USER MANUAL

SigmaLinks 2000/5000
Metro CWDM 6 Slot & 17 Slot Rack

CTC *union* **CTC Union Technologies Co., Ltd.**

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SigmaLinks
19" 5RU 17 Slot Chassis for CWDM.
19" 2RU 6 Slot Chassis for CWDM

User Manual
Version 0.9e Jan. 26 2007 Draft

This manual supports the following models:
SigmaLinks 5000
SigmaLinks 2000

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

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Chapter 1 Introduction

1.1 Introduction

Thank you for choosing SigmaLinks 2000/5000 CWDM (Coarse Wavelength Division Multiplexer), a transport technology whose cost-point and performance meet market demands. The SigmaLinks 2000/5000 has been designed to compete with carrier class products but at an affordable price, which allows metro customers to provide a powerful metro network solution. Due to the high price of DWDM systems, the call for CWDM products has been increasing, offering both low first-in cost and a quick ROI. Increased usable bandwidth equates to increased revenue, and this increase may be easily realized by investing in CWDM technology. Based upon the standards set forth in ITU-T G.695, the SigmaLinks 2000/5000 has been designed to fill the demand for a low cost, highly configurable, modularized CWDM design that includes options for redundancy and remote management.

1.2. Description

The SigmaLinks 2000/5000 series systems are high-performance, wavelength division multiplexers that provide bidirectional data communication. They are designed for communication over optical links in which different devices or applications are communicating over multiple fibers. Using wavelength conversion, several devices can communicate while being connected over one duplex fiber (two single fibers). The SigmaLinks 2000/5000 series systems expand the distance and application capabilities of existing local area networks (LANs), metropolitan area networks (MANs), and storage area networks (SANs). They are protocol-independent and can support virtually any fiber-optic device with speeds up to 2.5Gbps (STM-16/OC-48).

1.2.1 SigmaLinks 2000

The SigmaLinks 2000 is housed in a two rack unit (2RU) standard 19" chassis. The chassis are designed to hold two hot swappable power supplies of either auto-ranging AC (90-264VAC) or DC (18-56VDC or 36-72VDC) type. Minimally, one power module is required and may be either AC or DC. When two modules are installed, the supplies provide redundant power in case of single supply failure. Any power module type may be installed without restrictions. The Controller in the SigmaLinks 2000 is built-in and provides a local management interface (serial console) as well as providing power and environmental management. Two fans are built into the rear of the chassis and are managed by the Controller. Each chassis may hold up to 6 line cards, in any order or in any slot and all line cards are hot swappable.

6 Slots for Line Cards, Hot Swappable

Main Chassis 2RU 19 or 23" rack mountable

LED Indicators

Serial Console

Alarm Contacts

AC Power Module Hot swappable 90~264VAC

DC Power Module Hot swappable 18~56VDC or 36~72VDC

Cooling Fans
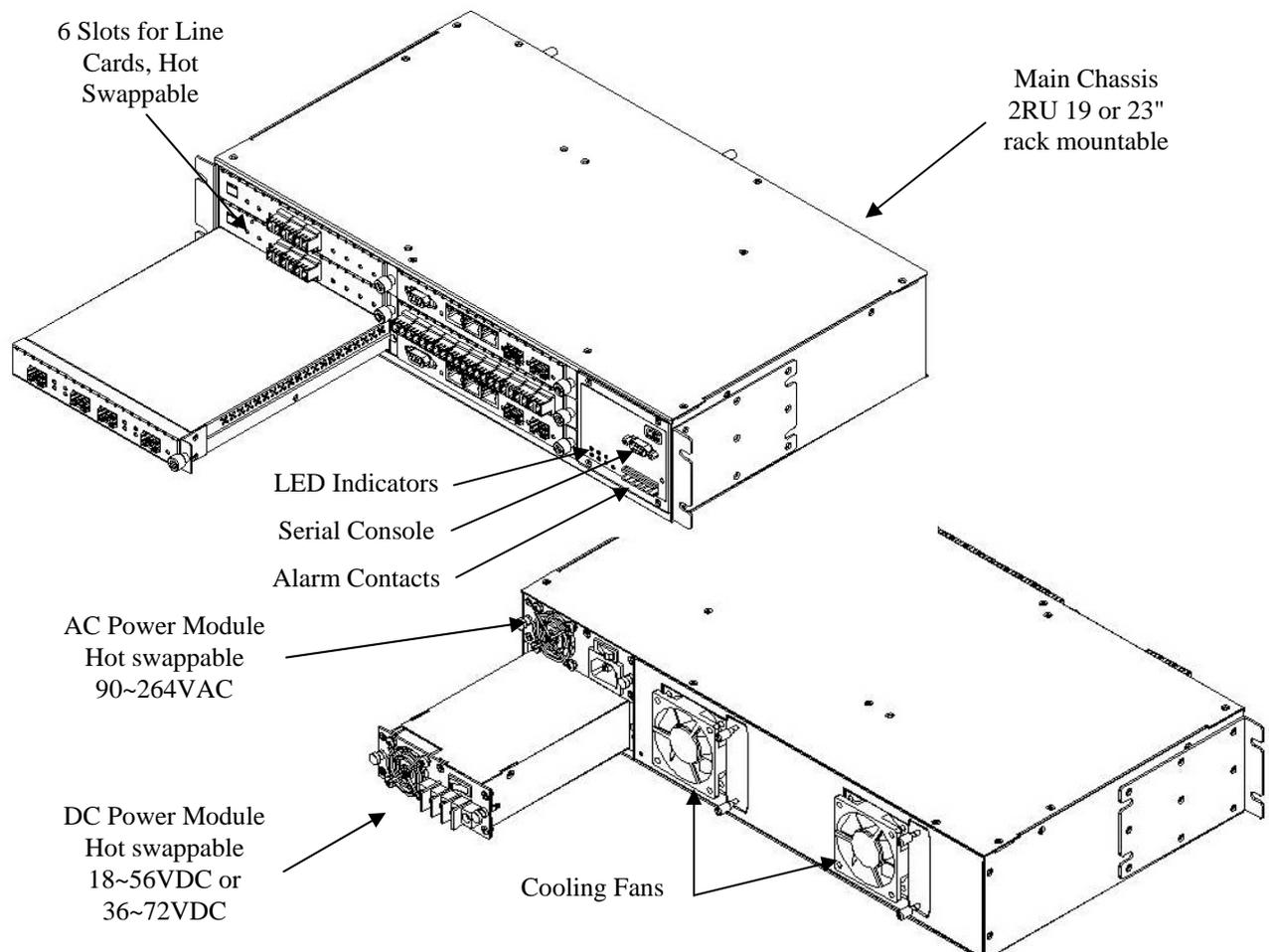
Figure 1. SigmaLinks 2000 Major Components

1.2.2 SigmaLinks 5000

The SigmaLinks 5000 is housed in a five rack unit (5RU) standard 19" chassis. The chassis are designed to hold two hot swappable power supplies of either auto-ranging AC (90-264VAC) or DC (18-56VDC or 36-72VDC) type. Minimally, one power module is required and may be either AC or DC. When two modules are installed, the supplies provide redundant power in case of single supply failure. Any power module type may be installed without restrictions. A Control Card is inserted into each rack to provide a local management interface (LCD and serial console) as well as to provide power and environment management. A fan module is inserted into the rear of the chassis and is managed by the Control Card. Each chassis may hold up to 17 line cards, in any order or in any slot and all line cards are hot swappable. The chassis is designed to be cascadable up to 6 chassis total or 102 slots. In the cascade configuration, only a single SMNP card is required in the master chassis to completely manage the entire system.

AC Power Module
Hot swappable
90~264VAC

Main Chassis
5RU 19" or 23"
rack mountable

Intelligent Fan
Field replaceable

Control Card
For local control via
LCD menu or Craft

DC Power Module
Hot swappable
18~56VDC or
36~72VDC

Line Cards
Hot swappable
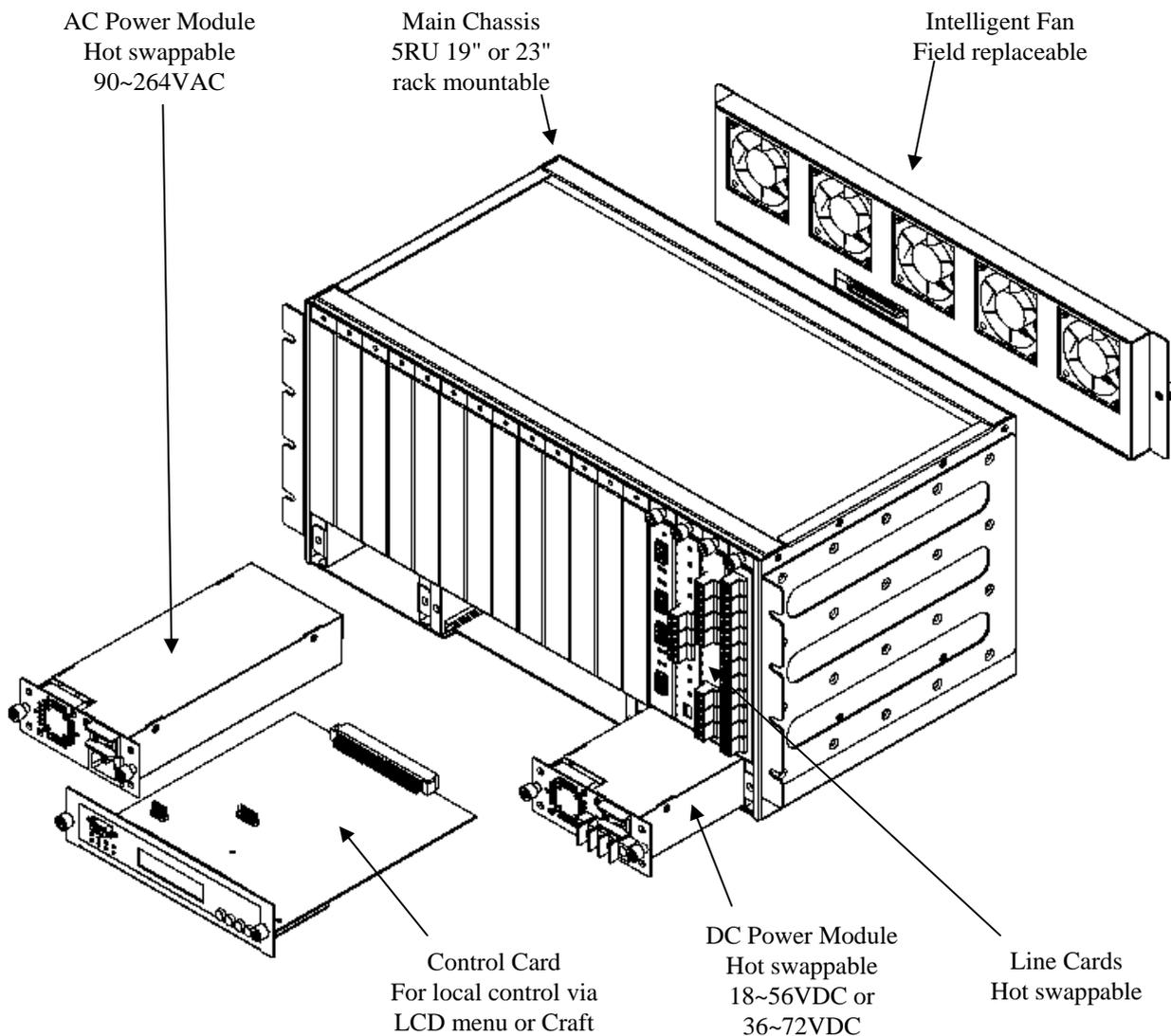
Figure 2. SigmaLinks 5000 Major Components

1.3 General Chassis Specifications

1.3.1 SigmaLinks 2000

Format:	2RU
Dimensions:	44.5cm wide x 8.9cm high x 25cm deep
Slot Capacity:	6 total (supports 5 Line cards + SNMP)
Power:	Modular/Redundant (90~264VAC, 18~56VDC or 36~72VDC module)
Fan Assembly:	2 x 60mm fans, temperature threshold activated, fault monitored, field replaceable.
Miscellaneous:	3 internal temperature sensors, Major/Minor Alarm contacts
Air Flow:	

The airflow system includes air intakes located in the face of each line card and field replaceable fans at the rear of the chassis. The chassis internal air temperature controls the activation of the fans, in auto mode. The state of the fans can either be observed through SNMP or it can be read off the fan LEDs on the controller on the front of the chassis. A red light signals that a fan is not working properly, which does not necessarily endanger the functioning of the air flow system because there is a backup fan. You can check the fan status on the display panel at the front of the chassis and through the serial console port and terminal connection. Refer to the SNMP Operation chapter for more information about fan observation using the SNMP card.

1.3.2 SigmaLinks 5000

Format:	5RU
Dimensions:	44cm wide x 22cm high x 25cm deep
Slot Capacity:	17 total (supports 16 Line cards + SNMP)
Power:	Modular/Redundant (90~264VAC, 18~56VDC or 36~72VDC module)
Fan Assembly:	5 x 60mm fans, temperature threshold activated, fault monitored, field replaceable.
Miscellaneous:	3 internal temperature sensors, rack ID switch, cascade connectors, Major/Minor Alarm contacts
Air Flow:	

The airflow system includes air intakes located in the face of each line card and a fan module with five fans at the rear of the chassis. The chassis internal air temperature controls the activation of the fans, in auto mode. The state of the fan module can either be observed through the SNMP module or it can be read off the fan LEDs on the control module on the front side of the chassis. A red light signals that a fan is not working properly, which does not necessarily endanger the functioning of the air flow system because there are backup fans. You can check the fan module status on the display panel at the front of the chassis and through the serial console port and terminal connection. Refer to the SNMP Operation chapter for more information about fan observation using the SNMP card.

1.4 Power Module Specifications

Dimensions:	90mm wide x 41mm high x 210mm deep
	Includes an integral 40mm cooling fan
	One power module is sufficient to power an entire chassis
AC model:	Input Voltage - 90 ~ 264VAC
	Input Frequency - 47 ~ 63Hz
	Output Voltage - 12VDC
	Output Current - 8.5A
	Output Power - 100watts
DC model-1:	Input Voltage - 18 ~ 56VDC
	Output Voltage - 12VDC
	Output Current - 8.5A
	Output Power - 100watts
DC model-2:	Input Voltage - 36 ~ 72VDC
	Output Voltage - 12VDC
	Output Current - 8.5A
	Output Power - 100watts

1.5 Introduction to CWDM

In 2001, CWDM technology was introduced to lower the cost of metro network deployments. As shown in Figure 3, CWDM uses wide (20nm) wavelength spacing and this enables the use of low cost un-cooled lasers and low cost thin film optical filters.

Figure 3. CWDM optical bands based upon ITU-T G.694.2

The SigmaLinks 2000/5000 uses the CWDM wavelengths in the S, C and L bands. Starting from the 1471nm band, 4 bands are used in the 4 channel MUX/DEMUX line card (1471, 1491, 1511, & 1531). In the 8 channel MUX/DEMUX line card, 8 bands are used (1471, 1491, 1511, 1531, 1551, 1571, 1591, & 1611). In the 4+1 or 8+1 MUX/DEMUX line cards, an additional 1310 channel is added for management use or as an additional transparent channel. The SigmaLinks 5000 follows the standards of ITU-T G.695.

1.6 Breakdown of Line cards for SigmaLinks 2000/5000

Model name	Generic Description
8140	4 channel MUX/DEMUX Line Card
8141	4+1 channel MUX/DEMUX Line Card
8180	8 channel MUX/DEMUX Line Card
8181	8+1 channel MUX/DEMUX Line Card
8011	1 channel Transponder, 1.25G, Line Card
8012	2 channel Transponder, 1.25G, Line Card
8021	1 channel Transponder, 2.5G, Line Card
8022	2 channel Transponder, 2.5G, Line Card
8210	Protection Card
9210	SNMP Card, Craft port, East/West 100Base-FX Fiber ports (SFP) plus 3-100Base-TX

Other line cards to be announced in the future.

1.7 CWDM Application

CWDM or Coarse wave Division Multiplexing differs from DWDM (Dense Wave Division Multiplexing) in the spacing and bandwidth of the optical carrier wavelengths (colors). The following application example shows a four channel point to point deployment. The 8012 Transponder cards provide the wavelength translation between the client side 1310nm equipment and the CWDM wavelengths of the 8140 MUX/DEMUX card. If the client side equipment supports industry standard SFP modules that are not digitally locked to a particular manufacturer's part, the CWDM wavelength SFP may be placed directly into the client equipment, thus eliminating the need for any transponder.
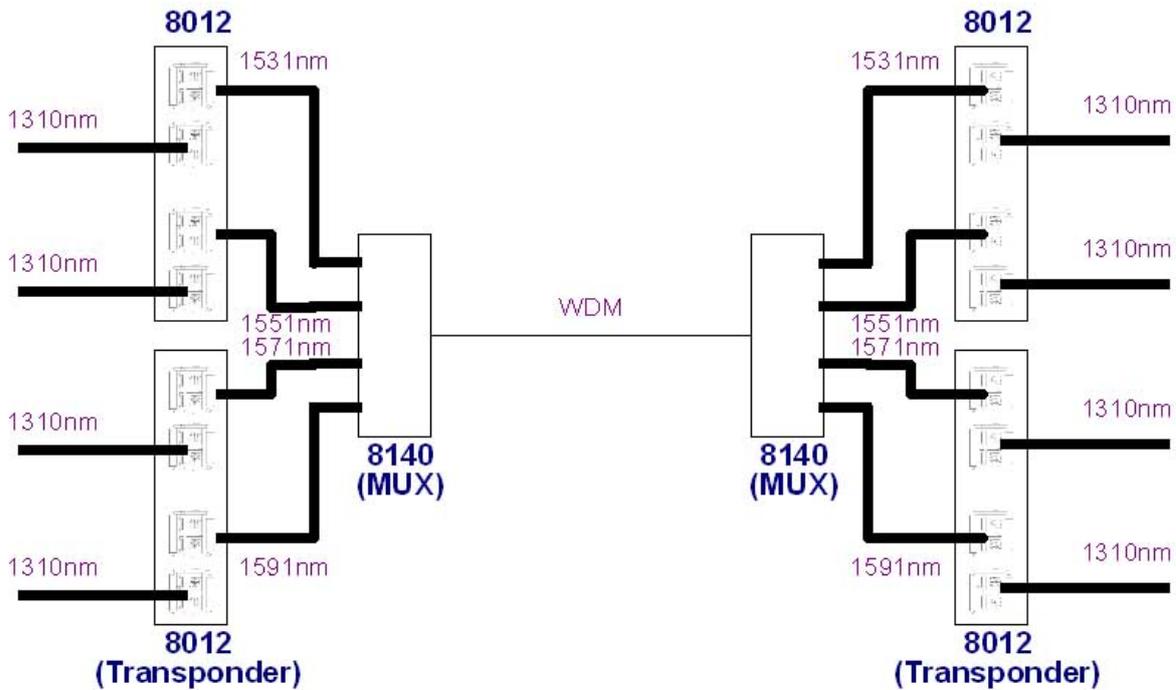

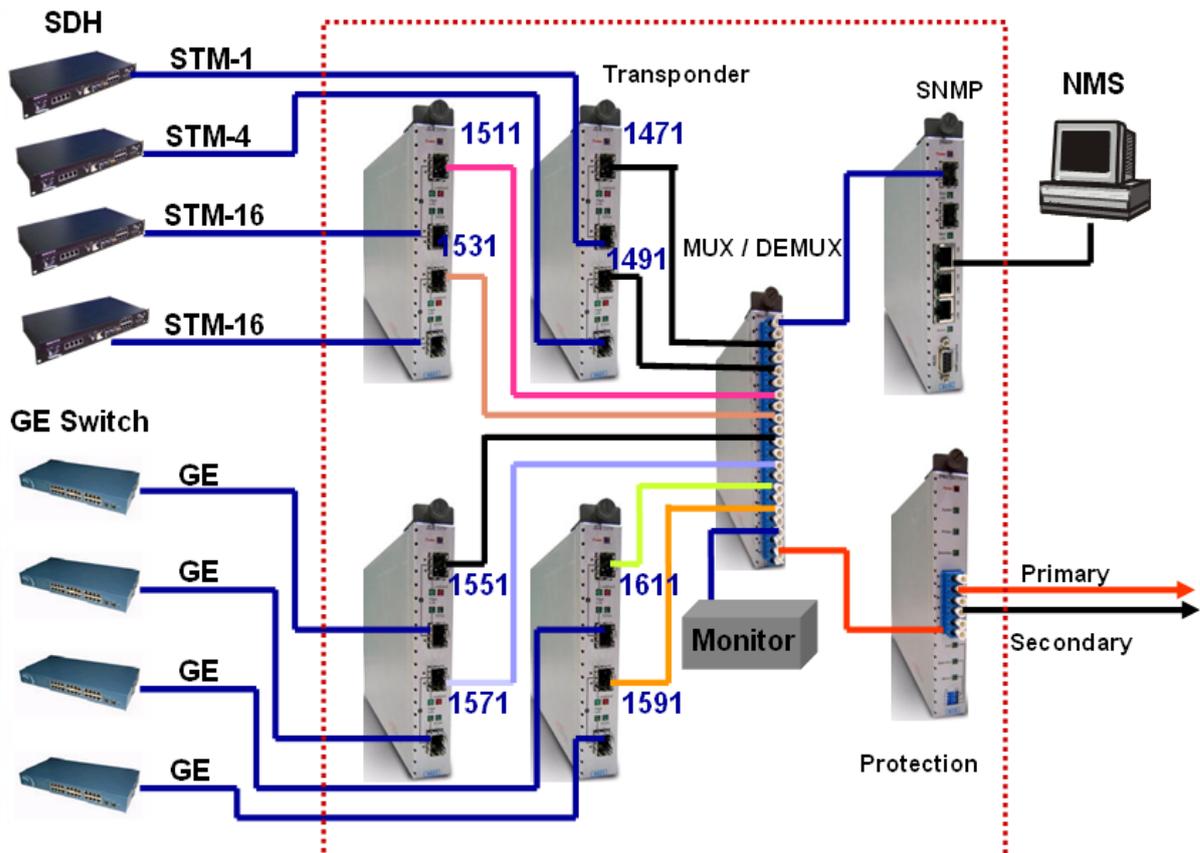Figure 4. 4 channel multiplex/demultiplex application.

Figure 5 Detailed physical connect of 8 channel CWDM with optical protection

1.8 Control Card

In the SigmaLinks 5000, the Control Card installs in the lower center of the chassis, between the power modules and provides the LCD and console interface to locally manage and configure the Chassis line cards. The Control Card also monitors the power supplies and chassis temperature to activate the chassis cooling fans when the internal temperature reaches a pre-defined threshold. The chassis fans may also be manually enabled via the LCD menu system. The Control Card may be hot swapped in the event of failure, allowing the chassis to continue normal transmissions. Every SigmaLinks chassis must have a Control card installed.

In the SigmaLinks 2000, the Control functions are built-in to the chassis and provide the console interface to locally manage and configure the Chassis line cards. The Controller also monitors the power supplies and chassis temperature to activate the chassis cooling fans when the internal temperature reaches a pre-defined threshold. The chassis fans may also be manually enabled via the serial control port menu system.

General Features:
LCD 16x2 with Back Light + 4 Menu Keys (5000 only)
Back Light control by software (5000 only)
Console Port, RS-232 async., DB9F (DCE), 19200bps,8,N,1
8 LEDs to indicate chassis status

LED Indicator Descriptions:
Power 1	(OFF)	= No Power Module inserted
	(Green)	= Power 1 Module Exists
	(Red)	= Power 1 Failure
Power 2	(OFF)	= No Power Module inserted
	(Green)	= Power 2 Module Exists
	(Red)	= Power 2 Failure
Power 1 FAN	(OFF)	= Normal
	(Red)	= Fail
Power 2 FAN	(OFF)	= Normal
	(Red)	= Fail
Chassis FAN	(OFF)	= Normal
	(Red)	= Fail
Major Alarm	(OFF)	= Normal
	(Red)	= Alert
Minor Alarm	(OFF)	= Normal
	(Yellow)	= Alert
Chassis Link	(OFF)	= No cascaded Chassis (5000 only)
	(Green)	= Next Chassis Link

Alarm Relay contacts: (6 pole Terminal Block)
Major Alarm *1
Minor Alarm *1

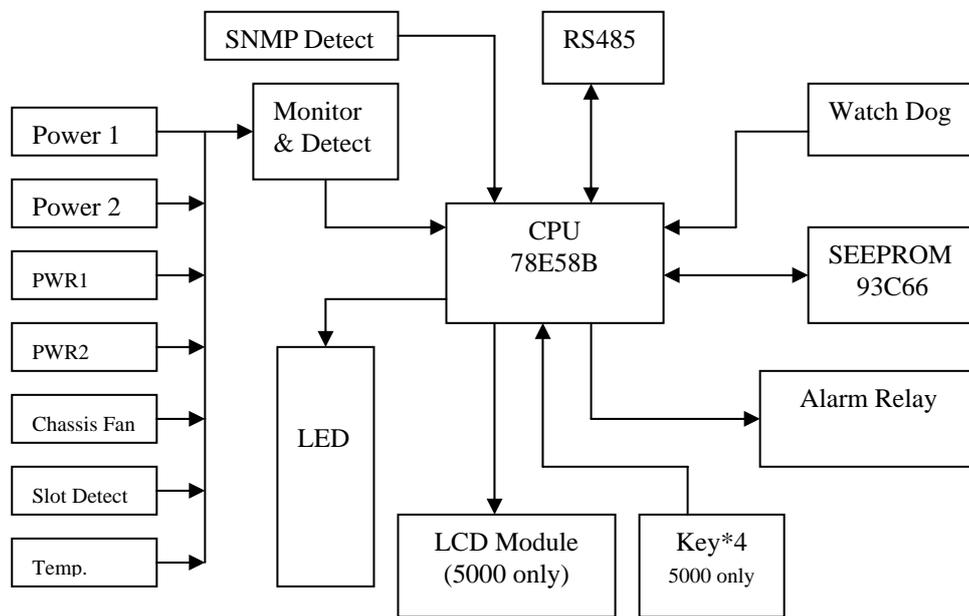*256 Bytes for Parameter storage*
Serial EEPROM (93C66)

System Status Monitor:
Power Module Status, Power Failure, Power Fan, Chassis Fan, [Chassis ID (5000 only)]

Controller will disable polling when SNMP Option exists.

Controller firmware can be upgraded from serial console port via Xmodem protocol.

The following is the block diagram of the Controller.

```
┌──────────────┐              ┌──────────┐
│ SNMP Detect  │              │  RS485   │
└──────┬───────┘              └────┬─────┘
       │         ┌──────────┐      │            ┌──────────────┐
┌──────────┐     │ Monitor  │      │            │  Watch Dog   │
│ Power 1  │────▶│ & Detect │      ▼            └──────┬───────┘
└──────────┘     └────┬─────┘  ┌──────────┐            │
┌──────────┐          └───────▶│          │◀───────────┘
│ Power 2  │──▶                │   CPU    │            ┌──────────────┐
└──────────┘                   │  78E58B  │◀──────────▶│   SEEPROM    │
┌──────────┐                   │          │            │    93C66     │
│  PWR1    │──▶                └──┬────┬──┘             └──────────────┘
└──────────┘                     │    │
┌──────────┐          ┌──────┐   │    │                ┌──────────────┐
│  PWR2    │──▶        │ LED  │   │    └───────────────▶│  Alarm Relay │
└──────────┘          │      │   │                     └──────────────┘
┌──────────┐          │      │   ▼         ▲
│Chassis Fan│──▶       └──────┘ ┌─────────┐ │
└──────────┘                   │LCD Module│┌─────────┐
┌──────────┐                   │(5000 only)││ Key*4   │
│Slot Detect│──▶               └─────────┘│5000 only│
└──────────┘                              └─────────┘
┌──────────┐
│  Temp.   │──▶
└──────────┘
```

1.9 MUX/DEMUX Line Card

The function of the MUX/DEMUX card is to provide the basic multiplexing and demultiplexing of the optical channels to and from the optical WAN.

Type Name: CWDM Mux/Demux, Model name: 81XX
General Features:
Channel: 4 channels.
                            4+1 channels.
                            8 channels.
                            8+1 channels.
Passive Module, Requires no power, (Rack type card type or stand-alone operation)
Utilizes industry standard ITU CWDM wavelengths
Wavelength:
                            4 channels, 1531,1551,1571,1591 nm
                            4+1 channels, 1311,1531,1551,1571,1591 nm
                            8 channels, 1471,1491,1511,1531,1551,1571,1591,1611 nm
                            8+1 channels, 1311,1471,1491,1511,1531,1551,1571,1591,1611 nm
Optical input/output monitoring port
Full native mode performance
Protocol transparent, no limitation
Optical connectors: LC connectors, Single Mode Fiber 9/125
Insertion loss:
                            4 channels <3.0dB
                            4+1 channels <3.5dB for CWDM wavelength
                            <1.5dB for 1310nm channel
                            8 channels <4.5dB
                            8+1 channels <5.0dB for CWDM wavelength
                            <1.5dB for 1310nm channel
Return loss: Min 45dB

Management Feature – Get Status (Only for rack type)
                            Card Exist status
                            Card Type, Example: 4CH, 4CH+1, 8CH, 8CH+1,with/without monitoring port
                            Line Card H/W, F/W version.
Management Feature – Set Configure
                            None
Power supply (when used stand-alone)
          Not required
Environment
          Operating temperature 0 to +60 Degree C
          Humidity 10-90% non condensing
          Storage temperature -40 to +80 Degree C
Mechanical Specification
          Dimensions XXXmm x YYYmm x ZZZmm
          Weight TBA

The following diagram shows the basic function of a MUX/DEMUX line card.

LC	1611nm	15		
LC	1591nm			
LC	1571nm			
LC	1551nm			
LC	1531nm			
LC	1511nm			
LC	1491nm			
LC	1471nm			
LC	1451nm			
LC				

1.10 TRANSPONDER Line Card

The function of the Transponder card is to provide the wavelength translation from the standard CWDM optical wavelengths to the client side's 1310nm or 1550nm optical wavelength. The Transponder card is provided without SFP plug-in modules. Plug-in modules are optional and may use any industry standard module depending on each individual application. The 8011 & 8021 (1.25G) transponder cards provide transparent conversion for gigabit services, while the 8012 & 8022 (2.5G) provides multi-rate conversion for any optical connection up to 2.5GHz (STM-16 or OC-48).

Type Name: CWDM Transponder, Model name: 80XX

General Features:
Channel:

      1 channel (1.25G / 2.5G). [8011 / 8012]
      2 channels (1.25G / 2.5G). [8021 / 8022]

Optical Connectors:

      SFP-LC (Line Side)
      SFP-LC (Client Side)

Line Side Wavelength: (depends on SFP transceiver module)
      1471 / 1491 / 1511 / 1531 / 1551 / 1571 / 1591 / 1611

Client Side Wavelength: (depends on SFP transceiver module)
      1310 / 1550

Management Features: (when placed in SigmaLinks Rack only)
  Get Status (Read)

      Card Exist Status
      Card Type (1 or 2 channel)
      Line card H/W, F/W version
      LED Status, Link Status
      Transceiver Type
      Parameters

  Set Parameters (Write)

      Tx Enable/Disable
      Diagnostic Loop back

LED Definitions:
Power LED	OFF (No Power), ON (power on)
Link LED (Line)	OFF (link loss), ON (link)
Link LED (Client)	OFF (link loss), ON (link)
Tx Active	OFF (Tx disabled), ON (Tx enabled)

Power supply (for stand-alone use)
      Power in DC 9~18V
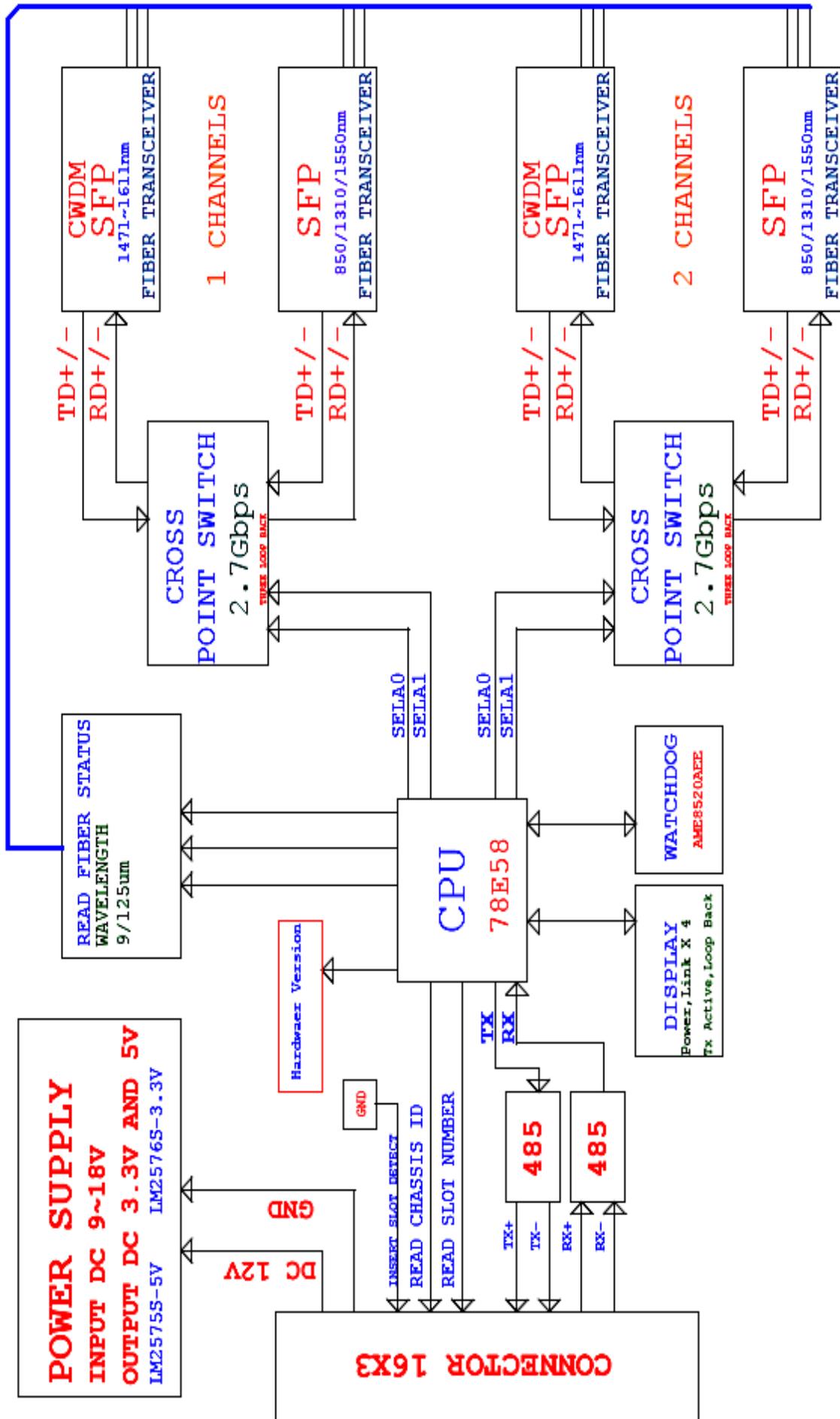   Power consumption <5W

Environment

      Operating temperature 0 to +60 Degrees C [32 ~ 140 Degrees F]
      Humidity 10-90% non condensing
      Storage temperature -40 to +80 Degrees C [-40 ~ 176 Degrees F]

Mechanical Specification

      Dimensions 161mm(H) x 25mm(W) x 220mm(D) [6 3/8" x 1" x 8 5/8"]
      Weight 860g [~2 lb.]

The following diagram shows the basic block diagram of a TRANSPONDER line card.

1.11 PROTECTION Line Card

The function of the Protection line card is to provide redundant operation of the WDM optical link. The protection card is placed in the signal path between the MUX/DEMUX line card and the primary and secondary (redundant), physical optical connections to the remote SigmaLinks chassis.

Type Name: CWDM PROTECTION, Model name: 8210

General Features:

1+1 full optic protection
Wide operating wavelength
Fast switching speed, <50ms
Low insertion loss
Low channel crosstalk
Highly reliable and stable
Low power consumption
Auto, semi- auto protection modes and manual control mode

Optical Connectors:

LC (Common Path)
LC (Primary Path)
LC (Secondary Path)

Management Features:
 Get Status (read)

Card Exist status
Card Type
Primary path link status, include optic power
Secondary path link status, include optic power
Switching function: Automatic/Semi-auto/Manual
Line Card H/W, F/W Version.
Front panel LED status, ON/OFF
Front panel DIP SW setting

 Set Configure (write)

Switching functions: Automatic/Semi-auto/Manual
Switching function in manual line select: Primary/Secondary
Detection level: -5 to -29 dB, Step = 2dB, 13 steps

LED indicators -

Blue   Power on
Green   System OK
Green   Work in primary path
Green   Work in secondary path
Green   Set in Auto mode
Green   Set in Semi-Auto mode
Green   Set in Manual mode

DIP switch settings:

SW-1	OFF	
	ON	Work in Auto mode.
SW-2	OFF	
	ON	If SW-1 is OFF, work in Semi-Auto mode.
SW-3	OFF	
	ON	If SW-1 and SW-2 are OFF, work in Manual mode.
SW-4	When mode set to manual mode,	
	OFF:	Work in primary path.
	ON:	Work in secondary path.

SW-1 to SW-3 must have one set to ON, if all are OFF, then the unit defaults to Auto mode; the SW-1 has highest priority. SW-1>SW-2>SW-3.

Specifications:

Protection mode	1+1
Switching type	Latching
Restoration time	<50ms
Durability	>10^7 cycles
Switching function	Automatic, Semi-auto, Manual
Input power range (TX)	+3 ~ -15 dBm
Input power range (RX)	-2 ~ -29 dBm
Detection range	-5 ~ -29 dBm (step = 2 dB)
Insertion loss	< 6.5 dB
Return loss	> 45 dB
Crosstalk	< -55 dB
Optical connector type	LC

Power supply (for stand-alone use)

Power in DC 9~18V
Power consumption < 10 Watts

Environment

Operating temperature 0 to +50 Degree C
Storage temperature   -20 to +80 Degree C
Humidity   10-90% non-condensing

Mechanical Specification
Dimensions   YYYmm x YYYmm x YYYmm
Weight   YYYkg

The following is a block diagram of the Protection line card.

1.12 OADM Line Card

The Optical Add-Drop Multiplexer line card provides the ability to add or drop, one or two lambda at an intermediate location between two main Mux/Demux equipped chassis.

Chapter 2 Installation

2.1 General

The Installation chapter will cover the physical installation of the SigmaLinks Chassis, the electrical connections, line card installation and cabling requirements. A brief overview of the functional components such as power modules, line cards and management options will also be outlined in this chapter.

Required Tools
You will need these tools to install the SigmaLinks:
- Number 2 Phillips screwdriver for the 3mm and the 12-24 chassis installation screws.
- Wrist strap or other personal grounding device to prevent ESD occurrences.
- Antistatic mat or antistatic foam to set the equipment on.
- Level (optional)

2.2 Unpacking

Step 1. Inspect the outside carton for any shipping damage and report immediately to your freight forwarder if any damage is visible.
Step 2. Place the shipping carton with the top facing up. Carefully cut through the shipping tape with a box cutter knife.
Step 3. Open the top cover of the carton and remove any pizza box.
Step 4. Pull the entire chassis straight up out of the carton, including the endcaps.
Step 5. Once the chassis is clear of the carton, you may remove the endcaps.
Step 6. The chassis should be wrapped in a plastic bag. Remove the chassis from the plastic bag. Set the chassis on a secure flat surface and again inspect for any shipping damage. Report any damage immediately to your freight forwarder.

2.3 Rack Mount Instructions

The rack mount brackets that ship with the SigmaLinks chassis allow mounting in either 19" or 23" wide rack spaces. A total of four different mounting configurations are possible. Please see the chassis top view graphics below.


Figure 2-1 Chassis mounting options

It is recommended that the SigmaLinks chassis be mounted into the rack cabinet prior to installing any required power modules and line cards. Without cards, the chassis is still quite heavy, but it can easily be installed by a single person.

WARNING!!: A fully loaded chassis is very heavy and unbalanced. Dropping a fully loaded chassis would result in severe damage to the chassis and line cards, as well has pose a serious safety hazard resulting in bodily injury to the installation personnel. Only trained and qualified personnel should be allowed to install, replace, or service this equipment.

2.4 Electrical Installation

WARNING!!: Proper polarity must be observed for DC power connections or severe electrical damage may occur to the chassis. Always confirm the polarity with a voltage meter before inserting line cards or powering on the mains switches.

With an AC power module, AC power is supplied to the SigmaLinks through a standard IEC 3-prong receptacle, located on the front of the module. With a DC power module, DC -48V is connected to the terminal block, observing the proper polarity. The SigmaLinks should always be grounded through the protective earth lead of the power cable in AC installations, or via the ground connection for DC installations.
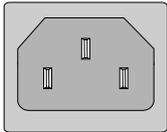
Left: Live line
Right: Natural line
Middle: Ground

-V GND +V

Figure 2-2 IEC AC power and DC terminal block connector pin assignment

2.5 AC/DC Power Module Installation

The AC and DC power modules for SigmaLinks are hot pluggable power modules that slide in and out of the chassis from the front on the SigmaLinks 5000 or from the rear on the SigmaLinks 2000. In the dual AC or dual DC chassis application, two AC or DC power modules may be installed. In the mixed AC+DC application, one AC and one DC power module are installed. The location, left or right does not matter. (Please refer to figure 2-3) The chassis is fully capable of being utilized with only one power module, however there is no redundant power protection if only one power module is used.
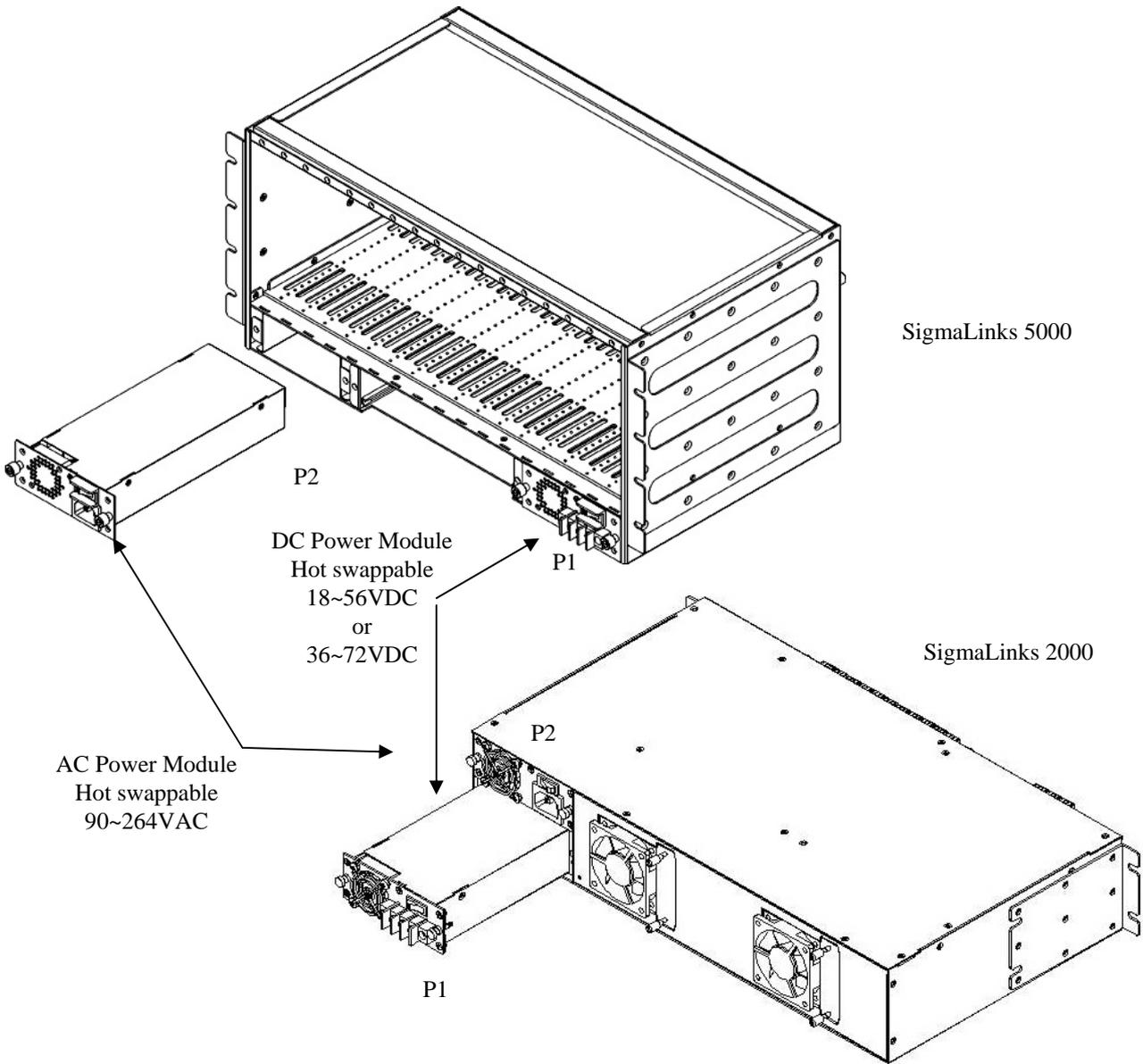
SigmaLinks 5000

P2

DC Power Module
Hot swappable
18~56VDC
or
36~72VDC

P1

SigmaLinks 2000

P2

AC Power Module
Hot swappable
90~264VAC

P1

Figure 2-3 Install the Power Modules into the SigmaLinks 2000/5000 chassis.

2.6 Control Card Removal / Replacement (5000 only)

The control card provides local control via LCD menu or serial console port, monitoring of chassis environment (temperature, voltages, etc.) and controls the automatic operation of the cooling fans. On the SigmaLinks 5000, the control card is located in the chassis front, lower-center, and is removed by loosening the two thumb screws and pulling the unit straight out by the thumb screws. Replacement is followed in the reverse order, align the card with the slot rails, slide it in, seat it and re-tighten the thumb screws. The SML2000 does not have a removable control card. The functions are fixed within the 2U chassis.
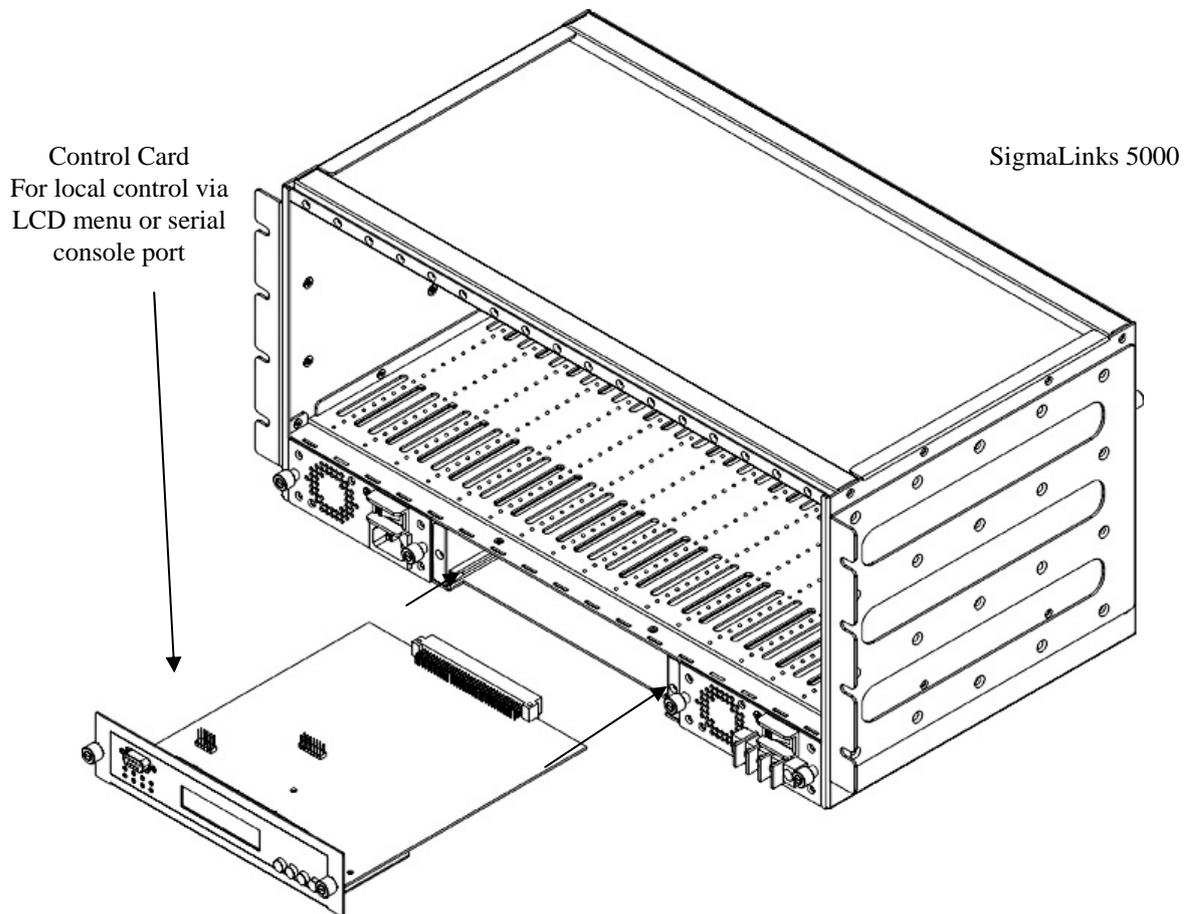
Control Card
For local control via
LCD menu or serial
console port

SigmaLinks 5000

Figure 2-4 Install the Control Card into the SigmaLinks 5000 chassis.

2.7 Installing a SigmaLinks Line Card

Use the following procedure to install a Line Card in the main chassis.

Step 1. Using either an anti-static grounded wrist strap or touching a grounded metal frame, remove the line card from its anti-static protective bag by grasping the metal panel. Do not touch the PCB or connector on the PCB.

Step 2. While still grasping the center of the front panel of the card with one hand, place the other hand under the card to support it.

Step 3. Slide the Line Card into the slot until it makes contact with the backplane.

Step 4. Gently press the card the remaining way into the backplane connector until fully seated.
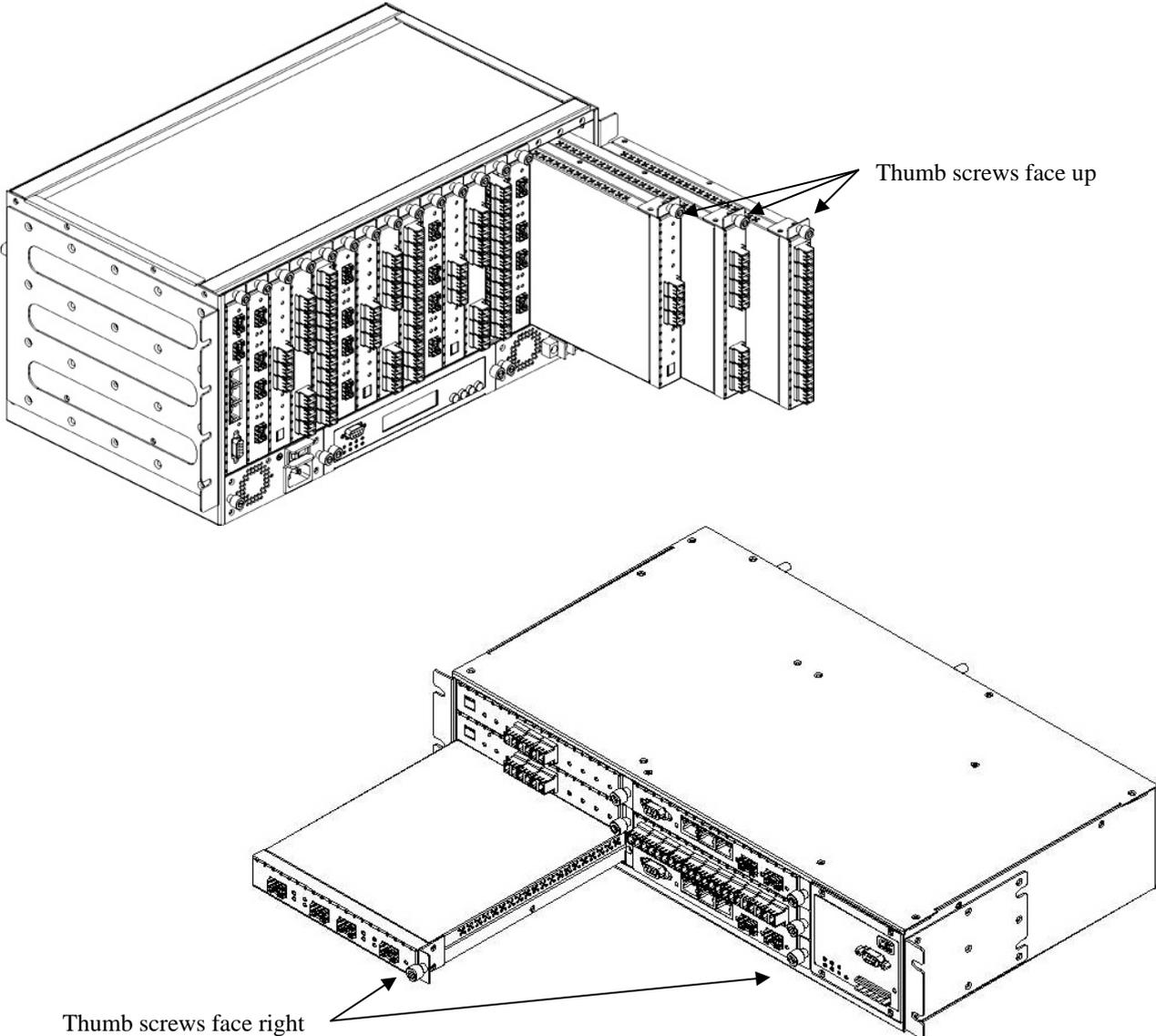
Step 5. Tighten the thumbscrew by hand.

Thumb screws face up

Thumb screws face right

Figure 2-5 Install Line Cards into the SigmaLinks 2000/5000 chassis.

2.8 Cooling Fan

The cooling fan unit in the SigmaLinks 5000 is a hot swappable, field replaceable unit (FRU). If any one of the five cooling fans should fail, routine maintenance may be scheduled and the entire FRU replaced at the customer's site in less than a minute. Then the failed FRU may be repaired with new fan at a repair center. The fan assembly is held with two thumb screws that are loosened to remove the assembly. Replacement requires aligning the connector, seating the assembly and re-tightening the thumb screws.
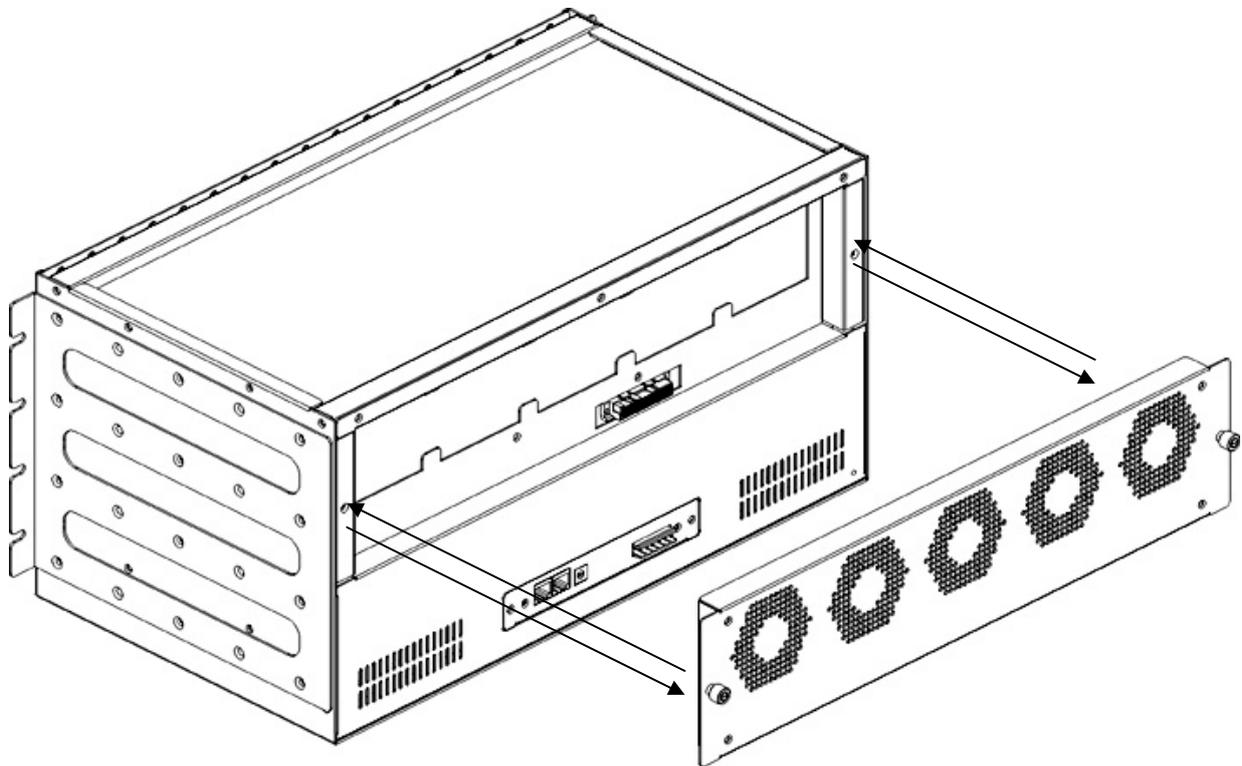
Figure 2-6 Replacing the fan assembly for the SigmaLinks 5000.

Figure 2-7 Replacing a fan in the SigmaLinks 2000.

2.9 Expansion Chassis

The SigmaLinks 5000 chassis may be stacked up to 6 chassis with monitoring and configuration done by a single SNMP card in the 'master' chassis. The below figure shows the 'master' chassis on top with ID set to '0'. The RS-485 bus output cascades to the next unit's input connector, with ID set to '1' and so on. Use any Cat. 3,4,5, or 6 Ethernet patch cable to connect the chassis. Use a straight cable (PC to HUB), not a crossover (PC to PC) cable.

Figure 2-8 Connecting multiple chassis by cascading, for the SigmaLinks 5000.

2.10 Alarm Connections

Chapter 3 Configuration and Operation

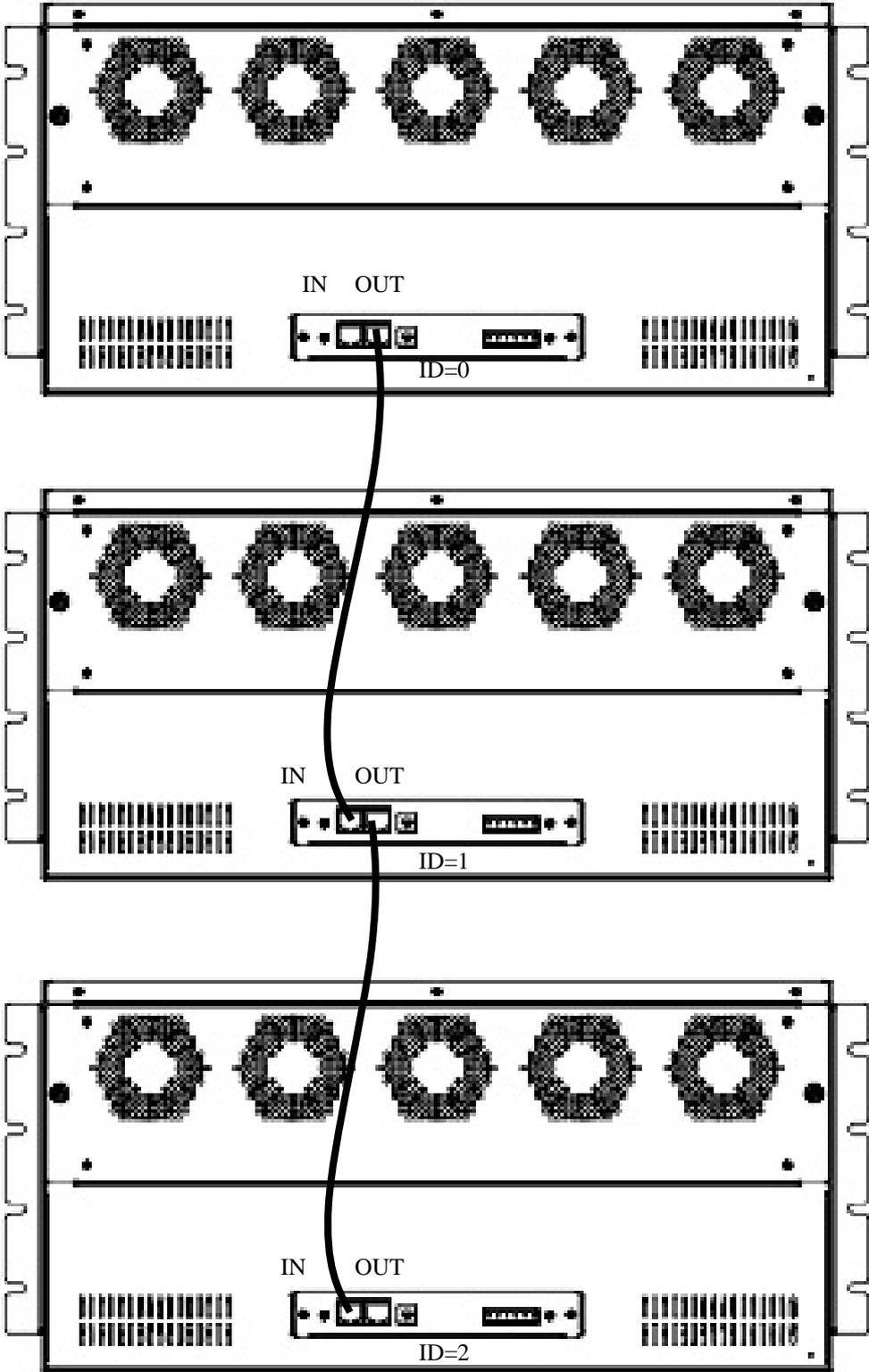This chapter will explain the configuration procedures for the SigmaLinks 5000, including the LCD/menu key operation and serial console operation. SNMP and Telnet operation are reserved for the specific chapter on SNMP.

3.1 LCD Menu Operation

The very first screen that displays after the unit has powered and initialized is the SigmaLinks Login screen.

```
S i g m a   L i n k s   5 0 0 0
   S Y S   L O G i n :
```

The default password is four zeros or '0000'. Pressing the Enter key will display a "0" in the first digit location. Using the arrow cursor keys will change the value in the range from zero to nine. Press Enter at the cursor location will accept the digit for that location and move to the next digit. Four digits are used for the password. Pressing Enter four times will enter the default password of '0000'.

```
S i g m a   L i n k s   5 0 0 0
   S Y S   L O G i n : 0 0 0 0
```

The menu will now display the 'Setting' menu set for the Chassis. The Chassis configuration includes reading the version number, setting the alarm relay functions, modifying the chassis password, and setting the LCD backlight.

```
◀ C H A S S I S   I D : 0 0   ▶
   S E T T I N G
```

```
◀ C H A S S I S   I D : 0 0   ▶
V e r : 1 . 0 4 - 0 . 2 - 1 . 1
```

This display indicates:
1. Controller firmware is version 1.04
2. FPGA is version 0.2
3. Hardware is version 1.1.

```
◀ C H A S S I S   I D : 0 0   ▶
   R E L A Y : A L L   O N
```

This setting can change the activation of the Alarm Relays. The settings are:
1. 'ALL ON' (all active)
2. 'MAJOR ON' (only Major alarms are active)
3. 'MINOR ON' (only Minor alarms are active)
4. 'ALL OFF' (no alarms will be indicated by the relays)

```
◀ C H A S S I S   I D : 0 0   ▶
M o d i f y   P a s s w o r d
```

This setting allows changing the default '0000' password to any number from 1 to 9999.

```
◄ C H A S S I S   I D : 0 0   ►
L C D   L I G H T : O N
```

The setting for the LCD back light may be changed as follows:
1. 'ON' (the back light will remain on permanently)
2. 'OFF' (the backlight will remain off permanently)
3. 'AUTO' (the backlight will automatically shut off after a period of keyboard inactivity)

The next major menu item is the Power Modules. There is an item for both module 1 & 2. The display can show the module type installed in the slot, if any, the status of the power module and the speed of the fan in the power module.

```
◄ P O W E R   M O D U L E   1 ►
  A C 9 0 - 2 6 4 V / 1 0 0 W
```

There are three module types for the SigmaLinks 2000/5000. One AC type and two DC types:
1. 'AC90-264V/100W' (the universal AC power module)
2. 'DC18-56V/100W' (the DC module that covers both 24V and 48V DC power)
3. 'DC36-72V/100W' (this is a special module for higher voltage for central office power up to 72VDC)
4. 'EMPTY' (the slot has no power module installed)

```
◄ P O W E R   M O D U L E   1 ►
◄ O U T : N O R M A L         ►
```

If a power module is installed, the power output status can be determined from the display.
1. 'OUT:NORMAL' (the power supply is putting out power normally)
2. 'OUT:FAULT' (the power supply has no output, check if it has power source and is switched on)

```
◄ P O W E R   M O D U L E   1 ►
◄ F A N :     7 9 2 0   r p m ►
```

The speed of the fan in the power module is displayed in revolutions per minute (rpm). If the fan is not spinning, it will read 0 rpm.

The next major menu item is for monitoring and setting the cooling fans in the SigmaLinks chassis.

```
◄     F A N   M O D U L E     ►
    5   F A N s   T Y P E
```

The SigmaLinks 5000 has a 5 fan type cooling system, while the SigmaLinks 2000 has 2 fans. The display will show the current operating RPM for each fan automatically, one at a time.
FANx: xxxx rpm

The very last major menu item dealing with the chassis monitoring and functions is temperature. There are three temperature sensors located in the chassis, in the left, center, and right. The temperature is monitored and displayed in degrees Celsius.

```
◄     T E M P E R A T U R E     ►
      M O N I T O R I N G
```

Press the enter key.

```
◄    L F   C E N T E R   R T    ►
   + 2 3 C   + 2 4 C   + 2 2 C
```

The temperatures in the left, center, and right, as viewed from the line card side of the rack, are displayed.

```
◄    T E M P E R A T U R E      ►
     H I G H :  + 4 0 C
```

These threshold settings are set in the program code and conneot be changed by the end user. They can be viewed here for reference.
1. 'HIGH' (when any sensor reaches +40C, the cooling fans will start if they are set to Auto.)
2. 'OVER' (If a temperature sensor should reach +50C, an over-temperature alarm will be triggered.)

If we continue browsing through the top level menu screen, we will find all the slot IDs in the chassis. For the SigmaLinks 5000, there are 17 slots which will be displayed from 17 on down to 1. For the SigmaLinks 2000, there are only 6 slots to display.

Here is an example of an empty slot:

```
◄ S L O T   # 1 7 :            ►
  E M P T Y
```


Displays for SigmaLinks Line Cards

```
◄ S L O T   # 1 4 :  8 0 1 2    ►
2   T R A N S P O N D E R 1 2 5
```


This display identifies a 2 channel transponder card, model 8012, supports up to 1.25Gbps. Other cards include:
1. '2 TRANSPONDER25' 2 channel tranponder, model 8022, supports up to 2.5Gbps.
2. '8+1 MUX/DEMUX m' 8 lambda multiplexer/demultiplexer.
3. '4+1 MUX/DEMUX m' 4 lambda multiplexer/demultiplexer
4. 'Protection' model 8210 protection card
5. 'OADM' this optical add-drop, model 8324

3.2 Serial Console Operation

3.2.1 Configuring HyperTerminal

3.2.1.1 Introduction

HyperTerminal™ is an accessory program provided with the basic Windows® operating system. The purpose of this document is to describe the setup, configuration and to verify proper operation of the terminal program for later use in accessing console configuration ports of various devices.

3.2.1.2 Program Startup

To start the HyperTerminal program, click the Window's "Start" button and follow the path Programs => Accessories => Communications => HyperTerminal.
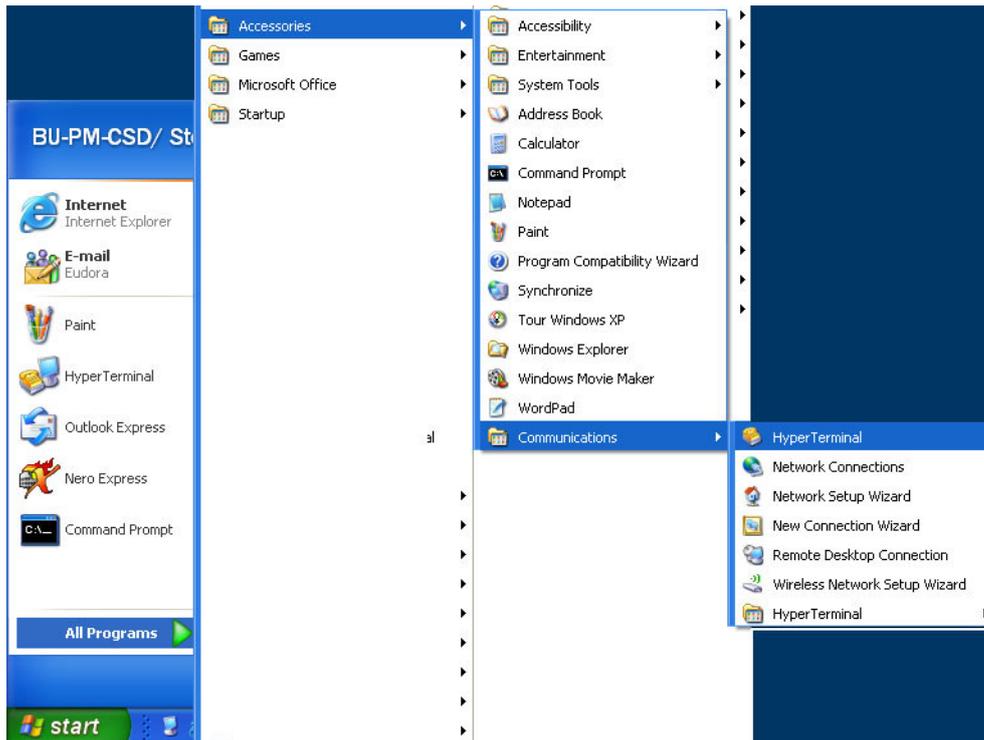
Once you have started HyperTerminal you will need to create a Connection Description for it. In our case, we want a serial terminal that connects through COM1 of the PC. Proceed as follows:
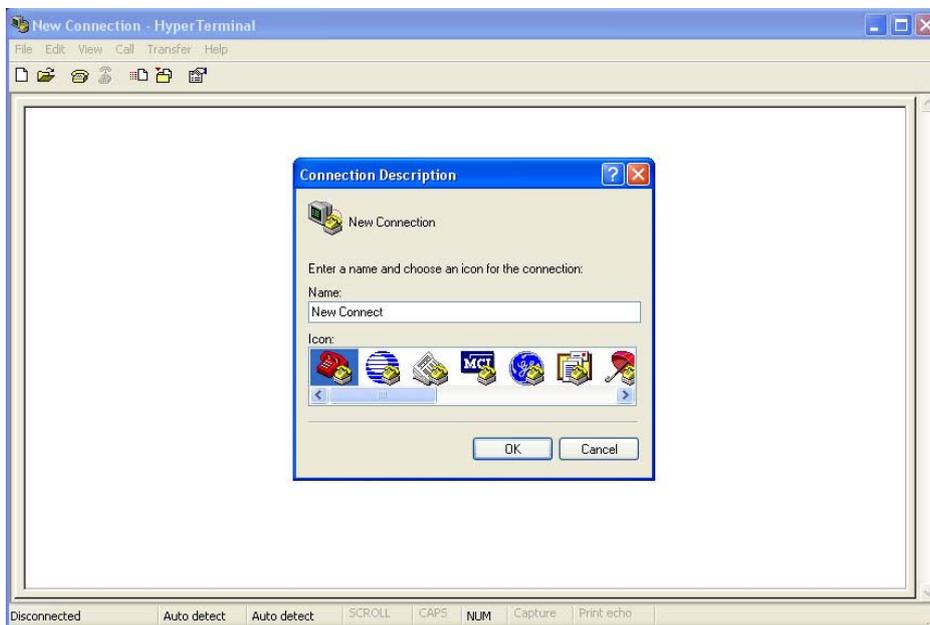
Select any Icon, key in a Name for this connection (New Connect in our example), then click the 'OK' button.

3.2.1.3 Creating a Connection
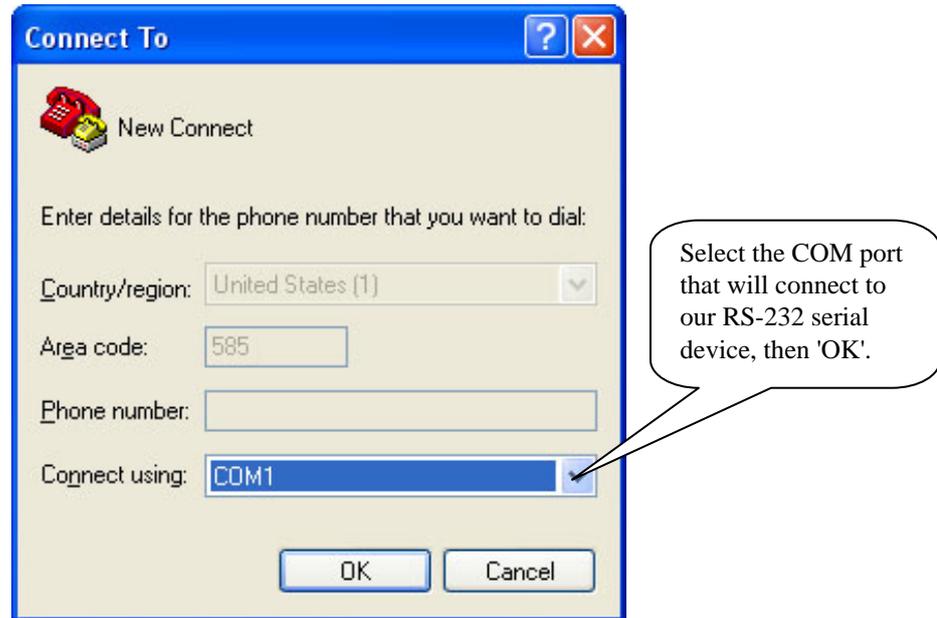
In our example, we will select "COM1" for our connection. If your COM1 is occupied then select COM2. For notebooks that use a USB to Serial adapter, please check the Device Manager to see which COM port has been assigned to the adapter and use that COM here.

3.2.1.4 Configure Communication Properties
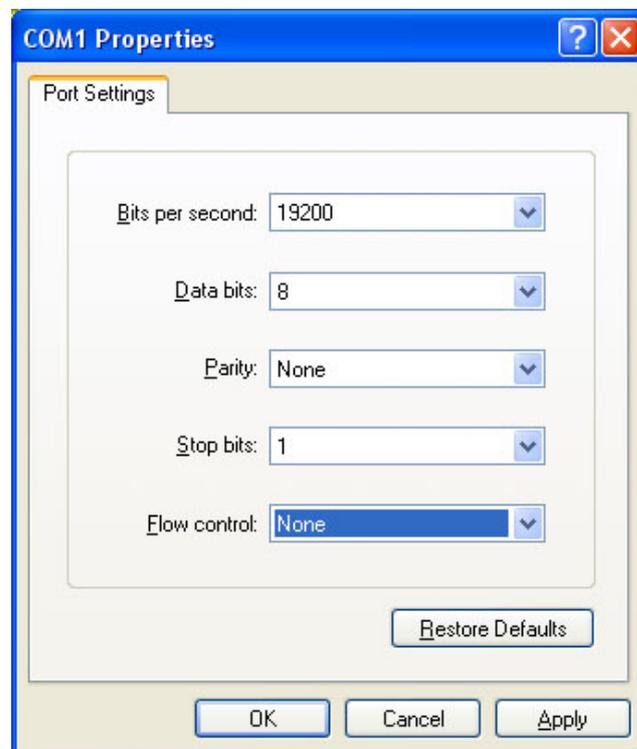
You will now be presented with the "COM Properties" dialogue box. In our example, we need to set the baud rate to 19,200. Select the baud rate (19200), Data bits (8), Parity (none), Stop bits (1) and no flow control. Click the 'OK' button.

Fully Configured HyperTerminal Window
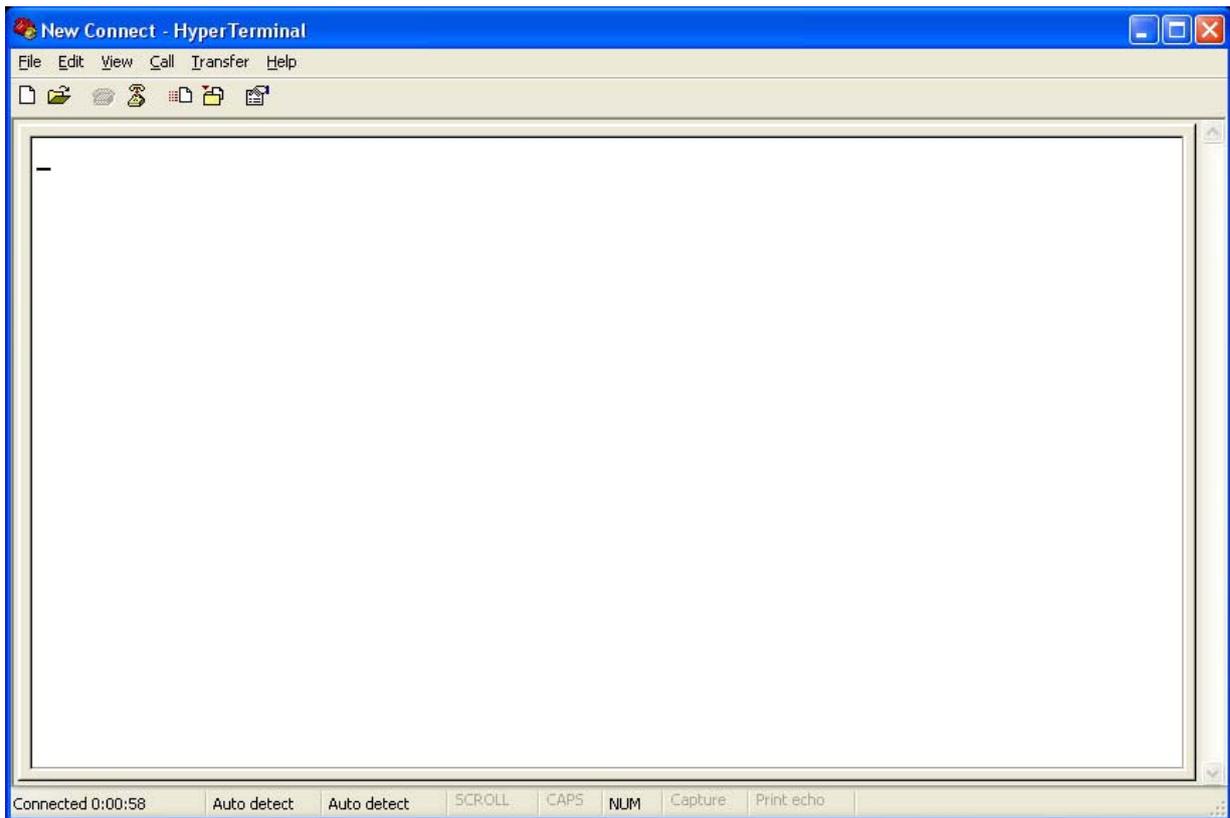
This is the terminal window. Note the pull down menu items (File, Edit, View, Call, Transfer, & Help) above the function icons. The main terminal window is empty. The connection status is displayed in the footer of the window.

3.2.1.5 Confirm Terminal Operation

Now we will do a quick functional test before we actually use the terminal with our equipment. Locate the COM1 port connector on the back of the PC. It should be a DB9 male connector. Short pins 2 & 3 together to create a physical loop back. (We loop the Tx signal back to Rx on the same port.)
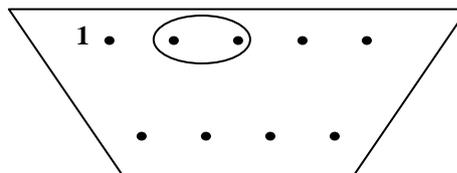
RS-232 DB9M Loop Back

Now type characters from the PC keyboard. They should "echo" back. Each character should display as typed.

```
New Connect - HyperTerminal
File  Edit  View  Call  Transfer  Help

the quick brown fox jumped over the lazy dog_
```

Connected 0:00:54   Auto detect   19200 8-N-1   SCROLL   CAPS   NUM   Capture   Print echo
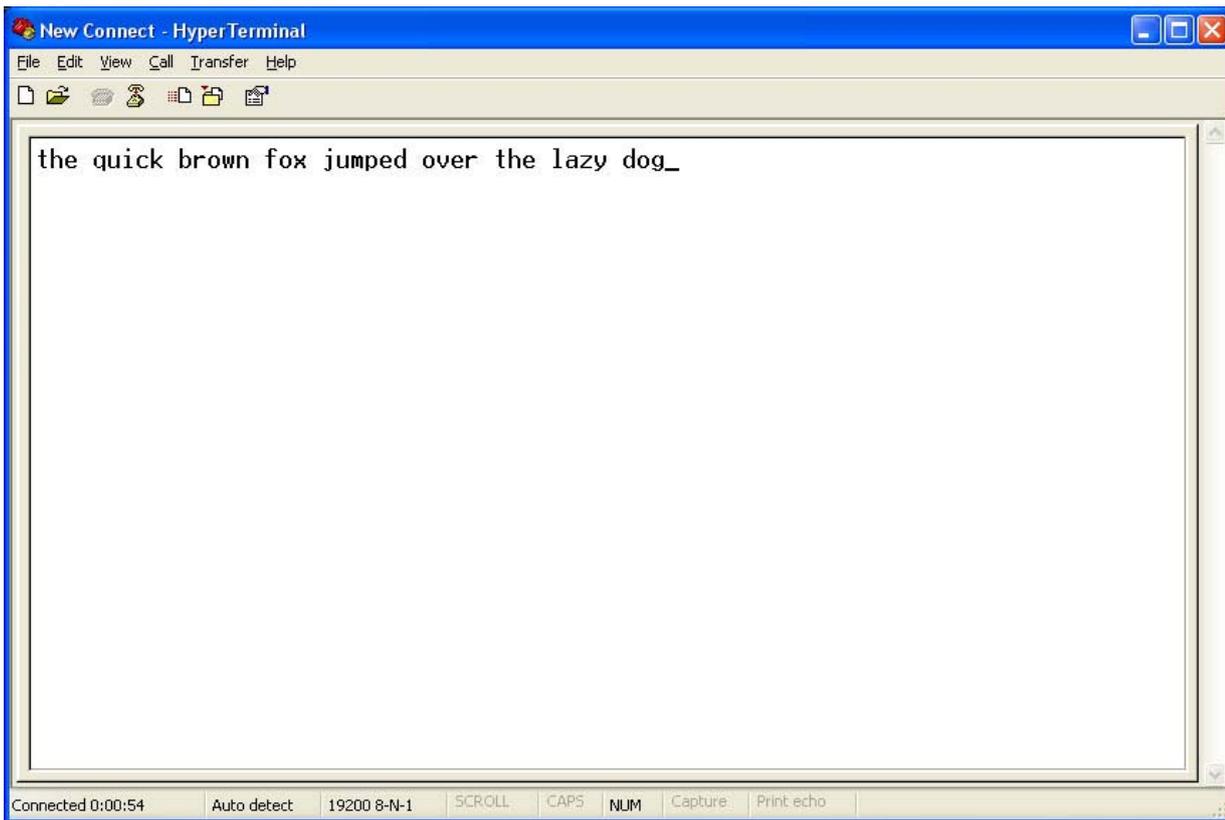
There should be no characters "echoed" with the loop back removed. If you see double characters, then check the ASCII properties. Click the "Properties" button (far right button below menu bar). The properties window will open. Click the "Settings" tab. Click the ASCII Setup button. Make sure that the "Echo typed characters locally" check box is unchecked. Click "OK". Check the "Emulation" pull down. If you require a specific terminal emulation, such as VT100, select it here. Click "OK". From the file pull down menu, select "Save".

Don't turn on echo or double characters will display.

ASCII Setup

ASCII Sending
☐ Send line ends with line feeds
☐ Echo typed characters locally
Line delay: 0   milliseconds.
Character delay: 0   milliseconds.

ASCII Receiving
☐ Append line feeds to incoming line ends
☐ Force incoming data to 7-bit ASCII
☑ Wrap lines that exceed terminal width

OK   Cancel

Set the terminal emulation type here. VT100 preferred.

19200 Properties

Connect To | Settings

Function, arrow, and ctrl keys act as
⦿ Terminal keys   ○ Windows keys

Backspace key sends
⦿ Ctrl+H   ○ Del   ○ Ctrl+H, Space, Ctrl+H

Emulation:
VT100   Terminal Setup...

Telnet terminal ID: VT100

Backscroll buffer lines: 500

☐ Play sound when connecting or disconnecting

Input Translation...   ASCII Setup...

OK   Cancel

This concludes the setup and testing of HyperTerminal™ on the PC.

HyperTerminal™ is a trademark of Hilgraeve Inc.
Windows® is registered by Microsoft Corporation.

3.2.2 SigmaLinks Console Configuration

Now that the terminal is ready, connect the PC's serial port to the SigmaLinks. The SigmaLinks console port is a DB9 connector, located on the Control Card in the front-lower center of the rack chassis. The console cable only requires a 1:1 connection since the port on the SigmaLinks is DCE and the PC's COM port is DTE.

Once the serial communication is established with the SigmaLinks, the following terminal display will be shown with a prompt to enter the password. The default password from the factory is '0000' (four zeros, no quotes). Note, if the console does not display immediately, press the 'Space Bar' once.

```
          *****************************************
          ***   CTC UNION TECHNOLOGIES CO., LTD  ***
          ***  Sigma Links 5000 Console Ver 1.02 ***
          *****************************************
                   CHASSIS ID : 00


          SYS Login:
```

After entering the proper password, the main display window will be displayed showing the chassis ID number and an inventory of all the inserted line cards.

```
          *****************************************
          ***   CTC UNION TECHNOLOGIES CO., LTD  ***
          ***  Sigma Links 5000 Console Ver 1.02 ***
          *****************************************
                   CHASSIS ID : 00
0 : LOGOUT
1 : SLOT #01 >                        B : SLOT #11 > 8210 Protection
2 : SLOT #02 >                        C : SLOT #12 > 8181 8+1 MUX/DEMUX  m
3 : SLOT #03 >                        D : SLOT #13 >
4 : SLOT #04 >                        E : SLOT #14 >
5 : SLOT #05 >                        F : SLOT #15 >
6 : SLOT #06 >                        G : SLOT #16 >
7 : SLOT #07 >                        H : SLOT #17 >
8 : SLOT #08 >                        I : SLOT #18 > 9051 5 FANs
9 : SLOT #09 >                        J : CONTROL Card
A : SLOT #10 > 8012 2 TRANSPONDER125
```

```
Please select the items.   < R > to refresh screen.
```

Note that the current chassis shows an 8012 Transponder in slot 10, a 8210 Protection card in slot 11, and an 8 channel Mux/Demux card in slot 12. The slots are numbered from right to left when viewed from the front of the chassis and there are 17 slots. "Slot 18" is designated for the Field Replaceable Unit fan assembly which is installed in the rear of the chassis.

From this menu, press any alphanumeric key from 1-9 or a-I to configure the component in that slot. In the next example we will show the configuration menu for the transponder card located in slot 10. To enter the configuration menu, press "a" or "A". The menu on the next page will be shown.

Transponder Card Configuration

```
            *****************************************
            ***    CTC UNION TECHNOLOGIES CO., LTD  ***
            ***   Sigma Links 5000 Console Ver 1.02 ***
            *****************************************
                     CHASSIS ID : 00
SLOT #10 > 8012 2 TRANSPONDER125  [ Ver:1.00-0.0-1.1 ]

CH 1       Vender Name        Vender Part Number  Wavelength (nm)
LINE    [ FIBERXON INC.     ] [ FTM-3125C-L40    ] [ 1311 ]
CLIENT  [ Empty             ] [ Empty            ] [ Unknow ]
CH 2
LINE    [ APAC Opto         ] [ KS38-C3L-TC-N    ] [ 1311 ]
CLIENT  [ FIBERXON INC.     ] [ FTM-3125C-L40    ] [ 1310 ]

1 : Ch 1 Tx Active        [ Enable  ]
2 : Ch 1 Loopback         [  OFF    ]
3 : Ch 2 Tx Active        [ Enable  ]
4 : Ch 2 Loopback         [  OFF    ]


U. Firmware Upgrade.

Please select the items.   < ESC > to previous menu.
```

The 8012 Transponder is a line card that provides the bi-directional lambda translation from one optical frequency to another, for two separate channels. The 8012 supports SFP optical transceivers that operate at 1.25GHz for gigabit Ethernet or 1Gbit Fiber Channel.

The terminal display will reveal the transponder card's version and attempt to identify the manufacturer and type of SFP transceivers installed in the line card.

Functions are also provided to disable an individual channel or to enable loop back functions.

Finally, the card may also be upgraded as newer firmware becomes available in the future.

Protection Card Configuration

The following screen shows the protection card which is designed to provide a redundant optical path on the WAN or WDM side. There are two settings for this card. The protection mode, which can be automatic, semi-automatic, or manually set, and the detection level that forces the auto or semi-auto switch to redundant fiber pair.

Firmware upgrade is also available for this card when future versions are released.

```
            *****************************************
            ***    CTC UNION TECHNOLOGIES CO., LTD  ***
            ***   Sigma Links 5000 Console Ver 1.02 ***
            *****************************************
                    CHASSIS ID : 00
SLOT #11 > 8210 Protection         [ Ver:0.02-0.0-0.1 ]

PRI Rx Power              SEC Rx Power              Working Path
 [ -62dBm ]               [ -62dBm ]                  [ PRI ]

1 : Protect Mode [ AUTO    ]
2 : Detect Level [ -33dB ]




U. Firmware Upgrade.

Please select the items.   < ESC > to previous menu.
```

The following menu displays the setting options for the protection mode.

```
            *****************************************
            ***    CTC UNION TECHNOLOGIES CO., LTD  ***
            ***   Sigma Links 5000 Console Ver 1.02 ***
            *****************************************
                    CHASSIS ID : 00
SLOT #11 > 8210 Protection         [ Ver:0.02-0.0-0.1 ]

PRI Rx Power              SEC Rx Power              Working Path
 [ -62dBm ]               [ -62dBm ]                  [ PRI ]

1 : Protect Mode [ AUTO    ]
2 : Detect Level [ -33dB ]
-----------------------------------------
1 : Protect Mode
 1. AUTO
 2. SEMI
 3. MANUAL PRI
 4. MANUAL SEC


U. Firmware Upgrade.

Please select the items.   < ESC > to previous menu.
```

The next screen shows the threshold settings for the fallback function of the protection card. Sixteen settings are available from -5dB to -35dB.

```
             ******************************************
             ***   CTC UNION TECHNOLOGIES CO., LTD  ***
             ***  Sigma Links 5000 Console Ver 1.02 ***
             ******************************************
                       CHASSIS ID : 00
SLOT #11 > 8210 Protection         [ Ver:0.02-0.0-0.1 ]


PRI Rx Power              SEC Rx Power              Working Path
 [ -62dBm ]                [ -62dBm ]                 [ PRI ]


1 : Protect Mode [ AUTO    ]
2 : Detect Level [ -33dB ]
-----------------------------------------
2 : Detect Level
 1. -5dB         6. -15dB        B. -25dB         G. -35dB
 2. -7dB         7. -17dB        C. -27dB
 3. -9dB         8. -19dB        D. -29dB
 4. -11dB        9. -21dB        E. -31dB
 5. -13dB        A. -23dB        F. -33dB


U. Firmware Upgrade.

Please select the items.   < ESC > to previous menu.
```

MUX/DEMUX Line Card

The MUX/DEMUX card works completely passively. There is a version number that can be read from the card when it is placed in the SigmaLinks chassis. The following screen is an example of the typical display.

```
             ******************************************
             ***   CTC UNION TECHNOLOGIES CO., LTD  ***
             ***  Sigma Links 5000 Console Ver 1.02 ***
             ******************************************
                       CHASSIS ID : 00
SLOT #12 > 8181 8+1 MUX/DEMUX  m  [ Ver:0.01-0.0-0.1 ]
```

```
U. Firmware Upgrade.

Press < ESC > to previous menu.
```

Fan Module and Environmental Settings

The fan module is a Field Replaceable Unit (FRU) that contains 5 user replaceable cooling fans. The Controller monitors the fans' speed and will report an alarm if any fan falls out of specification. Additionally, the fan control may be configured in an "always on" mode, or in an automatic mode that enables the fans only when the chassis temperature reaches a threshold temperature.

```
            *****************************************
            ***    CTC UNION TECHNOLOGIES CO., LTD   ***
            ***   Sigma Links 5000 Console Ver 1.02 ***
            *****************************************
                     CHASSIS ID : 00
SLOT #18 > 9051 5 FANs


FAN        1            2            3            4            5
    [ 3825rpm ] [ 3735rpm ] [ 3690rpm ] [ 3645rpm ] [ 3780rpm ]




1   MODE           [ ALL ON ]




Please select the items.   < ESC > to previous menu.
```

Three modes are available for the fan setting; All fans ON, All fans OFF, or fan control automatic depending on chassis internal temperature.

```
            *****************************************
            ***    CTC UNION TECHNOLOGIES CO., LTD   ***
            ***   Sigma Links 5000 Console Ver 1.02 ***
            *****************************************
                     CHASSIS ID : 00
SLOT #18 > 9051 5 FANs


FAN        1            2            3            4            5
    [ 3780rpm ] [ 3690rpm ] [ 3645rpm ] [ 3780rpm ] [ 3825rpm ]




1   MODE           [ ALL ON ]
---------------------------------------
 1. AUTO
 2. ALL ON
 3. ALL OFF




Please select the items.   < ESC > to previous menu.
```

Control Card Configuration

A Control Card is required in every SigmaLinks chassis. From the main menu press "j" to enter the configuration screen. The controller monitors the chassis internal temperature in three locations and monitors the DC output voltage and fan status for the installed power supplies.

The following is a typical display for a SigmaLinks chassis that has one AC and one DC supply.

```
                 ******************************************
                 ***    CTC UNION TECHNOLOGIES CO., LTD   ***
                 ***   Sigma Links 5000 Console Ver 1.02 ***
                 ******************************************
                           CHASSIS ID : 00
CONTROL Card                          [ Ver:1.02-0.2-1.1 ]

Temp.  LEFT      CENTER      RIGHT    Alarm Major  Minor    ACO
      [ +23C ]  [ +25C ]   [ +23C ]        [ NC ] [ NC ] [ Disable ]


            TYPE               OUT        FAN
PWR 1  [ DC36~72V/100W ]    [ FAULT  ]  [    0rpm ]
PWR 2  [ AC90~264V/100W ]   [ NORMAL ]  [ 7020rpm ]

1 : Alarm Relay                    [ ALL ON   ]
2 : Modify Login Password




U. Firmware Upgrade.

Please select the items.   < ESC > to previous menu.
```

Note that in the above example, the DC supply is showing a fault status and the fan is not moving. This is probably an indication that there is no incoming DC voltage. The AC supply is working normally.
The following shows the setting of the Alarm Relays for activation with Major alarms only, Minor Alarms only, All alarms or disabling the relays for any alarms.

```
                 ******************************************
                 ***    CTC UNION TECHNOLOGIES CO., LTD   ***
                 ***   Sigma Links 5000 Console Ver 1.02 ***
                 ******************************************
                           CHASSIS ID : 00
CONTROL Card                          [ Ver:1.02-0.2-1.1 ]

Temp.  LEFT      CENTER      RIGHT    Alarm Major  Minor    ACO
      [ +23C ]  [ +25C ]   [ +23C ]        [ NC ] [ NC ] [ Disable ]


            TYPE               OUT        FAN
PWR 1  [ DC36~72V/100W ]    [ FAULT  ]  [    0rpm ]
PWR 2  [ AC90~264V/100W ]   [ NORMAL ]  [ 6975rpm ]

1 : Alarm Relay                    [ ALL ON   ]
2 : Modify Login Password
-----------------------------------------
RELAY
 1. ALL ON
 2. MAJOR ON
 3. MINOR ON
 4. ALL OFF
Please select the items.   < ESC > to previous menu.
```

The next configuration function shown is the password modification. This may be done through the console as well as the LCD display.

```
          *****************************************
          ***   CTC UNION TECHNOLOGIES CO., LTD   ***
          ***  Sigma Links 5000 Console Ver 1.02 ***
          *****************************************
                    CHASSIS ID : 00
CONTROL Card                        [ Ver:1.02-0.2-1.1 ]

Temp.  LEFT     CENTER     RIGHT    Alarm Major  Minor   ACO
     [ +23C ]  [ +25C ]   [ +23C ]        [ NC ] [ NC ] [ Disable ]


           TYPE              OUT        FAN
PWR 1  [ DC36~72V/100W ]    [ FAULT  ]  [    0rpm ]
PWR 2  [ AC90~264V/100W ]   [ NORMAL ]  [ 6975rpm ]

1 : Alarm Relay                   [ ALL ON   ]
2 : Modify Login Password
----------------------------------------
Modify Password
 Input 4 Numbers : ____
```

Keyin a new 4 digit password using any combination of number 0 thru 9. The system will queue you for confirmation of the new password.

```
          *****************************************
          ***   CTC UNION TECHNOLOGIES CO., LTD   ***
          ***  Sigma Links 5000 Console Ver 1.02 ***
          *****************************************
                    CHASSIS ID : 00
CONTROL Card                        [ Ver:1.02-0.2-1.1 ]

Temp.  LEFT     CENTER     RIGHT    Alarm Major  Minor   ACO
     [ +23C ]  [ +25C ]   [ +23C ]        [ NC ] [ NC ] [ Disable ]


           TYPE              OUT        FAN
PWR 1  [ DC36~72V/100W ]    [ FAULT  ]  [    0rpm ]
PWR 2  [ AC90~264V/100W ]   [ NORMAL ]  [ 6975rpm ]

1 : Alarm Relay                   [ ALL ON   ]
2 : Modify Login Password
----------------------------------------
Modify Password
 Input 4 Numbers : ****
 Are you sure (Y/N) ?
```

Keyin "y" to accept the new password or "n" to abandon this operation without changing the password.

Firmware Upgrade

The SigmaLinks Controller may be upgraded when future firmware becomes available, either to support new line cards or to add new features. The upgrade method uses the Xmodem protocol which may be done via the HyperTermianl application under the "Transfer > Send File" menu. Initiate the firmware upgrade from the console menu and in HyperTerminal Browse to the upgrade binary file, ensure Xmodem protocol is chosen and send the file. The upgrade process will take several minute. DO NOT INTERRUPT THE COM LINK or POWER DURING THE UPGRADE PROCESS.

```
        *********************************
        * Sigma Links 5000 series       *
        * Winbond W78E58B Flash Program *
        *                  with Xmodem  *
        *                 Version 1.00  *
        *********************************

1.  Firmware Upgrade.
2.  Exit to Main Program.

Please select item.
```

This completes the terminal program configuration explanation.

Chapter 4 Management with SNMP

The purpose of this chapter is to quickly get a SigmaLinks (SL) chassis up and running with SNMP and web management when the SNMP card is installed in the SigmaLinks (SL) Chassis. Three logical steps are required for any installation:

1. Configure and connect a serial console (PC-HyperTerminal).
2. Configure the SNMP card (agent's) network parameters. Enter the management workstation parameters (who will manage this equipment?).
3. Connect to the equipment with web browser. Do simple and intuitive configuration and monitoring of the chassis via remote web browser.

So, let's start!

4.1 Serial Console Configuration

Physically connect a serial console cable, DB9F to DB9M, 1:1 cable between the serial terminal (PC with HyperTerminal) and the port marked "RS-232 SNMP Console Port" on the 9210 SNMP card. Configure the terminal protocol to VT100 and communication settings to 115.2K, No parity, 8 Bits, 1 Stop bit and no flow control. Connect the serial console (software connect) and then power on the SL chassis. You should see the following initial message:

```
Checking...
System setting checksum is ok!
Press any key to setup system configure:  3 2 1 0
   Loading BIOS ...
   Verifying Checksum ... OK
   Uncompressing ... OK
```

Following successful boot of the SNMP hardware, the login screen should be displayed.

```
               ***************************************
               *** CTC UNION TECHNOLOGIES CO., LTD. ***
               *** Sigma Links 2000 SNMP  VER. 1.15 ***
               ***************************************
Login:admin
Password:
```

SigmaLinks 5000

☆ Default username is '**admin**' and no password. After logging in, the display will show the current hardware inventory in the chassis. The chassis slots are numbered according to the following diagrams, with the chassis viewed from the front.

17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
P2				CTRL									P1			

4	1	
5	2	CTRL
6	3	
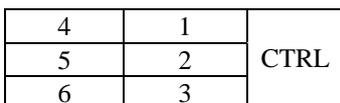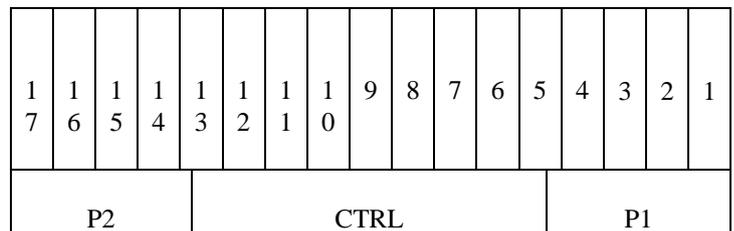
SigmaLinks 2000

```
             ****************************************
             *** CTC UNION TECHNOLOGIES CO., LTD. ***
             *** Sigma Links 2000 SNMP  VER. 1.15 ***
             ****************************************
             CHASSIS ID: 00    SNMP SLOT ID: 05
<1>:SLOT #01 > 8012 2 TRANSPONDER125
<2>:SLOT #02 > 8324 OADM 1591/1611nm
<3>:SLOT #03 > 8210 Protection
<4>:SLOT #04 > 8012 2 TRANSPONDER125
<5>:SLOT #05 > 9210 SNMP
<6>:SLOT #06 > 8181 8+1 MUX/DEMUX  m

<I>:FAN       >    2 FANs
<J>:CONTROL CARD > Exist
<K>:SNMP CARD


<L>:SNMP System Configuration Setup
<M>:SNMP Manager Configuration Setup
<P>:Password Setup
<X>:Reboot
<Z>:Logout
Please select an item.
```

SNMP Version

SNMP card location

1.25G, 2ch, transponder

optical add-drop mux

optical protection

8+1 ch, Mux/Demux

Agent network config

manager network config

4.2 SNMP System Configuration

Select item '**L**' (use either upper or lowercase letter, it doesn't matter) to do **SNMP System Configuration Setup**. The following is the factory default (MAC address will of course be different on every unit.).

```
             ****************************************
             *** CTC UNION TECHNOLOGIES CO., LTD. ***
             *** Sigma Links 2000 SNMP  VER. 1.15 ***
             ****************************************
<< SNMP System Configuration Setup >>

     Model= SIGMA 2000
     S/N= 606001
     Target MAC Address= 00:02:ab:0d:22:e6
<1>: Target IP=          192.168.1.200
<2>: Target Netmask=     255.255.255.0
<3>: Target Gateway=     192.168.1.254
<4>: Target Name=        SML2000
<5>: TFTP Server IP=     192.168.1.100
<6>: TFTP Download File= image.001
<7>: Load default and write to system.
<ESC>: Write to system and go to previous menu.


Please select an item.
```

The following TCP/IP configuration must be done in order to access the SNMP agent via IP. Here are sample key in entries for all TCP/IP agent items:

```
Target IP=172.24.1.132
Target Netmask=255.255.0.0
Target Gateway=172.24.190.254
Target Name=SL2000
TFTP Server IP=172.24.1.125
TFTP File= sl2v115.bin
```

agent's IP and subnet

network's default gateway

8 or less alphanumeric

TFTP info for upgrading

After completing all key in data, your screen might look something like this:

```
          ****************************************
          *** CTC UNION TECHNOLOGIES CO., LTD. ***
          *** Sigma Links 2000 SNMP  VER. 1.15 ***
          ****************************************
<< SNMP System Configuration Setup >>

     Model= SIGMA 2000
     S/N= 606001
     Target MAC Address= 00:02:ab:0d:22:e6
<1>: Target IP=         172.24.1.132
<2>: Target Netmask=    255.255.0.0
<3>: Target Gateway=    172.24.190.254
<4>: Target Name=       SL2000
<5>: TFTP Server IP=    172.24.1.125
<6>: TFTP Download File= sl2v115.bin
<7>: Load default and write to system.
<ESC>: Write to system and go to previous menu.

Please select an item.
```

If you are satisfied with all settings, press '**ESC**' and the settings will immediately be saved and you will be taken back to the main menu. The terminal will display the message:

```
The settings were modified.
```

4.3 SNMP Manager Configuration

Direct access of the chassis with web browser is now possible (see 4.5) or select '**M**' to do **SNMP Manager Configuration Setup**.

```
          ****************************************
          *** CTC UNION TECHNOLOGIES CO., LTD. ***
          *** Sigma Links 2000 SNMP  VER. 1.15 ***
          ****************************************
<< SNMP Manager Configuration Setup >>
   Manager's IP         Community String Access
   =================== ================ ==========
#1 1.12.123.1/16        1234567890123456 read-only
#2 ---                   ---              ---
#3 ---                   ---              ---
#4 ---                   ---              ---
#5 ---                   ---              ---
#6 ---                   ---              ---
#7 ---                   ---              ---
#8 192.168.0.0/24       public           read-write
Command Function Key:
<1>~<8>: Edit manager #1 to #8 setting.
<D>    : Delete all settings.
<N>    : Go to Trap Configuration menu.
<S>    : Confirm above setting and restart SNMP.
<ESC>  : Back to main menu without modification.
Please select an item.
```

Key in '**D**' to clear all previous settings.

```
Are you sure to delete all settings?['Y' or 'N']=y
```

Now select the first manager with '**1**' (one) and key in as per this example. These settings are required so manager can access the SigmaLinks SNMP and receive trap messages.

```
#1 Manager's IP['default','192.168.0.0/24',or '*' for disable]
   =172.24.1.125
Community=public
Read-Write['Y' or 'N']=y


              ****************************************
              *** CTC UNION TECHNOLOGIES CO., LTD. ***
              *** Sigma Links 2000 SNMP  VER. 1.15 ***
              ****************************************
<< SNMP Manager Configuration Setup >>
   Manager's IP         Community String Access
   =================== ================= ==========
#1 172.24.1.125         public           read-write
#2 ---                   ---              ---
#3 ---                   ---              ---
#4 ---                   ---              ---
#5 ---                   ---              ---
#6 ---                   ---              ---
#7 ---                   ---              ---
#8 ---                   ---              ---
Command Function Key:
<1>~<8>: Edit manager #1 to #8 setting.
<D>    : Delete all settings.
<N>    : Go to Trap Configuration menu.
<S>    : Confirm above setting and restart SNMP.
<ESC>  : Back to main menu without modification.
Please select an item.
```

Press '**S**' to confirm and save settings. The terminal will display:

```
The settings were modified.
```

4.4 SNMP Trap Configuration

Traps are unsolicited messages sent by the SNMP agent to the manager workstation. They usually are sent as the result of some alarm issued by the SNMP agent. Select item '**N**' (use either upper or lowercase letter, it doesn't matter) to do **Trap Configuration**. The following is the factory default.

```
                ****************************************
                *** CTC UNION TECHNOLOGIES CO., LTD. ***
                *** Sigma Links 2000 SNMP  VER. 1.15 ***
                ****************************************
<< Trap Configuration Setup>>
   Trap Receiver IP Community String
   ================ ================
#1 123.12.1.123     1234567890123456
#2 ---              ---
#3 ---              ---
#4 ---              ---
#5 ---              ---
#6 ---              ---
#7 ---              ---
#8 192.168.0.20     public
Command Function Key:
<1>~<8>: Edit trap receiver #1 to #8 setting.
<D>    : Delete all settings.
<N>    : Go to Manager Configuration menu.
<S>    : Confirm above setting and restart SNMP.
<ESC>  : Back to main menu without modification.
Please select an item.
```

Clear the current settings by entering '**D**'.

```
The settings were modified.
Are you sure to delete all settings?['Y' or 'N']=y
```

Enter the IP address of the destination manager workstation for traps. Up to 8 managers may receive trap messages.

```
#1 Trap Receiver IP['192.168.0.100' or '*' for disable]
   =172.24.1.125
Community=public
```

```
                ****************************************
                *** CTC UNION TECHNOLOGIES CO., LTD. ***
                *** Sigma Links 2000 SNMP  VER. 1.15 ***
                ****************************************
<< Trap Configuration Setup>>
   Trap Receiver IP Community String
   ================ ================
#1 172.24.1.125     public
#2 ---              ---
#3 ---              ---
#4 ---              ---
#5 ---              ---
#6 ---              ---
#7 ---              ---
#8 ---              ---
Command Function Key:
<1>~<8>: Edit trap receiver #1 to #8 setting.
<D>    : Delete all settings.
<N>    : Go to Manager Configuration menu.
<S>    : Confirm above setting and restart SNMP.
<ESC>  : Back to main menu without modification.
Please select an item.
```

Save settings by entering '**S**' and then '**ESC**' from the trap configuration menu.

4.5 Management Via Web Browser

Now that the agent has an IP address and the Ethernet is connected to a network, any web browser can access the agent for configuration. We have tested with Internet Explorer, Firefox and Mozilla browsers and they are all compatible with the SigmaLinks SNMP.

Open the web browser and key in the address of the SNMP agent, for example http://172.24.1.132.

Log on is required to enter the management screens of the SigmaLinks SNMP. The default username is 'admin' and no password. For security, password may be set from the console terminal under the 'Password' setting menu.
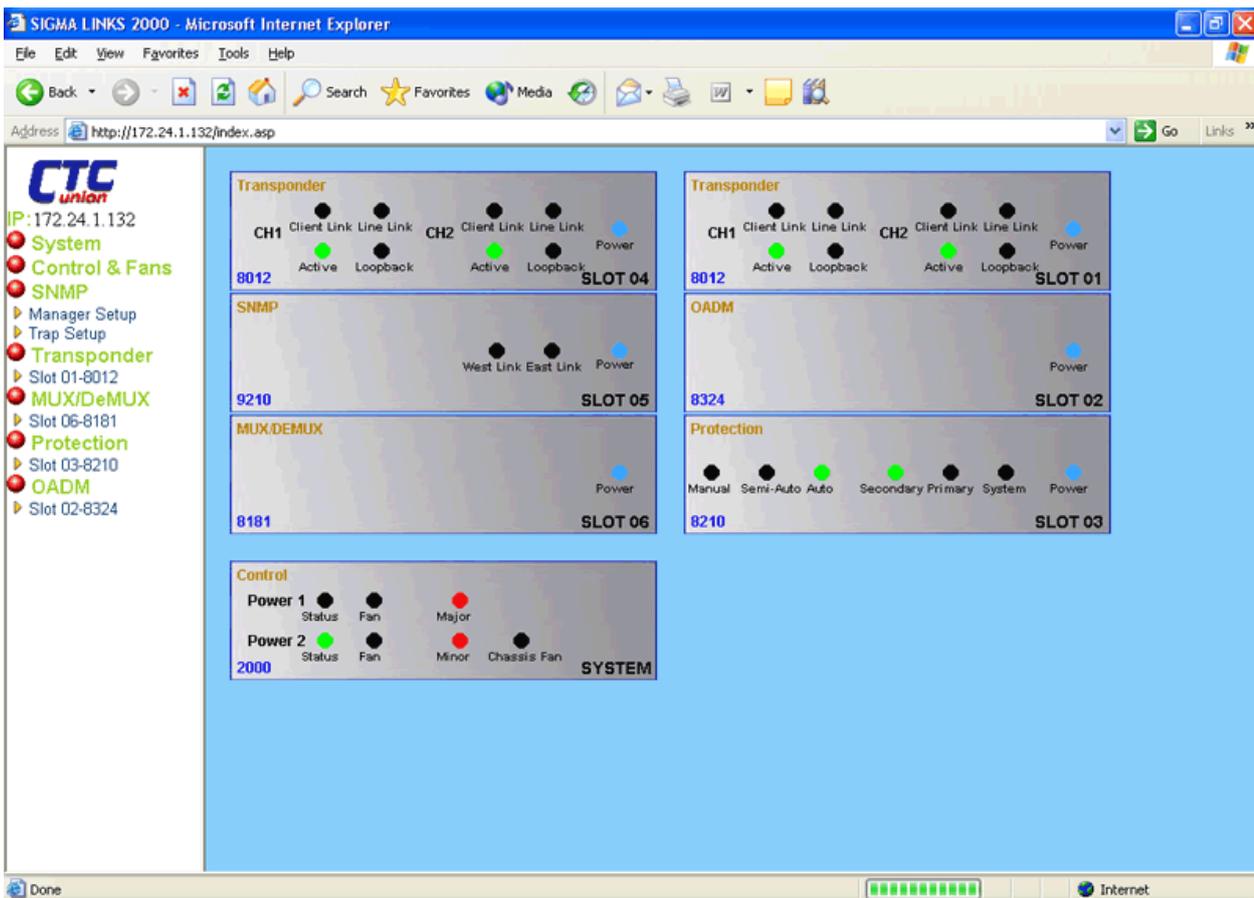
After successfully logging in to the web interface, the entire chassis and real-time LED status are displayed. This screen is refreshed to update any changes. The left hand 'menu' allows accessing the system and line cards for monitoring or configuration.

4.5.1 MUX/DEMUX

The MUX/DEMUX line card employs passive components. This screen is informational only, showing the card type, slot location and version number.

Chassis ID	Slot	Part No	Type	Version
00	06	8181	MuxDeMux8+1	1.03-0.0-0.1

4.5.2 OADM

The OADM (Optical Add Drop Multiplexer) line card employs passive components. This screen is informational only, showing the card type, slot location and version number.

Chassis ID	Slot	Part No	Type	Version
00	02	8324	OADM_1591_1611nm	1.00-0.0-0.1

4.5.3 TRANSPONDER

The transponder card provides optical frequency translation by employing as SFP with CWDM wavelength and optical drive facing towards the optical MUX and another SFP with client side 1310 or 1550 wavelength facing the customer equipment. The following display is for the 2 channel, 1.25G transponder card.

When SFP modules that support digital diagnostics are employed, that diagnostic information such as transmit power, receive power, link status, internal temperature along with vendor name and part number can all be displayed on this page.

Chassis ID	Slot	Part No	Type	Version
00	01	8012	Transponder_1_25G_2CH	1.00-0.0-1.1

Channel 1 Line

Vendor Name	Vendor PartNo	Wave Length	Link	Digital Diag.	Tx Power	Rx Power	Temparature
FIBERXON INC.	FTM-6128C-L5059	1591	Loss	Yes	+01 dBm	-40 dBm	+37 C

Channel 1 Client

Vendor Name	Vendor PartNo	Wave Length	Link	Digital Diag.	Tx Power	Rx Power	Temparature
FIBERXON INC.	FTM-3125C-L40	1310	Loss	Yes	+01 dBm	-40 dBm	+36 C

Channel 2 Line

Vendor Name	Vendor PartNo	Wave Length	Link	Digital Diag.	Tx Power	Rx Power	Temparature
FIBERXON INC.	FTM-6128C-L5051	1511	Loss	Yes	+00 dBm	-40 dBm	+36 C

Channel 2 Client

Vendor Name	Vendor PartNo	Wave Length	Link	Digital Diag.	Tx Power	Rx Power	Temparature
FIBERXON INC.	FTM-3125C-L40	1310	Loss	Yes	+00 dBm	-40 dBm	+36 C

Ch1 Tx Active Enable **Ch1 Loopback** Off

Ch2 Tx Active Enable **Ch2 Loopback** Off SET

Refresh Status

Control options for the Transponder line card include enabling or disabling either channel and doing optical loop back for troubleshooting optical network problems. The setting changes are done when the 'SET' button is clicked. This page requires manual refreshing by clicking the 'Refresh Status' button.

4.5.4 PROTECTION

The protection card allows the WAN fiber connection to be redundant (using 2 fiber pairs). The switching supports three methods which are defined as follows:

1. Auto : In this mode, transmission will fallback to secondary fiber pair if the primary fiber pair is broken and will return to the primary pair when the primary pair's transmission capability is restored. This mode ensures maximum use of the primary fiber pair at all times.

2. Semi-Auto : In this mode, transmission will fallback to the secondary pair if the primary fiber pair is broken, but will not return to the primary pair when it's transmission capability has been restored. Transmission will only resume operation on primary pair if the secondary pair suffers fault. This mode minimizes the switching loss (<50ms) anytime the fiber transmission switches pairs.

3. Manual : In this mode the fiber switching is done completely manually and under operator control.

Chassis ID	Slot	Part No	Type	Version
00	03	8210	Protection	0.02-0.0-0.1

Primary Rx Power Level	-62 dBm
Secondary Rx Power Level	-62 dBm
Working Path	SEC

Protect Mode   Auto

Detect Level   -5 dB   SET

Refresh Status

Control options for the Protection line card include setting the 'protection mode' (see above for description) and the 'detection level'. If the receive level on the working pair falls below the detect level threshold setting, the transmission will switch to the other fiber pair (in auto or semi-auto) The setting changes are done when the 'SET' button is clicked. This page requires manual refreshing by clicking the 'Refresh Status' button.

4.5.5 SNMP MANAGER

You may add or change managers (workstations running Network Management programs) through this web interface.

Manager Information

	Manager IP	Community String	Access
1	172.24.1.125/16	public	○ read-only ● read-write
2			● read-only ○ read-write
3			● read-only ○ read-write
4			● read-only ○ read-write
5			● read-only ○ read-write
6			● read-only ○ read-write
7			● read-only ○ read-write
8			● read-only ○ read-write

SET

The Manager IP can be "default", "192.168.0.100", or "192.168.0.0/24" format.

Set the IP and subnet of manager, the SNMP community string and the access permission from this screen. Click 'Set'.

4.5.6 TRAP MANAGER

You may add or change managers (workstations running Network Management programs) that receive traps through this web interface.

Trap Information

	Trap Receiver IP	Community String
1	172.24.1.125	public
2		
3		
4		
5		
6		
7		
8		

SET

Set the IP of manager and the SNMP community string from this screen. Click 'Set'.

4.5.7 CONTROL & FANS

Most of the display here is informational. There are three temperature sensors in the chassis. The power modules and all fan status can be viewed here. Alarm relays may be activated or disabled.

Chassis ID	Part No	Type	Version
00	2000	Control Card	1.01-1.0-1.0

Temperature

Left	Center	Right
+25	+25	+00

Alarms

Major	Minor	ACO
NC	NC	Normal

Power 2

Type	Output	RPM
AC 90~264V/100W	Normal	7290

Alarm Relay Both Relays Enable SET

Fan Module

Status	FAN#1 RPM	FAN#2 RPM
Off	4455	4095

Fan Mode Auto Mode SET

Refresh Status

The Fan control has 3 modes.
1. Auto: fans turn on and off by temperature threshold.
2. All On : the fans are forced on always.
3. All off : the fans are forced off always.

4.5.8 SNMP

This is an informational screen for the SNMP module itself. The TCP/IP settings are displayed, TFTP information, and the East/West transceiver status. The SFP optical interfaces may be enabled or disabled here as well.

Chassis ID	Slot	Part No	Type	Version
00	06	9210	SNMP	1.15-0.0-1.0

SNMP Target Information

Target IP	172.24.1.132
Netmask	255.255.0.0
MAC Address	00-02-AB-0D-22-E6
Gateway IP	172.24.190.254
Target Name	SL2000

TFTP Information

TFTP IP	172.24.1.125
TFTP File	sl2v115.bin

FX Transceiver Information

West FX Transceiver	Exist	Rx LOS	LOS	Tx Fault	Normal
East FX Transceiver	Exist	Rx LOS	LOS	Tx Fault	Normal

West TX Enable Enable

East TX Enable Enable   SET

Refresh Status

Appendix A

A.1 MIB Detailed Structure

A-1

A.2 Trap Codes

A-2

Fiber Series

CTC Union Technologies Co., Ltd.
Far Eastern Vienna Technology Center
(Neihu Technology Park)
8F, No.60, Zhouzi Street
Neihu, Taipei, Taiwan
Phone:(886) 2.2659.1021   Fax:(886) 2.2799.1355
E-mail: info@ctcu.com   http://www.ctcu.com