

**PRISM 2100  
T1  
CSU**



**34-00187 .G  
August 2001**

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# 1. General

## Introduction

Verilink's 2100 CSU (channel service unit) is an advanced frame transparent unit providing an interface between the customer premises equipment (CPE) and the carrier T1 facilities. The unit is compatible with all T1 carrier transmission equipment and is designed to comply with all industry standard CSU specifications. The 2100 CSU is responsible for providing the proper electrical interface to the T1 circuit and for shaping and regenerating the 1.544 Mbps signal.

The CSU works with any T1 line format and is line code transparent to unframed, D4, and ESF framing formats. Optionally, the CSU provides AMI/B8ZS conversion from the DTE to the facility and B8ZS/AMI conversion from the facility to the DTE. The unit monitors transmission for bipolar violations and maintains the pulse density of the transmitted signal.

The CSU's front panel has features which aid in quick fault isolation. Eleven LED indicators display status, alarm, and test conditions. A DIP switch allows for the quick configuration of operation and test parameters. Test jacks allow bridged monitoring of the passed signal and signal insertion toward the network or the DTE. A test switch activates local and remote loops and controls the internal BERT generator and comparator.

Power options for the CSU include line or local -24/-48 VDC power. Network and DTE connections are made through RJ-48C jacks.

The CSU is available as a stand-alone unit or for use in a multi-unit chassis holding up to 12 CSUs. The chassis can consolidate the CSU requirements of an entire network node. Power supplies are available from Verilink to meet any requirement, including full redundancy.

## Features

- Available as a stand-alone unit or a nest mounted unit
- Transparent to framing; supports ESF or D4 framing
- AMI or B8ZS line coding; B8ZS transparency
- Front panel test access jacks and test switch
- Complete diagnostic capabilities including loopbacks and built-in BERT

- Selectable alarms with alarm indicators and optional alarm relay contacts
- Selectable facility ALBO levels and DTE DSX levels
- Line or local -48 VDC powering

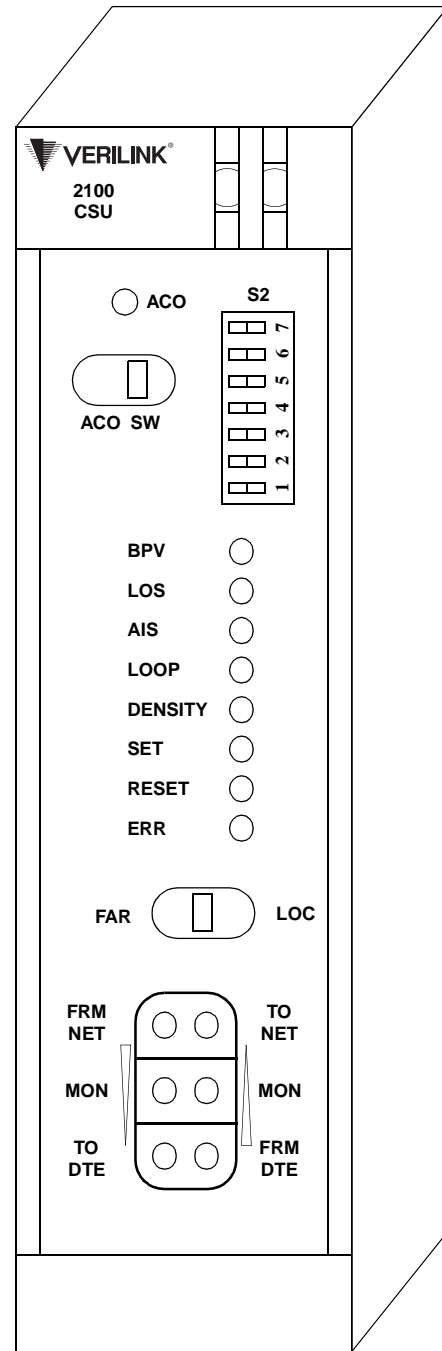


Figure 1-1 Verilink 2100 CSU

# Specifications

## Network Interface

Line Rate:	1.544 Mbps, $\pm 50$ ppm for internal clock, $\pm 200$ bps in through mode
Line Framing:	D4 or ESF (transparent)
Line Code:	AMI or B8ZS
Input Signal:	DS1, 0 to -30 dB ALBO
Connection:	RJ-48C jack, $100 \Omega (\pm 5\%)$
Output Signal:	3.0 V ( $\pm 15\%$ ) base-peak into $100 \Omega$
Line Build Out:	0, -7.5, -15, and -22.5 dB attenuation
Line Protection:	1000 V lightning, fused input/output
Keep Alive:	Line loopback or all ones (framed or unframed)
Jitter Control:	per TR62411 and T1.403
Pulse Density:	15 or 175 zeros

## Equipment Interface

Line Rate:	1.544 Mbps, $\pm 50$ ppm for internal clock, $\pm 200$ bps in through mode
Line Framing:	D4 or ESF (transparent)
Line Code:	AMI or B8ZS
Input Signal:	DSX1 to -6 dB
Connection:	RJ-48C jack, $100 \Omega (\pm 5\%)$
Output Signal:	Selectable DSX1 level from 0 to 655 feet in six incremental levels
Line Protection:	1000 V lightning

## Diagnostics

Loopbacks:	Line loopback on network and DTE interface
Network BERT:	1 in 8 (B8ZS), 3 in 24 (AMI), Clear, selectable framed or unframed pattern

## Alarms

Network Activation:	BPVs, all zeros, AIS
DTE Activation:	Low density ( $>15$ or $>175$ zeros)
Reporting:	Front panel LEDs and alarm contacts
Contact Ratings:	UL 120 mA @ 110 VAC or 110 VDC
Connection:	Terminal strip

## Power

Local Power:	19 VDC to 60 VDC, 4.3 W, 15 BTU
Connection:	Terminal strip

## Mechanical

Mounting:	desktop, wall, horizontal rack, vertical rack
Dimensions:	1.72" W, 6.8" H, 10.5" D
Weight:	2 lbs.


## Environmental

Operating Temp:	0° to 50° C (32° to 122°F)
Storage Temp:	-20° to 85° C (-4° to 185°F)
Humidity:	95% max (non-condensing)

## Industry Listings

FCC Compliance:	Part 15 Subpart B, Class A
FCC Part 68 Reg:	FXKUSA-74937-DE-N
UL Approved:	E110448
CSA Certified:	LR98859
DOC/CSO3:	1653 5331 A

## FCC Requirements

 **WARNING: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.**

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference. The user will be required to correct the interference at his own expense.

**Notice to Users of 1.544 Mbps Service:** The following instructions are provided to ensure compliance with FCC Rules, Part 68:

1. All direct connections to T1 lines must be made using standard plugs and jacks.
2. Before connecting your unit, you must inform the local telephone company of the following information:

Port ID: SS-650810-A-NF  
 REN/SOC (Service Order Code): 6.0 N  
 FIC (Facility Interface Code):

04DU9-BN  
 04DU9-DN  
 04DU9-IZN  
 04DU9-IKN  
 04DU9-ISN

USOC jack: RJ-48C  
 RJ-48H

3. If the unit appears to be malfunctioning, it should be disconnected from the telephone lines until you learn whether the source of trouble is your equipment or the telephone line. If your equipment needs repair, it should not be reconnected until it is repaired.
4. The unit has been designed to prevent harm to the T1 network. If the telephone company finds that the equipment is exceeding tolerable parameters, they can temporarily disconnect service. In this case, the telephone company will give you advance notice, if possible.
5. Under FCC rules, no customer is authorized to repair this equipment. This restriction applies regardless of whether the equipment is in or out of warranty.
6. If the telephone company alters their equipment in a manner that will affect the use of this device, they must give you advance warning so that you can have the opportunity for uninterrupted service. You will be advised of your right to file a complaint with the FCC.
7. The attached affidavit must be completed by the installer.
8. In the event of equipment malfunction, all repairs should be performed by our company or an authorized agent. It is the responsibility of users requiring service to report the need for service to our company or to one of our authorized agents.

## Canadian Emissions Requirements

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

*End users should use existing 48 VDC battery sources or a CSA certified power supply.*

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques (de la class A) prescrites dans le Règlement

sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

## Warranty

Verilink's product warranty is included at the back of this document.

## Ordering Numbers

The part numbers for the stand-alone unit and the modular chassis unit are shown in Table 1-A on page 1-3.

The unit is shipped from the factory with the 2100 CSU reference manual. Refer to Table 1-B on page 1-3 for the optional equipment part numbers.

**Table 1-A 2100 CSU Part Numbers**

Part Number	Description
F-2100-100-1 <u>BCD</u>	2100 D4 CSU stand-alone unit
<u>B</u>	Special option
1	Standard unit
2	Ones-density disable
<u>C</u>	<u>Backplane option</u>
1	RJ-48C NET / RJ-48C DTE
2	RJ-48C NET / DB-15 DTE
3	DB-15 NET / DB-15 DTE
<u>D</u>	<u>ACO (alarm cut off) option</u>
0	Without ACO
1	With ACO
F-2100-101-11 <u>C0</u>	2100 D4 CSU module (chassis)
<u>C</u>	<u>Panel / ACO option</u>
0	1051 chassis without ACO
1	1051 chassis with ACO
2	K - type without ACO
3	K - type with ACO

The following accessories may also be needed for the installation and operation of the 2100 CSU.

**Table 1-B Optional Equipment**

Part Number	Description
9-1544N-075--X*	8-pin jack to 15-pin adapter w/ post
9-1544N-076--X*	8-pin jack to 15-pin adapter w/ nuts
9-1001-006--X*	8-pin jack to 15-pin adapter w/ screw
9-1001-009--010	8-pin to 8-pin twisted pair
9-1001-011--025	50-pin male-male twisted pair
9-1001-012--025	50-pin male-female twisted pair
9-1001-036--010	50-pin to 8-pin modular (DTE)
9-1001-037--010	50-pin to 8-pin modular (NET)
9-1001-048-1	Y male adapter/cable (splits EM8000 In/Out), DB-25 to two 6-pin NMS ports
33-00085	Bantam to bantam test cord - red
33-00086	Bantam to bantam test cord - black

**Table 1-B Optional Equipment (Continued)**

Part Number	Description
9-2000-036--1	Stand-alone to rack mount conversion module with DB-25 to 6-pin adapter
F-1051-000--111	1051-1 chassis (RJ-48H)
F-1051-000--112	1051-2 chassis (RJ-48C)
9-2000-001--1	19" single unit rack mount adapter
9-2000-001--2	19" dual rack mount adapter
9-2000-002--1	23" single unit rack mount adapter
9-2000-002--2	23" dual rack mount adapter
F-1040-000--111	Power shelf with single 48 VDC, 2 A supply
F-1040-000--112	Shelf with redundant 48 VDC, 2 A supply
F-1200-000--11	1200 power supply with redundant -48 VDC, 5 A with fuse panel
9-8000-001-1	EM8000 with manual on 3-1/2 inch disk
9-8000-001-2	(DOS and UNIX version, respectively)

*\*Variable X in the part number as follows: 1 = male, 2 = female.*

## Verilink Customer Service

Verilink provides easy access to customer support information through a variety of services. This section describes these services.

### Support from Your Network Supplier

If assistance is required, contact your network supplier. Many suppliers are authorized Verilink service partners who are qualified to provide a variety of services, including network planning, installation, hardware maintenance, application training, and support services. When you contact your network supplier for assistance, have the following information ready:

- Diagnostic error messages
- A list of system hardware and software, including revision levels
- Details about recent configuration changes, if applicable

### Support from Verilink

If you are unable to receive support from your network supplier or want to contact us directly, Verilink offers worldwide customer support by telephone, e-mail, and through Verilink's Internet Web site.

#### Telephone

Customer support is available by telephone 24 hours a day, 7 days a week. To speak directly with a Verilink customer service representative, you may dial one of the following numbers:

Sales and Marketing: 800-VERILINK (837-4546)

Technical Support: 800 - 285 - 2755 (toll-free)

#### E-mail

You can request sales and marketing information or pose a technical support question about your Verilink product by contacting us at the e-mail addresses provided below. Verilink will respond to e-mailed requests for support during regular business hours (8–5 CST, Monday–Friday).

Sales and Marketing: [info@verilink.com](mailto:info@verilink.com)

Technical Support: [support@verilink.com](mailto:support@verilink.com)

#### Internet

Visit Verilink's Web site to access the latest Verilink product information, technical publications, news releases, contact information, and more:

<http://www.verilink.com>

If this reference manual is revised to reflect code changes or other updates, the most recent version will be posted to the Verilink Web site.

### Product Returns

Refer to Verilink's product warranty included at the back of this document for information on returning products to Verilink.

# 2. Installation

## Introduction

This chapter contains information and instructions required to prepare the Verilink 2100 CSU for use. Included are initial inspection procedures, mounting instructions, configuration guidelines, connection instructions, and powering information.

*Throughout this manual, all factory default settings are underlined.*

## Safety Summary

This manual contains information and warnings that must be followed to ensure safe operation and to retain the equipment in a safe condition.



***The WARNING sign denotes a hazard to the operator. It calls attention to a procedure or practice which if not correct performed or adhered to, could result in injury or loss of life. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.***

*Follow proper ESD (electrostatic discharge) procedures while handling the circuit boards.*

## Unpacking and Inspection

This unit is carefully packaged to prevent damage in shipment. Upon receipt, inspect the shipping container for damage. If the shipping container or cushioning material is damaged, notify the carrier immediately and make a notation on the delivery receipt that the container was damaged (if possible, obtain the signature and name of the person making delivery). Retain the packaging material until the contents of the shipment have been checked for completeness and the instrument has been checked both mechanically and electrically.

If the contents of the shipment are incomplete or, if there is mechanical damage or defect, notify Verilink. If the shipping container is also damaged, or the cushioning material shows signs of stress, notify the carrier of the damage as well as Verilink. Keep the shipping materials for carrier's inspection. Verilink will arrange for repair or replacement without waiting for claim settlement.

## Supplied Materials

The Verilink 2100 CSU is shipped from the factory with the 2100 CSU reference guide.

The following additional material may be required for the installation and operation of the unit:

- -48 VDC power source
- Network and DTE interface cables
- Bantam test cables
- 20-gauge stranded wire (or similar) for DC power and alarm connection

For specific applications, additional adapters and cables may be required. The interface requirements of any application may be met by using the appropriate cable. Standard cables and ordering numbers are listed in Optional Equipment on page 1-3. Contact Verilink for any needed assistance in cable selection.

## Mounting

The Verilink 2100 CSU is a modular unit that plugs into either single unit housing or into a chassis that holds up to 12 CSUs. Single units are designed for stand-alone desktop use, wall mounting, or rack mounting (in either a vertical or horizontal orientation). The CSU utilizes an interchangeable front panel to accommodate the chassis card cage.

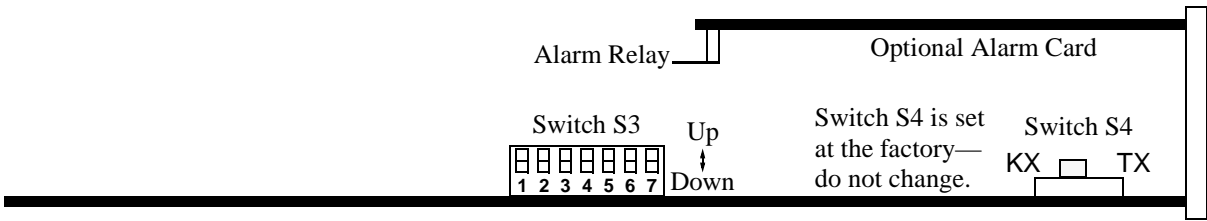
## Stand-alone Unit

To access the circuit boards and configuration switches, perform the following steps:

1. Remove the front panel cover by opening the front panel access door and gently spreading the plastic from the middle using both hands.
2. Pull the two sides of the plastic cover from the middle outwards until the four stops are clear of the front panel. Pull the cover off the front panel.
3. Remove the two Phillips-head screws from the front panel and pull the front panel and circuit boards out of the housing. Observe the proper electrostatic discharge procedures while handling the circuit boards.

The stand-alone unit may be used in a chassis installation with the following modifications:

1. Remove the housing as described in the procedure above and then remove the four screws holding the front panel to the circuit boards



**Figure 2-1 Bottom-Edge View of the 2100 CSU**

- Replace the stand-alone front panel with a front panel module. The unit can now slide into one of the 12 CSU slots on the chassis front.

## Chassis Assembly

Up to 12 modular units may be inserted into a chassis and the chassis may be installed in a 19-inch or 23-inch rack using four screws. Connections are made from the rear of the chassis. Refer to Figure 2-6 on page 2-5.

## Unit Configuration

The Verilink 2100 CSU is hardware configured using two DIP switches and a jumper located on the side of the circuit boards. These are shown in Figure 2-1 except for Switch S2 which is located on the front panel (see Figure 2-2). The numbering system used for each switch position is as follows: Position 2 of Switch S3 is referred to as Switch S3-2, and so on.

Before installation, verify each configuration switch setting. Differences in the switch settings between the chassis-mount and stand-alone units are shown on their respective configuration guides.

### Configuration Switch S2

Front panel Switch S2 (Figure 2-2) is used to set the configuration parameters listed in the following paragraphs.

Keep Alive - <u>All Ones</u>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Keep Alive - Loopback
Keep Alive - <u>Unframed</u>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Keep Alive - Framed
Test Mode - <u>BERT</u>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Test Mode - <u>Clear</u>
Line Mode - <u>B8ZS</u>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Line Mode - AMI
Test Pattern - <u>Framed</u>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Test Pattern - Unframed
Zeros - <u>15</u>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Zeros - 175
not used	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	not used

Left ↔ Right

**Figure 2-2 Switch S2**

### Zero Suppression

Position S2-2 implements ones-density insertion after the preset number of zeros has been received from the DTE and the Keep Alive mode is activated.

Left: 15 zeros      Right: 175 zeros

### Test Pattern

Position S2-3 sets the framing of the SET, RESET, and BERT test signals.

Left: Framed      Right: Unframed

### Line Coding

Position S2-4 sets the network line coding. If set to AMI, the unit indicates a BPV error for each event. The B8ZS code coming from the network and sets the test signals to B8ZS.

Left: B8ZS      Right: AMI

### Test Mode

Position S2-5 either sets or clears the test pattern. The BERT position allows the CSU to send a BERT pattern after the set signal (LOOP) is sent. Clear passes the traffic from the DTE through the network and allows network access via test jacks to run bit error tests (affects network tests only).

Left: BERT      Right: Clear

### Keep Alive

Positions S2-6 and S2-7 are used to select the action that occurs upon loss of DTE signal, when the unit switches to the Keep Alive mode on the network line. The choices are shown in Table 2-C.

**Table 2-C Keep Alive Settings**

Function	S2-6	S2-7
Keep Alive is unframed all ones	Left	Left
Keep Alive is framed all ones	Left	Right
The Keep Alive signal is the activation of the line loopback.	Right	Left
	Right	Right

## Configuration Switch S3

Switch S3 is used to set the configuration parameters listed in the following paragraphs.

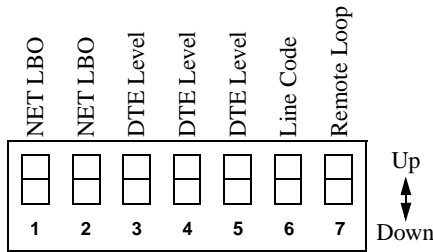


Figure 2-3 Switch S3

### Network LBO

Positions S3-1 and S3-2 set the output signal level to the transmit data (TXD) from the CSU to the network to the proper *line build out*. These values are shown in Table 2-D. The output level is factory set at 0 dB. It may be attenuated by 7.5 dB, -15 dB, or -22.5 dB if operating conditions require that it be changed. The telco should provide the proper setting to the user. If unsure of the exact setting, then leave it at 0 dB.

Table 2-D Network Line Build Out

Network LBO	S3-1	S3-2
0 dB	Down	Down
-7.5 dB	Down	Up
-15.0 dB	Up	Down
-22.5 dB	Up	Up

### DSX Level

Positions S3-3, S3-4, and S3-5 set the DTE line interface DSX level to one of the values shown in Table 2-E. The setting should match the cable length from the CSU DTE port to the attached equipment (cross-connect).

Table 2-E DSX Level

DTE LBO	S3-3	S3-4	S3-5
0-133 ft	Up	Up	Down
134-266 ft	Down	Down	Up
267-399 ft	Up	Down	Up
400-533 ft	Down	Up	Up
534-655 ft	Up	Up	Up

### Line Code

Position S3-6 is used to provide AMI/B8ZS conversion from the DTE to the facility and B8ZS/AMI conversion from the facility to the DTE or set the line code to be transparent.

Up: Transparent      Down: Conversion

### Remote Loop

Position S3-7 is used to select the signal sent to the DTE during a remote loop.

Up: AIS to DTE      Down: Network data to DTE

### ACO/Alarm Card (Optional)

The optional ACO/alarm card monitors the alarm indicators for an alarm active or an alarm clear condition and provides closure contact points on the rear panel. The corresponding front panel LED lights when an alarm condition is detected on four different conditions:

- Network AIS (all ones)
- Network LOS (all zeros)
- Network BPVs
- DTE ones density

The alarm card circuitry scans the status (on or off) of the alarm indicators ten times a second (100-ms windows). The card declares an alarm if one or more indicators are on for 100 consecutive 0.1-second samplings (10 seconds). When this happens, the red Status indicator turns on until no alarm conditions are detected for more than 100 consecutive 0.1-second samplings (another 10 seconds).

## DTE Connection

The DTE interface of the CSU is a DSX interface. The DTE output level should be set as described in DSX Level on page 2-3. The DTE physical interface for both the stand-alone unit (Figure 2-4) and the chassis unit (Figure 2-5 and Figure 2-6) is a standard RJ-48C, 8-pin modular jack with the pinout shown in Table 2-F.

**Table 2-F DTE Interface Pinout**

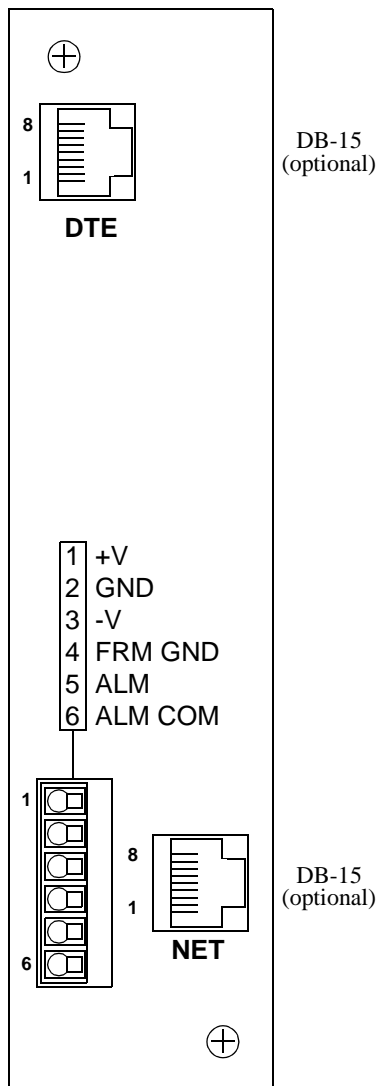
Pin	DTE Interface
1	Data Out
2	Data Out
3	Not Used
4	Data In
5	Data In
6	Not Used
7, 8	Chassis Ground

## DB-15 Connection

DB-15 connectors are optional for the DTE and network interfaces. Refer to Optional Equipment on page 1-3 for ordering information. The DB-15 pinout is shown in Table 2-G.

**Table 2-G DB-15 DTE and Network Interface Pinouts**

Pin	DTE	NET
1	Data In	Data Out
2	Frame Ground	Frame Ground
3	Data Out	Data In
4	Frame Ground	Frame Ground
9	Data In	Data Out
11	Data Out	Data In



**Figure 2-4 2100 CSU Stand-alone Rear Panel**

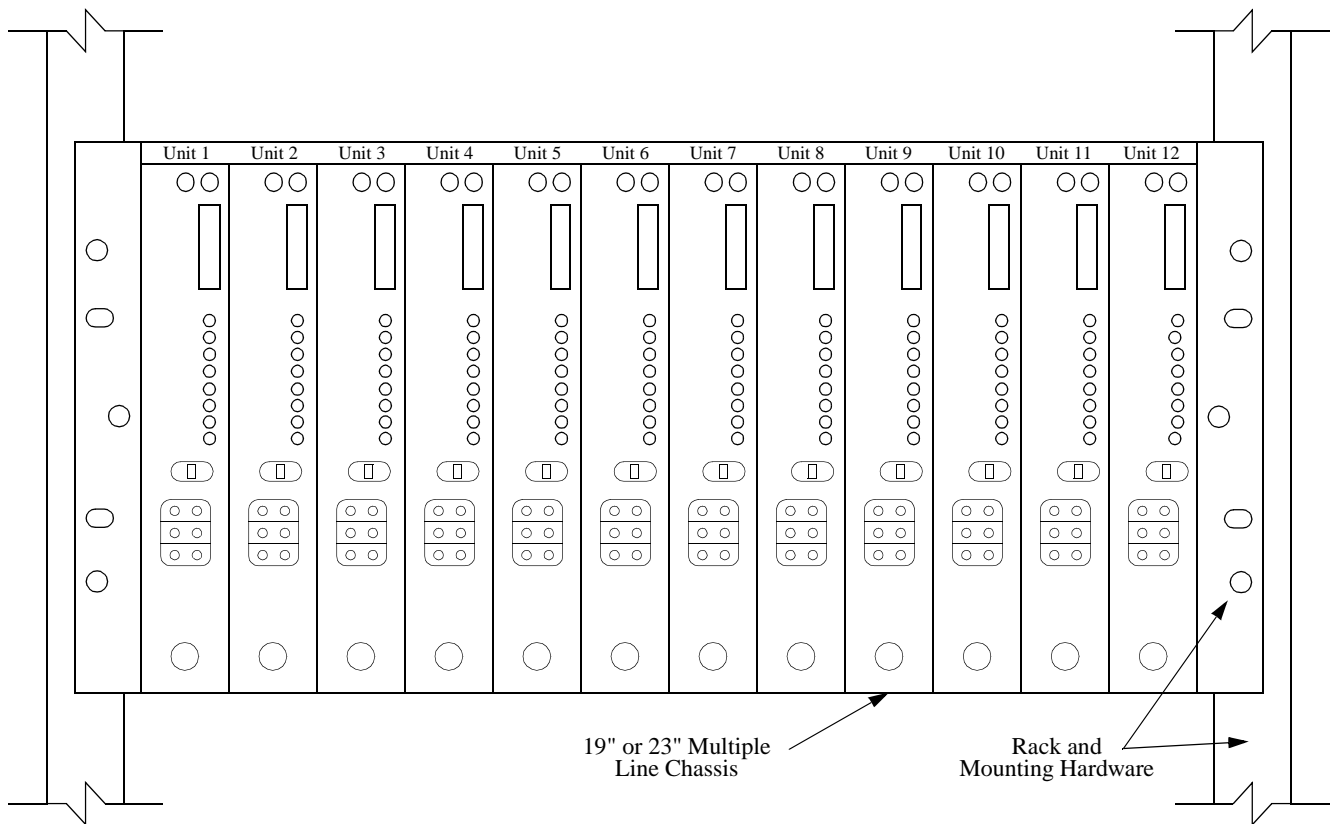


Figure 2-5 Model 1051-2 Chassis, Front View

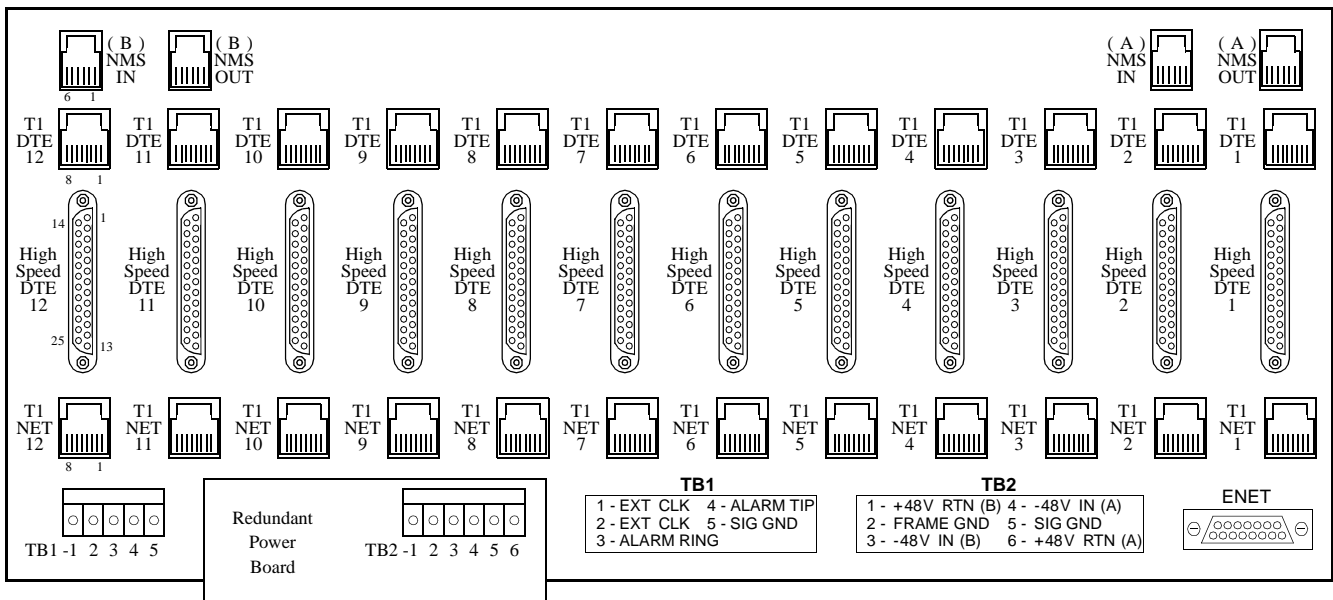


Figure 2-6 Model 1051-2 Chassis, Rear View

# Network Connection

The network side of the CSU is referred to as the network interface. This interface, located on the CSU rear panel, contains an ALBO to allow the unit to be located a substantial distance away from the telco network interface (receive signal level down to -30 dB).

The network interface line build out (LBO) levels should be adjusted as in Table 2-D on page 2-3. The maximum suggested cable lengths for connection of the CSU to the network are shown in Table 2-H. Calculations are based on a 70°F cable temperature; a 0.083 µF capacitance; a 30-dB loss; and a 100-Ω, non-loaded, twisted pair cable. PIC refers to Plastic Insulated Cable.

**Table 2-H Line Loss versus Cable Gauge**

Cable Type	Loss per 1000'	Max Length
26-gauge PIC	6.8 dB	4,400 ft
24-gauge PIC	5.4 dB	5,500 ft
22-gauge PIC	4.2 dB	7,100 ft
19-gauge PIC	3.0 dB	10,000 ft

The network physical interface for both the stand-alone unit and chassis unit is a standard RJ-48C 8-pin modular jack with the pinout shown in Table 2-I.

**Table 2-I Network Interface Pinout**

Pin	NET Interface
1	Data In
2	Data In
3	Not Used
4	Data Out
5	Data Out
6	Not Used
7, 8	Chassis Ground

*In accordance with FCC rules, Part 68.218(b), notify the telephone company before disconnecting the CSU.*

## Alarm Connection (Optional)

The stand-alone unit and the chassis modular unit provide rear panel alarm relay contacts as an option. These dry (isolated) alarm contacts permit connection to a remote indicating device.

The unit allows normally open (NO) or normally closed (NC) alarm relay contacts. Using NO contacts, a nest of CSUs and any other equipment may use a common based alarm line. Using a NC contact set allows a serial daisy chain from unit to unit. Any unit going into alarm then breaks the alarm loop.

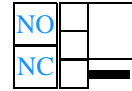
## Stand-alone Unit

The connection for the stand-alone unit is made on pins 5 and 6 of the Alarm/Power connector as shown in Table 2-J.

**Table 2-J Power and Alarm Connector Pinout**

Pin	Function
1	48 VDC Return
2	Signal Ground
3	-48 VDC
4	Frame Ground
5	Alarm Contact
6	Alarm Common

Pin 5 is configured to operate in either a normally open (NO) or normally closed (NC) mode as determined by the setting of the alarm relay jumper shown in Figure 2-7. This jumper is located on the circuit board.



**Figure 2-7 Alarm Relay Jumpers and Strap**

NO and NC refer to the contact's relationship to the common contact under a no alarms condition. Move the jumper to NC for normally closed operation (opens on alarm) or to NO for normally open operation (closes on alarm).

Make connections to the alarm contacts using 20-gauge stranded (or similar) wire. The contacts are rated at 120 mA AC or 120 mA DC.

## Chassis Unit

Alarm conditions from all modules in the chassis are bused together in parallel and are presented on a single set of alarm relay contacts which permit connection to a remote indicating device. When connected, pins 3 and 4 on terminal strip TB1 operate in normally open mode. Refer to the 1051-2 Chassis Configuration Guide for further information.

*All PRISM 3001 modules in a common chassis must use the normally open (NO) contact mode.*

Make connections to the alarm contacts using 20-gauge stranded wire (or similar). The contacts are rated at 120 mA AC or 120 mA DC.

# Power Connection

The stand-alone unit and the modular chassis unit require a 19- to 60-VDC power supply capable of delivering 4.3 watts per unit. Power supplies are available from Verilink and are listed in Optional Equipment on page 1-3.



**Connect the ground lead before applying power to the unit.**

## Stand-alone Unit

The power source is connected to pins 1 and 3 of the Power and Alarm terminal as shown in Table 2-J on page 2-6.

Connect a chassis ground lead (18- to 20-gauge is recommended) to the Frame Ground terminal (pin 4). Connect the other end of this lead to an appropriate facility ground. Often, the 48 DC return is also ground. In that case, both return and ground leads should be connected to ground.

Connect the lead of the -48VDC source to the -V terminal (18- to 20-gauge wire is recommended). Connect the return lead of the 48-volt source to the +V terminal. When powered up, the STATUS indicator on the front panel lights and the unit goes through the normal LED sequencing.

## Chassis Unit

The chassis is designed with two power buses. The A bus feeds the odd slots while the B bus feeds the even slots. Refer to Figure 2-6 on page 2-5 for an illustration of the 1051-2 rear panel and to the appropriate 1051 chassis configuration guide for further information.

Three modes of powering the chassis are available:

### Redundant Power Source

A redundant power board is factory installed on power connector TB2 which allows connection of two independent -48 VDC supplies operated in a redundant mode. All slots are powered from the combined input of the A and B power supplies. If either supply fails, the other powers the entire chassis.

### Single Power Source

Using a single power source is essentially the same as the redundant configuration with power supply B not operational. If the redundant power board is not used, the A bus and the B bus must be connected together with a jumper.

### Dual Power Source

When using a dual independent power supply, one -48 VDC source feeds the A bus while another -48 VDC source feeds the B bus.

*Each 2100 CSU requires a 19- to 60-VDC power supply capable of delivering 4.3 watts. Ensure*

*the proper fuse size is used. Refer to the 1040 Power Shelf configuration guide.*



# 3. Operation

## Introduction

This chapter contains the general operation instructions for the Verilink 2100 CSU. The unit is operated manually by using the front panel controls and indicators (described in this chapter) and configuration Switch S2 (described in the Installation chapter).

## Front Panel Descriptions

The 2100 CSU uses LED indicators to convey major alarm conditions and looping status. The front panel contains 11 LED indicators, a test switch, and a set of bantam test jacks. The following paragraphs describe these controls and indicators and are referenced to the illustration on this page.

### General Status Indicators

1. **STATUS:** The CSU has two LED indicators on the front panel bezel that are exposed whether the access door is open or closed. These general status LEDs provide a quick check of the CSU's operating condition (Go or No Go).

If neither LED is lit, the unit is not powered. If the green LED is lit, the unit is powered and functioning normally. If the red LED is lit, there is a line fault which exceeds alarm thresholds or another type of unit failure. The problem can be isolated by further examination of the other front panel LEDs as described below.

### Alarm Controls and Indicators

2. **ACO:** This red LED lights whenever the *alarm cut off* switch is in the right (On) position (when the alarm relay contacts are disabled).
3. **ACO SW:** The *alarm cut off switch* controls the alarm relay circuitry. If the switch is placed in the right On position, this circuitry is deactivated. The left Off position enables the contacts to report alarm conditions.
4. **BPV:** This red LED lights (0.1 second minimum) for each occurrence of *bipolar violations* from the network.
5. **LOS:** This red LED lights constantly when a *loss of signal* condition is detected from the network.
6. **AIS:** This red *alarm indication signal* LED lights constantly if an unframed all-ones condition is detected from the network.

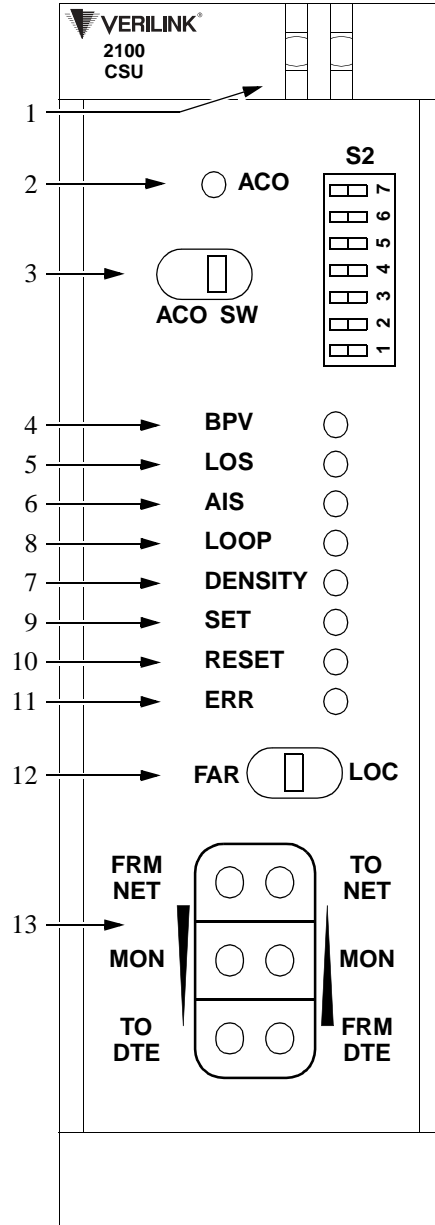


Figure 3-1 2100 CSU Front Panel

7. **DENSITY:** This red LED lights constantly if the *ones density* from the equipment is less than 12.5 percent or if there is a loss of signal.

### Test Controls and Indicators

8. **LOOP:** This yellow LED lights constantly when the network interface is in a *line loopback*.

9. **SET:** This yellow LED flashes if the set code is transmitted. It lights constantly if the set code is received.
10. **RESET:** This yellow LED flashes if the reset code is transmitted. It lights constantly for five seconds if the reset code is received.
11. **ERR:** This red LED lights 0.1 second if an error is received during a network test.
12. **Test Switch:** This switch (FAR/LOC) is used for local testing. Refer to “Test Switch” below for more information.
13. **Test Access Jacks:** These six bantam test jacks are provided for access to the T1 line on the DTE side of the CSU. Refer to “Test Access Jacks” below for more information.

## Front Panel Testing

The previous section gave a brief description of each front panel control and LED indicator. This section explains the front panel test functions. Testing may also be performed using software control from the Verilink EM8000 element manager (refer to the EM8000 reference manual).

### Test Switch

This switch is used for local testing. When in the Far position (FAR), the unit sends five seconds of IBLC (in-band loop codes), then switches to Clear Test or BERT. When transmitting IBLC or the test pattern, the test LED flashes. The ERR LED lights for 0.1 second when a bit error or sync loss is detected.

When this switch is returned to the *normal* center position, the unit sends five seconds of loop down code (100) and then returns to its normal operating mode.

When the Test switch is in the local position (LOC), the unit performs a bidirectional loopback as shown in the following diagram. The LLB indicator should be lit.

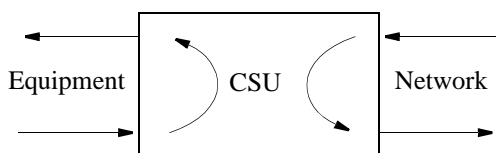


Figure 3-2 Local Loop

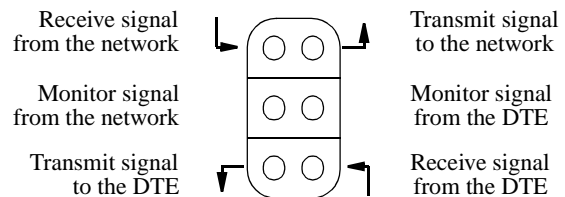


Figure 3-3 Test Jacks

### Test Access Jacks

Six bantam test jacks are provided for access to the T1 line on the DTE side of the CSU. Jacks allow transmit and receive toward the network, toward the DTE, or monitoring traffic between DTE and network. Jacks are customarily used to inject and receive T1 signals using a T1 test set.

#### NET

The top two ports are used to insert into the line in both directions. They break connection to the DTE and make connection to the CSU in the direction of the network.

#### MON

The middle two ports are used for non-intrusive bridge monitoring of the line in both directions. They monitor the signals passing through the CSU (between the DTE and the network).

#### DTE

The bottom two ports are used to drop the line. They break connection to the CSU and make connection to the DTE.

# Affidavit for the Connection of Customer Premises Equipment to 1.544 Mbps and/or Subrate Digital Services

For work to be performed in the certified territory of

Telco's Name: \_\_\_\_\_

State of \_\_\_\_\_

County of \_\_\_\_\_

I, \_\_\_\_\_ (Authorized Representative Name), of \_\_\_\_\_ (Customer Name),  
\_\_\_\_\_ (Customer Address), \_\_\_\_\_ (Telephone Number),

being duly sworn, state:

I have responsibility for the operation and maintenance of the terminal equipment to be connected to \_\_\_\_\_ 1.544 Mbps and/or \_\_\_\_\_ subrate digital services. The terminal equipment to be connected complies with Part 68 of the Commission's rules except for the encoded analog content, and billing protection specifications. With respect to encoded analog content and billing protection:

- I attest that all operations associated with the establishment, maintenance, and adjustment of the digital CPE with respect to encoded analog content and encoded billing information continuously complies with Part 68 of the FCC's Rules and Regulations.
- The digital CPE does not transmit digital signals containing encoded analog content or billing information which is intended to be decoded within the telecommunications network.
- The encoded analog and billing protection is factory set and is not under the control of the customer.

I attest that the operator(s)/maintainer(s) of the digital CPE responsible for the establishment, maintenance, and adjustment of the encoded analog content and billing information has (have) been trained to perform these functions by successfully completing one of the following (Check the appropriate box(es) below):

- A. Training course provided by the manufacturer/grantee of the equipment used to encode analog signals; or
- B. Training course provided by the customer or authorized representative, using training materials and instructions provided by the manufacturer/grantee of the equipment used to encode analog signals; or
- C. Independent training course (e.g., trade school or technical institution) recognized by the manufacturer/grantee of the equipment used to encode analog signals; or
- D. In lieu of the preceding training requirements, the operator(s) maintainer(s) is (are) under the control of a supervisor trained in accordance with \_\_\_\_\_ (choose A, B, or C) above.

I agree to provide \_\_\_\_\_ (Telco's Name) with proper documentation to demonstrate compliance with the information as provided in the preceding paragraph, if so requested.

\_\_\_\_\_ (Signature)

\_\_\_\_\_ (Title)

\_\_\_\_\_ (Date)

Subscribed and Sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

\_\_\_\_\_  
Notary Public

My Commission expires \_\_\_\_\_.



## Five-Year Hardware Limited Warranty

- I. **Limited Warranty.** Subject to the limitations and disclaimers set forth in this Hardware Limited Warranty, Verilink warrants to the original purchaser ("Buyer") that the Verilink equipment and component parts ("Goods") purchased by Buyer shall be free from defects in material and workmanship under normal use and service for a period of five years from the date of shipment of the Goods to Buyer ("Limited Warranty"). Verilink's sole obligation and Buyer's sole remedy under this Limited Warranty shall be to repair or replace any Verilink Goods that Verilink determines to be so defective. Any claim by Buyer under this Limited Warranty must be presented to Verilink in writing within five years and fifteen (15) days of the date of shipment of the Goods to Buyer, as evidenced by Verilink's packing slip or similar shipment documentation from a Verilink authorized reseller. Any replacement Goods may be new or reconditioned. Verilink reserves the right to substitute equivalent Goods for defective Goods, in its sole discretion. As long as Verilink either so repairs or replaces the Goods, this Limited Warranty will not be found to have failed its essential purpose. If the defect has been caused by accident, misuse or abnormal operating conditions (including lightning damage) occurring after delivery to Buyer, repairs and/or replacement will be made at Buyer's expense. In such event, an estimate of cost will be submitted to Buyer before repair work is started. The Limited Warranty will continue to apply to replaced or repaired Goods for whichever is longer: the 90-day period after the shipment of such Goods to Buyer *or* the remainder of the original Limited Warranty period.
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- V. **MODIFICATIONS BY VERILINK.** Minor deviations from specifications that do not materially affect performance of the Goods covered hereby, as mutually agreed upon by Verilink and Buyer, shall not be deemed to constitute a breach of the Limited Warranty. Verilink also reserves the right to discontinue Goods and change specifications for Goods without notice, provided such changes do not adversely affect the performance of the Goods manufactured by Verilink or do not reduce performance below any applicable contract specifications between Verilink and the Buyer. Verilink also reserves the right to make product improvements without incurring any obligations or liability to make the same changes in Goods previously manufactured or purchased. Non-payment of any invoice rendered within the stated payment terms automatically suspends the application of, but not the running of, the Limited Warranty for the duration of the non-payment.
- VI. **AMENDMENT OF WARRANTY TERMS.** These terms and conditions of this Hardware Limited Warranty may be revised by Verilink from time to time in its sole discretion. The terms and conditions in effect at the time of purchase will apply to such Goods.
- VII. **RETURN OF GOODS.** If for any reason the Buyer must return a Verilink product, it must be returned to the factory, shipping prepaid, and packaged to the best commercial standard for electronic equipment. Verilink will pay shipping charges for delivery on return. The Buyer is responsible for mode and cost of shipment to Verilink. The Buyer must have a Return Material Authorization (RMA) number marked on the shipping package. Products sent to Verilink without RMA numbers will be returned to the sender, unopened, at the sender's expense. A product sent directly to Verilink for repair must first be assigned a Return Material Authorization (RMA) number. The Buyer may obtain an RMA number by calling the Verilink Customer Service Center at 1.800.926.0085, extension 2282 or 2322. When calling Verilink for an RMA, the Buyer should have the following information available:
- Model number and serial number for each unit
  - Reason for return and symptoms of problem
  - Purchase order number to cover charges for out-of-warranty items
  - Name and phone number of person to contact if Verilink has questions about the unit(s).
- A return address will be provided at the time the RMA number is issued. The standard delivery method for return shipments is Standard Ground for domestic returns and International Economy for international returns (unless otherwise specified).
- VIII. **GOVERNING LAW.** This Agreement is governed by the laws of the State of Alabama, U.S.A., without reference to its conflicts of law provisions. The provisions of the UN Convention on Contracts for the International Sale of Goods shall not apply.