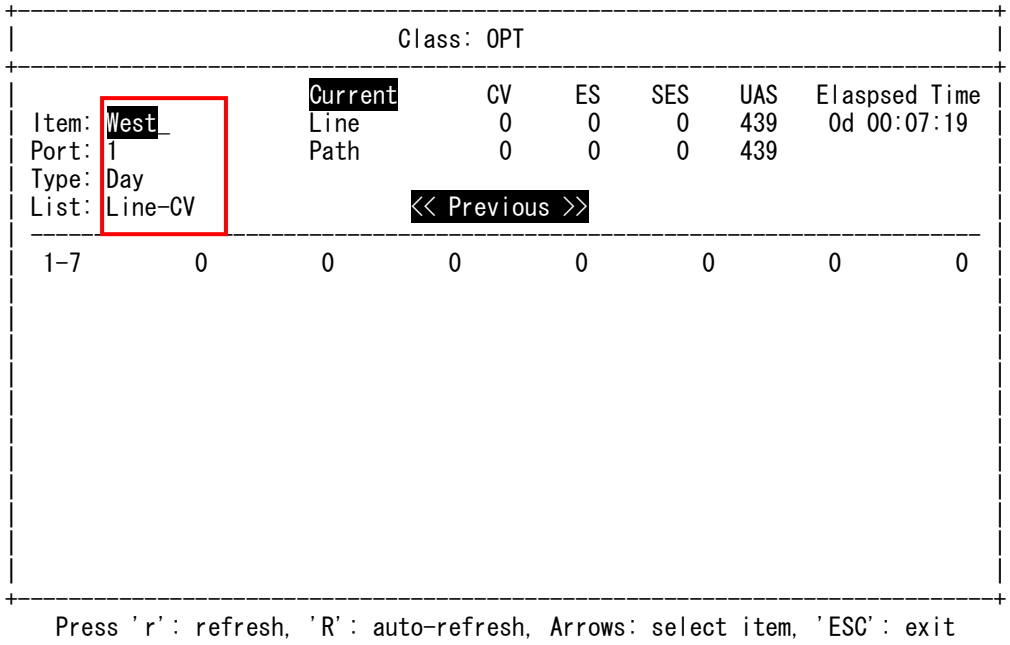


Use ←→ to change the levels: Event, Minor, Major, or Critical. After "Save" is executed, the system will respond with success or not.

II. Performance Data

There are "PM Retrieve", "PM Reset" and "RMON Counters" sub functions under performance data.

1. PM Retrieve:

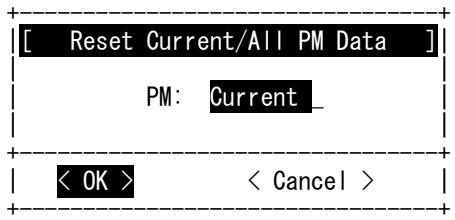


In this window the user can select Item, Port, Type of PM and the Item of PM. The Type could be: "Day", "Hour" and "Quarter". The Item could be: "Line-CV", "Line-ES", "Line-SES", "Line-UAS", "Path-CV", "Path -ES", "Path -SES" or "Path -UAS":

2. PM Reset:

This is used to reset the PM values. Enter through "PM" -> "PM Reset".

Use ←→ to select the reset item.



The options are:

"Current": Reset the PM of current interval of 15 minutes and day.

"ALL": Reset all PM, including all intervals of 15 minutes and day.

3.RMON Counters:

Statistic counters may be used in performance monitoring or to check problems in the network.

```
+-------------------------------------------------------------------------------+
| Item: S-4      Class: QSW          Press 'Port Number'(WAN is 5) to Reset |
+-------------------------------------------------------------------------------+
|   Counter       Port 1      Port 2      Port 3      Port 4       WAN          |
|  ------------  ----------  ----------  ----------  ----------  ----------     |
|   InGoodBytes           0           0           0           0           0     |
|    InBadBytes           0           0           0           0           0     |
|     InUnicast           0           0           0           0           0     |
|   InBroadcast           0           0           0           0           0     |
|   InMulticast           0           0           0           0           0     |
|       InPause           0           0           0           0           0     |
|   InUndersize           0           0           0           0           0     |
|    InFragment           0           0           0           0           0     |
|    InOversize           0           0           0           0           0     |
|      InJabber           0           0           0           0           0     |
|       InRxErr           0           0           0           0           0     |
|      InFCSErr           0           0           0           0           0     |
|      OutBytes           0           0           0           0           0     |
|    OutUnicast           0           0           0           0           0     |
|  OutBroadcast           0           0           0           0           0     |
|  OutMulticast           0           0           0           0           0     |
+-------------------------------------------------------------------------------+
  Press 'r': refresh, '<-' or '->': select item, ' ': other page, 'ESC': exit
```

The counters are designed to support:

- RFC 2819 – RMON MIB (this RFC obsoletes 1757 which obsoletes 1271)
- RFC 2665 – Ethernet-like MIB (this RFC obsoletes 1643, 1623 and 1398)
- RFC 2233 – MIB II (this RFC obsoletes 1573 & 1213 with obsoletes 1229 & 1158)
- RFC 1493 – Bridge MIB (this RFC obsoletes 1286)

In this window the user can use ←→ to select slot and use SPACE to view page(s). Pressing Number 1-5 can reset counters for ports 1 to WAN, while pressing Number 0 will reset all counters.

Ingress Statistics Counters

InGoodByte: The sum of lengths of all good Ethernet frames received, that is frames that are not bad frames.

InBadBytes: The sum of lengths of all bad Ethernet frames received not counting Preamble.

InUnicast: The number of good frames received that have a Unicast destination MAC address.

InBrdcast: The number of good frames received that have a Broadcast destination MAC address.

InMultcasts: The number of good frames received that have a Multicast destination MAC address.

InPause: The number of good Flow Control frames received.

InUnder: Total frames received with a length of less than 64 octets but with a valid FCS.

InFragment: Total frames received with a length of less than 64 octets and an invalid FCS.

InOversize: Total frames received with a length of more than MaxSize octets but with a valid FCS.

InJabber: Total frames received with a length of more than MaxSize octets but with an invalid FCS.

InRcvErr: Total frames received with an Rx_Error event seen by the receive side of the MAC.

InFCSErr: Total frames received with a CRC error not counted in InFragments, InJabber.

Egress Statistics Counters

OutBytes: The sum of lengths of all Ethernet frames sent from this MAC. This includes Flow Control frames and partial frames transmitted due to collisions.

OutUnicast: The number of frames sent that have a Unicast destination MAC address. This does not include frames dropped due to excessive collisions or frames counted in OutFCSErr.

OutBrdcast: The number of good frames sent that have a Broadcast destination MAC address. This does not include 802.3 Flow Control frames, or frames dropped due to excessive collisions or frames counted in OutFCSErr.

OutMltcast: The number of good frames sent that had a Multicast destination MAC address. This does not include 802.3 Flow Control messages, nor frames counted in OutPause nor does it include Broadcast frames counted in OutBroadcasts.

OutPause: The number of Flow Control frames sent.

Collisions: The number of collision events seen by the MAC not including those counted in Late or Excessive.

Deferred: The total number of successfully transmitted frames that were delayed because the medium was busy during the first attempt and then the frame was transmitted without any collisions (this counter is valid in half-duplex mode only.

Single: The total number of successfully transmitted frames that experienced exactly one collision. This counter is applicable in half-duplex only.

Multiple: The total number of successfully transmitted frames that experienced more than one collision. This counter is applicable in half-duplex only.

OutFCSErr: The number of frames transmitted incorrectly due to an internal MAC transmits error, for example, bad CRC detected when the frame was read from memory.

Excessive: The number frames dropped in the transmit MAC due to excessive collision condition. This counter is applicable in half-duplex only.

Late: The number of late collision events seen by the MAC.

Histogram Counters

64Bytes: Total frames received and transmitted with a length of exactly 64 octets, including those with errors.

65 to 127: Total frames received and transmitted with a length of between 65 and 127 octets inclusive, including those with errors.

128 to 255: Total frames received and transmitted with a length of between 128 and 255 octets inclusive, including those with errors.

256 to 511: Total frames received and transmitted with a length of between 256 and 511 octets inclusive, including those with errors.

512 to 1023: Total frames received and transmitted with a length of between 512 and 1023 octets inclusive, including those with errors.

1024 to Max: Total frames received and transmitted with a length of between 1024 and MaxSize octets inclusive, including those with errors.

III. Configuration:

Under Configuration there are "Interface Summary", "General Settings", "Optical Interface", "E1 Interface", "V35 Interface", "Ethernet Interface", "Advanced ETH Setup", "Cross Connect Tab" and "Default Settings" sub menus.

```
  1. Interface Summary
  2. General Settings
  3. Optical Interface
  4. E-X/DS-X Interface
  5. V.35 Interface
  6. Ethernet Interface
  7. Advanced ETH Setup
  8. Cross Connect Tab
  9. Default Settings
  0. Previous Menu
```

1. Interface Summary:

Retrieve the summary report. Use ←→ to select the Item.

For optical interface, you will get:

```
+------------------------------------------------------------------------------+
| Item: West _  Class: OPT                                                     |
+------------------------------------------------------------------------------+
| Port  Service   ALS   Restart  Loopback   Priority     Status    Alarm       |
| ----  -------  -----  -------  --------  -----------  ---------  -----       |
|   1      IS      no    300(s)    None      Primary     Active     LOS       |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
+------------------------------------------------------------------------------+
          Press 'r': refresh, '<-' or '->': select item, 'ESC': exit
```

For E1 interface, you will get:

```
+------------------------------------------------------------------------------+
| Item: S-3_    Class: QE1B                                                    |
+------------------------------------------------------------------------------+
| Port  Service  Mode  Code   Frame   Impedance     L-Len    Loopback  Alarm  |
| ----  -------  ----  ----  -------  ---------  ----------  --------  -----  |
|   1      IS     E1   HDB3  Unframe   75  ohm  -------- ft    None     LOS   |
|   2      IS     E1   HDB3  Unframe   75  ohm  -------- ft    None     LOS   |
|   3      IS     E1   HDB3  Unframe   75  ohm  -------- ft    None     LOS   |
|   4      IS     E1   HDB3  Unframe   75  ohm  -------- ft    None     LOS   |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
+------------------------------------------------------------------------------+
          Press 'r': refresh, '<-' or '->': select item, 'ESC': exit
```

For V.35 interface, you will get:

```
+-------------------------------------------------------------------------------+
| Item: S-2_    Class: QV35                                                     |
| ------------ ------------------------------------------------------------------|
| Port  Service  Clk  Rate   Frame    LLB    DTR   DTR  RTS  Loopback  Alarm   |
| ----  -------  ---  ----  -------  -----  -----  ---  ---  --------  -----   |
|   1       IS   Int   32   Unframe  Check  Check  OFF  OFF     None     LOS   |
|   2       IS   Int   32   Unframe  Check  Check  OFF  OFF     None     LOS   |
|   3       IS   Int   32   Unframe  Check  Check  OFF  OFF     None     LOS   |
|   4       IS   Int   32   Unframe  Check  Check  OFF  OFF     None     LOS   |
|                                                                               |
|                                                                               |
|                                                                               |
|                                                                               |
|                                                                               |
|                                                                               |
|                                                                               |
|                                                                               |
|                                                                               |
+-------------------------------------------------------------------------------+
          Press 'r': refresh, '<-' or '->': select item, 'ESC': exit
```

For Ethernet interface, you will get:

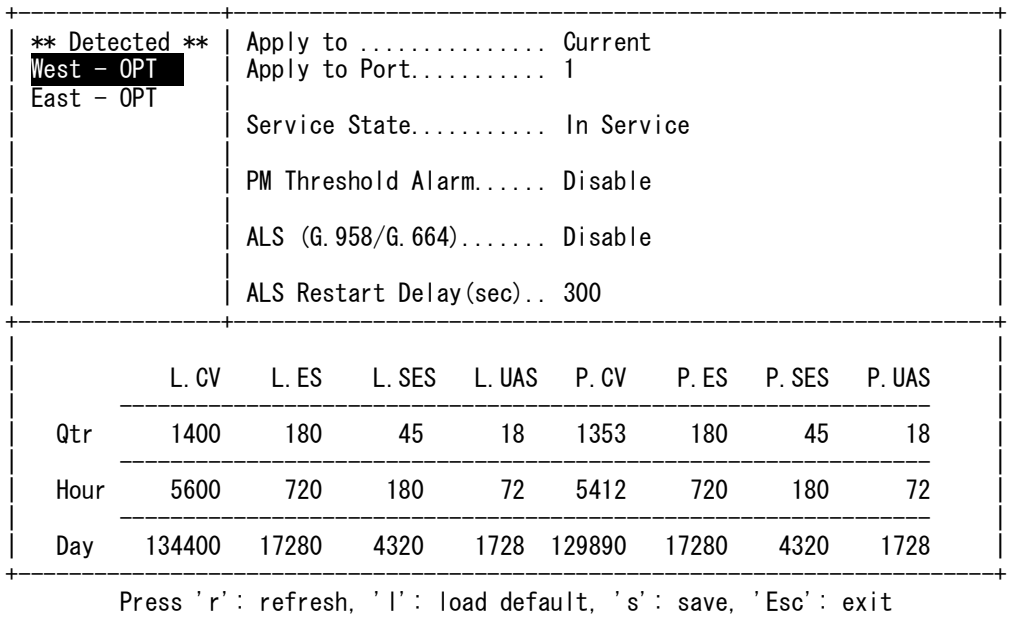
```
+-------------------------------------------------------------------------------+
| Item: S-4_    Class: QSW                                                      |
| ------------ ------------------------------------------------------------------|
| Port  Service  Link Ctrl   Link     Speed     Flow Ctrl   Priority   Alarm   |
| ----  -------  ---------  ------  ---------  ----------  --------  -------   |
|   1       IS    AutoNeg     Up    100M Full       no          0       ---    |
|   2       IS    AutoNeg   Down     10M Half       no          0     LNK DWN  |
|   3       IS    AutoNeg   Down     10M Half       no          0     LNK DWN  |
|   4       IS    AutoNeg   Down     10M Half       no          0     LNK DWN  |
|  WAN      IS    AutoNeg     Up    100M Full       no          0       ---    |
|                                                                               |
|                                                                               |
|                                                                               |
|                                                                               |
|                                                                               |
|                                                                               |
|                                                                               |
|                                                                               |
|                                                                               |
+-------------------------------------------------------------------------------+
          Press 'r': refresh, '<-' or '->': select item, 'ESC': exit
```

2. General Settings:

Here you can set optical protection switch to "Non-Revertive" or "Revertive", set the WTR Delay time based on fiber signal fail (LOS, LOF), and even setup the BER threshold to do APS switch. All of this optical line protection is defined in ITU-T Rec. G.783.

```
+-----------------------------------------+
|[          General Configuration         ]|
|                                         |
|        <<   Optical Interface   >>      |
|  Optical Protection Switch: Non-Revertive|
|         Wait To Restore(min): 0         |
|             Switch Threshold: 3_        |
|              Threshold Scale: 10^-5     |
|                                         |
+-----------------------------------------+
|     < Save >              < Abort >     |
+-----------------------------------------+
```

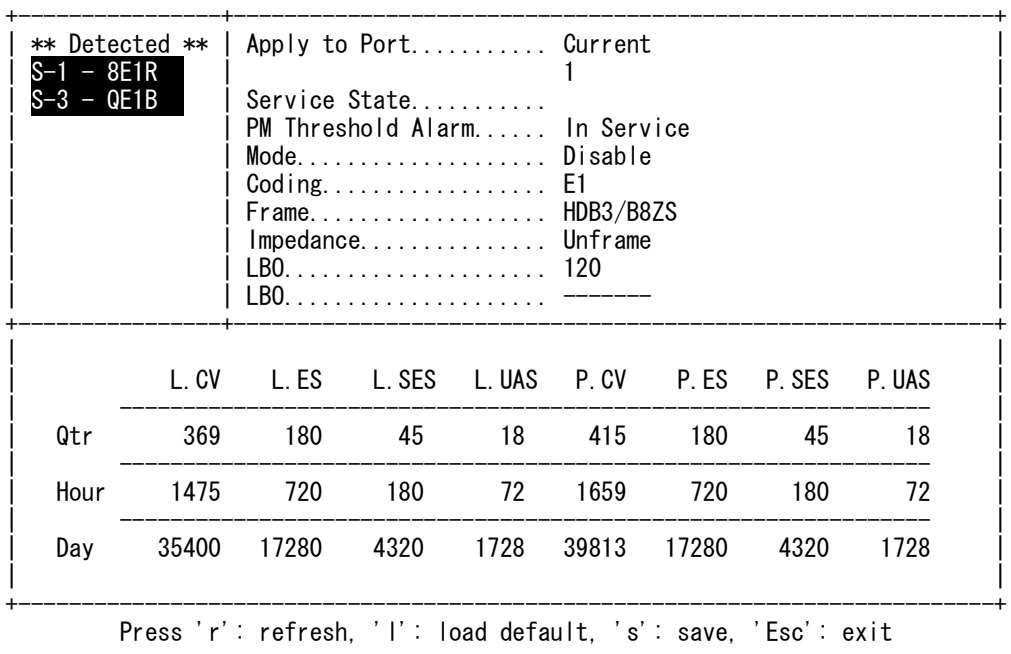
3. Optical Interface:



On this page you can edit the service state to "IS" (In Service) or "OOS" (out of service), enable or disable TCA report, enable or disable ALS mode, set the delay time in seconds of ALS, and set the threshold values for performance alarms.

At any time you can press "r" to reload settings, "l" to load default values, "s" to save the changes or "Esc" to exit without saving.

4. E1 Interface:



On this page you can set the interface service state to "IS" (in service) or "OOS" (out of service), enable or disable TCA report, set the line coding and set the Threshold values for the performance parameters for Qtr (15 minute), Hour and Day.

At any time you can press "r" to reload settings, "l" to load default values, "s" to save the changes or "Esc" to exit without saving.

5. V.35 Interface:

```
+---------------+-------------------------------------------------------+
| ** Detected ** | Apply to ..............  Current                      |
| S-2 - QV35     | Apply to Port..........  1                           |
|                |                                                      |
|                | Service State..........  In Service                  |
|                |                                                      |
|                | Clock Mode.............  Internal                     |
|                | Data Rate..............  32                           |
|                | Framing Mode...........  Unframe                     |
|                |                                                      |
|                | LLB Signal.............  Normal                     |
|                | DTR Signal.............  Normal                     |
|                |                                                      |
|                | V.54(RDL) Detection.....  Disable                    |
|                | Time to Release(Min)....  5                          |
|                |                                                      |
|                | Interface Mode..........  DCE-DTE                    |
|                | Tx Data Output Edge.....  Rising Edge                |
|                |                                                      |
|                |                                                      |
+---------------+-------------------------------------------------------+
        Press 'r': refresh, 'l': load default, 's': save, 'Esc': exit
```

On this page you can set the service state as "IS" or "OOS", set the clock mode, set the Data rate, set framing mode, enable V.54 detection, and set to ignore DTR or LLB signals. DTR and LLB signals are from V.35 DTE, but some DTE do not provide them. You can also set "Ignore" to ignore V.35 alarms caused by DTR or LLB signals.

At any time you can press "r" to reload settings, "l" to load default values, "s" to save the changes or "Esc" to exit without saving.

6. Ethernet Interface:

```
+---------------+-------------------------------------------------------+
| ** Detected ** | Apply to ..............  Current                      |
| S-4 - QSW      | Apply to Port..........  1                           |
|                |                                                      |
|                | Service State..........  In Service                  |
|                | Link Control...........  Auto-Negotiation            |
+---------------+-------------------------------------------------------+
| Flow Control.............  Disable      Ingress Rate.............  Disable |
| Default Priority.........  0                Rate.................  100M    |
|                                            Flow Control.........  Disable |
| Double VLAN Tag..........  Disable          Unknown Unicast.....  limit   |
|     Provider Tag.........  0000.           Unknown Broadcast...  limit   |
|                                            Unicast..............  limit   |
| Default VLAN ID..........  0000.           Multicast............  limit   |
|     Force VID............  Disable          Broadcast............  limit   |
|                                            MGMT Frames..........  limit   |
| VLAN Port Mode...........  802.1Q Disable   ARP..................  limit   |
|     Egress Tag...........  Unmodified                                      |
|     Ingress Tag..........  None             Bucket Increment....  ae.      |
|                                            CBS Limit............  060000.  |
| Egress Rate .............  100M             EBS Limit............  fffff0.  |
+-------------------------------------------------------------------------+
        Press 'r': refresh, 'l': load default, 's': save, 'Esc': exit
```

On this page you can set the service state, speed rate, set flow control, Default Priority, Double VLAN tag, Default VLAN ID, Egress Rate and Ingress Rate Settings.

The user can set more advanced functions like enabling flow control or limiting the traffic according the traffic-type like broadcast frames or ARP. Also the user can set other parameters like Committed Burst size (CBS) and/or Excess Burst size (EBS).

Note: Only change the default values if you are sure of the values to configure. Wrong configuration will lead to unpredictable results.

More on configuring Ethernet

When enabling Flow control, there is flow control at the ingress rate configured and no packet loss will happen. Usually this option should be disabled. If flow control in Ingress rate is enabled, be sure that you have set flow control for this port in the second option for the global QSW menu. If this is not the case ingress rate won't work.

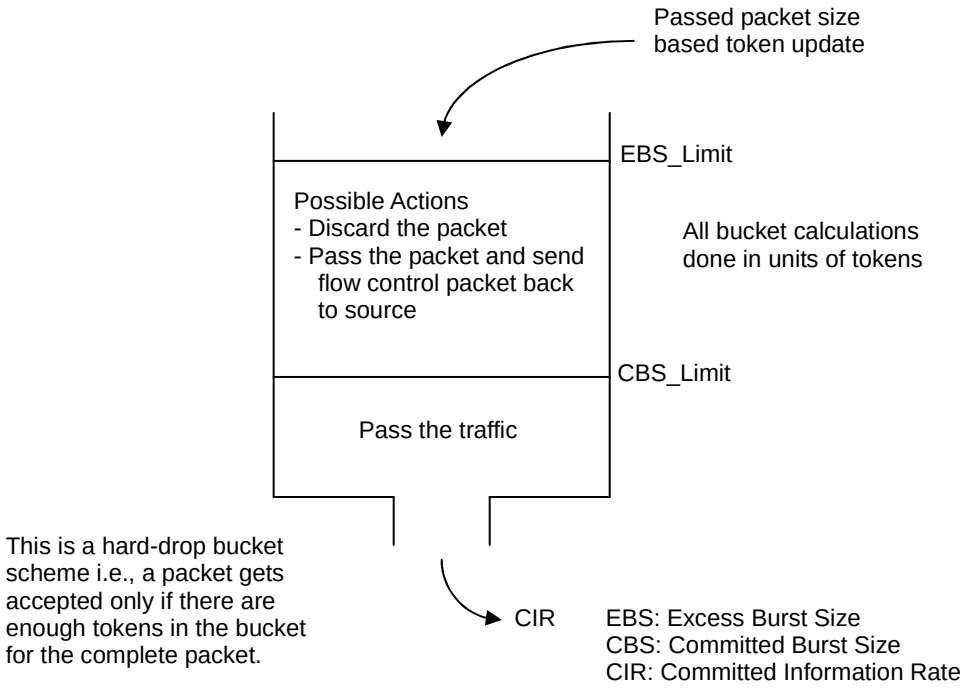
The scheme for implementing ingress rate limiting is a leaky bucket. Imagine a bucket that drains tokens constantly at a rated called Committed Information Rate (CIR) (Rate option in the menu) and the bucket gets replenished with tokens whenever frames are allowed to go through the bucket. All calculations for this bucket are carried out in tokens.

Bucket Increment (Hex) controls how many tokens need to get added after accepting each frame. It is recommended that this value be 0xAE.

EBS_limit is directly proportional to the amount of bytes that can be accommodated as part of the frame burst. Recommended value = 0xFFFFF0.

CBS_limit signifies the minimum token depth necessary to allow frames go through. Recommended value = 0x060000.

Next figure explains better the concept of a leaky bucket:



VLAN Port Mode:

QSW card has different levels of security for VLANs (802.1q Disabled, Fallback, Check and Secure). Egress tagging and untagging is supported dynamically using 802.1Q VLANs, or statically based on the configuration of the port when the frame doesn't have VLAN information or the VLAN doesn't exist. QSW card supports the discarding of frames that are tagged or not tagged on a port-by-port basis.

VLAN ID is related to the VLAN information contained in the Ethernet frame.

VLAN table is related to the VLAN IDs that have been added in the FOM.

VLAN Mode:

-802.1q Disabled (Default Value): VLAN ID information is not considered in this port.

-Secure: The VLAN ID must be contained in the VLAN Table and the ingress port must be a member of the VLAN or the frame is discarded. The frame is allowed to exit only those ports that are members of the frame's VLAN ID.

-Check: The VLAN ID must be contained in the VLAN Table or the frame is discarded. The frame is allowed to exit only those ports that are members of the frame's VLAN ID.

-Fallback: Frames are not discarded if their VLAN ID is not contained in the VLAN table. If the frame's VID is contained in the VLAN table, the frame is allowed to exit only those ports that are members of the frame's VLAN ID.

Note: Fallback mode is the most common mode to enable VLAN function.

Egress Tag:

This option is used as the default egress mode for this port when frames don't have VLAN information or the frame's VLAN is not contained in the VLAN table.

-Unmodified (Default Value): Frames are transmitted unmodified.

-Untagged: Remove the tag from any tagged frame.

-Tagged: Add a tag to any untagged frame. The tag added is the one from the frame during Ingress. If the frame that came by ingress doesn't have VLAN ID, the tag added is the default VID of the port where the frame ingresses.

Ingress Tag:

QSW supports the discarding of frames that are tagged or not tagged on a port-by-port basis. No discard is the default value.

At any time you can press "r" to reload setting, "l" to load default values, "s" to save the changes or "Esc" to exit without saving.

7. Advanced ETH Setup:

There are "Bandwidth View", "Port Trunking", "Port-Based VLAN" and "Tagged VLAN" sub options.

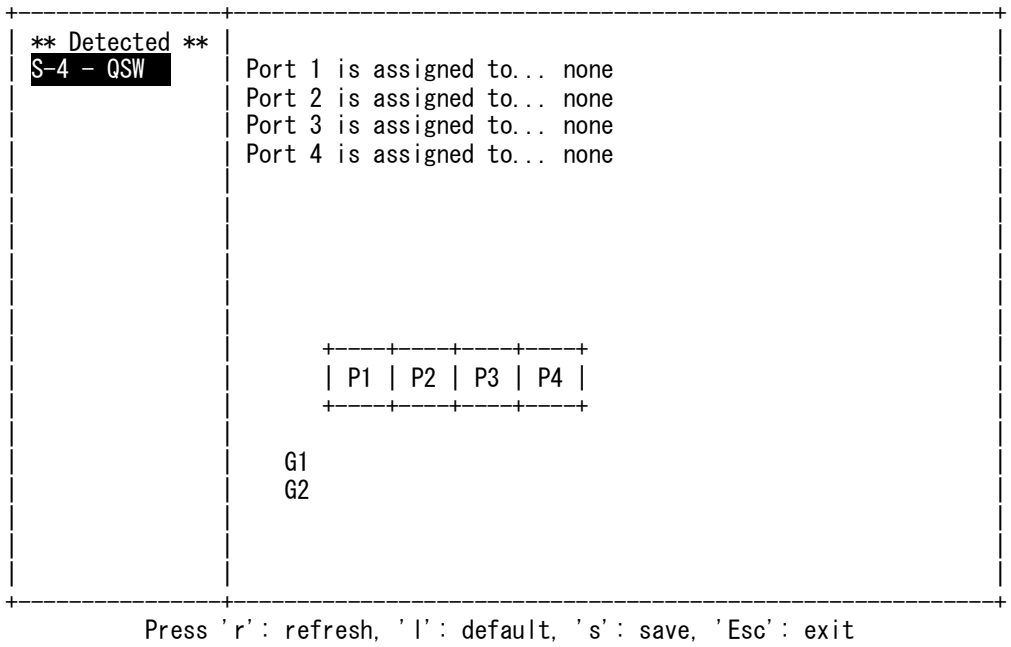
```
 1. Bandwidth View
 2. Port Trunking
 3. Port-Based VLAN
 4. Tagged VLAN
 0. Previous Menu
```

Bandwidth View:

To view the bandwidth used by QSW. Enter the menu through "Configuration" -> "Advanced ETH Setup" -> "Bandwidth View".

```
+-----------------------------------+
|[       Ethernet Bandwidth         ]|
|                                   |
|     Bandwidth:  3  (6.53 Mb)      |
|                                   |
+-----------------------------------+
|              < OK >               |
+-----------------------------------+
```

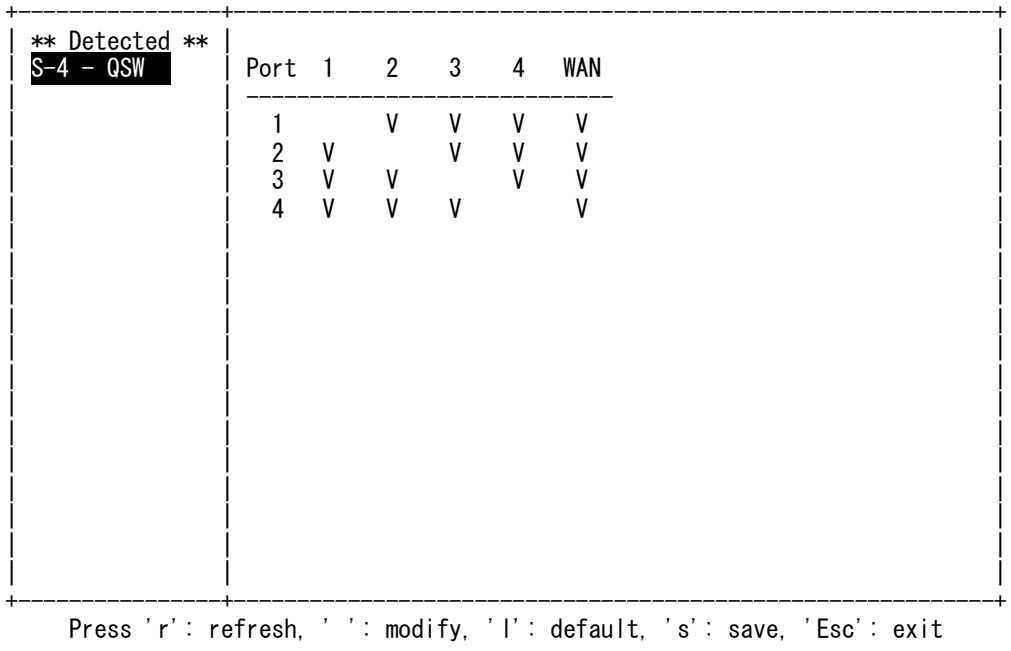
Port Trunking:



You can edit the port trunking setting here by using Arrow keys.

At any time you can press "r" to reload setting, "l" to load default values, "s" to save the changes or "Esc" to exit without saving.

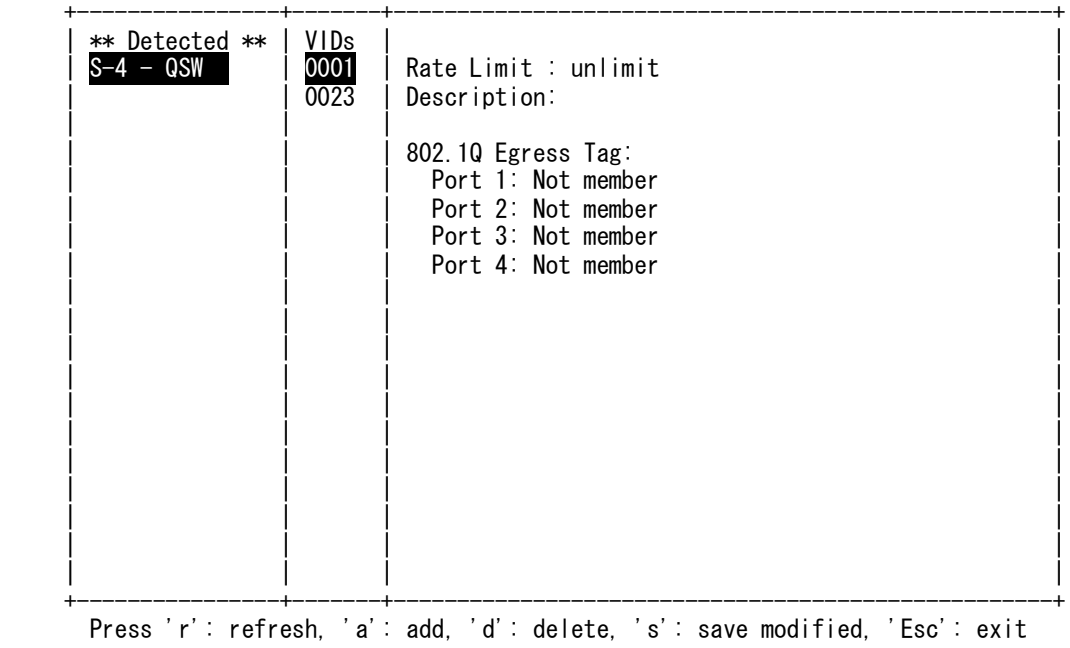
Port-Based VLAN:



You can edit the port-based VLAN setting here by using Arrow keys and SPACE key.

At any time you can press "r" to reload setting, "l" to load default values, "s" to save the changes or "Esc" to exit without saving.

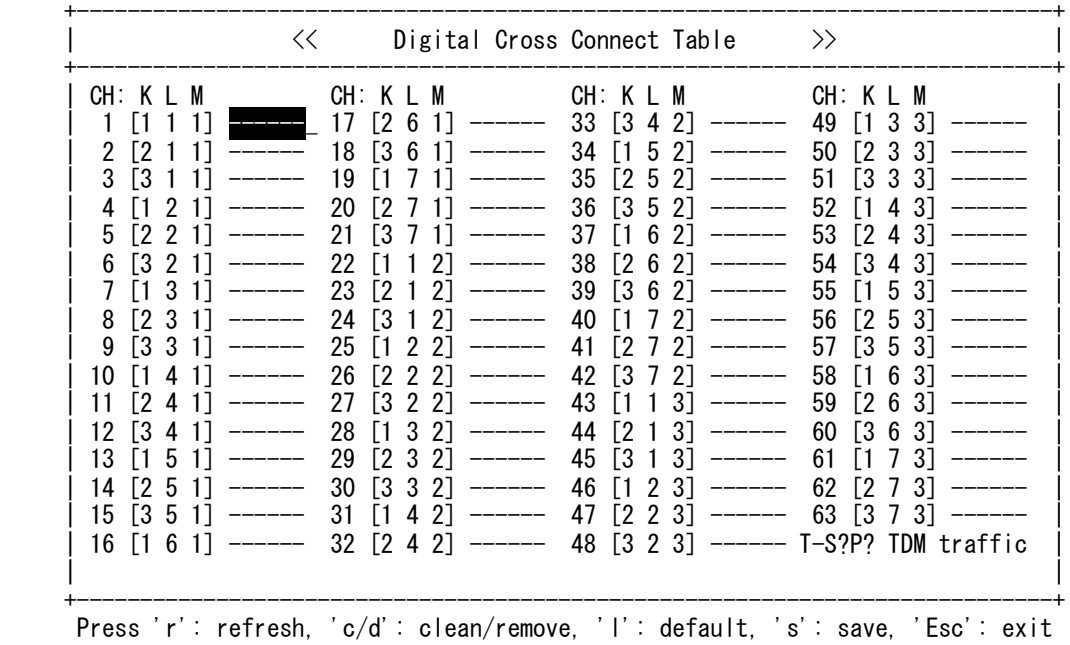
Tagged VLAN:



You can edit the tagged VLAN setting of QSW.

At any time you can press "r" to reload setting, "l" to load default values, "s" to save the changes or "Esc" to exit without saving.

8. Cross Connect Tab:

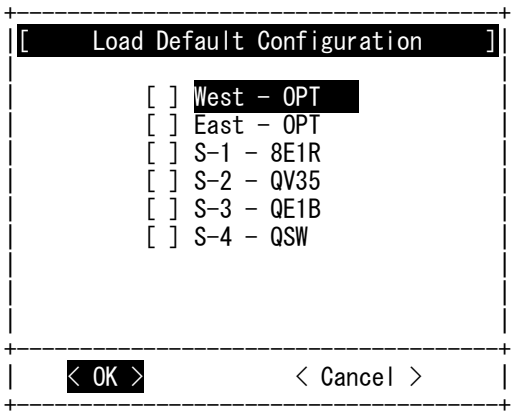


This page is one of the most important for configuring the tributary channels and EoS mapped to the STM-1 VC12 circuits. Use the [Space] key to select Slot and Port channel for each VC (1 to 63). Use arrow keys to navigate to different VCs.

At any time you can press "r" to reload setting, 'c' to remove all assignments, 'd' to remove current assignment, "l" to load default values, "s" to save the changes or "Esc" to exit without saving.

9. Default Settings:

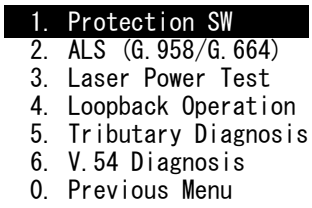
Use this screen to load default configurations. Enter the menu through "Configuration" -> "Default Settings".



Use Space Key to change the selection. After "OK" executed, the system will response success or not.

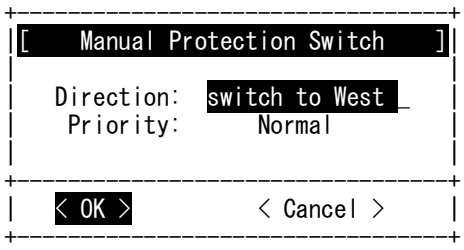
IV. Diagnosis Tools

There are "Protection SW", "ALS (G.958/G.664)", "Laser Power Test", "Loopback Operation", "Tributary Diagnosis" and "V.54 Diagnosis" sub menus under the Diagnostic Tools.



1. Manual fiber Protection SW:

Operate manually the optical protection switch by software. Enter through the menu as follows. Select the switching method.



There are both Direction and Priority parameters.

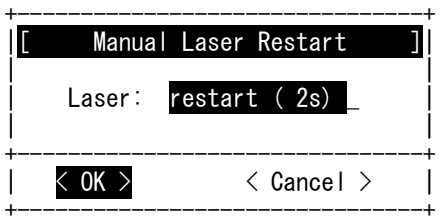
Direction options: "Switch to West", "Switch to East"

Priority options: "Normal", "Lock"

The operation is done after "OK" executed.

2. ALS (G.958/G.664):

This screen operates the manual start of ALS. Enter through "Diagnosis Tools" -> "ALS (G.958/G.664)".

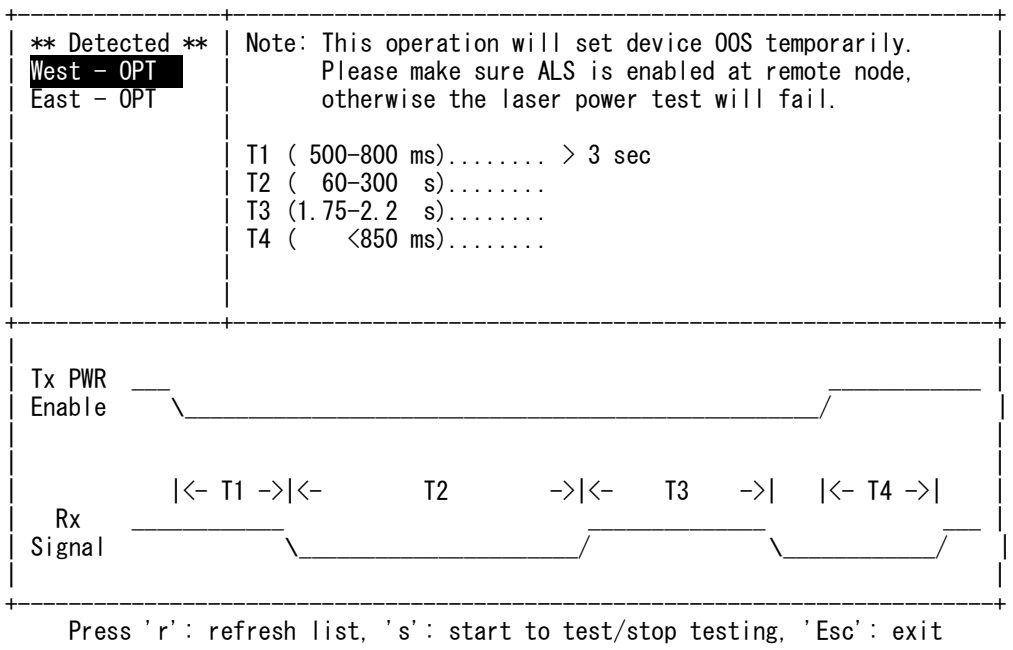


Restart Type options: restart 2s (laser output lasting for 2 seconds), restart 90s (laser output lasting for 90 seconds).

3. Laser Power Test:

This screen operates the laser power test. Enter through "Diagnosis Tools" -> "Laser Power Test".

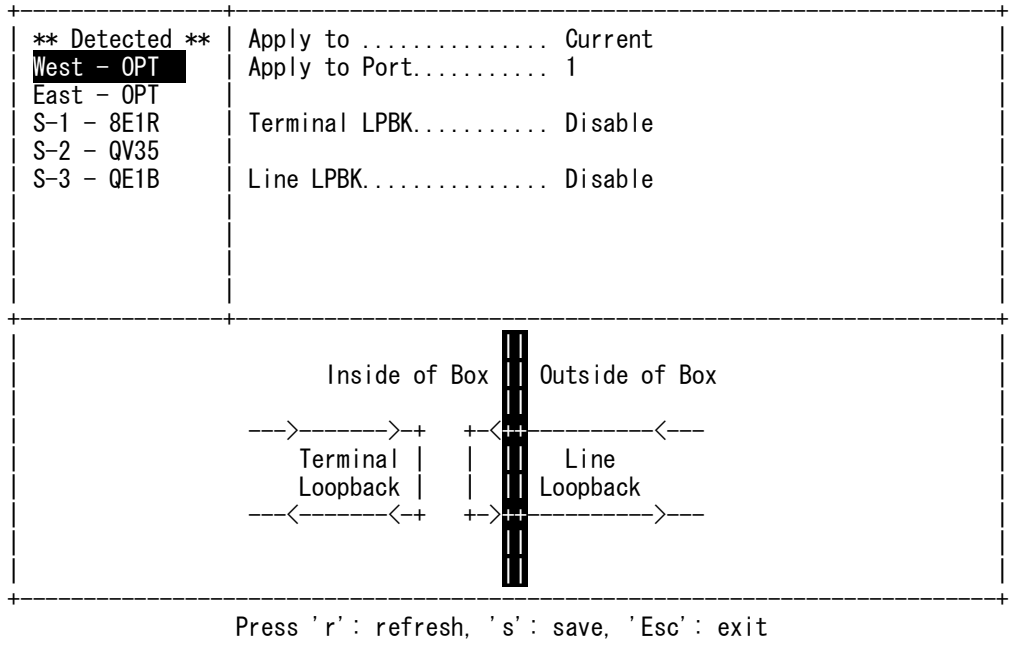
CAUTION: Transmissions will be halted during this test.



At any time you can press "r" to refresh the list, "s" to start the test or "Esc" to exit without saving. This function can let the user test remote SDH01A ALS function from local SDH01A console. The user can get T1 /T2 /T3 /T4 period to make sure if remote SDH01A meets ITU G.958 or G.664 spec. from console easily.

4. Loop back Operation:

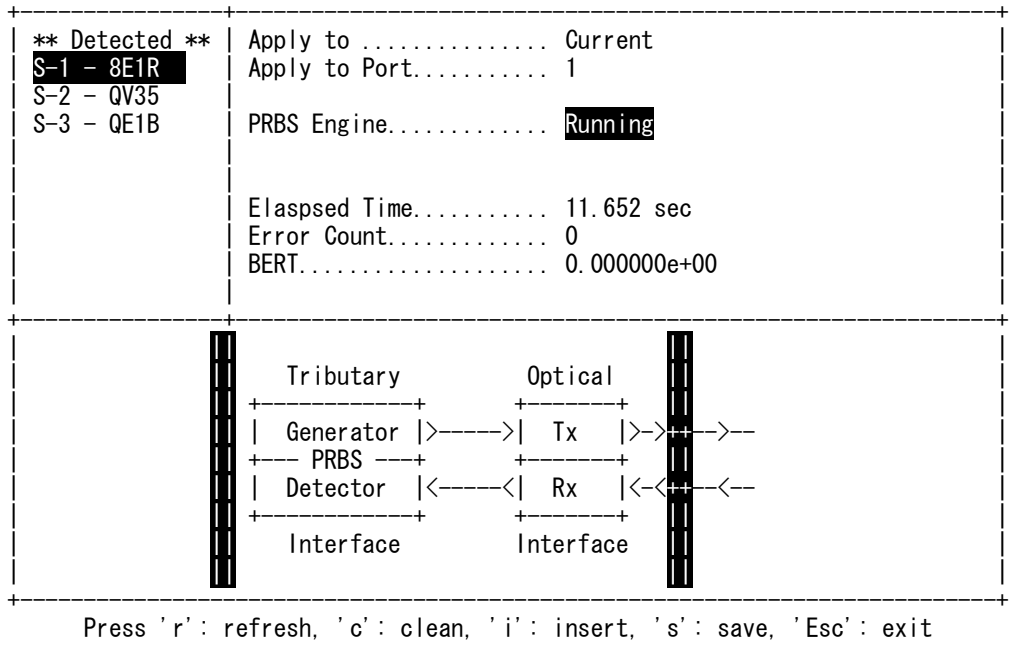
This screen operates the loop back functions. Enter through "Diagnosis Tools" -> "Loopback Operation".



At any time you can press "r" to reload setting, "s" to save the changes or "Esc" to exit without saving.

5. Tributary Diagnostics:

To Implement E1 self-diagnostic test, enter through "Diagnosis Tools" -> "Tributary Diagnosis".

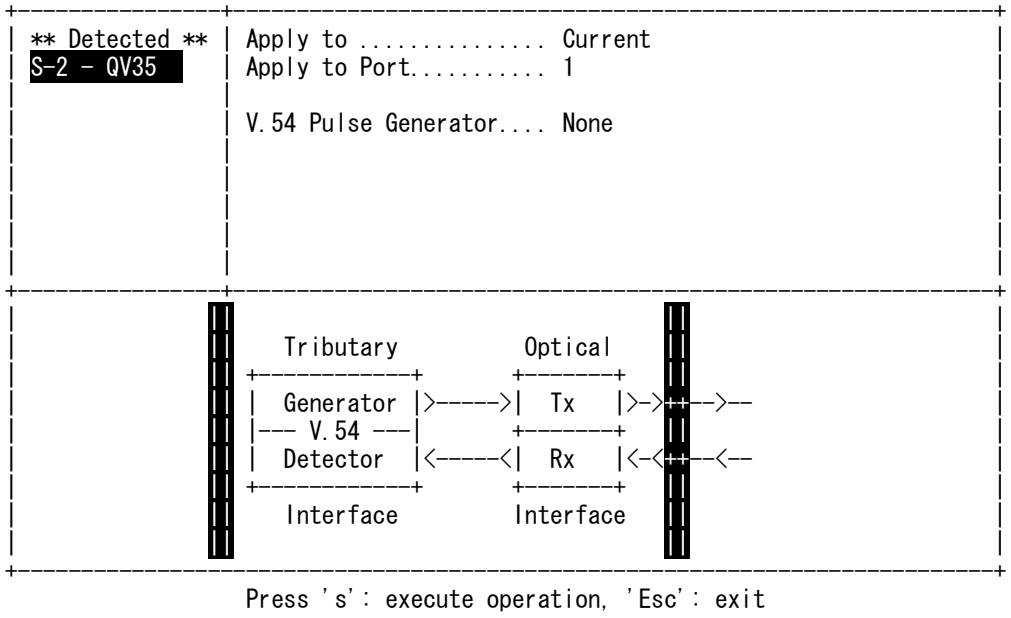


The above example illustrates the BER test on Slot 1 Port 1, an E1 channel.

At any time you can press "r" to reload setting, "c" to reset counter, "i" to insert a error, "s" to save the changes or "Esc" to exit without saving.

6. V.54 Diagnostics:

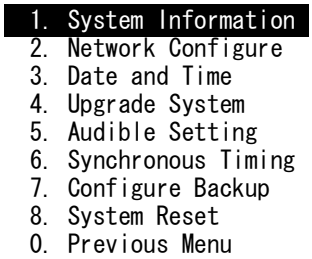
To implement V.35 self-diagnostic test, enter through "Diagnosis Tools" -> "V.54 Diagnosis".



Please press "s" to execute the command or "Esc" to exit without saving.

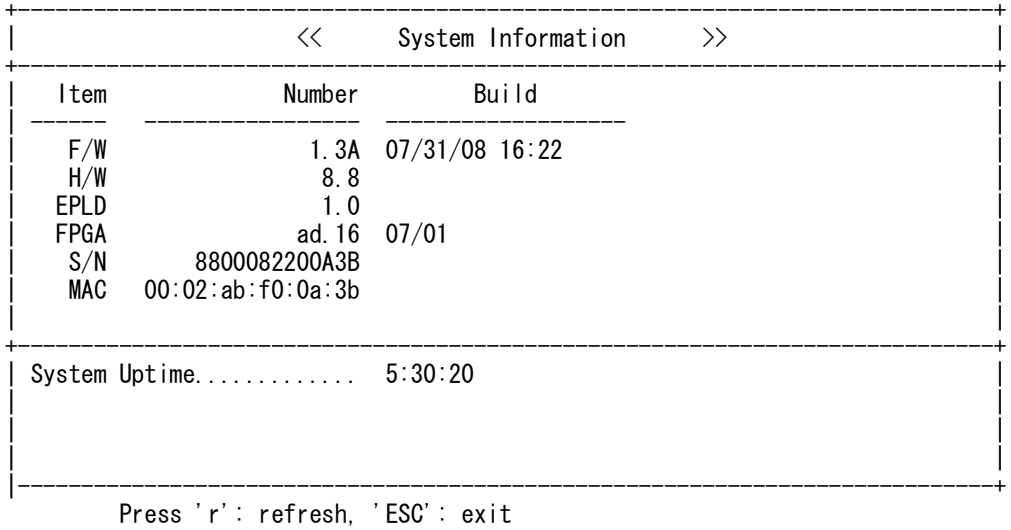
V. System Settings

There are "System Information" "Network Configure", "Date and Time", "Upgrade System", "Audible Setting", "Synchronous Timing", "Configure Backup", and "System Reset" sub menus under the System Settings.



1. System Information:

Used to retrieve the version of equipment and show the version information.



2. Network Configure:

Set the IP address of the equipment. Enter through "System Settings" -> "Network Configure". The following options are available

```
1. Host Network
2. SNMP Trap IP
3. SNMP Setting
0. Previous Menu
```

Host Network

Input the IP address, Netmask, and Gateway or Enable DHCP client. Then press [Enter] to complete the setting.

```
+-----------------------------------+
|[          Host Network           ]|
|                                   |
|        DHCP: Disable              |
|     Host IP: 192.168.0.161        |
|     Netmask: 255.255.255.0        |
|     Gateway: 192.168.0.254        |
|                                   |
+-----------------------------------+
|  < Save >          < Abort >      |
+-----------------------------------+
```

SNMP Trap IP:

Input the Trap IP 1 address, Trap IP 2, and Trap IP 3. Then press [Enter] to complete the setting.

```
+-------------------------------------+
|[           SNMP Trap IP            ]|
|                                     |
|    Trap IP #1: 192.168.0.73         |
|    Trap IP #2: 192.168.0.223        |
|    Trap IP #3: 0.0.0.0              |
|                                     |
+-------------------------------------+
|   < Save >           < Abort >      |
+-------------------------------------+
```

SNMP Community:

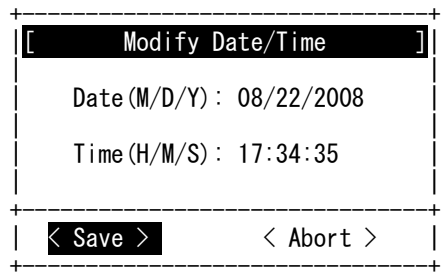
Input the Get (Read-only) Community, and Set (Write) Community. Then press [Enter] to complete the setting.

```
+-----------------------------------------------+
|[                SNMP Setting                  ]|
|                                               |
|    Get Community(    public):                 |
|    Confirm Get Community    :                 |
|                                               |
|    Set Community(   private):                 |
|    Confirm Set Community    :                 |
|                                               |
+-----------------------------------------------+
|      < Save >              < Abort >          |
+-----------------------------------------------+
```

3. Set Date/Time:

Set the date of the system. Enter through "System Settings" -> "Date and Time".

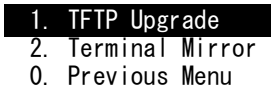
Select the date and time to set.



The user can modify the Date/Time by editing the data. Then press [Enter] to complete the setting.

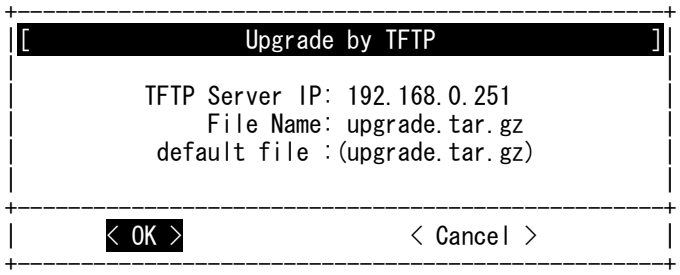
4. Upgrade System

The following options are available under upgrade system:



TFTP Upgrade:

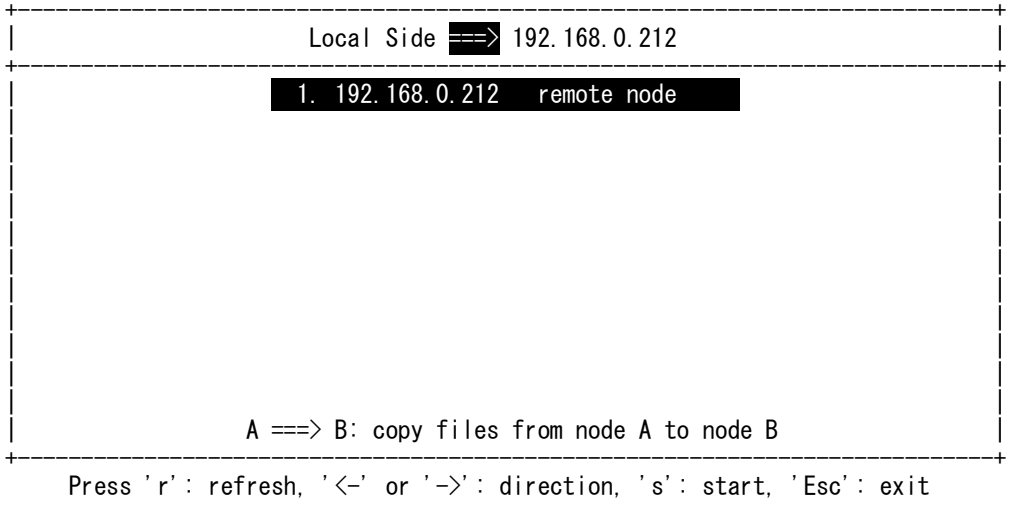
This option lets the user upgrade software using tftp server. The user must specify the IP address of the tftp server and the name of the file containing the software to upgrade:



Once <OK> is pressed the upgrade will proceed. It will take around 1 minute to complete.

Mirror Upgrade:

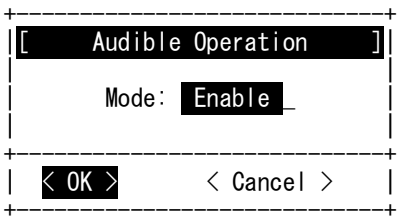
This option lets the user mirror software from node to node (remote upgrade). The user needs specify the mirror direction from/to local side by ←→:



Once "s" is pressed the upgrade will proceed. It will take around 3 minutes to complete a remote upgrade.

5. Audible:

This screen sets the mode of audible office alarm. Enter through "System Settings" -> "Audible Setting". Then select the mode.



The mode setting include:

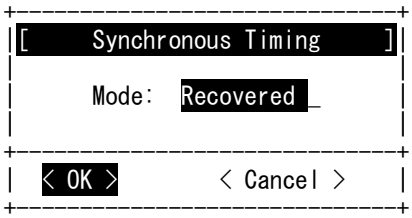
Disable: Disable this function;

Enable: Enable this function;

Cut Off: Turn off the sound. It will sound again if new alarm occurs.

6. Synchronous Timing:

This screen sets the mode of system clock. Enter through "System Settings" -> "Synchronous Timing". Then select the mode.



The mode settings include:

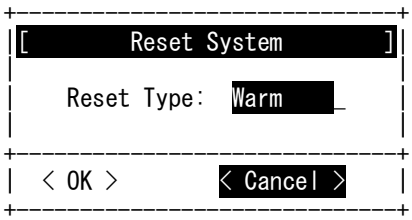
Free-Run: internal oscillator

Recovered: system recovers clock from optical interface.

7. Reset System

Enter this screen to do a system reset. Enter through "System Settings" -> "System Reset".

Select the reset method and then press [Enter] to execute the command.



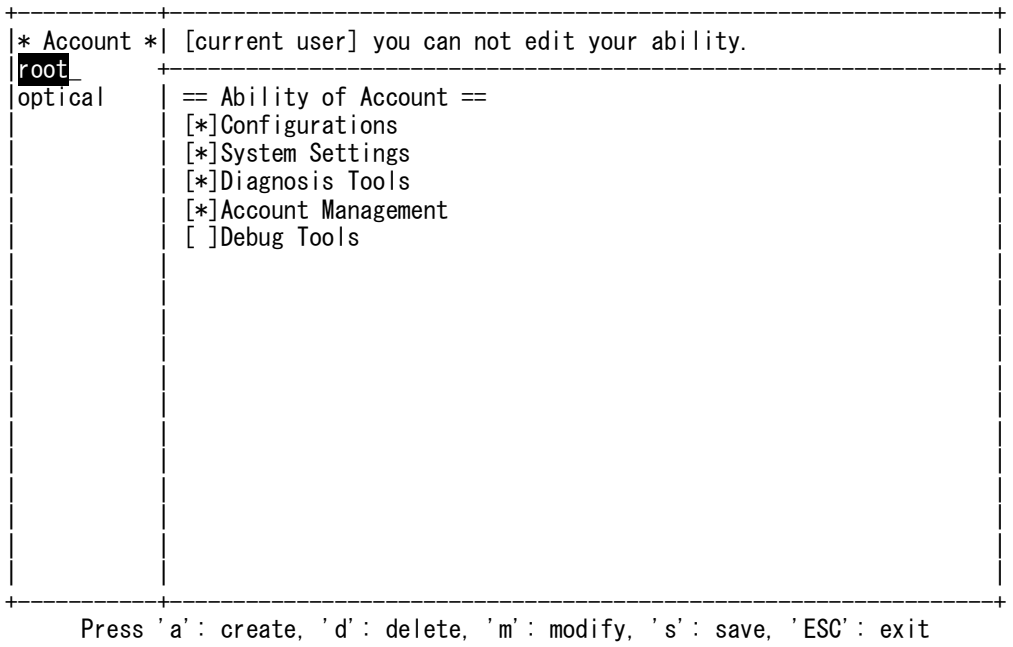
There are two available reset options as follows.

Warm: reset the system software without interrupting traffic. (Same as the RST button on the front panel)

Cold: reset the system hardware. It will impact the traffic.

Restore: When this option is taken, a cold start is performed and the backup system will be resorted after the restart.

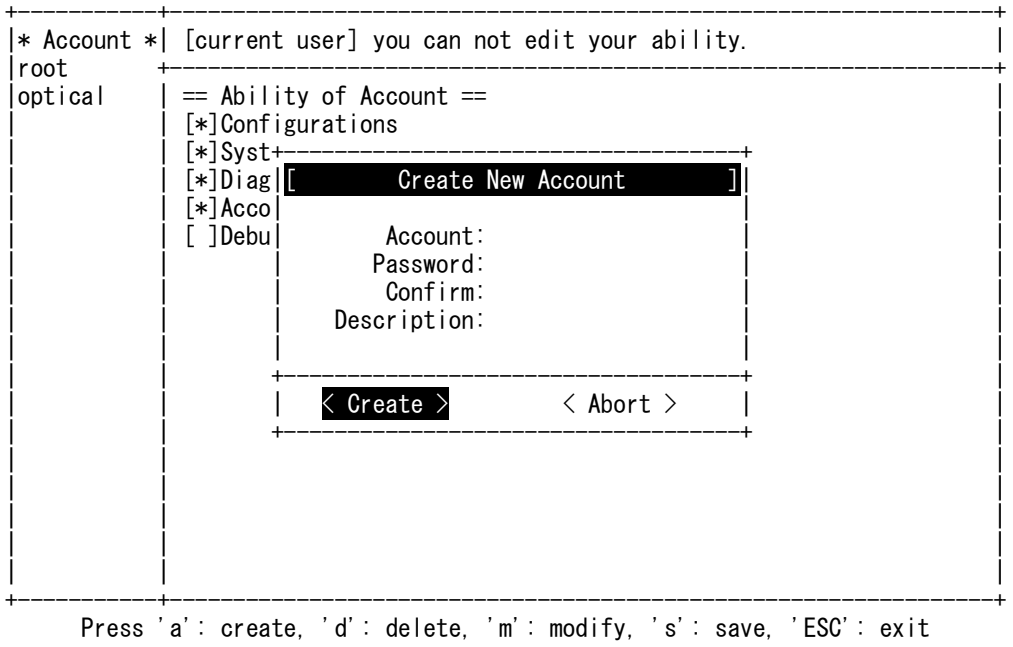
VI. Account Management



All user accounts will be shown in the left window. You can change account permissions in the right window. At any time you can press "a" to popup account creation window, "d" to popup account deletion window, "m" to popup account modification window, "s" to save the changes or "Esc" to exit without saving.

1. Add User Account

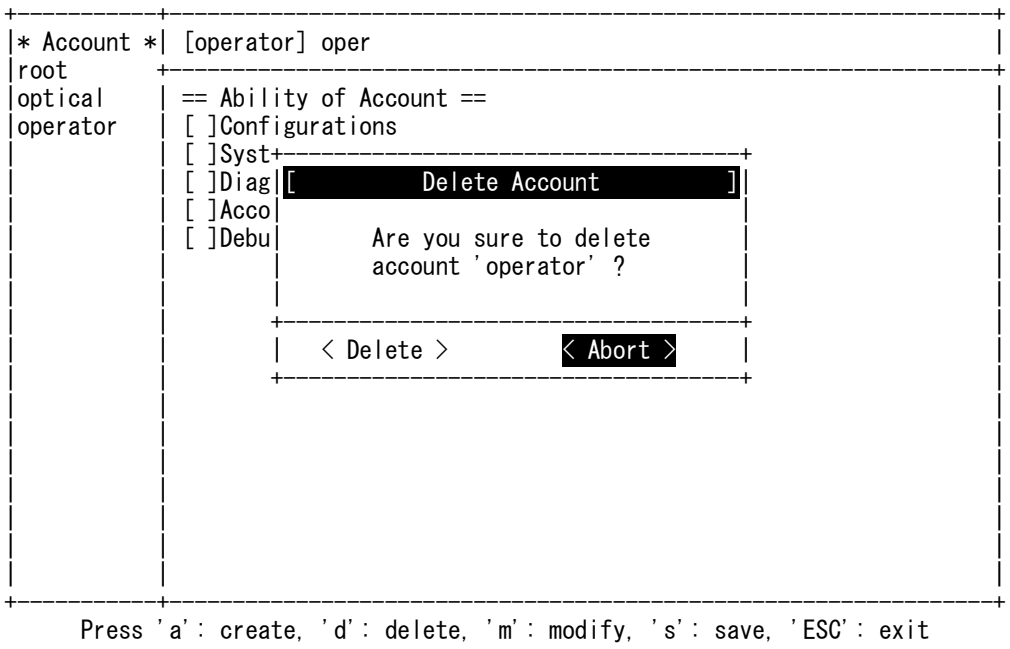
When selecting the "a" account creation, a popup window will appear. Fill in the user information, including name, password, confirm password and description.



The user is added after "Create" is executed.

2. Del User Account

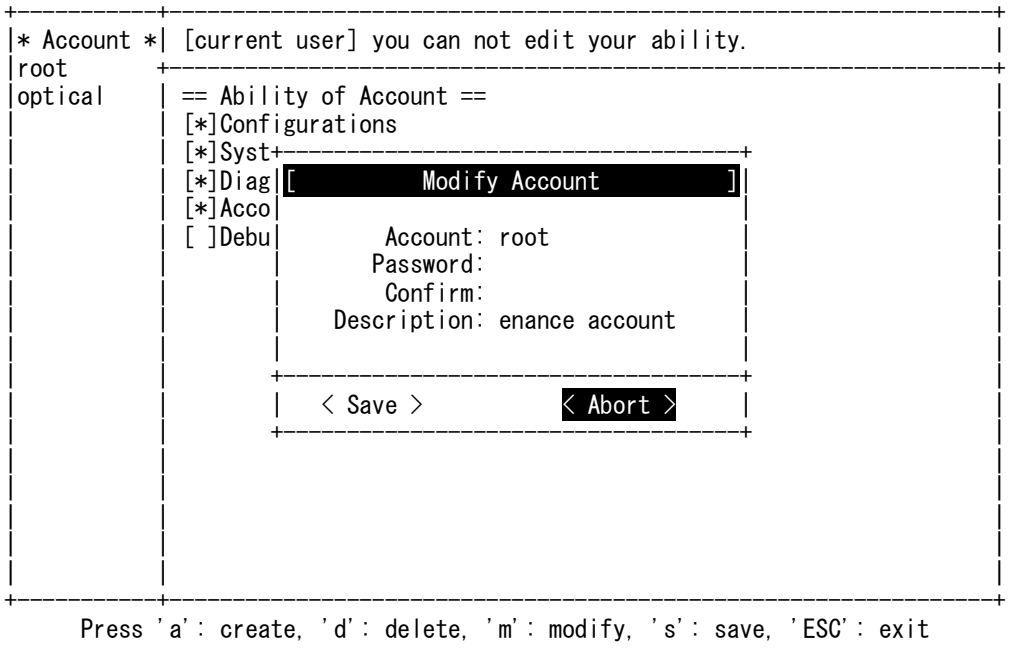
When selecting the "d" deletion creation, a popup window will appear.



After "Delete" is executed, the user is deleted.

3. Edit User Account

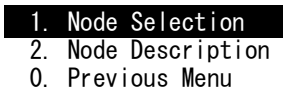
Select the user name you want to edit. When selecting the "m" account modify, a popup window will appear. Then edit the data of the user.



Execute "SAVE" to complete the editing after data input.

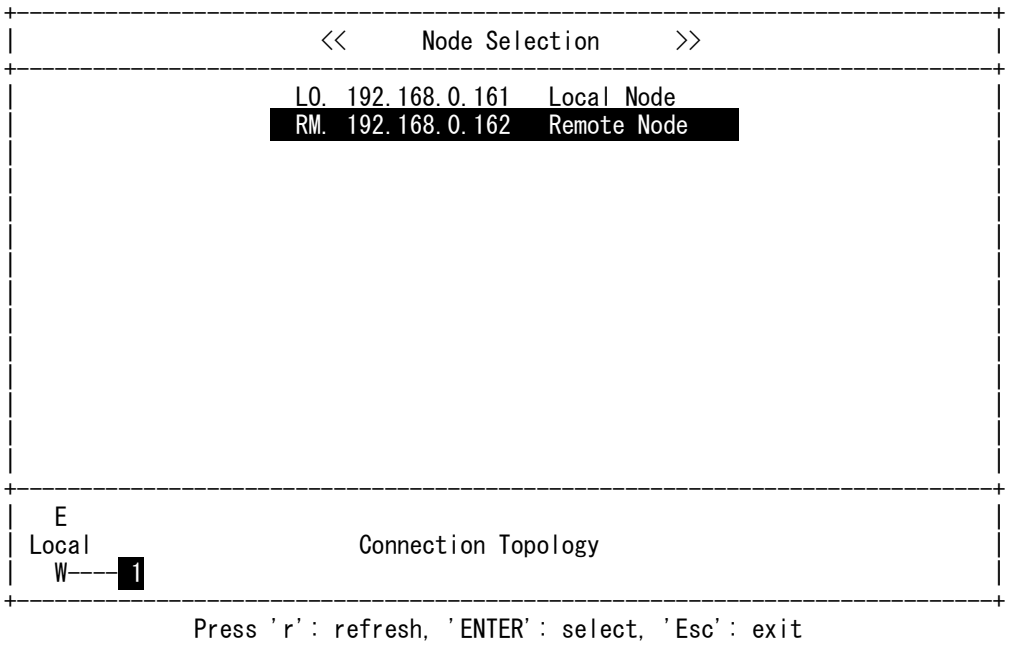
VII. Node Access

Under Node Access, the following options are available:



1. Node Selection

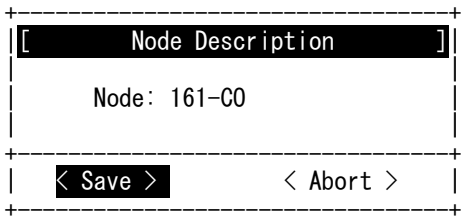
Under Node settings, set the site, local side or remote side, to manage by the Menu-Driven interface.



Press ↑↓ to select Local or Remote site. The name of site is shown on the top of the menu window to indicate the site under management. All the operations are done to this site after selection.

2. Node Description

Use this setup screen to give the SDH01A a system name. Edit the node field.

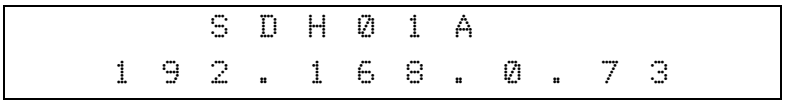


Execute "SAVE" to complete the save after data input.

Appendix C. LCD Operations

This section will explain the operations of the LCD interface.

The LCD has two rows and can display up to 16 characters per row on the panel.
UR: Upper Row; BR: Bottom Row



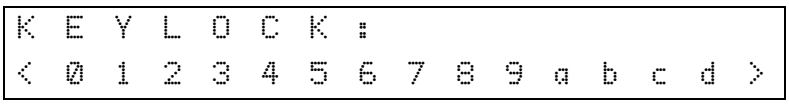
There are four keypads under the LCD panel: [ESC] [<=] [ENT+] [=>]
[ESC]: return to the previous view or abandon current operation
[<=][=>]: move cursor or select parameter
[ENT+]: select, execute, or change number

I. Operating Procedures:

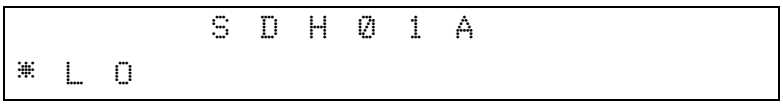
UR is the previous hierarchy items of BR. Use [<=] or [=>] to move and [ENT+] to select the item of BR. The item selected will show on UR. The number on the left is the position in the hierarchy. The character on the right of BR reminds you the next keypad to operate.

II. Key Lock Protection:

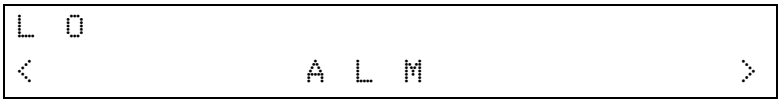
LCD is protected by key lock. After booting or if no key is pressed within 10 minutes, LCD will enter key lock mode. Unless you input the correct password, LCD will remain in key lock mode and enter normal operation mode. The default password is "6666". You can change the password by pressing [ENT+] and [=>] at the same time in welcome display (LCD shows model name and host IP). [ENT+] and [ESC] at the same time in welcome display can force LCD to enter key lock mode immediately.



Press the 'right arrow' key until the cursor is over the "6" character. Press the 'ENT+' key 4 times to login.



Once logged on, the user may select either the Local unit for configuration or the ReMote unit.



This screen shows the main menu; the top of the hierarchy in the menu scheme.

III. The Function Menu List:

ALM: (Alarm Management)
VIEW
CURR/HIST
ALL/SYS/OPT/E1/V35/ETH
RST
CURR/HIST
SEVER
OPT
LOS : CRITICAL / MAJOR / MINOR / EVENT
LOF : CRITICAL / MAJOR / MINOR / EVENT
AIS : CRITICAL / MAJOR / MINOR / EVENT
RDI : CRITICAL / MAJOR / MINOR / EVENT
E1
LOS : CRITICAL / MAJOR / MINOR / EVENT
AIS : CRITICAL / MAJOR / MINOR / EVENT
RDI : CRITICAL / MAJOR / MINOR / EVENT
V35
LOS : CRITICAL / MAJOR / MINOR / EVENT
AIS : CRITICAL / MAJOR / MINOR / EVENT
RDI : CRITICAL / MAJOR / MINOR / EVENT
ETH
LNKDWN: CRITICAL / MAJOR / MINOR / EVENT

PM: (Performance Data)
VIEW
OPT
Curr/Prev
QTR/HOUR/DAY
Line
LCV/LES/LSES/LUAS
Path
PCV/PES/PSES/PUAS
E1
Port Number
Curr/Prev
QTR/HOUR/DAY
Line
LCV/LES/LSES/LUAS
Path
PCV/PES/PSES/PUAS
RST
Curr/All
RMON
Slot Number
{RMON Data}
RMONRST
Slot Number

All/1/2/3/4/WAN

CFG: (Configuration)
SMRY
OPT
SVC: IS / OOS
ALS: Enable / Disable
DELAY: 60~300 sec
LPBK: None / Line / Term
E1
SVC: IS / OOS
MODE: E1
CODE: HDB3 /AMI
FRAME: Unframe
IMPED: 75-ohm /120-ohm
LBD:------
V35
SVC: IS / OOS
REF: Internal / External / Recovery
RATE: 1~32
FRAME: Unframe / PCM-31C / PCM-30C / PMC-31 / PMC-30
LLB: Normal/ Ignore
DTR: Normal/ Ignore
DTR: OFF / ON
RTS: OFF / ON
LPBK: None / Line / Term
ETH
SVC: IS / OOS
LINK: Up / Down
SPEED: 10M / 100M
DUPLEX: Half / FULL
FLOW: OFF / ON
PRIO: 0~3
GNAL
PSW: Revert / Non-Revert
WTR: 0~15 Min.
SWTCA: 1~9
SWSCALE: 10-5~10-9

OPT
ALL / 1
SVC: IS / OOS
TCARPT: Enable /Disable
ALS: Enable /Disable
DELAY: 60~300 sec
TCA
E1
ALL 1 2 3 4
SVC: IS / OOS
TCARPT: Enable /Disable

MODE: E1
CODING: HDB3/AMI
FRAME: Unframe
IMPED:75-ohm
LBO: ------
TCA
V35
ALL 1 2 3 4
SVC: IS / OOS
CLK: Internal / External / Recovery
FRAME: Unframe / PCM-31C / PCM-30C / PCM-31 / PCM-30
RATE: 1~32
LBK: Normal / Ignore
DTR: Normal / Ignore
ETH
ALL 1 2 3 4 WAN
CFG
SVC: IS / OOS
FLOW: Enable /Disable
PRIO: 0~4
VLAN
DBVLAN: Enable /Disable
PROVIDER: 0000~FFFF
DEF-VID: 0~4095
FORCE-VID: Enable /Disable
VLANPORT: 802.1Q Disable / Fallback / Check / Secure
EG-TAG: Unmodified / Untagged / Tagged
ING-TAG: None / Drop Untagged / Drop Tagged
EGRESS
EgressRate: 64K~100M
INGRESS
ING-ENA: Enable /Disable
ING-RATE: 64K~100M
ING-FLOW: Enable /Disable
UNKUNICAST: Unlimit / limit
UNKBCAST: Unlimit / limit
UNKICAST: Unlimit / limit
MULTICAST: Unlimit / limit
BCAST: Unlimit / limit
MGMT: Unlimit / limit
ARP: Unlimit / limit
BUCKET: 00~FF
CBS: 0000~FFFF
EBS: 0000~FFFF
ADVETH
TRUNK
PBVLAN
TAGVLAN
NEW / DEL / EDIT
ETHBW: 64K~100M

DXC
DEFAULT

DIAG: (Diagnosis Tools)
APS:
E□W / W□E
ALS:
Restart(2s) / Test(90s)
LASER: (Laser test)
OPT
LPBK
OPT
Term / Line
E1
Term / Line
V35
Term / Line
TRIB
E1
1 2 3 4
BER/ERR/TIME
View Result/ Run/Stop / Inject Error /Clean Result
V35
1 2 3 4
BER/ERR/TIME
View Result/ Run/Stop / Inject Error /Clean Result
V.54
V35
Activation/Termination
SYS: (System Settings)
INFO
F/W / H/W / EPLD / FPGA / S/N / MAC / UPTIME
NET
IP: (Set IP Address): {user keying}
MASK: (Set IP Mask): {user keying}
GATE: (Set Gateway): {user keying}
TRAP
TRAP1 / TRAP2 / TRAP3
COMMUNITY
SET / GET
TIME
{user keying}
UPG
TFTP
Tftp server IP: xxx.xxx.xxx.xxx {user keying}
Upgrade file: xxxx.tar.gz {user keying}
MIRROR:
L□R / R□L
AUDI:
Disable / Enable / Cut off

Synchronous:
Free-Run / Recovered
RST:
Disable / Enable / Cut off

NODE: (Node Settings)
{user keying}

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www.ctcu.com

T +886-2 2659-1021 F +886-2 2659-0237 E info@ctcu.com