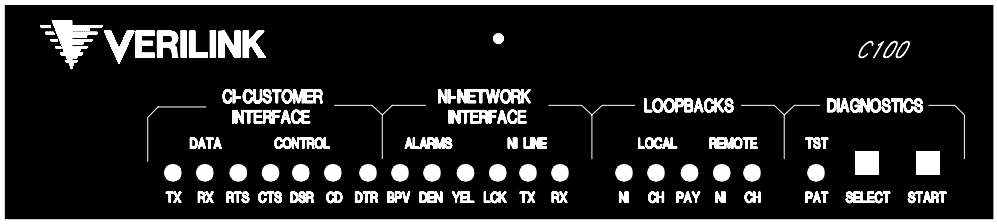
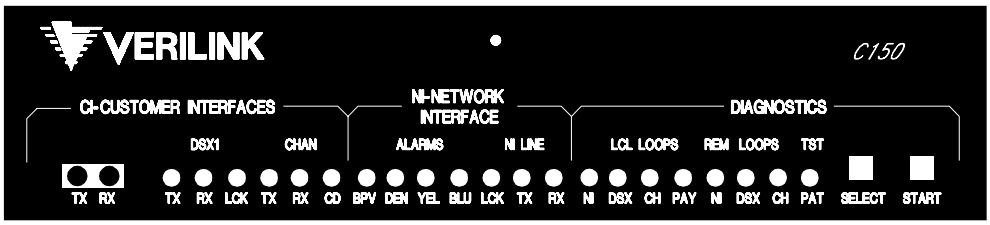




"C" Series

- C100 T1/FT1 CSU/DSU
- C150 T1/FT1 CSU/DSU with Drop and Insert

User Manual

Part Number 880-502893-001-B
June 1999

VERILINK

Copyright notices

VERILINK CORPORATION DISTRIBUTES THIS REFERENCE "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER LIMITED OR IMPLIED. Verilink Corporation reserves the right to revise this publication from time to time without notice. Some states or jurisdictions do not allow disclaimer of express or implied warranties in certai transactions; therefore, this statement may not apply to you.

The following are trademarks or registered trademarks of Verilink Corporation: Access System 2000, Access Manager 2000, Advanced Programmable Architecture, Advanced Communications Series, and Craft Interface.

Your right to copy software and this manual is limited by copyright law. Making copies of this reference, or any part thereof, without prior written authorization from Verilink Corporation is prohibited by law and constitutes a punishable violation of the law.

Customer service and sales information

To receive more detailed information on service options and pricing, contact Customer Services at 1.800.VERILINK (1.800. 837-4546). Or access ourFAX on Demand System for our latest customer service brochure at 1.800.957-LINK (1.800.957-5465).

FCC statement (for users of AS2000 equipment)

The Federal Communications Commission (FCC) Rules require that you be notified of the following:

This equipment has been tested and found to comply within the limits for a Class A digital device pursuant to Part 15 of the FCC rules. These limits are designed to provide protection against harmful interference in a residential installation.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the use is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio / TV technician for help.

Per FCC Part 68 requirements, the customer is required to notify the Telephone Company prior to disconnecting any CSU from the network interface.

The FCC registration number for Access System 2000 is GICUSA-18804-DE-N.

The following references apply to this system:

a. The FCC registration number for Access System 2000 is GICUSA-18804-DE-N.

b. The 'USOC' jack required [USOC RJ48C / M / X]

c. The Facility Interface Code for Digital Service is 04DU9-1KN / ISN / ISN / 12N.

d. The Service Order Code for Digital Service is 6.0N.

Warnings and Caution Notices

Note: In ACE-based modules, the battery referred to in the following notices is contained *inside* the clock chip.

English

DANGER!

The battery could explode if it is incorrectly replaced! Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

DANGER!

To avoid electrical shock in case of failure, the power supply must be installed by a professional installer. The terminal labeled with the ground symbol (⏚) on the power supply must be connected to a permanent earth ground.

CAUTION!

Interconnecting circuits must comply with the requirements of EN60950:1992/A2:1933 Section 6.2 for telecommunications network voltages (TNV) circuits.

Français

ATTENTION!

Une explosion peut se produire si la batterie est remplacéed'unefaçonincorrecte!Remplacez-laseulement avec le même modêle de batterie ou un modèle équivalent selon les recommendations de manufacture. Disposez de les batteries usées selon les instructions de manufacture

ATTENTION!

Pour évite électrique choc en cas de insuccès, la provision de pouvoir devré êtré installé par un installeur professionnel. La terminal du la provision de pouvoir, marque du symbol de terre, (⏚) doit connecté à un permanent terre électrique.

ATTENTION!

Les circuits doivent êtré interconnectés de manière à ce que l' équipement continue à êtré en agrément avec "EN60950:1992/A2:1933, Section 6.2, pour les circuits de voltage de liaisons d' échanges (réseau) par les télécommunications (TNV)," après les connections de circuits.

Española

PELIGRO!

La bateria puede explotar is se reemplaza incorrectamente. Reemplace la bateria con el mismo tipo de bateria ó una equivalente recomendada por el manufacturero. Disponga de las baterias de acuerdo a las instrucciones del manufacturero.

PELIGRO!

Para evitar contacto con circuitos que electrocutan, la fuentedealimentaciódebeserinstaladaporuntécnico profesional. La terminal de la fuente de alimentación marcada con el símbolo de tierra (⏚) debe ser conectadaauncircuitodevueltaportierrapermanente.

CIRCUITOS A INTERCONECTARSE

Circuitosqueseinterconectanalaredde telecomunicaciones deben hacerse de tal manera que cumplan con los requisitos estipulados en las especificaciones "EN60950:1992/A2:1933, Sección 6.2, para los voltages decircuitosinterconnectadosalaReddeTelecomunicaciones (TNV)," despues de terminar las connecciones entre los circuitos.

Deutsch

VORSICHT!

Explosionsgefahr bei unsachgemäßem Ersetzen der Batterie! Batterie gleichen Typs und gleicher Qualität benutzen,wievomHerstellerempfohlen.Entsorgungder Batterie nach Anweisung des Herstellers!

VORSICHT, GEFAHR!

Um keinen Schlag zu erhalten beim Versagen der electrischen Anlage, muss der Stromanschluss von einem Elektriker vorgenommen werden. Der elektrische Pol, versehen mit dem Erdsymbol (⏚) muss am Stromanschluss permanent geerdet sein.

VORSICHT!

Schaltungen, die in den Geräten zusammengeschaltet sind,müssenweiterhindenVorschriftenEN60950:1992/ A2:1933, Absatz 6.2 für Telecommunications Netz Spannung (TNV) Schaltkreize entsprechen.

Important Safety Instructions

When handling this equipment, follow these basic safety precautions to reduce the risk of electric shock and injury:

- Follow all warnings and instructions marked on the product and in the manual.
- Unplug the hardware from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a slightly damp cloth for cleaning.
- Do not place this product on an unstable cart, stand, or table. It may fall, causing serious damage to the product.
- Slots and openings in the shelves are provided for ventilation to protect them from overheating. These openings must not be blocked or covered. Never place this product near a radiator or heat register.
- This product should be operated only from the type of power source indicated on the marking label and manual. If you are unsure of the type of power supply you are using, consult your dealer or local power company.
- Do not allow anything to rest on the power cord. Do not locate this product where the cord will interfere with the free movement of people.
- Do not overload wall outlets and extension cords, as this can result in fire or electric shock.
- Never push objects of any kind into the shelves. They may touch dangerous voltage points or short out parts that could result in fire or electric shock. Never spill liquid of any kind on this equipment.
- Unplug the equipment from the wall outlet and refer servicing to qualified service personnel under the following conditions:

a. When the power supply cord or plug is damaged or frayed.

b. If liquid has been spilled into the product.

c. If the product has been exposed to rain or water.

d. If the product has been dropped or if the cabinet has been damaged.

Table of Contents

List of Figures

List of Tables

Chapter 1

Introduction

This manual is the operating and reference manual for theVerilink “C” Series products: the C100 T1/FT1 CSU/DSU and the C150 T1/FT1 CSU/DSU with Drop and Insert. These standalone devices are T1 and fractional T1 Channel Service Units/Data Service Units. The C150 has the additional functionality of Drop-and-insert.

This manual assumes you are already familiar with T1 industry standards and terminology.

Overview

The C100 and C150 T-1 CSU/DSUs connect the following T-1 customer equipment to T-1 carrier services:

- T-1 multiplexers
- routers
- bridges
- switches
- PBXs (C150 only)

  The C150 comes equipped additionally with a DSX-1 (T1) drop-and-insert channel.

They can be used single-ended in a T-1/fractional T-1 application, i pairs on a T-1 carrier provided service, or in pairs when used as Limited Distance Modems (LDMs) using a customer provided four-wire facility.

The C100 comes standard with a Network Interface (T-1) and a synchronous channel which supports any multiple of 56K and 64K bps of serial data. The synchronous channel includes three built-in interfaces: V.35, RS530/RS422 and the RS232 standard.

All DS-0s can be allocated to either channel or split between them and can be contiguous or non-contiguous for full or fractional T-1 applications.

The C100/150 supports D4 or ESF Framing with AMI or B8ZS coding.

Standards compliance

The C100/C150 is compliant with the following telecommunication and Federal standards:

- AT&T Technical Reference ESF 54016
- AT&T Technical Reference 62411
- ANSI T1.403 specification
- FCC Part 15 and Part 68
- Various SNMP standards (See Appendix D, *C100 and C150 SNMP MIB*.)

Configuration and management options

The C100/C150 provides an embedded SNMP agent for management and unit configuration. Other methods of configuration and management are front panel LEDs and DIP switches and an ASCII terminal console interface.

Timing options

The C100 has three timing choices, Network, Internal and Channel, enabling the unit to be used in a variety of network applications.

The C150, additionally, has a DSX-1 timing option.

Physical configuration

The unit is packaged in a rugged extruded aluminum case which ca be used as a tabletop model or mounted in groups of eight in an optional rackmount unit. It comes with a Network interface cable, an ASCII console cable and a 110 VAC-to-12 VDC adapter.

Controls, indicators, user interfaces, and ports

This sections describes the C100 / 150 user interfaces, controls and indicators, and data and network ports.

DIP-switch and console interfaces

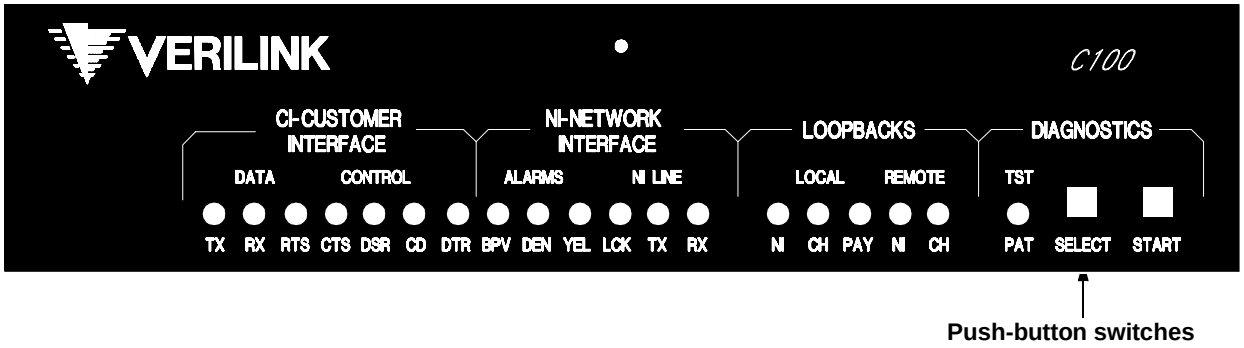
The C100 / C150 T-1 CSU / DSU is configured with simple to use DIP switches. As illustrated in Figure 1-1, color-coded LED indicators display status and loopbacks simultaneously.

The C100 T-1 CSU / DSU also includes a user-friendly ASCII console that can be used instead of the DIP switches. Two console connectors on the rear of the unit permit up to eight units to be multi-drop polled and controlled by a single console connected either locally or remotely.

The console port supports VT100s and PC terminal emulation mode, with either a direct or dial-up modem connection.

C100 front and rear panels

Figure 1-1 C100 front panel

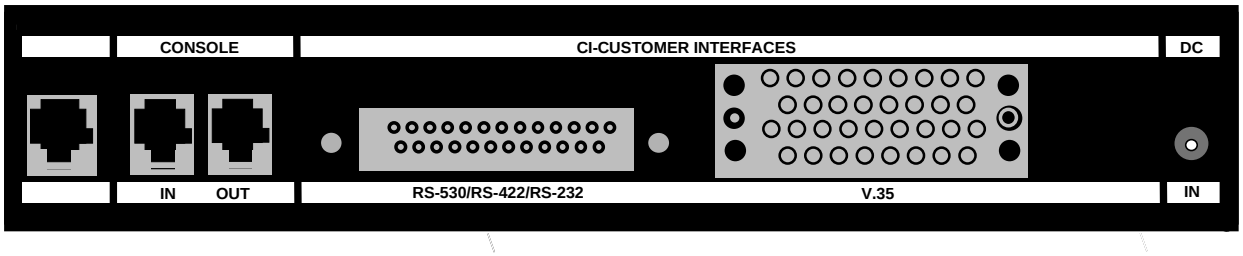


Two push-button switches on the front panel are used to test all local and remote units.

C100 rear panel

The C100 has no DSX-1 connector on its rear panel.

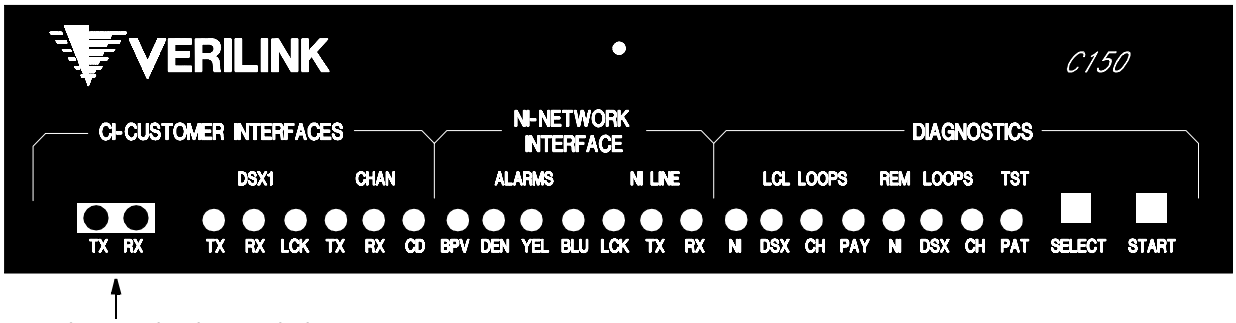
Figure 1-2 C100 rear panel



C150 front and rear panels

The C100 T-1 CSU / DSU can generate and detect five local and remote loopbacks. (The C150 has seven.) A built-in 2047 pattern generator and checker is used to self-test the unit as well as test the facility and remote unit. On the C150, a DSX monitor jack on the Customer Interface (CI) side provides access for external test equipment.

Figure 1-3 C150 front panel



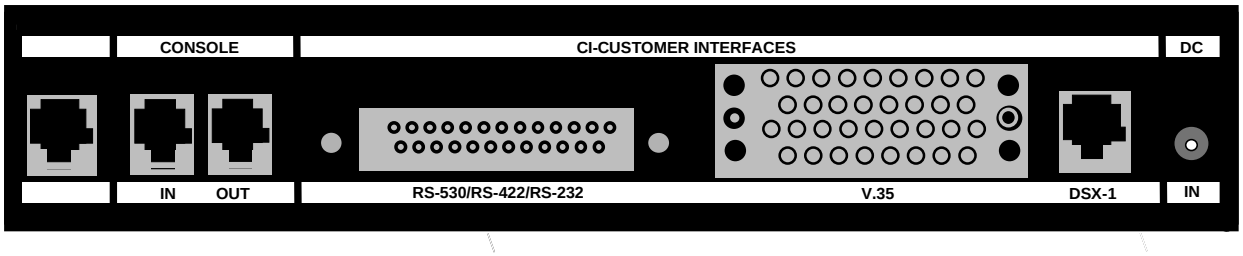
DSX-1 bantam signal access jacks

The C150 has DSX-1 and channel LEDs on the front panel. The Customer interface signals are different from the C100 front panel. They are labeled DSX-1 and Channel instead of Data and Control. The individual LEDs are: LCK, TX, and RX instead if RTS, CTS, and DSR. The Diagnostics LEDs are also labeled differently from the C100 Loopback andTest LEDs.

C150 rear panel

The C150 has a DSX-1 connector on the rear panel.

Figure 1-4 C150 rear panel



Applications

The C150 T-1 CSU / DSU can be used in all C100 applications plus drop-and-insert applications. The C100 and C150 synchronous channel includes an RS232, RS422 / RS530 and a V.35 interface.

The C150 includes both the DSX-1 port and synchronous data channel as standard. The DSX-1 port can drive up to 6000 feet.

The following subsection give some typical applications where the C100 and C150 T-1 CSU / DSUs can be used.

C100 or C150 applications

Figure 1-5 shows the T-1 CSU / DSU connecting two sites over a T-1 facility in the first of two very basic applications. The Network Interface (NI) side of each unit connects to the T-1 facility and the Customer Interface (CI) synchronous interface of each unit connects to the customer LAN Routers.

The synchronous channel interfaces can be RS232, RS530 / RS422 or V.35. They can be changed by toggling a switch since they are built-in, and they can be different at each end.

The speed of the synchronous channel can be any multiple of 56000 or 64000 bps up to 1536000 bps.

Figure 1-5 C100 or C150 T-1 CSU/DSU connecting two LANS over a T-1 service

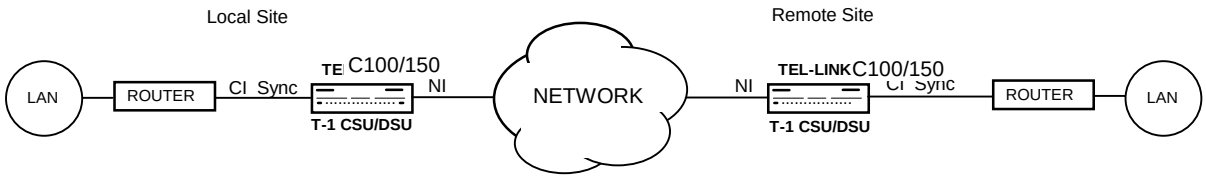


Figure 1-6 shows the T-1 CSU / DSU in a single-ended application connected to a Frame Relay Service. The Network Interface (NI) side of the unit connects to the T-1 facility and the Customer Interface (CI) synchronous channel of the unit connects to the customer LAN Router.

Figure 1-6 C100 or C150 T-1 CSU/DSU connecting to a frame relay service

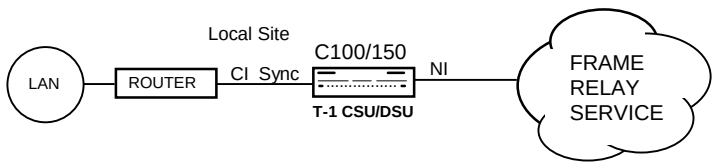
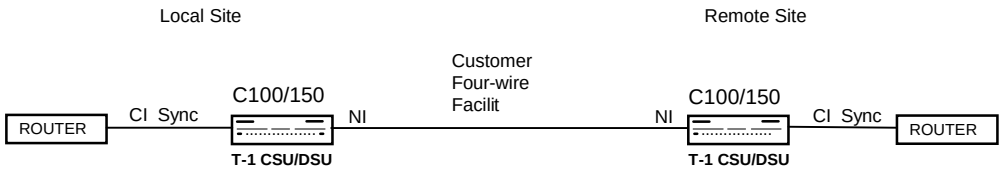


Figure 1-7 shows a typical application for the CSU / DSU connecting two sites and using both channels over a T-1 facility. The Network Interface (NI) side of each unit connects to a customer owned four-wire facility and the Customer Interface (CI) side of each unit connects to the customer equipment. In this application, the T-1 CSU / DSUs ca be as far as 6000 feet apart.

Figure 1-7 C100 or C150s connecting two sites over customer-owned four-wire facility



C150 only applications

C150 applications can make use of drop-and-insert. Figure 1-8 shows the C150 T-1 CSU / DSU connecting two sites over a T-1 facility in the second of two very basic applications. The Network Interface (NI) side of each unit connects to the T-1 service and the Customer Interface (CI) DSX-1 interface of each unit connects to the customer PBX.

Figure 1-8 Two C150s connecting PBXs together over T1

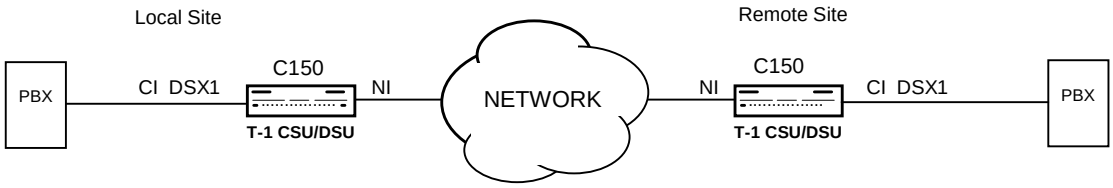


Figure 1-9 shows a typical application for the C150 CSU / DSU connecting two sites and using both Customer Interfaces connections over a T-1 facility. The Network Interface (NI) side of each unit connects to the T-1 facility and the Customer Interface side of each unit connects to the customer equipment. In this basic application, the user is using 224 Kbps (4 DS-0s) for the router to router communication and the remaining 1120K bps (20 DS-0s) for PBX to PBX voice communications.

Figure 1-9 C150s connecting two sites over T1

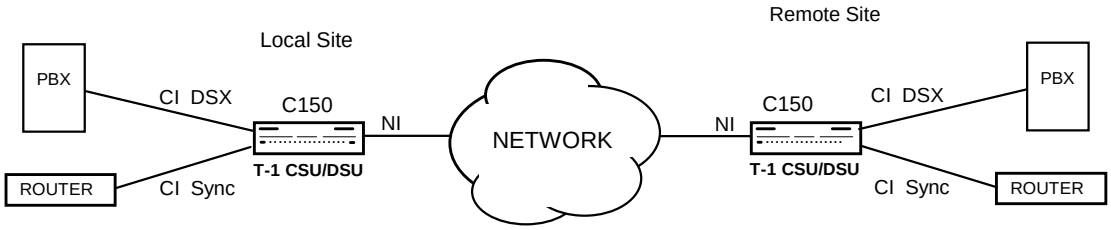


Figure 1-10 is similar to the application described in Figure 1-8 sites and uses both channels over a T-1 facility. The Network Interface (NI) side of each unit connects to a customer owned four-wire facility and the Customer Interface (CI) side of each unit connects to the customer equipment. In this application, the T-1 CSU / DSUs can be as far as 6000 feet apart.

Figure 1-10 C150s connecting two sites with PBXs over a customer-owned four-wire facility

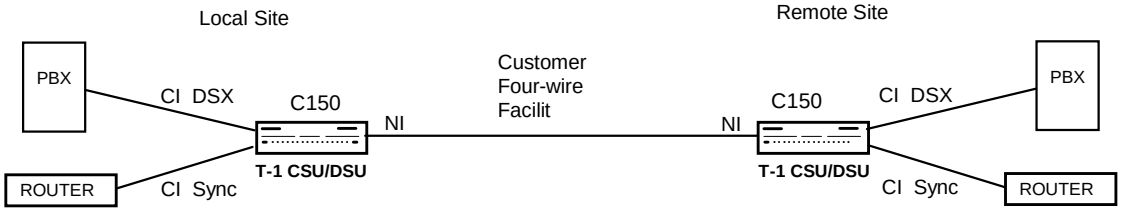
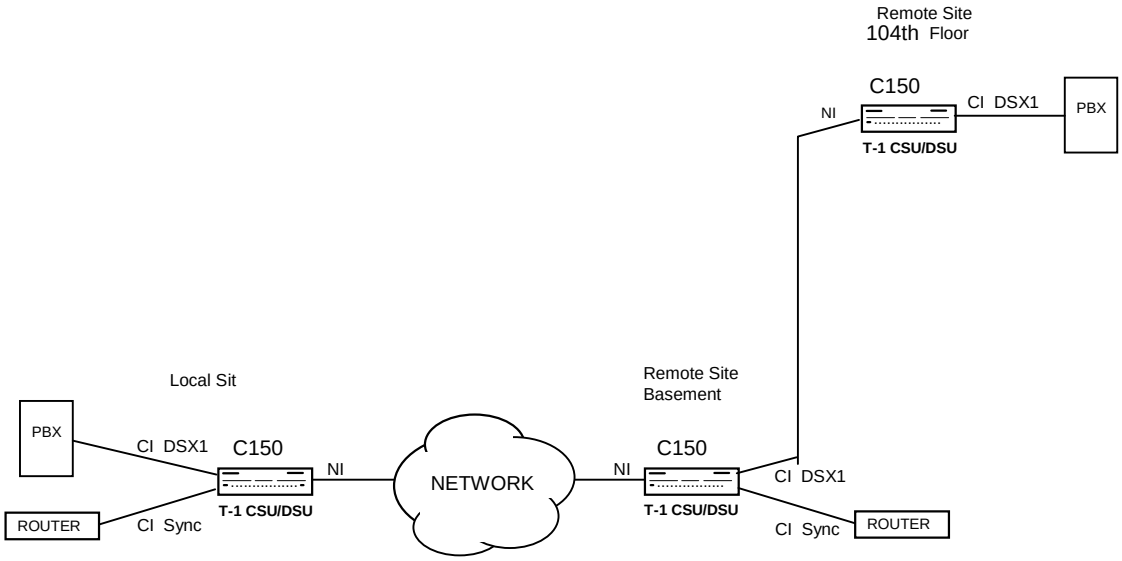


Figure 1-11 shows a typical application for the CSU/DSU connecting two sites over a T-1 facility. In this application, the user is using 224K bps (4 DS-0s) for the router-to router communications and the remaining 1120K bps (20 DS-0s) for PBX to PBX voice communications. The PBX in this application happens to be over 100 floors away. Since the C150 T-1 CSU/DSU has a long haul T-1 CSU on the DSX-1 interface, only one additional CSU, instead of two, is needed to connect to the 104th floor.

Figure 1-11 C150s connect two sites over T1 with the PBX many floors from the remote site



Chapter 2 Installation

Unpacking and Inspection

All C100/C150 T-1 CSU/DSU's are shipped in cardboard cartons with foam inserts to protect the units from shock and vibration experienced during shipment. Upon arrival of the equipment, inspect the condition of the received cartons and compare all items to the packing list attached to the upper right corner of the carton. Be sure to remove the two cables from the cable storage compartment beneath the T-1 CSU/DSU. Notify both the carrier and the distributor immediately if there are any damages. Notify the distributor immediately if there are any shortages.

Power On and Self-Test

Before connecting any cables to the T-1 CSU/DSU, remove the wallmount power supply from the shipping carton, plug one end into the unit, and then plug the other end into an AC outlet. The T-1 CSU/DSU has built-in automatic self-test features and when powered on, will check the hardware in the unit. When power is first applied, all twenty-one LEDS will light for four seconds and then three green LEDS will be on for two seconds. If any of the LEDS do not light during the sequencing test, a hardware problem may exist and C100/C150 and/or the distributor should be notified immediately.

Installation

At this point, the units are ready to be programmed. Pull down the front panel and program the units according to the instructions in Section 3 of this document. Ensure the Network Interface framing and coding are configured the same as the provisioning of the T-1 facility Check with the T-1 carrier provider to ensure the T-1 line has been tested and ready for use.

The following installation procedures are for a point-to-point T-1 facility. The basic strategy when installing the T-1 CSU/DSUs is to install both units without any channel cables connected. After the units are communicating with each other across the T-1 Network successfully, then the channels will be connected and tested.

When installing a system with a DSX1 channel, keep it disabled through the initial installation and testing until both units are communicating with each other across the Network. Then the DSX1 channel should be enabled and tested.

After the unit passes the power-on self-test and has been programmed, connect the T-1 Network Interface cable Part # CB8S0002 or CB8S0003 to the RJ48C on the rear of the unit labeled NI for Network Interface.

Plug the other end of the cable into the smart jack provided by the T-1 carrier.

Look at the LEDs on the front panel. All the LEDS on the front panel should be off except for the NI Line LEDs. The NI Line TX (data) and RX (data) LEDs may be on, off or blinking. The NI Line LED labeled LCK (Frame Lock) should be solid green. If it is, the unit is now communicating with the T-1 line. Perform this procedure at both ends of the T-1 facility. Before connecting any channels at either end, both units must have the NI Line LCK LED solid green.

When connecting channel cables, always secure them with the provided screws. This will help avoid future intermittent problems. Connect the appropriate channel cables at both ends and the system should now be operational.

If a DSX1 channel is being used now is the time to reprogram the units to enable them at both ends. Connect the proper DSX1 cables at both ends and check out PBX to PBX operation.

If any questions arise prior to installation or if any problems occur during installation, call Verilink Customer Service for assistance.

Chapter 3

Configuration Using the DIP Switches

This chapter describes configuring the C100 and C150 using the front panel DIP switches.

The Console and SNMP are the other methods of configuring the units. See the appropriate Console or SNMP chapter for these methods.

Overview

The C100 / C150 T-1 CSU / DSU is easy to program and can be configured to meet a variety of user applications. The unit can be programmed with DIP switches or through the async console port which is described in Chapter 5, *Using the Console Port* of this manual. This Section describes configuring the unit with DIP switches. There are seven programming option switch packs S1 through S7 located directly behind the front panel. Each switch pack contains eight switches.

Specific applications with programming charts and cable descriptions are in Appendix B, *Sample Applications.*

Factory default settings are also described. The switch settings can be shipped from the factory set for a specific customer application direct to remote sites. This permits non-technical users at those sites to easily install the units.

Accessing DIP switches

To access the DIP switch packs, grasp the knob located on the top center of the front panel and pull outward and down. Located on the back of the front panel is a condensed programming chart that can be used to set the DIP switches in most applications without a manual. Rocker-type DIP switches are used so they may be easily programmed using a paper clip, small screwdriver, fingernail, etc. When the manual refers to a DIP switch in the Off position, it means the rocker arm of the switch is in its lowest position (down) on the side of the switch closest to the front panel. When the manual refers to a DIP switch in the On position, the rocker arm of the switch is in its lowest position on the side of the switch towards the rear of the unit.

IMPORTANT

After setting the DIP switches, power-on/off the unit to get it to read the new switch settings. Once the unit is configured and operating, powering-on/off resets the performance and diagnostic registers.

A detailed description of the programming options as well as the factory default settings follows.

Programming the unit configuration (C100 and C150)

Switch pack 1 is used to program the Unit Configuration, including selection of one of the three methods of configuring the unit. The following table and subsections describe the Unit Configuration settings:

Table 3-1 C100/C150 Switch pack 1—Unit Configuration

1	2	3	4	5	6	7	8	Setting
Off	Off	Off	—	—	—	—	—	Unit Address 1
On	Off	Off	—	—	—	—	—	Unit Address 2
Off	On	Off	—	—	—	—	—	Unit Address 3
On	On	Off	—	—	—	—	—	Unit Address 4
Off	Off	On	—	—	—	—	—	Unit Address 5
On	Off	On	—	—	—	—	—	Unit Address 6
Off	On	On	—	—	—	—	—	Unit Address 7
On	On	On	—	—	—	—	—	Unit Address 8
—	—	—	—	—	Off	Off	—	Switches enabled
—	—	—	—	—	On	Off	—	Console enabled (activated)
—	—	—	—	—	Off	On	—	SNMP activated
—	—	—	—	—	—	—	Off	Enable Channel Remote Loops
—	—	—	—	—	—	—	On	Disable Channel Remote Loops
Off	Off	Off	Off	Off	Off	Off	Off	Factory default setting

Unit address

Switch pack 1 positions 1,2 and 3 determine the Unit address. Setting these switches is only necessary when using a single console to control up to eight units. When controlling eight units (described in Chapter 5, *Using the Console Port*. Console Port) from a single console, each of the eight units must be programmed with a different Unit address so the console can communicate with them. If any two units are programmed with the same address when connected together, the console will not be able to operate properly with those two units.

Switches, console, or SNMP activated

Switch pack 1 positions 6 and 7 are used to select the method of programming the C100 / C150 T-1 CSU / DSU: switches, console, or SNMP

With positions 6 and 7 Off, the DIP switches are enabled to configure the unit. The configuration screen on the console is disabled (it still may be viewed but no configuration changes are permitted).

When position 6 is set to On and 7 off, only the console port ca perform configuration. The only switches that can be programmed are the unit address switches discussed in a previous subsection.

In either switch position, loops and test pattern diagnostics, on both the console, and front panel operate.

Console or SNMP

SNMP must be set starting in the Console mode and the Console is used to enter the IP address, after which the switches are reset to SNMP mode. Switch 7 is set to On to activate SNMP. For full details and procedures, see Chapter 7, *Configuring the Console Port for SNMP*.

Remote loop disable

Switch pack 1 position 8 is used to enable / disable the unit from recognizing most remote loop commands. With position 8 On, the unit is disabled and does not respond to Remote Channel Loop. It will still respond to the Network Interface Remote Loop commands (Loop Up / Loop Down) and Payload Loop as requiredin Technical Reference 62411 and ANSI T1.403.

In the Off position, all remote loops are enabled and remote loops can be set by remote commands.

Programming the network interface

Switch pack 2 is used to program the Network Interface (NI). The following is a description of the Network Interface settings:

Table 3-2 C100 and C150 Switch-2: Network Interface

1	2	3	4	5	6	7	8	Setting
Off	-	-	-	-	-	-	-	ESF Framing
On	-	-	-	-	-	-	-	D4 Framing
	Off	-	-	-	-	-	-	B8ZS Coding
	On	-	-	-	-	-	-	AMI Coding
		Off	-	-	-	-	-	Enforce Density
		On	-	-	-	-	-	Clear Channel
			Off	-	-	-	-	AT&T 54016
			On	-	-	-	-	ANSI T1.403
				Off	Off			0 dB Line Build Out
				On	On			-7.5 dB Line Build Out
				On	Off			-15 dB Line Build Out
				Off	On			-22.5 dB Line Build Out
						Off	Off	Network supplies Timing
						Off	On	Internal Timing
						On	Off	DSX-1 supplies Timing[a]
						On	On	Channel supplies Timing
Off	Off	On	Off	Off	Off	Off	Off	Factory default setting

a. C150 only

NI Framing

Switch pack 2 position 1 determines the type framing. With position 1 Off, the unit will generate and expect ESF framing to and from the Network Interface. With position 1 On, the unit will generate and expect D4 framing. The framing selected in the unit must match the framing option provided by the T-1 Carrier

NI Coding

Switch pack 2 position 2 selects the type of coding the unit will generate. Position 2 Off, makes the unit generate B8ZS encoding and in the On position causes the unit to generate AMI (Alternate Mark Inversion) encoding. This coding selection, similar to the framing, must match the provisioning provided by the T-1 Carrier supplier otherwise intermittent errors may occur.

Density

Switch pack 2 position 3 determines whether the unit will enforce density to the Network or be Clear Channel. Position 3 in Off will configure the unit to enforce density. This means that data from the Channel being transmitted to the Network must meet the ones density requirements specified in 62411 and T1.403 (approximately 1 in every 8 bits must be a one and no more than 15 consecutive zeros). If the data from the channels violate density, the C100 / C150 T-1 CSU / DSU wit this option selected will put ones in the output data to guarantee density compliance and in the process will put errors in the customer data.

With position 3 On, the unit will let data from the Customer pass to the Network transparently. If the facility provided by the T-1 Carrier is not Clear Channel and this Clear Channel option is selected, the Customer will experience data errors.

54016 or T1.403

Switch pack 2 position 4 selects whether the unit is compatible with the Technical Reference 54016 or ANSI T1.403 ESF Data Link messages. Switch pack 2 position 4 Off programs the unit to be compatible with the 54016 specification. With this position On, the unit will be compatible with the T1.403 specification. As with the preceding selections, this option must match the requirements of the T-1 Carrier provider.

Line build out

Switch pack 2 positions 5 and 6 program the Line Build Out. In most cases, this selection will be set to 0 dB which is positions 5 and 6 Off.

Timing

Switch pack 2 positions 7 and 8 select the Timing option the unit will use. Position 7 Off and 8 Off is Network supplies timing. This optio must be selected when connecting to a public T-1 Network where data will be going through a switch or DACS (MEGACOM, SUPERTRUNK, etc.). With this option the C100 / C150 T-1 CSU / DSU will lock its timing on to the T-1 facility receive data and frequency lock its transmit data to the receive data so the Network receives its own timing back. If any of the other settings are used when connected to a public T-1 facility, with switched services and the transmit path to the Network is not frequency locked to the Network, timing slips will occur. A typical indication of timing slips is frame losses occurring at a fixed rate.

Another common timing option is Internal. Many T-1 facilities provided to the user such as T-SPAN do not go through switched services. In these applications, the T-1 CSU / DSU must supply timing at one end. Therefore, the CSU / DSU at one end must be programmed for Internal. With Internal Timing selected, position 7 Off and 8 On, the unit's internal oscillator will be the timing source. When using this mode, the remote unit at the other end must be programmed for Network supplies Timing. This mode is also selected when using the unit as a Limited Distance Modem (LDM) over Customer-owned wiring.

Channel or DSX-1 timing

The other selections, Channel or DSX-1 supplies Timing is used when the timing on the DSX-1 or Channel is derived from a Public Network or an extremely accurate timing source.

DSX-1 timing is set if timing is provided by CPE equipment such as a PBX or Channel Bank.

Channel timing is set when customer DTE is supplying timing (very rare). It is most commonly used in tail circuit timing.

Programming the DSX1 Interface (C150 only)

Switch pack 3 is used to program the DSX1 Interface. The following is a description of the DSX1 Interface settings:

Table 3-3 SWITCH Pack 3 - DSX1 interface (C150 only)

1	2	3	4	5	6	7	8	Setting
Off		-						DSX1 enabled
On								DSX1 disabled
	Off							ESF Framing
	On							D4 Framing
		Off						B8ZS Coding
		On						AMI Coding
			Off	Off	Off			133 feet or 0 dB Line Build Out
			On	Off	Off			266 feet
			Off	On	Off			399 feet
			On	On	Off			533 feet
			On	On	On			655 feet
			Off	Off	On			-7.5 dB Line Build Out
			On	Off	On			-15 dB Line Build Out
			Off	On	On			-22.5 dB Line Build Out
						Off		Idle
						On		Busy
Off	Off	Off	Off	Off	Off	Off	Off	Factory default setting

DSX1 in or out

Switch 3 position 1 is used to enable or disable the DSX1 interface. In the On position, the DSX1 interface is completely disabled and all three LEDS (TX, RX and LOCK) associated with the DSX1 interface will not light. When the DSX1 is not used, the DSX1 should be disabled for proper operation of the unit. When a DSX1 input is used, position 1 must be Off.

DSX1 framing

Switch 3 position 2 determines the type framing. With position 2 Off, the unit will generate and expect ESF framing to and from the DSX1 interface. With position 2 On, the unit will generate and expect D4 framing. The framing selected on the DSX1 interface does not have to match the framing on the Network Interface. The T-1 CSU / DSU can be used to connect an ESF T-1 facility to a PBX which only supports D4.

DSX1 coding

Switch 3 position 3 selects the type of coding the unit will generate. Position 3 Off, makes the unit generate B8ZS encoding (clear channel) and in the On position causes the unit to generate AMI (Alternate Mark Inversion) encoding. This coding selection, must match the Customer Equipment connected to the DSX1 interface otherwise intermittent errors may occur.

DSX1 line length/build out

Switch 3 positions 4, 5 and 6 control the output power of the T-1 driver on the DSX1 interface. The driver on the DSX1 interface can support both short haul (PBXs up to 655 feet) and long haul (other T-1 CSUs up to 6000 feet) applications. When the DSX1 interface is connected to customer equipment with short haul interfaces, the settings that should be used are 133, 266, 399, 533 or 655. When the DSX1 interface is connected to another T-1 CSU / DSU up to 6000 feet away, the settings that should be used are the standard 0, -7.5, -15 or -22.5. The typical setting is 0 dB / 133 feet.

Idle or busy character

Switch 3 position 7 selects either an Idle or a Busy character for insertion into the DSX1 output in all DS0s used by the Synchronous Channel. With position 7 Off, an Idle character is inserted into all the unused DS0s on the DSX1 interface. With position 7 On, a Busy character is inserted into all the unused DS0s. Typically the Idle character is the insertion character. On a few older PBXs, the Busy character is required.

Programming the Synchronous Channel Interface (C100 and C150)

Switch pack 4 is used to program the Synchronous Channel Interface (CI). The following is a description of the settings:

Table 3-4 Switch pack-4–C100 and C150 customer interface

1	2	3	4	5	6	7	8	Setting
Off	-	-	-	-	-	-		reserved
On	-	-	-	-	-	-		reserved
	Off	Off	-	-	-	-	-	RS530 / RS422
	Off	On	-	-	-	-	-	V.35
	On	Off	-	-	-	-	-	RS232
-	-	-	Off	-	-	-	-	56000
-	-	-	On	-	-	-	-	64000
-	-	-	-	Off	-	-	-	Carrier On
-	-	-	-	On	-	-	-	Switched Carrier
-	-	-	-	-	Off	-	-	Channel TX Data - Normal
-	-	-	-	-	On	-	-	Channel TX Data - Invert
-	-	-	-	-	-	Off	-	Channel Clock - Normal
-	-	-	-	-	-	On	-	Channel Clock - Invert
-	-	-	-	-	-	-	Off	Internal TX Clock
-	-	-	-	-	-	-	On	External TX Clock
Off	Off	Off	Off	Off	Off	Off	Off	Factory default setting

Synchronous Channel Interface

Switch pack 4 positions 2 and 3 are used to select the interface on the Synchronous Channel. With both positions 2 and 3 Off, the interface selected will be RS422 / RS530 and all the interface signals will be on the DB 25-pin female connector on the rear of the unit.

With position 2 Off and position 3 On, the interface selected will be CCITTV.35 and all the interface signals will be on the 34-pin female Winchester connector on the rear of the unit.

With position 2 On and position 3 Off the interface selected will be RS232 and all the interface signals will be on the DB 25-pin female connector on the rear of the unit.

The 34 pin and 25-pin interface cables may not be connected at the same time.

56000 or 64000

Switch pack 4 position 4 determines whether the bandwidth of all DS-0s to the Synchronous Channel is 56000 or 64000 bps. With position 4 Off all DS-0s to the Synchronous Channel are 56000 bps. To calculate the Channel speed, multiply 56000 times the number of DS0s going to the Channel. If 4 DS-0s were selected to go to the Synchronous Channel, the Channel speed would be 224000 bps.

Setting position 4 to On gives 64000 bps to all the selected DS0s going to the Channel. The same calculation applies when using 64000 bps. Multiply 64000 times the selected DS-0s to calculate Channel speed.

The following chart lists all the multiples of 56000 and 64000 bps available with the C100/C150 T-1 CSU/DSU. This option must be set the same in both units.

Table 3-5 Number of 56000 or 64000 DS0s selected

Numbers of DS0's selected	Multiplied by 56000	Multiplied by 64000
1	56000	64000
2	112000	128000
3	168000	192000
4	224000	256000
5	280000	320000
6	336000	384000
7	392000	448000
8	448000	512000
9	504000	576000
10	560000	640000
11	616000	704000
12	672000	768000
13	728000	832000
14	784000	896000
15	840000	960000
16	896000	1024000
17	952000	1088000
18	1008000	1152000
19	1064000	1216000
20	1120000	1280000
21	1176000	1344000
22	1232000	1408000
23	1288000	1472000
24	1344000	1536000

Continuous or switched carrier (Receive Line Signal Detect) control

Switch pack 4 position 5 selects Switched or Continuous Carrier Control. This option works in conjunction with the Request-To-Send (RTS) control signal, the Carrier Detect (CD or RLSD) control signal and the 56000 / 64000 (Switch pack 4 position 4) DS-0 bandwidth selection.

If the Synchronous Channel DS-0 selection switch is 64000 (no extra bandwidth available), both the local and remote units output Carrier is high to the Synchronous Channel. The Switched / Continuous selectio is then ignored.

If the Synchronous Channel DS-0 selection is 56000, the difference between 64000 and 56000 bps of 8000 bps (or multiples) is used to pass Request-To-Send from the local unit to the remote unit and outputted by the remote Synchronous Channel as Carrier Detect. In this mode if Switch pack 4 position 5 is Off (Continuous), a high is transmitted to the remote unit and Carrier Detect will be high on the remote Synchronous Channel. If Switch pack 4 position 5 is On (Switched), the RTS signal at the local Synchronous Channel will be sent across the T-1 line to the Synchronous Channel at remote unit and outputted as Carrier Detect.

If the speed of the Synchronous Channel is 224000 bps or a lower multiple of 56000, the Carrier control signal will be aligned with data. If the speed is above 224000 bps and multiples of 56000, the Carrier control signal will still be transparent but may not be aligned with data.

CAUTION

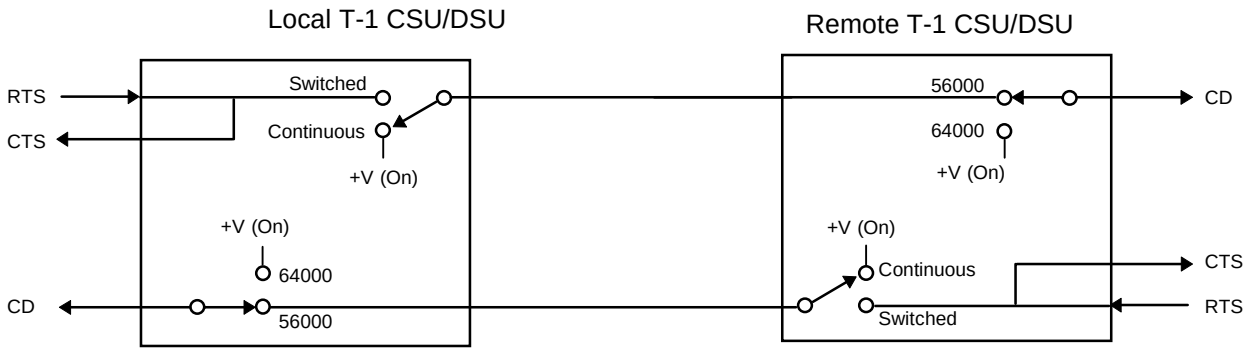
If RTS is not supported by the local terminal equipment, Switch pack 4 position 5 should be Off (Continuous) to insure that ones density will be maintained over the T-1 link.

NOTE

Carrier Detect and Data Set Ready will drop if the Network Interface is Out Of Frame.

Figure 3-1 is a block diagram which shows the end-to-end interaction of Request-To-Send, Carrier Detect and the DS-0 selection.

Figure 3-1 Block diagram of Carrier (Receive Line Signal Detect) Control



Synchronous ChannelInvert Data

Switch pack 4 position 6 determines whether data to and from the Synchronous Channel is normal or inverted. With position 6 Off, data on the Synchronous Channel passes normally. With position 6 On, both the transmit and receive data signals at the local Synchronous Channel are inverted. By inverting the data, this feature permits certain protocols such as HDLC, SDLC, etc. to pass over the T-1 facility at multiples of 64000 bps and meet ones density requirements of the Network. When using this mode, both the local and remote units must have this option selected.

Synchronous Channel Invert External Transmit Cloc

Switch pack 4 position 7 determines whether External Transmit Clock from the Synchronous Channel is normal or inverted. With position 6 Off, the External Transmit Clock on the Synchronous Channel passes normally. With position 7 On, External Transmit Clock from the local Synchronous Channel is inverted. This feature is used when the round trip delay of the Transmit Clock exceeds one half bit time (due to cable length and higher frequencies). This feature should be tried if sporadic errors are noticed on the Synchronous Channel.

Synchronous Channel Internal Or External Transmit Cloc

Switch pack 4 position 8 determines whether Internal Clock or External Transmit Clock is used. With position 8 Off, Internal Transmit Clock from the T-1 CSU / DSU is provided to the Synchronous Channel. With position 8 On, ExternalTransmit Clock from the terminal equipment to the Synchronous Channel. When using this mode, External Transmit Clock coming from the terminal equipmen

must be frequency-locked to the Receive Clock provided by the C100/C150T-1 CSU/DSU or DIP Switch pack 2 positions 7 and 8 must be On.

Programming the DS-0s and DSX-1s (C100 and C150)

Switch packs 5, 6, and 7 settings are required for both the C100 and C150.

DS-O assignment

Switch packs 5, 6 and 7 are used to determine whether a DS-0 is give to the Synchronous Channel or the DSX-1. There are twenty-four DS-0s in a T-1 frame and these DS-0s may be assigned to the Channel or DSX-1 on a contiguous or non-contiguous basis.

If the switch position is Off (rocker arm down towards the front panel), the DS-0 is not used or assigned to the DSX-1, depending on whether the unit is a C100 or C150.

If the switch position is On, the DS-0 is assigned to the Synchronous Channel. Even when the DSX1 interface is disabled, this selection must be made in order to determine how many DS-0s go to the Synchronous Channel

The programming of the DS-0s must match the DS-0 selection in the remote unit when they are used on a point-to-point connection or they must match the DS-0 selection on the Fractional T-1 facility provided by the T-1 Carrier supplier.

Table 3-6 Switch pack-5: C100/C150 DS0-01 through DS0-08 and C150 DSX1-01 through DSX1-08

1	2	3	4	5	6	7	8	C100 Setting	C150 Setting
Off	-	-	-	-	-	-	-	DS0-01 not used	DSX1-1
On	-	-	-	-	-	-	-	DS0-01 to Channel	
	Off		-	-	-	-	-	DS0-02 not used	DSX1-2
	On		-	-	-	-	-	DS0-02 to Channel	
	-	Off		-	-	-	-	DS0-03 not used	DSX1-3
	-	On		-	-	-	-	DS0-03 to Channel	
	-	-	Off		-	-	-	DS0-04 not used	DSX1-4
	-	-	On		-	-	-	DS0-04 to Channel	
	-	-	-	Off		-	-	DS0-05 not used	DSX1-5
	-	-	-	On		-	-	DS0-05 to Channel	
	-	-	-	-	Off		-	DS0-06 not used	DSX1-6
	-	-	-	-	On		-	DS0-06 to Channel	
	-	-	-	-	-	Off		DS0-07 not used	DSX1-7
	-	-	-	-	-	On		DS0-07 to Channel	
	-	-	-	-	-	-	Off	DS0-08 not used	DSX1-8
	-	-	-	-	-	-	On	DS0-08 to Channel	
Off	Off	Off	Off	Off	Off	Off	Off	Factory default setting	

Table 3-7 Switch pack-6: C100/C150 DS0-09 through DS0-16 and C150 DSX1-09 through DSX1-16

1	2	3	4	5	6	7	8	C100 Setting	C150 Setting
Off	-	-	-	-	-	-	-	DS0-09 not used	DSX1-09
On	-	-	-	-	-	-	-	DS0-09 to Channel	
	Off		-	-	-	-	-	DS0-10 not used	DSX1-10
	On		-	-	-	-	-	DS0-10 to Channel	
	-	Off		-	-	-	-	DS0-11 not used	DSX1-11
	-	On		-	-	-	-	DS0-11 to Channel	
	-	-	Off		-	-	-	DS0-12 not used	DSX1-12
	-	-	On		-	-	-	DS0-12 to Channel	
	-	-	-	Off		-	-	DS0-13 not used	DSX1-13
	-	-	-	On		-	-	DS0-13 to Channel	
	-	-	-	-	Off		-	DS0-14 not used	DSX1-14
	-	-	-		On	-		DS0-14 to Channel	
-	-	-		-		Off		DS0-15 not used	DSX1-15
	-	-	-	-	-	On		DS0-15 to Channel	
	-	-	-	-	-	-	Off	DS0-16 not used	DSX1-16
	-	-	-	-	-	-	On	DS0-16 to Channel	
Off	Off	Off	Off	Off	Off	Off	Off	Factory default setting	

Table 3-8 Switch pack-7: C100/C150 DS0-17 through DS0-24 and C150 DSX1-17 through DSX1-24

1	2	3	4	5	6	7	8	C100 Setting	C150 Setting
Off	-	-	-	-	-	-		DS0-17 not used	DSX1-17
On	-	-	-	-	-	-		DS0-17 to Channel	
-	Off	-	-	-	-	-	-	DS0-18 not used	DSX1-18
-	On	-	-	-	-	-	-	DS0-18 to Channel	
-	-	Off	-	-	-	-	-	DS0-19 not used	DSX1-19
-	-	On	-	-	-	-	-	DS0-19 to Channel	
-	-	-	Off	-	-	-	-	DS0-20 not used	DSX1-20
-	-	-	On	-	-	-	-	DS0-20 to Channel	
-	-	-	-	Off	-	-	-	DS0-21 not used	DSX1-21
-	-	-	-	On	-	-	-	DS0-21 to Channel	
-	-	-	-	-	Off	-	-	DS0-22 not used	DSX1-22
-	-	-	-	-	On	-	-	DS0-22 to Channel	
-	-	-	-	-	-	Off	-	DS0-23 not used	DSX1-23
-	-	-	-	-	-	On	-	DS0-23 to Channel	
-	-	-	-	-	-	-	Off	DS0-24 not used	DSX1-24
-	-	-	-	-	-	-	On	DS0-24 to Channel	
Off	Off	Off	Off	Off	Off	Off	Off	Factory default setting	

Chapter 4

LED Indicators and Diagnostics

Overview

The T-1 CSU/DSU is equipped with twenty-one LEDS, seve loopbacks, a pattern generator/checker and two sets of monitor jacks to help install and diagnoseT-1 problems. The following sections describe these items:

Figure 4-1 C100 Front Panel LEDs

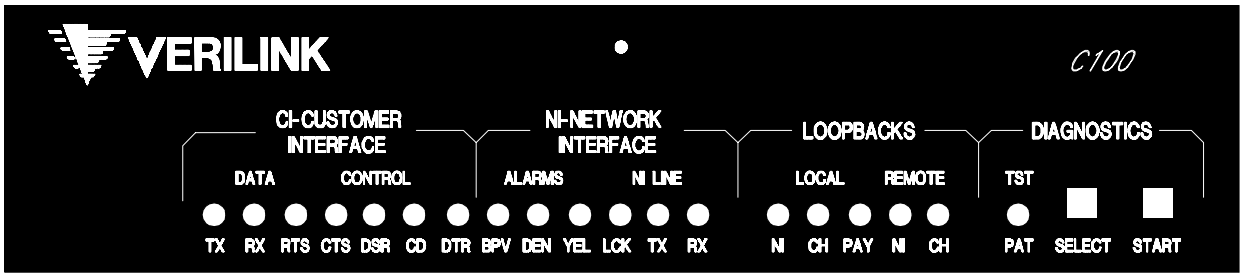
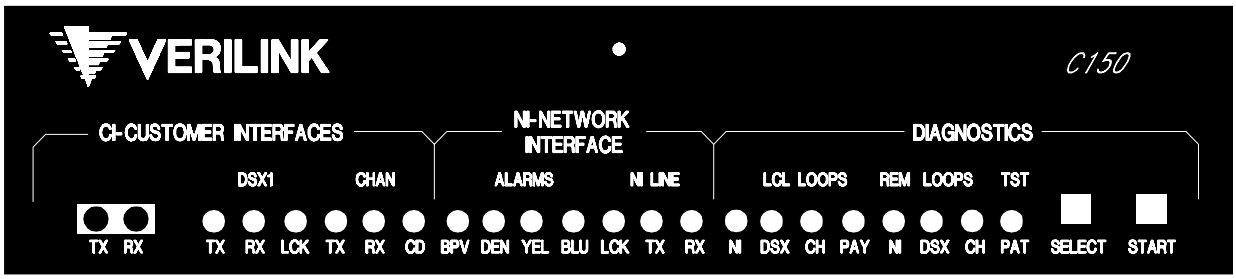


Figure 4-2 C150 front panel LEDs



Channel LED Indicators

On the C150, the first three Customer Interface LEDs are used for DSX1. The C100 instead has three other Customer Interface LEDs: RTS, CTS, and DSR, which are not found on the C150.

C150 only

CI DSX1 TX DAT

The CI DSX1 TX DATA LED is lit whenever CI DSX1 TXDATA is spacing. The color of this LED is green.

CI DSX1 RX DAT

The CI DSX1 RX DATA LED is lit whenever CI DSX1 RXDATA is spacing. The color of this LED is green.

CI DSX1 LOCK

The CI DSX1 LOCK LED is green when the T-1 CSU / DSU is frame locked to the T-1 stream coming from the customer equipment. This LED will be red when no framing is detected from the customer equipment. This LED will be not be lit when the CI DSX1 channel is disabled with the DIP switches. The color of this LED is red / green.

CI Chan TX DATA

The CI Channel TX DATA LED is lit whenever CI Channel TXDATA to the customer equipment is spacing. The color of this LED is green.

CI Chan RX DATA

The CI Channel RX DATA LED is lit whenever CI Channel RX DATA from the customer equipment is spacing. The color of this LED is green.

CI Chan RTS

The CI Channel RTS (Request to Send) LED is lit whenever CI Channel RTS from the customer equipment is spacing. The color of this LED is green.

CI Chan CTS

The CI Channel CTS (Clear to Send) LED is lit whenever CI Channel CTS to the customer equipment is spacing. The color of this LED is green.

CI Chan DSR

The CI Channel DSR (Data Set Ready) LED is lit whenever CI Channel DSR to the customer equipment is spacing. The color of this LED is green.

CI Chan CD

The CI Channel CD (Carrier Detect) LED is lit whenever pin 8 on the CI Channel interfaces to the customer equipment is spacing. The colo of this LED is green.

CI Chan DTR

The CI Channel DTR (DataTerminal Ready) LED is lit whenever CI Channel DTR from the customer equipment is spacing. The color of this LED is green.

Alarm and Network Interface LEDs

BPV Alarm

The BPV (Bi-Polar Violation) ALARM LED is lit when a bi-polar violation is detected in the received T-1 data from Network. The BPV ALARM LED stays on approximately 500 milliseconds and then goes out. The color of the BPV ALARM LED is red.

Density Alarm

The DENSITY ALARM is lit when a Ones Density Alarm is detected in the received T-1 stream. A Ones Density Alarm occurs when there are an insufficient number of one bits or more than 15 consecutive zero bits. The DENSITY ALARM LED stays on approximately 500 milliseconds and then goes out. The color of the DENSITY ALARM LED is red.

Blue Alarm

(Appears only on the C150.) This LED is lit when BLUE ALARM (unframed all 1's) is received from Network. The color of the BLUE ALARM LED is red.

Yellow Alarm

The YELLOW ALARM LED is lit when either a Yellow Alarm (8 1's followed by 8 0's) is received in the 4K Data Link message from the Network in ESF or a Yellow Alarm (bit 2 spacing in every DS0) is received from the Network in D4 Framing. A Yellow Alarm from the Network usually means the Network is not receiving framing. Th color of the YELLOW ALARM LED is red.

NI TX DAT

This LED is lit whenever NI TX DATA is spacing. The color of this LED is green.

NI RX Data

This LED is lit whenever NI RX DATA is spacing. The color of this LED is green.

NI Lock

The NI LOCK LED is lit green when the T-1 CSU / DSU is frame locked to the Network. When the unit is Out of Frame or not frame-locked, this LED will be red. The color of this LED is red / green.

Loopbacks and diagnostics LEDs

Loopbacks are labeled Local and Remote on the C100. On the C150 they are labeled LCL LOOPS and REM LOOPS. The C150 has DSX loopback LEDs in addition to the C100 loopback LEDs. See the front panel illustrations below.

Local Network Interface (NI) Loopback

The Local Network Interface (NI) LOOPBACK LED is on solid when it is selected by the Select push-button. When the Local NI LOOPBACK LED blinks at a fast rate, the T-1 CSU / DSU has the Network Interface looped back onto itself (see circled loop in Figure 4-3a.) and was activated locally. When the Local NI Loopback LED blinks at a slow rate the T-1 CSU / DSU has the Network Interface looped back to the Network (see circled loop i Figure 4-3b.) and was activated by the carrier provider or the remote unit. The color of this LED is red.

Illustrations of examples of the C150 follow those of the C100. These example show PBXs connected by a DSX-1 line.

C100 examples

Figure 4-3 C100 T-1 CSU/DSU in Local NI Loopback

Figure 4-2a:

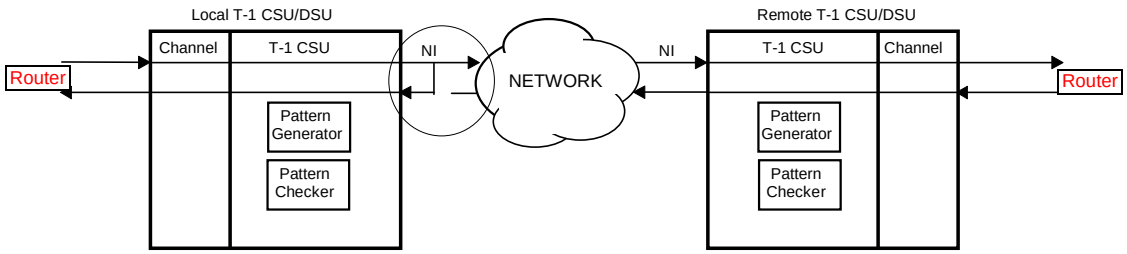
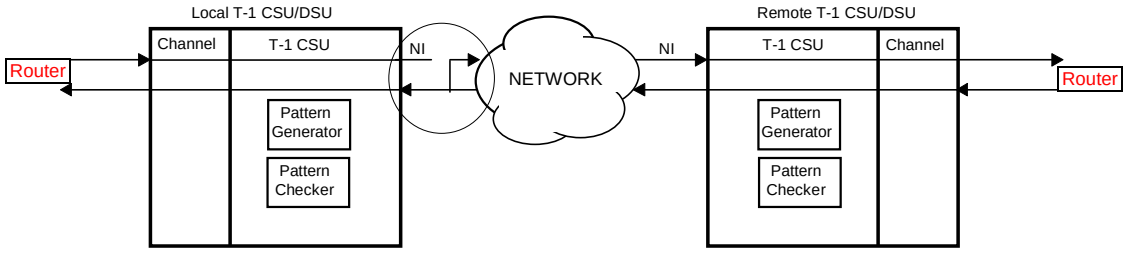


Figure 4-2b. T-1 CSU/DSU in Local NI Loopback (CSU Loopback from the Network):



C150 examples

Figure 4-4 C150 T-1 CSU/DSU in Local NI Loopback

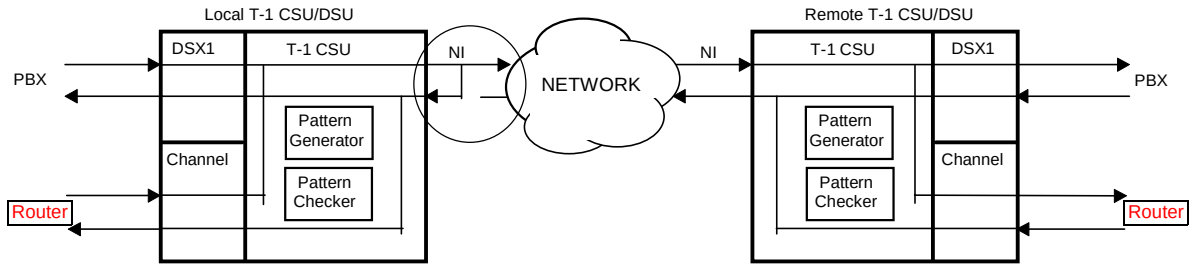
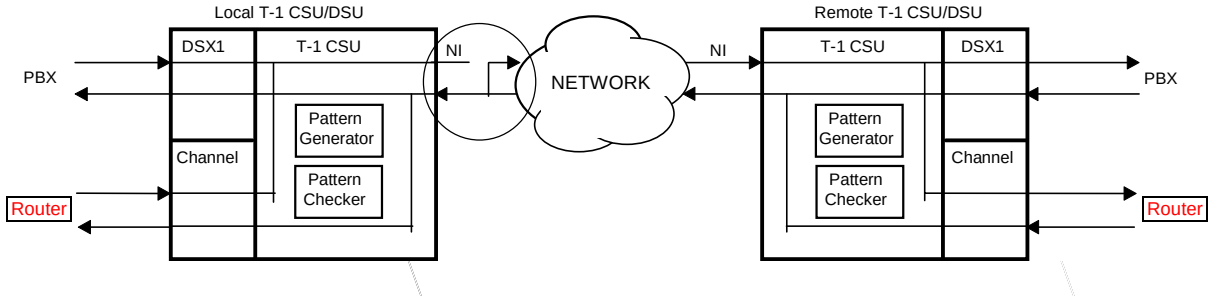


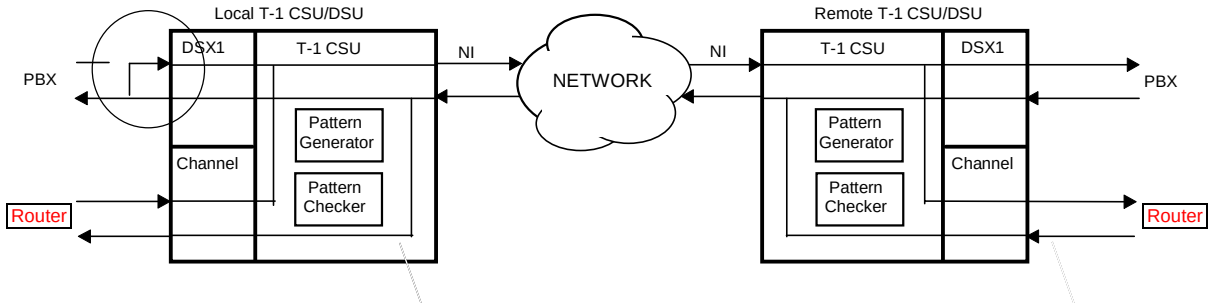
Figure 4-5 C150 T-1 CSU/DSU in Local NI Loopback



LocalDSX1channel loopback

The Local DSX1 Channel LOOPBACK LED is on solid when it is selected by the Select push-button. When the Local DSX1 Channel LOOPBACK LED blinks at a fast rate, the T-1 CSU / DSU has the DSX1 (Customer T-1 interface) looped back onto itself (see circled loop in Figure.) and was activated locally. When the Local DSX1 Channel Loopback LED blinks at a slow rate the T-1 CSU / DSU has the DSX1 (Customer T-1 interface) looped back onto itself but was activated by the carrier provider or the remote unit sending a V.54 command. When this loopback is activated, data continues to be transmitted to the customer equipment. The color of this LED is red.

Figure 4-6 C150 DSX-1 CSU/DSU in Local Channel Loopback



LocalSynchronous Channel Loopback

The Local Synchronous Channel LOOPBACK LED is on solid when it is selected by the Select push-button. When the Local Synchronous Channel LOOPBACK LED blinks at a fast rate, the T-1 CSU / DSU has the Channel interface in a bidirectional loopback (see circled loop in Figure 4-7.) and was activated locally. When the Local Synchronous Channel Loopback LED blinks at a slow rate the T-1 CSU / DSU has the Channel in a bidirectional loopback but was activated by the carrier provider or the remote unit sending a V.54 command. The color of this LED is red.

Figure 4-7 C100 T-1 CSU/DSU in Local CI Channel Loopback

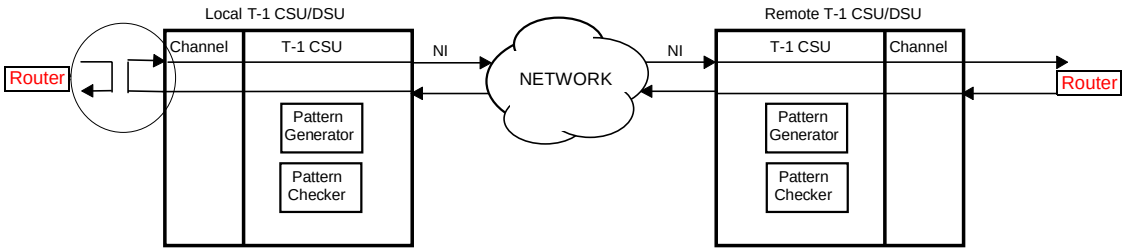
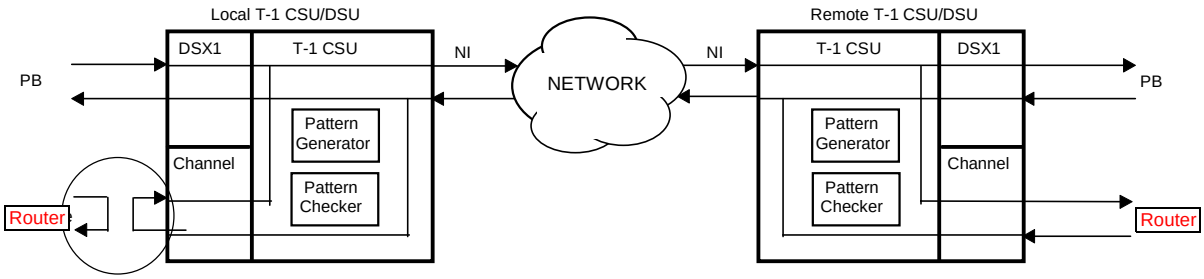


Figure 4-8 C150 T-1 CSU/DSU in Local CI Channel Loopback



Local Payload Loopback

C100 and C150

The C150 Local Payload LOOPBACK LED is on solid when it is selected by the Select push-button. When the Local Payload LOOPBACK LED blinks at a fast rate, the T-1 CSU / DSU is in a Payload Loopback and was activated locally. (See circled loops in the illustrations below.)

When the Local Payload Loopback LED blinks at a slow rate the T-1 CSU / DSU is in a Payload loopback activated by the T1 carrie provider or the remote end.

This loopback can be used when in both D4 and ESF Framing.

The color of this LED is red.

Figure 4-9 C100T-1 CSU/DSU in Local Payload Loopback

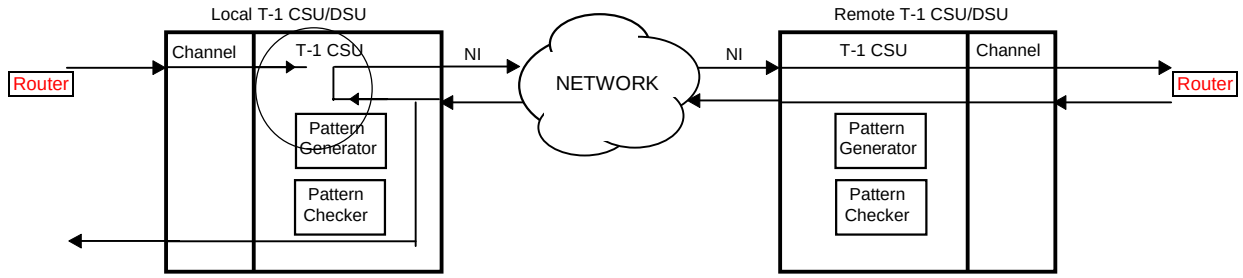
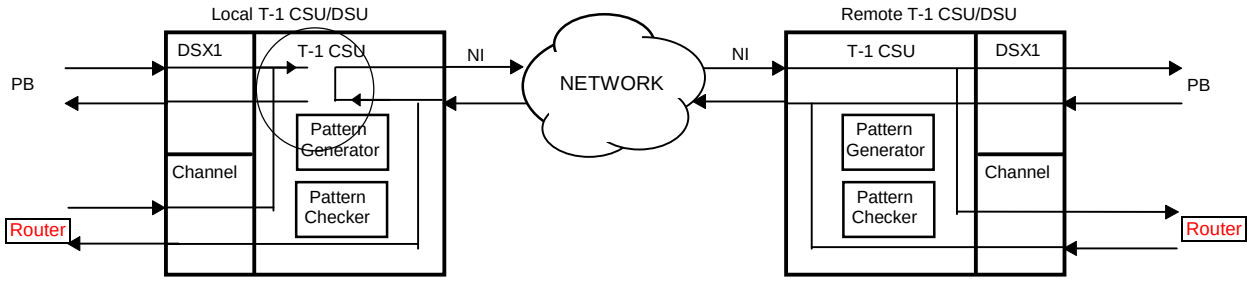


Figure 4-10 C150 T-1 CSU/DSU in Local Payload Loopback



Remote Network Interface (NI) Loopback

The Remote Network Interface (NI) LOOPBACK LED is on solid whe it is selected by the Select push-button. When the Remote NI LOOPBACK LED blinks at a fast rate, the T-1 CSU / DSU has sent a LOOP UP (Remote NI loop) command to the T-1 CSU / DSU (see circled loop i Figure 4-11 for the C100) at the other end of the Network. Since this loopback latches the unit at the other end, care

must be taken to ensure that a LOOP DOWN command is sent (pushing the Start push-button again) when finished testing. The color of this LED is red.

Figure 4-11 Remote C100T-1 CSU/DSU in Remote Network Interface Loopback

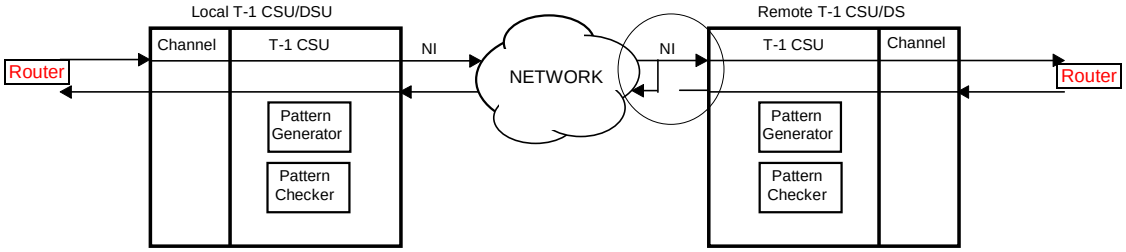
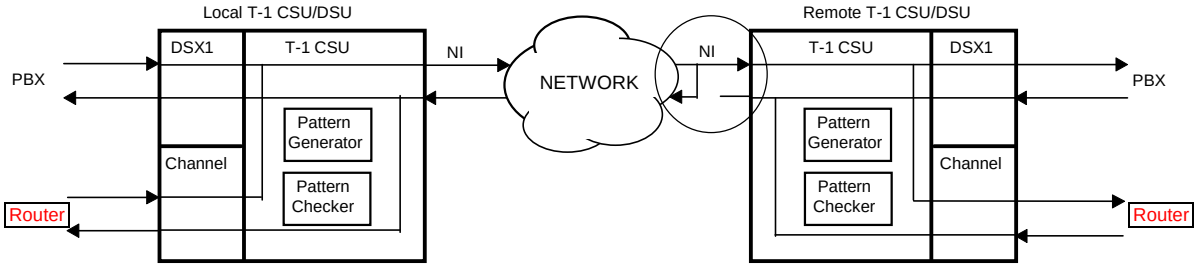


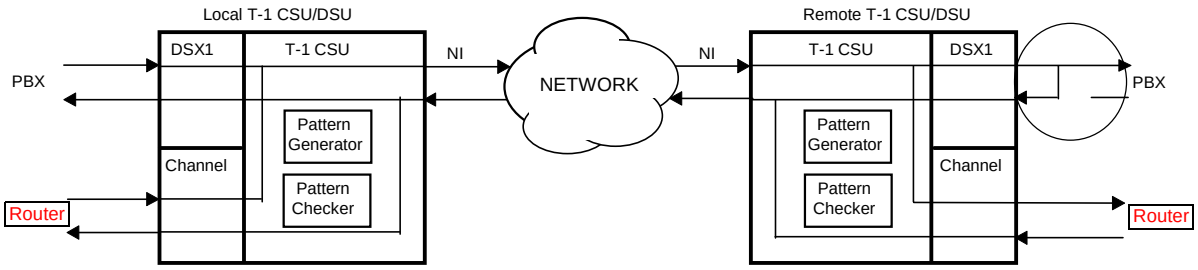
Figure 4-12 Remote C150T-1 CSU/DSU in Remote Network Interface Loopback



Remote DSX1 channel loopback

The Remote DSX1 Channel LOOPBACK LED is on solid when it is selected by the Select push-button. When the Remote DSX1 Channel LED blinks at a fast rate, the T-1 CSU / DSU has sent a V.54 LOOP ON command to the DSX1 Channel interface (see circled loop in the Figure) at the other end. Since this loopback latches the CI DSX1 interface in the unit at the other end, care must be taken to ensure that a V.54 LOOP OFF command is sent (pushing the Start push-button again) when finished testing. The color of this LED is red.

Figure 4-13 Remote C150 CSU/DSU in remote DSX-1 channel loopback



Remote Synchronous Channel Loopback

The Remote Synchronous Channel LOOPBACK LED is on solid when it is selected by the Select push-button. When the Remote Synchronous Channel LED blinks at a fast rate, the T-1 CSU / DSU has sent a V.54 LOOP ON command to the Synchronous Channel interface (see circled loop in Figure 4-14 for C100.) at the other end. Since this loopback latches the Synchronous Channel interface in the unit at the other end, care must be taken to ensure that a V.54 LOOP OFF command is sent (pushing the Start push-button again) when finished testing. The color of this LED is red.

Figure 4-14 Remote C100T-1 CSU/DSU in Remote Channel Loopback

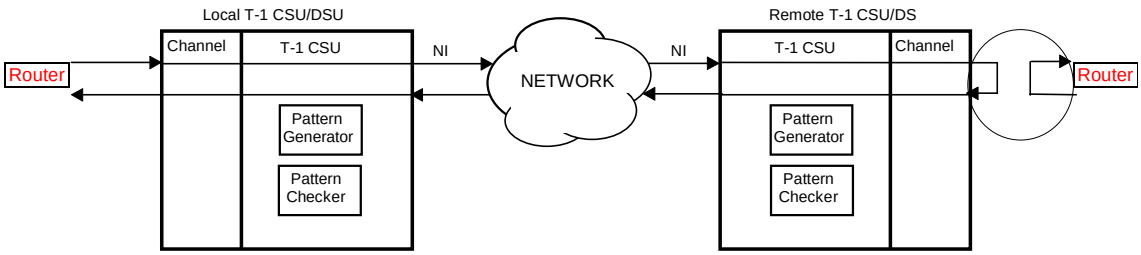
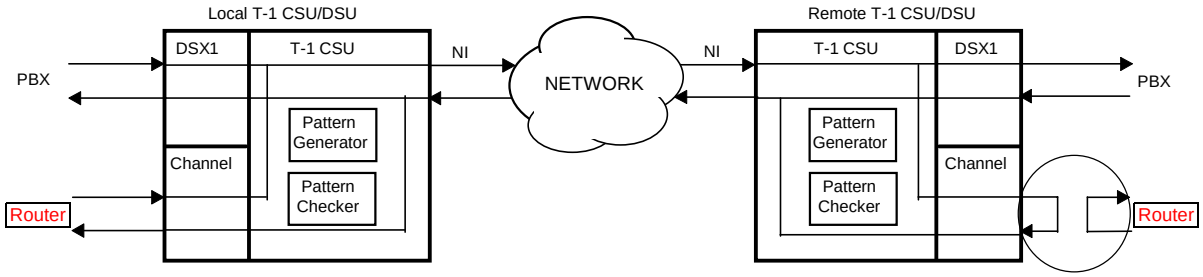


Figure 4-15 Remote C150T-1 CSU/DSU in Remote Channel Loopback



Test Pattern

C100

The Test Pattern LED is solid red when it is selected by the Select push-button. Pushing the Start push-button when this LED is lit, will cause a 2047 test pattern to be sent and theTest Pattern LED to blink red at a fast rate. The 2047 pattern will always be sent from the T-1 CSU / DS to the Network (see circled area in example i Figure 4-16 for the C100) unless a Local CI Channel Loopback (see circled area in example in Figure 4-17 for the C100) has been activated.

The 2047 pattern checker will look for a 2047 pattern from the Network, and if detected, will lightthe Test Pattern LED green. If a Local CI Channel Loopback has been activated, the 2047 test pattern will be sent to the Channel and the 2047 pattern checker will look fo the pattern from the Channel. The Test Pattern LED is a dual colo red / green LED.

Figure 4-16 Local C100 sending pattern to network with remote T-1 CSU in NI loopback

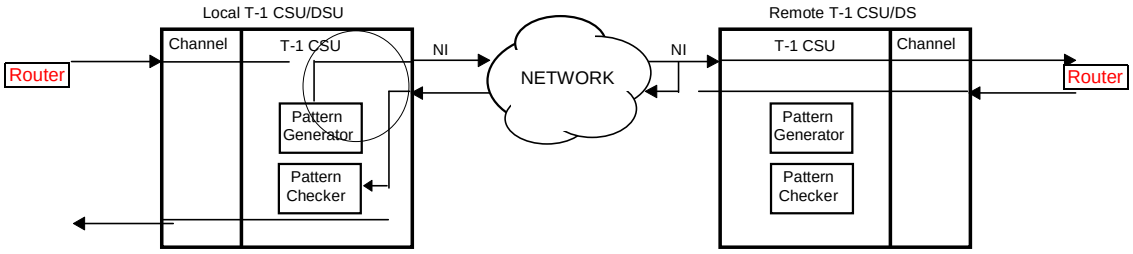
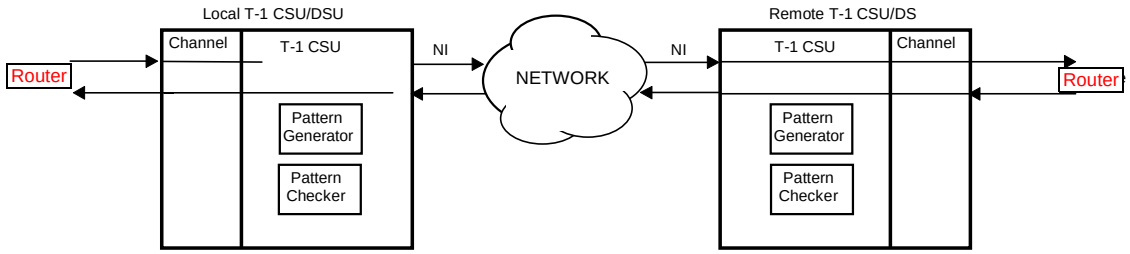


Figure 4-17 Local C100 CSU/DSU sending 2047 pattern to channel in local loopback



C150 Test Pattern

The Test Pattern LED is solid red when it is selected by the Select push-button. Pushing the Start push-button when this LED is lit, will cause a 2047 test pattern to be sent and theTest Pattern LED to blink red at a fast rate. The 2047 pattern will always be sent from the T-1 CSU / DS to the Network (see circled area in example in Figure 6.8.) unless a Local CI DSX1 or a Local CI Channel Loopback (see circled area i example in the Figure) has been selected. The 2047 pattern checker will look for a 2047 pattern from the Network, and if detected, will light the Test Pattern LED green. If a Local CI DSX1 or Channel Loopback has been activated, the 2047 test pattern will be sent to the DSX1 or Channel and the 2047 pattern checker will look for the pattern from either the DSX1 or Channel depending on the selected loopback. The Test Pattern LED is a dual color red / green LED.

Figure 4-18 Local C150 sending pattern to network with remote T-1 CSU in NI loopback

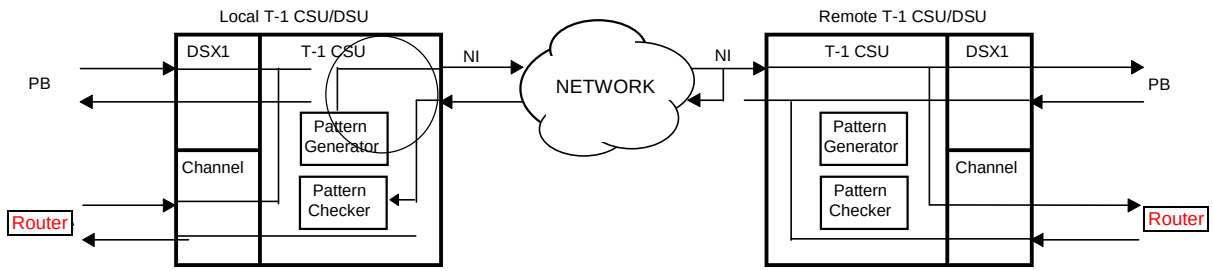
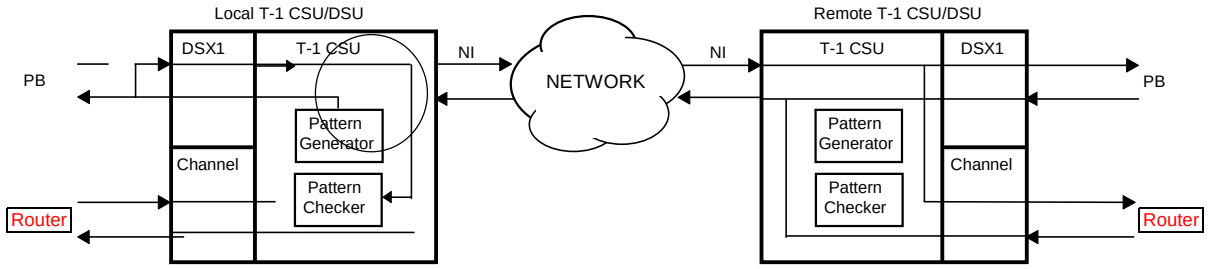


Figure 4-19 LocalT-1 C150 CSU/DSU Sending 2047 Pattern to Channel in Local Loopback



Select and Start Push-button

Separate subsections are given for the C100 and C150 because the C150 provides a DSX-1 line with a LED indicator. However push-button for both units operate nearly identically.

C100

The eight Loopback / Pattern LEDS work in conjunction with the Select and Start push-button. During normal operation all of the eight LEDs are off. To activate the switches, hold the Select push-button in for 3 seconds (this helps prevent unauthorized tampering).

Pushing the Select push-button once will light the Local NI Loopback LED. Pushing the Select push-button again, will turn off the Local NI Loopback LED and light the Local Channel Loopback LED. Each time the Select push-button is depressed, the LED that is on will go out and the LED to the right will go on selecting a new function. When theTest Pattern LED is on, pushing the Select push-button will causethe Test Pattern LED to go out and the Local NI Loopback LED to go on. Push the Select push-button until the desired function is lit. Pushing the Start push-button will cause that function to be activated and that LED will blink at a fast rate (approximately 200 milliseconds). Pushing the Start push-button again will cause the function to be deactivated.

Only one loopback at a time may be selected. The last loop command received will override all other loopbacks. An existing loopback must be turned off before a new loopback may be turned on.

When neither switch is depressed for two minutes, both switches will be deactivated. To re-activate the Select switch will have to be held i for 3 seconds again.

Example: Setting a Remote Channel Loopback.

Hold the Select push-button until the Local NI Loopback indicato lights (approximately 3 seconds). Push the Select push-button 4 times to advance to the Remote Channel Loopback LED which should be lit. Now push the Start push-button and the Remote Channel Loopback

LED should blink at a fast rate. This means aV.54 loop On command has been sent to the channel in the remote unit. The remote unit's Local Channel Loopback LED should be blinking at a slow rate and the remote unit should be in a loopback. Pushing the Start push-button again will send aV.54 loop Off command to the remote unit removing the loop. All loopback LEDs at the remote unit will go off and the local unit's Remote Channel Loopback LED will stop blinking fast and be on solid.

C150 Select and Start Push-button

The eight Loopback / Pattern LEDS work in conjunction with the Select and Start push-button. During normal operation all of the eight LEDs are off. To activate the switches, hold the Select push-button in for 3 seconds (this helps prevent unauthorized tampering). Pushing the Select push-button once will light the Local NI Loopback LED. Pushing the Select push-button again, will turn off the Local NI Loopback LED and light the Local DSX1 Loopback LED. Each time the Select push-button is depressed, the LED that is on will go out and the LED to the right will go on selecting a new function. When the Test Pattern LED is on, pushing the Select push-button will causethe Test Pattern LED to go out and the Local NI Loopback LED to go on. Push the Select push-button until the desired function is lit. Pushing the Start push-button will cause that function to be activated and that LED will blink at a fast rate (approximately 200 milliseconds). Pushing the Start push-button again will cause the function to be deactivated.

Only one loopback at a time may be selected. The last loop command received will override all other loopbacks. An existing loopback must be turned off before a new loopback may be turned on.

When neither switch is depressed for two minutes, both switches will be deactivated. To re-activate the Select switch will have to be held i for 3 seconds again.

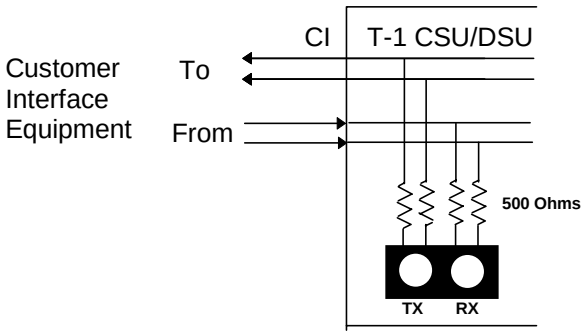
Example: Setting a Remote DSX1 Channel Interface Loopback.

Hold the Select push-button until the Local NI Loopback indicato lights (approximately 3 seconds). Push the Select push-button 5 times to advance to the Remote DSX1 Loopback LED which should be lit. Now push the Start push-button and the Remote DSX1 Loopback LED should blink at a fast rate. This means aV.54 loop On command has been sent to the DSX1 channel in the remote unit. The remote unit's Local DSX1 Loopback LED should be blinking at a slow rate and the remote unit should be in a DSX1 loopback. Pushing the Start push-button again will send a V.54 loop Off command to the remote unit removing the loop. All loopback LEDs at the remote unit will go off and the local unit's Remote DSX1 Loopback LED will stop blinking fast and be on solid.

Customer Interface DSX1 monitor jack

The CI DSX1 Monitor Jack located on left side of unit permits an external T-1 tester to monitor either or both the TX and RX pairs connecting the DSX1 port to the Customer Interface equipment (see the Figure). When using these jacks the TX and RX pairs are isolated by a 500 ohm resistors to protect the T-1 signals. These jacks are for monitor only.

Figure 4-20 C150 T-1 CSU/DSU wiring diagram of DSX1 Monitor Jack



Chapter 5

Using the Console Port

The console port is the menu-driven ASCII terminal user interface for the C100 and C150.

This chapter provides general information on using the console port. It also describes using the Utilities menu. Subsequent chapters describe using the major menus and functions of the console port:

- Chapter 6, *Configuring the C100/C150 Using the Console Port*
- Chapter 7, *Configuring the Console Port for SNMP*
- Chapter 8, *Performance Monitoring with the Console Port*

Overview

The T-1 CSU / DSU console port supports VT-terminal emulation with either a direct or modem dial-up connection. The speed of the console port is 9600 bps. Up to eight units can be daisy-chained together and controlled by a single console or a single modem. If all eight units are connected together, the unit address switches on each unit, must be programmed for a different address as described in Chapter 3, *Configuration Using the DIP Switches*. On power up, the unit with address 1 comes up with its console on and all other units are turned off. Each unit can then be polled individually by typing the letter “u” followed by a terminal address (1 through 8).

Cabling a Terminal to the Console Port

Each unit comes with a six conductor straight through RJ11 modular cable and an RJ11 modular to DB25 pin male hood as described in the Cable section of this manual. One end of the RJ11 cable is inserted into the connector on the rear of the unit labelled CONSOLE IN and the other end into the modular connector in the hood. Plug the hood into the DB25 pin connector on the VT100 terminal.

If more than one unit is to be controlled by the ASCII console, use the RJ11 cable provided with the second unit to daisy-chain it to the first unit. Plug one end of the second unit’s cable into the modular connector on the rear of the first unit labelled CONSOLE OUT. Insert the other end of the RJ11 into the modular connector labelled CONSOLE IN on the rear of the second unit. The hood provided with

the second unit is not used and can be stored in the shipping carton. Connect additional units in a similar fashion, using the RJ11 cable provided with them and storing the hoods.

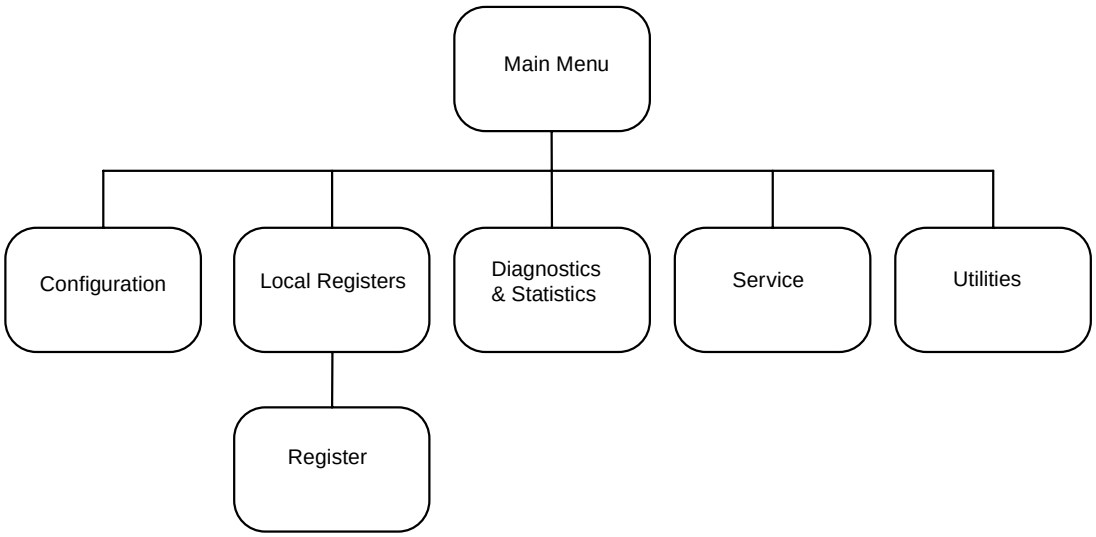
Cabling a Modem to the Console Port

To cable a modem to the Console Port, an optional hood is required. The hood can be supplied by Verilink or can be provided by the user. The hood is a modular RJ11 to 25 pin male Part Number CH2R0001 and a wiring diagram can be found in Appendix C, *Interfaces and Cables*. The same cable provided with the unit is used with this hood to connect the Console Port to the modem. If more than one unit is to be controlled by the modem, use the RJ11 cable provided with the second unit to daisy-chain it to the first unit. Plug one end of the second unit's cable into the modular connector on the rear of the first unit labeled CONSOLE OUT. Insert the other end of the RJ11 into the modular connector labeled CONSOLE IN on the rear of the second unit. The hood provided with the second unit is not used and can be stored i the shipping carton. Connect additional units in a similar fashion, using the RJ11 cable provided with them.

Using the console port

The console is also easy to use because the screen hierarchy is very flat. In most cases there is only one screen displayed from the Main Menu. The screen hierarchy is shown in the following illustration.

Figure 5-1 Screen hierarchyT-1 CSU/DSU



Setting up the terminal

The console port and the ASCII terminal or modem must be programmed for the same speed to use the console feature. The settings of the console port on the T-1 CSU / DSU is 9600 bps, 8 data bits, 1 stop bit and no parity.

After the T-1 CSU / DSU and the VT100 terminal connections have been cabled, powered up and communicating, the Main Menu show in Figure 5-2 is be displayed.

When using a single console for multiple units, each unit must be selected by typing U or u followed by a unit address number of 1 through 8.

Console menu/command keys

The console is user-friendly and very simple to operate since only a few keys are needed. Except for the two control keys, all keys are described on the bottom lines of the screens where they are used. description of these keys follows:

SPACE BAR	Pressing the space bar on all screens advances the blinking cursor to the next field.
Letter B / b	Pressing the letter B or b (case-insensitive) moves the blinking cursor to the previous field.
ENTER	Typing Enter causes 1 of 2 things to occur depending on the screen displayed. On the Mai Menu it selects the next screen to display.On the other screens ENTER displays the next choice in the field.
BACKSPACE	Pressing the Backspace key on a field displays the previous choice in the field.
ESC	Pressing the Escape key on all screens displays the Main Menu or exits Utility fields.
R / r	Resest. Typing the letter **R** or **r** (case-insensitive) on the Diagnostics & Statistics screen (Figure 8-5, Diagnostics and Statistics Screen) resets the following counters on the screen: • NI Alarms: CRC-6, BVP, Blue Alarm • All CI Alarms • All Test counters. The remaining counters are Telco controlled registers and cannot be reset by the end-user.
Control D	Holding the Control key down and then pressing the letter D or d disconnects the modem.
Control R	Holding the Control key down and then pressing the letter R or r refreshes the screen.

Main Menu

The Main Menu is the first screen displayed (see Figure 5-2).

Figure 5-2 Main Menu with Console Deactivated

```
29 APR 1997                VERILINK CORPORATION                    14:46:48
UNIT ADDRESS 1               T-1 CSU/DSU CONSOLE
                                 Main Menu
                             Configuration
                             Local Registers
                             Diagnostics & Statistics
                             Service
                             Utilities
                             Password:
                             Software: REV 3.01
                             CONSOLE DEACTIVATED
CURSOR FORWARD = [SPACE]      SELECT = [ENTER]          CURSOR BACK = [B]
```

Activating and deactivating the console

When first entering the Main Menu, the console is deactivated. ***** TO ACTIVATE THE CONSOLE, A PASSWORD MUST BE ENTERED *****.

To deactivate the console, advance the cursor with the SPACE bar to the Deactivate Console and press ENTER. The console is deactivated and the password is required to activate the console again.

The blinking cursor is positioned on the Configuration selection. Advance the blinking cursor to the Password selection by pressing the SPACE key until the cursor is positioned on the password selection. To enter the password mode press ENTER. The blinking cursor moves to the right of the word Password and wait for the password to be typed. **The default password when shipped from the factory is just the ENTER key**.

Pressing **Enter** activates the console, as shown in Figure 5-3. (the password can be changed later, in the Utilities section). With the console activated, the console works in conjunction with DIP switch 1. If DIP Switch 1 position 6 is OFF, the console is able to view only all screens and operate the diagnostics on the Diagnostics & Statistics screen. If DIP switch 1 position 6 is ON, the console is able to configure the T-1 CSU / DSU and the DIP switches is ignored except for Unit Address which can only be changed by DIP switches.

Navigating the menu tree

To display any of the five screens listed in the Main Menu, advance the blinking cursor to the left of the selection wanted and press the ENTE key.

Figure 5-3 Main Menu with Console Activated

```
29 APR 1997                VERILINK CORPORATION                    15:17:55
UNIT ADDRESS 1               T-1 CSU/DSU CONSOLE
                                 Main Menu
                             Configuration
                             Local Registers
                             Diagnostics & Statistics
                             Service
                             Utilities
                             Deactivate Console
                             Software: REV 3.01
                             CONSOLE ACTIVATED
CURSOR FORWARD = [SPACE]      SELECT = [ENTER]            CURSOR BACK = [B]
```

Service

For Technical Support notices, see page 2 of this manual (after the cover).

Figure 5-4 Service screen (Not currently implemented)

```
29 APR 1997                VERILINK CORPORATION                    14:52:39
UNIT ADDRESS 1              T-1 CSU/DSU CONSOLE
                                  Service









                                                        MAIN MENU = [ESC]
```

To return to the Main Menu, press ESCAPE.

Utilities

The Utilities menu provides menus and commands to set the time and date, rename the header, and set the password.

Figure 5-5 Utilities screen

```
29 APR 1997                  VERILINK CORPORATION                    14:53:38
UNIT ADDRESS 1                 T-1 CSU/DSU CONSOLE
                                   Utilities

                               Set Time
                               Set Date
                               Rename Header
                               Set Password:




CURSOR FORWARD = [SPACE]                                  CURSOR BACK = [B]
SELECT = [ENTER]           SELECT BACK = [BACKSPACE]      MAIN MENU = [ESC]
```

When the Utilities screen is entered, the blinking cursor is located to the left of the Set Time selection, As with all the other screens, pressing the SPACE bar advances the cursor and pressing “b” moves the cursor in the opposite direction. And again, these selections can only be changed when the console is enabled and the password activated.

A description of all the fields that can be changed follows:

Set Time

Pressing the ENTER key when on SetTime selection moves the blinking cursor to the low order hour digit at the top right of the screen.To change the hour press ENTER until the desired hour is displayed. The BACKSPACE key also changes the hour but it causes it to go backwards instead of forward to save time. Toadvance the blinking cursor to the low order minutes selection, press the SPACE bar. To change the minutes, use the ENTER and BACKSPACE keys until the desired minutes are displayed. To change the seconds, advance the cursor with the SPACE bar and use ENTER and BACKSPACE as in the previous steps. Pressing theSPACE bar agai moves the blinking cursor to the Set Time position.

Set Date

Pressing the ENTER key when on Set Date selection moves the blinking cursor to the low order day digit at the top left of the screen. To change the day press ENTER until the desired day is displayed. The BACKSPACE key also changes the day but it causes it to go backwards instead of forward. To advance the blinking cursor to the right hand letter of the month selection, press the SPACE bar. To change the month, use the ENTER and BACKSPACE keys until the desired month is displayed. To change the century and year, repeat previous steps. Pressing the SPACE bar again moves the blinking cursor back to the Set Date position.

Rename Header

Pressing the ENTER key when on the Rename Header moves the blinking cursor to the middle of the header field and erases the current header. Any new header can be typed in at this point. The heade characters allowable are the alphabet (both upper and lower case) and the numbers 0 through 9. After the new header is typed in, press ENTER to save the header and return to the blinking cursor to the left of Rename Header selection. Pressing ESCAPE while typing in the new header returns to the Main Menu leave the current header intact. Once the ENTER is press while typing in a new header, the current header is permanently erased and has to be retyped again.

Set Password

Pressing ENTER while on the Set Password selection moves the cursor to the beginning of the password field to the right of Set Password. A new password can be entered at this point. The password characters allowable are the alphabet (both upper and lower case) and the numbers 0 through 9. After typing in the new password press the ENTER key. The console requests PasswordVerification.Type in the exact password again and the new password is saved. If the second password does not match the first password, the message Invalid Verification is printed on the screen and the blinking cursor is returned to the left of Set Password. Pressing ESCAPE while typing in a new password or verifying a password returns to the Main Menu and leaves the old password intact. Pressing SPACE bar when on the Set Password selection advances the cursor back to SetTime.

To return to the Main Menu, press ESCAPE.

Chapter 6

Configuring the C100/C150 Using the Console Port

This chapter describes using the Configuration menu of the console port. Configuring can also be done via the DIP switches. See Chapter 3, *Configuration Using the DIP Switches*.

For general information on the console port, see Chapter 5, *Using the Console Port*.

Navigating the menu tree

To display any of the five screens listed in the Main Menu, advance the blinking cursor to the left of the selection wanted and press the ENTE key.

Figure 6-1 Main Menu with Console Activated

```
29 APR 1997                VERILINK CORPORATION                    15:17:55
UNIT ADDRESS 1               T-1 CSU/DSU CONSOLE
                                 Main Menu
                             Configuration
                             Local Registers
                             Diagnostics & Statistics
                             Service
                             Utilities
                             Deactivate Console
                             Software: REV 3.01
                             CONSOLE ACTIVATED
CURSOR FORWARD = [SPACE]      SELECT = [ENTER]          CURSOR BACK = [B]
```

Configuration menu

The following illustration is a display of the initial Console Interface menu.

Figure 6-2 Configuration–Console menu

```
29 APR 1997                VERILINK CORPORATION                    14:31:45
UNIT ADDRESS 1                T-1 CSU/DSU CONSOLE
                            Configuration - Console
IP Address:  000.000.000.000
NETWORK INTERFACE                      CUSTOMER INTERFACES
Framing:        ESF        DSX1:         Enable      SYNC Channel
Coding:         B8ZS       Framing:      ESF         Interface:    V.35
Density:        Disable    Coding:       B8ZS        Bandwidth:    56000
Mode:           62411      Line Length:  133 ft/0 dB Carrier:      On
Line Build Out: 0 dB       Fill Char:    Idle        Invert Data   Disable
Timing:         Network                              Invert Clk:   Disable
Remote Loop:    Enable                               Transmit Clk: Internal

DS01 DSX1    DS05 DSX1    DS09 DSX1    DS13 DSX1    DS17 DSX1    DS21 DSX1
DS02 DSX1    DS06 DSX1    DS10 DSX1    DS14 DSX1    DS18 DSX1    DS22 DSX1
DS03 DSX1    DS07 DSX1    DS11 DSX1    DS15 DSX1    DS19 DSX1    DS23 DSX1
DS04 DSX1    DS08 DSX1    DS12 DSX1    DS16 DSX1    DS20 DSX1    DS24 DSX1
CURSOR FORWARD = [SPACE]                                  CURSOR BACK = [B]
SELECT = [ENTER]                                          MAIN MENU = [ESC]
```

Overview of using the menu

When you enter the Configuration screen, the blinking cursor is positioned to the left of the Network Interface Framing selection. As in the Main Menu, pressing the SPACE bar advances the cursor to the next selection. If the selection wanted is passed accidentally, pressing the **B**-key moves the cursor in the reverse direction.

As mentioned previously, to change any of the selections on this screen, DIP switch 1 position 6 must be set to the console selection to enable the console function. (See Table 3-1, C100/C150 Switch pack 1—Unit Configuration.)

If the console function is enabled, the word **Console** is displayed to the right of the word Configuration at the top of the screen, and the console controls the configuration of the unit. If **DIP Switches** is Off (Switch pack 1, switch 6), the wor **Switches** is displayed to the right of the word Configuration at the top of the screen display, and the Console is not able to change the settings of the DIP switches.

The Unit Address displays the settings of the Unit Address programmed in the DIP switches. The Unit Address cannot be changed from the console.

The changes entered on the Configuration screen occur as the field is changed. A description of all the fields that can be changed by the console when it is enabled follows:

Programming the Network Interface

NI framing

This selection determines the type framing. With ESF selected, the unit generates and expects ESF framing to and from the Network Interface. Pressing **Enter** displays D4 and the unit generates and expects D4 framing. The framing selected in the unit must match the framing option provided by the T-1 Carrier.

NI coding

This field selects the type of coding the unit generates. When B8ZS is displayed, the unit generates B8ZS encoding. Pressing ENTER sets the line coding to AMI encoding. This coding selection must match the provisioning provided by the T-1 Carrier supplier or remote end, otherwise intermittent errors can occur.

Density

The Density selection determines whether the unit enforces ones density to the Network or operate in the Clear Channel mode. When the word **Enabled** is displayed, the unit enforces density. This means that data from the Channel and / or DSX-1 port being transmitted to the Network must meet the ones density requirements specified in 62411 and T1.403 (approximately 1 in every 8 bits must be a one and no more than 15 consecutive zeros). If the data from the channels violate density, the T-1 CSU / DSU, with this field enabled, puts ones in the output data, inserting logic errors in the customer data

With **Clear** selected, the unit lets data from the Customer pass to the Network transparently. If the facility provided by the T-1 Carrier is not Clear Channel and this Clear Channel option is selected, the Customer experiences data errors.

AT&T or ANSI

This field determines whether the unit is compatible with the AT&T 54016 Reference 54016 or ANSI T1.403 ESF Data Link messages. With 62411 displayed, the unit is compatible with the AT&T 54016 ESF specification.

With AINSI T1.403 displayed, the unit is compatible with the T1.403 specification. As with the preceding selections, this option must match the requirements of the T-1 Carrier provider.

Line build out

This selection programs the Line Build Out. In most cases, this selection should be set to 0 dB.

Timing

This field selects the Timing option the unit uses. With **Network** displayed, the Network supplies timing. This option must be selected when connecting to a public T-1 Network, which provides T-1 timing. This selection is the most used setting. If any of the other settings are used when connected to a public T-1 facility and the transmit path to the Network is not frequency locked to the Network, timing slips occur. A typical indication of timing slips is frame losses occurring at a fixed rate.

With Internal Timing selected, the unit's internal oscillator is the timing source. This mode is selected when using the unit as a Limited Distance Modem (LDM) over Customer-owned wiring, or a T1 carrier service that does not provide timing. When using this mode, the remote unit at the other end should be programmed for "Network supplies Timing." The other selection, "Channel supplies Timing" is used when the timing on the Channel is derived from a Public T-1 Network, or an extremely accurate timing source and the unit is used as an LDM.

Remote loop disable

This selection is used to enable / disable the unit from recognizing several remote loop commands. With this field disabled, the unit does not respond to Remote Channel Loop. It still responds to the Network Interface Remote Loop commands (Loop Up / Loop Down) and Remote Payload Loop as required in Technical Reference 62411 and ANSI T1.403. If this field is enabled, all remote loops are enabled and remote loops can be set by remote commands.

Programming the customer interface

C150

DSX-1 IN OR OUT

This choice is used to enable or disable the DSX-1 interface. With disable selected, the DSX-1 interface is completely disabled and all three LEDS (TX, RX and LOCK) associated with the DSX-1 interface will not light. When there is no DSX-1 interface, the DSX-1 must be disabled for proper operation of the unit. When a DSX-1 input is used, this selection must be enabled.

DSX-1 FRAMING

The type of DSX-1 framing is determined by this field. With ESF selected, the unit will generate and expect ESF framing to and from the DSX-1 interface. With D4 selected, the unit will generate and expect D4 framing. The framing selected on the DSX-1 interface does not have to match the framing on the Network Interface. The T-1 CSU / DSU can be used to connect an ESF T-1 facility to a PBX which only supports D4.

DSX-1 coding

This field selects the type of coding the unit will generate. The B8ZS selection makes the unit generate B8ZS encoding and in the AMI selection causes the unit to generate AMI (Alternate Mark Inversion) encoding. This coding selection, must match the Customer Equipment connected to the DSX-1 interface otherwise intermittent errors can occur.

DSX-1 line length/build out

This selection controls the output power of the T-1 driver on the DSX-1 interface. The driver on the DSX-1 interface can support both short haul (PBXs up to 655 feet) and long haul (other T-1 CSUs up to 6000 feet) applications. When the DSX-1 interface is connected to customer equipment with short haul interfaces, the selections that should be used are 133, 266, 399, 533 or 655 feet depending on distance. When the DSX-1 interface is connected to another T-1 CSU / DSU up to 6000 feet away, the selections that should be used are the standard 0, -7.5, -15 or -22.5. The typical selection is 133 feet / 0 dB.

Idle or busy fill character

This field selects the fill character, either an Idle or a Busy for insertion into the DSX-1 output in all DS0s used by the Synchronous Channel. With Idle displayed, an Idle character is inserted into all the unused DS0s on the DSX-1 interface. With Busy selected, a Busy character is inserted into all the unused DS0s. Typically the Idle character is the insertion character. On a few older PBXs, the Busy character is required.

Pressing the SPACE bar when on the Fill Character field advances the blinking cursor to the Sync Channel Interface selection.

C100/C150

Synchronous channel interface

This field is used to select the interface on the Synchronous Channel. With 422 / 530 selected, the interface selected is RS422 / RS530 and all the interface signals are on the DB 25 pin female connector on the rea of the unit. With V.35 selected, the interface selected is CCITTV.35 and all the interface signals are on the 34 pin female Winchester connector on the rear of the unit. With RS232 selected, the interface selected is RS232 and all interface signals are on the DB 25 pin female connector on the rear of the unit. Both the 34 pin and 25 pin interface cables must not be connected at the same time.

56000 or 64000

This field determines whether the bandwidth of all DS0s to the Synchronous Channel is 56000 or 64000 bps. With 56000 selected, all DS0s to the Synchronous Channel are 56000 bps. To calculate the Channel speed, multiply 56000 times the number of DS0s going to the Channel. If 4 DS0s were selected to go to the Synchronous Channel, the Channel speed would be 224000 bps. Selecting 64000 in this field, gives 64000 bps to all the selected DS0s going to the Channel. The same calculation applies when using 64000 bps. Multiply 64000 times the selected DS0s to calculate Channel speed. The following referenced chart lists all the multiples of 56000 and 64000 bps available with the T-1 CSU / DSU.

Carrier (Receive Line Signal Detect) Control

See Table 3-5, Number of 56000 or 64000 DS0s selected and Figure 3-1, Block diagram of Carrier (Receive Line Signal Detect) Control.

Synchronous channel invert data

This selection determines whether data to and from the Synchronous Channel is normal or inverted. When Disabled is displayed, data on the Synchronous Channel passes normally. When Enabled is displayed, both the transmit and receive data signals at the local Synchronous Channel are inverted. By inverting the data, this feature permits certain protocols such as HDLC, SDLC, and so forth, to pass over the T-1 facility at multiples of 64000 bps and meet ones-density requirements of the Network. When using this mode, usually both the local and remote units have this option selected.

Synchronous Channel Invert External Transmit Clock

The External Transmit Clock field determines whether External Transmit Clock from the Synchronous Channel is normal or inverted. When Disable is selected, the ExternalTransmit Clock on the Synchronous Channel passes normally. With Enable selected, External Transmit Clock from the local Synchronous Channel is the inverted Synchronous Channel signal.

This feature is used when the round trip delay of the Transmit Clock exceeds one half bit time (due to cable length and higher frequencies). This feature should be tried if sporadic errors are noticed on the Synchronous Channel.

Internal or external transmit clock

This field determines whether Internal Clock or External Transmit Clock is used. With Internal selected, Internal Transmit Clock from the T-1 CSU/DSU is provided to the Synchronous Channel. With External selected, External Transmit Clock from the terminal equipment to the Synchronous Channel. When using this mode, External Transmit Clock coming from the terminal equipment must be frequency-locked to the Receive Clock provided by the T-1 CSU/DSU

Pressing the SPACE bar when on theTransmit Clock field advances the blinking cursor to the DS01 selection.

Programming the DS0s (C100 and C150)

C150 DSO assignment

These fields are used to determine whether a DS0 is given to the Synchronous Channel or the DSX-1 interface. There are twenty-four DS0's in a T-1 frame and these DS0s can be assigned to the Channel or DSX-1 on a contiguous or non-contiguous basis. Hitting Enter on any of the DS0 fields changes the field from DSX-1 to Channel or from DSX-1 to Channel.

Leaving a setting on DSX-1 assigns that DS0 to the DSX-1 Interface and leaving it on Channel assigns that DS0 to the Synchronous Channel. Even when the DSX-1 interface is disabled, these selections must be made in order to determine how many DS0s go to the Synchronous Channel. The programming of the DS0s must match the DS0 selection in the remote unit when they are used on a point-to-point connection or they must match the DS0 selection on the Fractional T-1 facility provided by the T-1 Carrier supplier.

Pressing the SPACE bar when on DS24 field advances the blinking cursor to the Network Interface Framing field.

C100 DSO assignment

These fields are used to determine whether a DS0 is given to the Synchronous Channel. There are twenty-four DS0's in a T-1 frame and these DS0s can be assigned to the Channel on a contiguous or non-contiguous basis. Pressing Enter on any of the DS0 fields changes the field from not used to Channel or from Channel to not used. Leaving a setting on Channel assigns that DS0 to the Synchronous Channel. The programming of the DS0s must match the DS0 selection in the remote unit when they are used on a point-to-point connection or they must match the DS0 selection on the Fractional T-1 facility provided by the T-1 Carrier supplier.

Pressing the SPACE bar when on DS24 field advances the blinking cursor to the Network Interface Framing field.

Chapter 7

Configuring the Console Port for SNMP

This chapter describes using the Consol and the front panel switches to enable SNMP and set the IP address for SNMP communication.

Navigating the menu tree

To display any of the five screens listed in the Main Menu, advance the blinking cursor to the left of the selection wanted and press the ENTE key.

Figure 7-1 Main Menu with Console Activated

```
29 APR 1997                VERILINK CORPORATION                    15:17:55
UNIT ADDRESS 1               T-1 CSU/DSU CONSOLE
                                 Main Menu
                             Configuration
                             Local Registers
                             Diagnostics & Statistics
                             Service
                             Utilities
                             Deactivate Console
                             Software: REV 3.01
                             CONSOLE ACTIVATED
CURSOR FORWARD = [SPACE]      SELECT = [ENTER]          CURSOR BACK = [B]
```

Configuring for SNMP

This section describes configuring the Console and module for SNMP.

Overview

To use an SNMP network manager, you need to enter the IP address field in the Console main menu.

Figure 7-2 Configuration–Console example menu showing IP address field

```
29 APR 1997                VERILINK CORPORATION                    14:31:45
UNIT ADDRESS 1                T-1 CSU/DSU CONSOLE
                            Configuration - Console
IP Address:  000.000.000.000
NETWORK INTERFACE                      CUSTOMER INTERFACES
Framing:        ESF        DSX1:        Enable      SYNC Channel
Coding:         B8ZS       Framing:     ESF         Interface:    V.35
Density:        Disable    Coding:      B8ZS        Bandwidth:    56000
Mode:           62411      Line Length: 133 ft/0 dB Carrier:      On
Line Build Out: 0 dB       Fill Char:   Idle        Invert Data   Disable
Timing:         Network                             Invert Clk:   Disable
Remote Loop:    Enable                              Transmit Clk: Internal
DS01 DSX1    DS05 DSX1    DS09 DSX1    DS13 DSX1    DS17 DSX1    DS21 DSX1
DS02 DSX1    DS06 DSX1    DS10 DSX1    DS14 DSX1    DS18 DSX1    DS22 DSX1
DS03 DSX1    DS07 DSX1    DS11 DSX1    DS15 DSX1    DS19 DSX1    DS23 DSX1
DS04 DSX1    DS08 DSX1    DS12 DSX1    DS16 DSX1    DS20 DSX1    DS24 DSX1
CURSOR FORWARD = [SPACE]                                  CURSOR BACK = [B]
SELECT = [ENTER]                                          MAIN MENU = [ESC]
```

In conjunction with this procedure, you need to set the DIP switches in Switch pack 1. After, you power-on reset the C100/C150 module. Full procedures are given in this section.

Before hand, you must have recompiled your SNMP network software with the MIB provided on diskette. (For more information, see Appendix D, *C100 and C150 SNMP MIB*.)

Procedure for setting the IP address

Initializing the console

1. Power up the unit and configure it for Console operation by setting Switch 1 position 6 OFF and 7 ON.

   For more information, see Chapter 3, *Configuration Using the DIP Switches*,section: ***Programming the unit configuration (C100 and C150)***, subsection: ***Switches, console, or SNMP activated***.

2. Plug the VT100 console into the connector labeled CONSOLE IN.

3. Enter password and activate the console.

Entering the IP address field

1. Make sure you have the unit in Console mode (not the switches mode).
2. Go to the Configuration Screen and enter the IP address as described in the following steps. The IP address field is at the to left of the Configuration menu. Initially it is all set to zeros. There are four three-digit segments to the number. You need to set each segment separately.
3. Initially, the cursor is positioned at the beginning of the I address field. Press **ENTER** to enter the first segment of the IP address field.
4. Once you are in the field, you can press the Space Bar to go forward or the **B**-key to go backward until you position the cursor to at the digit you wish to change.
5. Set the first number segment to the correct number by using the Enter and Backspace keys to increment or decrement each IP address number segment:
   - Increment the number by pressing the **Ente** -key.
   - Decrement the number by pressing the **Backspace**-key.
6. Use the Space key to advance to the next segment, until you have entered all digits of the IP address.
7. Press the Space Bar to enter the next number segment of the I address or the **B**-key to go back to the previous number segment.

   Increment or decrement each number segment as necessary, until you have set the entire IP address. Incrementing and decrementing are described above.
8. Press the Space Bar again to exit the IP address field and return to the Main menu.

Connecting the Network Management Console

1. Once the IP address has been entered, as described above, power-off the unit.
2. Re-program Switch 1 for SNMP operation by setting Switch pack 1, switch position 6 OFF and switch 7 ON. The CONSOLE IN connector now becomes SLIP interface.

3. Remove VT100 console from the CONSOLE IN connector.
4. Power-on the unit.
5. Plug SNMP Manager into CONSOLE IN connector. The unit is now ready for SNMP Management.

Chapter 8

Performance Monitoring with the Console Port

This chapter describes local performance registers monitoring and diagnostics and statistics using the Console. It also provides information on interpreting the front panel LEDs in conjunction with console status and statistical displays of loopbacks and alarms.

Main Menu

The Main Menu is the first screen displayed (see Figure 8-1).

Figure 8-1 Main Menu with Console Deactivated

```
29 APR 1997                VERILINK CORPORATION                    14:46:48
UNIT ADDRESS 1               T-1 CSU/DSU CONSOLE
                                 Main Menu
                             Configuration
                             Local Registers
                             Diagnostics & Statistics
                             Service
                             Utilities
                             Password:
                             Software: REV 3.01
                             CONSOLE DEACTIVATED
CURSOR FORWARD = [SPACE]      SELECT = [ENTER]          CURSOR BACK = [B]
```

Navigating the menu tree

To display any of the five screens listed in the Main Menu, advance the blinking cursor to the left of the selection wanted and press the ENTE key.

Figure 8-2 Main Menu with Console Activated

```
29 APR 1997                VERILINK CORPORATION                    15:17:55
UNIT ADDRESS 1               T-1 CSU/DSU CONSOLE
                                 Main Menu
                             Configuration
                             Local Registers
                             Diagnostics & Statistics
                             Service
                             Utilities
                             Deactivate Console
                             Software: REV 3.01
                             CONSOLE ACTIVATED
CURSOR FORWARD = [SPACE]      SELECT = [ENTER]          CURSOR BACK = [B]
```

Local Registers

Figure 8-3 Local Registers Page 1

```
29 APR 1997                  VERILINK CORPORATION                    14:48:37
UNIT ADDRESS 1                 T-1 CSU/DSU CONSOLE
                             Local Registers Page 1
IN  ES UAS SES BES LOF CSS IN  ES UAS SES BES LOF CSS IN ES  UAS SES BES LOF CSS
01 000 900 000 000 000 000 17 000 900 000 000 000 000 33 000 900 000 000 000 000
02 000 900 000 000 000 000 18 000 900 000 000 000 000 34 000 900 000 000 000 000
03 000 900 000 000 000 000 19 000 900 000 000 000 000 35 000 900 000 000 000 000
04 000 900 000 000 000 000 20 000 900 000 000 000 000 36 000 900 000 000 000 000
05 000 900 000 000 000 000 21 000 900 000 000 000 000 37 000 900 000 000 000 000
06 000 900 000 000 000 000 22 000 900 000 000 000 000 38 000 900 000 000 000 000
07 000 900 000 000 000 000 23 000 900 000 000 000 000 39 000 900 000 000 000 000
08 000 900 000 000 000 000 24 000 900 000 000 000 000 40 000 900 000 000 000 000
09 000 900 000 000 000 000 25 000 900 000 000 000 000 41 000 900 000 000 000 000
10 000 900 000 000 000 000 26 000 900 000 000 000 000 42 000 900 000 000 000 000
11 000 900 000 000 000 000 27 000 900 000 000 000 000 43 000 900 000 000 000 000
12 000 900 000 000 000 000 28 000 900 000 000 000 000 44 000 900 000 000 000 000
13 000 900 000 000 000 000 29 000 900 000 000 000 000 45 000 900 000 000 000 000
14 000 900 000 000 000 000 30 000 900 000 000 000 000 46 000 900 000 000 000 000
15 000 900 000 000 000 000 31 000 900 000 000 000 000 47 000 900 000 000 000 000
16 000 900 000 000 000 000 32 000 900 000 000 000 000 48 000 900 000 000 000 000
PAGE 2 = [ENTER]                                              MAIN MENU = [ESC]
```

The Local Registers Page 1 and Page 2 screens are for viewing only. They display the registers that Technical Reference 54016 require to be down loaded via the Facility Data Link in ESF. Local Registers Page 1 is displayed when entering this screen from the Main Menu. Pressing Enter displays Local Registers Page 2 and pressing Enter again returns to Local Registers Page 1. Pressing the ESCape key returns to the Main Menu.

Definitions for the abbreviations at the top of each column are as follows:

IN	Interval - The 96 previous fifteen minute intervals required to be stored by Tech Ref 54016.
ES	Errored Seconds - The number of Errored Seconds in that occurred in each 15 minute interval. An Errored Second is a second that contains a CRC6 error or an Out Of Frame (OOF) condition.

UAS	Unavailable Seconds—The number of Unavailable Seconds that occurred in each minute interval. Unavailable Seconds are the number of one second intervals during which service is unavailable.
BES	Bursty Errored Seconds - The number of Bursty Errored Seconds that occurred in each 15 minute interval.
LOF	Loss of Frame - The number of times a Loss Of Frame occurs in each 15 minute interval.
CSS	Controlled Slip Seconds - The number of Controlled Slip Seconds that occurred in each 15 minute interval. A Controlled Slip Second is any second in which the occurrence of a replication or deletion of a DS1 frame by the receiving T-1 CSU / DSU.

For a more detailed description of the abbreviations refer toTechnical Reference 54016.

Figure 8-4 Local Registers Page 2

```
29 APR 1997                  VERILINK CORPORATION                    14:49:33
UNIT ADDRESS 1                 T-1 CSU/DSU CONSOLE
                             Local Registers Page 2
IN ES UAS SES BES LOF CSS IN ES UAS SES BES LOF CSS IN ES UAS SES BES LOF CSS
49 000 900 000 000 000 000 65 000 900 000 000 000 000 81 000 900 000 000 000 000
50 000 900 000 000 000 000 66 000 900 000 000 000 000 82 000 900 000 000 000 000
51 000 900 000 000 000 000 67 000 900 000 000 000 000 83 000 900 000 000 000 000
52 000 900 000 000 000 000 68 000 900 000 000 000 000 84 000 900 000 000 000 000
53 000 900 000 000 000 000 69 000 900 000 000 000 000 85 000 900 000 000 000 000
54 000 900 000 000 000 000 70 000 900 000 000 000 000 86 000 900 000 000 000 000
55 000 900 000 000 000 000 71 000 900 000 000 000 000 87 000 900 000 000 000 000
56 000 900 000 000 000 000 72 000 900 000 000 000 000 88 000 900 000 000 000 000
57 000 900 000 000 000 000 73 000 900 000 000 000 000 89 000 900 000 000 000 000
58 000 900 000 000 000 000 74 000 900 000 000 000 000 90 000 900 000 000 000 000
59 000 900 000 000 000 000 75 000 900 000 000 000 000 91 000 900 000 000 000 000
60 000 900 000 000 000 000 76 000 900 000 000 000 000 92 000 898 000 000 001 000
61 000 900 000 000 000 000 77 000 900 000 000 000 000 93 000 000 000 000 000 000
62 000 900 000 000 000 000 78 000 900 000 000 000 000 94 000 000 000 000 000 000
63 000 900 000 000 000 000 79 000 900 000 000 000 000 95 000 000 000 000 000 000
64 000 900 000 000 000 000 80 000 900 000 000 000 000 96 000 000 000 000 000 000
PAGE 1 = [ENTER]                                          MAIN MENU = [ESC]
```

Diagnostics and Statistics

Figure 8-5 Diagnostics and Statistics Screen

```
29 APR 1997                VERILINK CORPORATION                    14:50:45
UNIT ADDRESS 1                T-1 CSU/DSU CONSOLE
                            Diagnostics & Statistics
 Local Loops              NI Alarms      15m 24 hr    CI Alarms         Total
   NI:           Off     ESF Err Event: 900 65535    ESF Err Event:    999999
   DSX1:         Off     CRC6 Errors:   000 00000    CRC6 Errors:      000000
   Chan:         Off     Errored Secs:  000 00000    Errored Secs:     000000
   Payload:      Off     Unavail Secs:  236 65535    Unavail Secs:     082224
 Remote Loops            Sev Errd Secs: 000 00000    Sev Errd Secs:    000000
   NI:           Off     Bur Errd Secs: 000 00000    Bur Errd Secs:    000000
   DSX1:         Off     Loss of Frame: 000 00001    Loss of Frame:    000001
   Chan:         Off     BiPolar Viol:  869 65047    BiPolar Viol:     999999
 Test:           Off     Tx Bit Dens:   000 00000    Tx Bit Dens:      999999
 Test Seconds:  000000    Rx Bit Dens:   900 65535    Rx Bit Dens:      999999
 Secs in Err:   000000    YEL Alarm Sec: 000 00000    YEL Alarm Sec:    000000
 Err Free Sec:  000000    BLU Alarm Sec: 000 00000    BLU Alarm Sec:    000000
                          Ctl Slip Secs: 000 00000
 Status:      FU000000    Val Interval:  91           Val Interval:     91
NI LEDS: TX    RX *      DSX1 LEDS: TX *  RX *    Chan LEDS: TX    RX    CD
         OOF                          OOF
CURSOR FORWARD = [SPACE]                                  CURSOR BACK = [B]
SELECT = [ENTER]             RESET = [R]                  MAIN MENU = [ESC]
```

The blinking cursor is positioned to the left of the Local NI Loop Selection when entering the Diagnostics and Statistics screen. There are eight fields that be changed on this screen; seven loopbacks and the test pattern. In addition there are a variety of other statistics on this screen.

All the loops and the test pattern work in conjunction with the front panel and with remote loops coming from the Network. They are both switches and indicators. If a loop is activated at the front panel, the screen changes to show the loopback and conversely if a loop is turned On with the console, the LED indicators on the front panel displays it. If a loop field displays **On**, the loop was activated locally either by the front panel or console. If the screen displays On-Rem, this indicates the loop came from the Network. When using loops and test patterns, care must be taken to insure there are no conflicts between the console, the front panel and loops coming from the Network. In general, the last loop activated takes priority.

The following is a description of the loopbacks, test pattern and statistics:

Local NI loop

Pressing the ENTER key while on the Local NI Loopback when Off is displayed causes the display to go to On and the NI transmitter of the T-1 CSU / DSU to be looped back to its receiver. If the display is On or On-Rem, pressing the ENTER key resets the loopback and the field displays to Off.

Local DSX-1 loop (C150)

Hitting the ENTER key while on the Local DSX-1 Loopback when Off is displayed will cause the display to go to On and the DSX-1 transmitter will be looped back to its receiver. (See Chapter 4, *LED Indicators and Diagnostics*.) If the display is On or On-Rem, pressing the ENTER key will reset the loopback and the field will display Off

Local channel loop

Pressing the ENTER key while on the Local Channel Loopback when Off is displayed causes the display to go to On and the Channel is pu into a bi-directional loopback. (See Chapter 4, *LED Indicators and Diagnostics*.) If the display is On or On-Rem, pressing the ENTER key resets the loopback and the field display Off.

Local payload loop

Pressing the ENTER key while on the Local Payload Loopback when Off is displayed causes the display to go to On and the T-1 CSU / DSU is put into a Payload loopback. (See Chapter 4, *LED Indicators and Diagnostics*.) If the display is On or On-Rem, pressing the ENTER key resets the loopback and the field displays to Off.

Remote NI loop

Pressing the ENTER key while on the Remote NI Loopback when Off is displayed causes the display to go to On and the T-1 CSU / DSU to send Loop Up command for five seconds to the remote unit. (See Chapter 4, *LED Indicators and Diagnostics*.) If the display is On, pressing the ENTER key sends a Loop Down command for five seconds to the remote unit, resets the loopback and the field display to Off. Since this loopback latches the unit at the other remote, care must be taken to ensure that the Loop Down command is sent when finished testing.

Remote channel loop

Pressing the ENTER key while on the Remote Channel Loopback when Off is displayed causes the display to go to On and sends a V.54 Loop On command to the Channel interface at the remote. (See Chapter 4, *LED Indicators and Diagnostics*.) If the display is On, pressing the ENTER key sends a V.54 Loop Off command to the remote unit an

the field displays Off. Since this loopback latches the unit at the other remote, care must be taken to ensure that the Loop Off command is sent when finished testing.

Remote DSX-1 loop (C150)

Pressing the ENTER key while on the Remote DSX-1 Loopback when Off is displayed will cause the display to go to On and will send aV.54 Loop On command to the DSX-1 interface at the remote. If the display is On, pressing the ENTER key will send aV.54 Loop Off command to the remote unit and the field will display Off. Since this loopback latches the unit at the other remote, care must be taken to ensure that the Loop Off command is sent when finished testing.

Test pattern (C100)

Pressing ENTER when on theTest Pattern field when Off is displayed causes the built-in 2047 test pattern to be sent. The 2047 pattern always is sent from the T-1 CSU / DSU to the Network (see circled area in example in Figure 4-14) unless a Local CI Channel Loopback (see circled area in the example in Figure 4-17) has been selected. If no local loopbacks are present, the 2047 pattern checker looks for the 2047 pattern from the Network. If a Local CI Channel Loopback has been activated, the 2047 test pattern is sent to the Channel and the 2047 pattern checker looks for the pattern from the Channel. When the Test Pattern is On,Test Seconds and Errored or Error Free Seconds is counting as described in the next paragraph. Pressing the SPACE bar when on this selection advances the cursor to Local NI Loop.

Test pattern (C150)

Pressing ENTER when on theTest Pattern field when Off is displayed will cause the built-in 2047 test pattern to be sent. The 2047 pattern will always be sent from the T-1 CSU / DSU to the Network unless a Local CI DSX-1 or a Local CI Channel Loopback has been selected. (See Chapter 4, *LED Indicators and Diagnostics*.) If no local loopbacks are present, the 2047 pattern checker will look for the 2047 pattern from the Network. If a Local CI DSX-1 or Channel Loopback has been activated, the 2047 test pattern will be sent to the DSX-1 or Channel and the 2047 pattern checker will look for the pattern from either the DSX-1 or Channel depending on the selected loopback. When the Test Pattern is On,Test Seconds and Errored or Error Free Seconds will be counting as described in the next paragraph. Hitting the SPACE bar when on this selection will advance the cursor to Local NI Loop.

Test Seconds

When the Test Pattern is On,Test Seconds begins counting in one second increments. When the Test Pattern is turned Off,Test Seconds stops counting. Pressing the lette **R** resets the counter to zero.

Secs In Err and Error Free Secs

When the Test Pattern is On, a comparator looks at the received Test Pattern and compares it to the transmit Test Pattern. The Seconds In Error counter is incremented if one or more bits do not compare during each second. The Seconds In Error counter increments only once per second, regardless of the amount of bit errors during eac second. The count in the Error Free Seconds counter is the difference between the Test Seconds counter less the Seconds In Error counter. Both the Secs In Err and the Err Free Secs counter in addition to the Total Seconds counter are reset to zero by pressing **R**.

Status

C100 status

The Status byte is required for ESF and displays the current status. Status consists of the unavailable signal and the Payload LoopBack status.

All statistics and counters are updated once per second. There are two sets of counters for the Network Interface. The two sets of Network Interface counters are for the current 15 minute interval and the last 24 hour cumulative count. The Network Interface counters can only be reset by removing power from the unit. The section below is a description of the error counters and statistics.

Status (C150)

The Status byte is required for ESF and displays the current status. Status consists of the unavailable signal and the Payload LoopBack status.

All statistics and counters are updated once per second. There are two sets of counters for the Network Interface and one set for the Customer Interface DSX-1 channel. The two sets of Network Interface counters are for the current 15 minute interval and the last 24 hour cumulative count.

CAUTION

Once it is configured and operating, do not power-on/off reset the unit, because, currently, may reset the TelCo registers.

The Network Interface (TelCo) counters can be reset only by removing power from the unit.

The DSX-1 Customer Interface counters can be reset by pressing the letter “r”. The section below is a description of the counters and statistics.

Counters and Statistics

ESF Err Event

Displays the number of ESF Errored Events. An ESF Error Event is determined by logical ORing of a CRC6 error and the occurrence of an OOF (Out Of Frame).

CRC6 Errors

Displays the number of CRC6 Errors. A CRC6 Error occurs when the CRC6 field calculated on the incoming Network signal does not agree with the CRC6 field contained in the received signal from the Network.

Errored Secs

Displays the number of Errored Seconds. An Errored Second is a second with one or more CRC6 errors or one or more OOFs.

Unavail Secs

Displays the number of Unavailable Seconds. An Unavailable Second is a second during which service is not available.

Sev Errd Secs

Displays the number of Severely Errored Seconds. A Severely Errored Second is a second with 320 or more CRC6 errors or one or more OOFs.

Bur Errd Secs

Displays the number of Bursty Errored Seconds. A Bursty Errored Second is a second with more than one but less than 320 CRC6 errors.

Loss of Frame

Displays the number of Loss Of Frames. A Loss Of Frame starts with 2.5 seconds continuous Loss Of Signal and clears with at least one second of no Loss Of Signal.

NI Bipolar Viol

Displays the number of BiPolar Violations received from the Network.

DSX-1 BIPOLAR VIOL (C150)

Displays the number of BiPolar Violations received from the DSX-1

NI TX Bit Dens

Displays the number of Bit Density Violations transmitted to the Network.

NI RX Bit Dens

Displays the number of Bit Density Violations received from the Network.

DSX-1 TX Bit Dens (C150)

Displays the number of Bit Density Violations transmitted to the DS 1.

DSX-1 RX Bit Dens (C150)

Displays the number of Bit Density Violations received from the DSX-1.

NI Yel Alarm Sec

Displays the number of seconds which had at least oneYellow Alarm. Yellow Alarm is a received signal or message which indicates that the Network is not receiving a T-1 frame from the T-1 CSU / DSU.

NI Blu Alarm Sec

Displays the number of seconds which had at least one Blue Alarm. Blue Alarm or Alarm Indication Signal (AIS) is an unframed all ones signal that is received from the Network in lieu of a normal signal upon loss of the originating signal.

DSX-1 Yel Alarm Sec (C150)

Displays the number of seconds which had at least oneYellow Alarm. DSX-1 Yellow Alarm is a received signal or message which indicates that the customer equipment connected to the DSX-1 Channel is not receiving a T-1 frame from the T-1 CSU / DSU.

DSX-1 BLU ALARM SEC (C150)

Displays the number of seconds which had at least one Blue Alarm. DSX-1 Blue Alarm or Alarm Indication Signal (AIS) is an unframed all ones signal that is received from the customer equipment in lieu of a normal signal.

Ctl Slip Secs

Displays the number of seconds which had one or more Controlled Slips. A Controlled Slip is the occurrence of a replication or deletion of a frame from the channel interface.

Val Interval

Displays the number of Valid Intervals. Valid intervals are those intervals since the last reset, if the reset occurred in the last 24 hours.

NI TX and RX LEDs

The two asterisks next to TX and RX represent LEDS which reflect the status of transmit and receive data on the Network Interface. These indicators are on when data spacing and off when data is marking.

DSX-1 TX and RX LEDS (C150)

The two asterisks next to TX and RX represent LEDS which reflect the status of transmit and receive data on the DSX-1 Interface. These indicators are on when data spacing and off when data is marking

Chan TX and RX LEDs

The two asterisks next to TX and RX represent LEDS which reflect the status of transmit and receive data on the Channel Interface. These indicators are on when data spacing and off when data is marking.

Chan CD LED

The asterisks next to CD represents the status of the Carrier (RLSD) control signal being sent to Synchronous Channel. When On, Carrier is high and when off, Carrier is low.

Appendix

A

C100 and C150 Specifications

This appendix contains technical specifications for the C100 and C150. Specifications apply to both unless otherwise specified.

Network Interface (NI)

Line Rate	1.544 Mbps + or - 50 ppm
Line Format	Bipolar AMI or B8ZS
Pulse Characteristics	AT&T 62411, T1.403 & Part 68 compliant
Impedance	100 ohms, input and output
Line Build Out (LBO)	0, -7.5, -15, or -22.5 dB
Elastic Store	1 frame ± 1 frame
Interface Termination	8-Position RJ48C
Timing Source	Network, Internal, CI Channel
	C150 only: CI DSX-1
LDM Mode	Will drive up to 6000 feet when used as LDM

C150 only

DSX-1 signal input level of customer interface:

minimum of -22 dB

Customer Interface (CI)

Rate: sync channel	up to 1.536 Mbps and any combination of 56K or 64K bps
Rate: DSX-1 channel	(C150 only) 1.544 Mbps +/- 50 ppm
Interfaces (Sync Channel)	
	Electrical: CCITT V.35
	EIA RS422/RS530
	EIA RS232

Interfaces—Electrical (DSX-1 Channel)	
	(C150 only) Bipolar AMI/B8ZS
Mechanical—Sync Channel	
RS530, RS422, RS232; 25 Pin female V.35; 34 Pin female	
Mechanical—DSX-1 Channel (C150 only)	
	Bipolar: 8-position RJ48C
Format, Sync channel	Binary Serial Synchronous
Format, DSX-1 channel	(C150 only) Bipolar AMI
LDM Mode	Will drive up to 6000 feet when used as LDM (Limited Distance Modem).

Network protection

Pulse Insertion	Pulse Insertion will occur when the CI inputs more than 15 consecutive ZEROS o when the CI does not input at least “n” ONES in each and every time window of 8 X (n+1) bits (where “n” = 1 to 23).
Certification	Meets FCC Part 15 and Part 68 Complies with AT&T Tech Pub 62411, 54016 and ANSI T1.403-1989
Programming	Programmed by 7 DIP switch packs or ASCII CRT
Console Port	Compatible with VT100 CRTs. RS232 interface with speed of 9600 bps with 8 data bits, 1 stop bit and no parity. Supports dial-in modems. Control-D used for disconnect.

Indicators

CI Chan TX DATA	Lit when CI RX DATA is spacing.
CI Chan RX DATA	Lit when CI TX DATA is spacing.
CI CCI Chan RTS	Lit when CI RTS is spacing.
CI Chan CTS	Lit when CI CTS is spacing.
CI Chan DSR	Lit when CI DSR is spacing.
CI Chan Carrier	Lit when Carrier to Channel is on.
CI Chan DTR	Lit when CI DTR is spacing.

BPV ALARM	Lit when Bipolar Violation received from Network.
DENSITY ALARM	Lit when Ones Density Violation is detected.
YELLOW ALARM	Lit when YELLOW alarm received from Network.
BLUE ALARM	Lit when BLUE alarm received from Network.
NI LOCK	Green when unit is frame-locked to Network. Red when Out Of Frame (OOF).
NI TX DATA	Lit when NI TX DATA is spacing.
NI RX DATA	Lit when NI RX DATA is spacing.
Local Network (NI)	Lit when Local Network loop is detected.
Local CI Chan	Lit when Local CI Channel loop is detected.
Local Payload	Lit when Payload loop is detected.
Remote Network (NI)	Lit when Remote Network loop is selected.
Remote CI Chan	Lit when Remote CI Channel loop is selected.
Test Pattern	Green when theTest Pattern is good. Red when the Test Pattern is not good.

C150 only

CI DSX1 TX DATA	Lit when DSX1 TX DATA is spacing.
CI DSX1 RX DATA	Lit when DSX1 RX DATA is spacing.
CI DSX1 LOCK	Green when unit is frame-locked to DSX-1 channel. Red when DSX1 channel is Out Of Frame (OOF).
Local CI DSX-1 Chan	Lit when Local CI DSX-1 Channel loop is detected.
Remote CI DSX-1 Chan	Lit when Remote CI DSX-1 Channel loop is selected.

Switches

Select	Momentary Pushbutton
Start	Momentary Pushbutton

Loopbacks generated

Local Network (NI)	Loopback Network to CSU.
Local CI Chan	Bidirectional Loopback at CI Channel Interface.
Local CI DSX-1Chan	(C150 only) Loopback CI DSX-1 output to input.
Local Payload	Local ESF Payload Loopback.
Remote Network (NI)	Loop Up and Loop Down to CSU at remote.
Remote CI Chan	V.54 Loopback to CI Channel at remote.
Remote CI DSX-1Chan	(C150 only) V.54 Loopback to CI DSX-1 Channel at remote.

Loopbacks responded to

Payload	ESF Payload from Network.
Network (NI)	Loop Up and Loop Down from Network o remote unit.
Remote CI Chan	V.54 Loopback from remote CSU.
Remote CI DSX-1 Chan	(C150 only) V.54 Loopback from remote CSU.

Pattern generator and checker

2047	Generates and checks a 2047 (2^{11}-1) bit pseudo-random pattern

Power input and consumption

Power supply AC-to-DC adapter

Input	12 Watts: 120 VAC, 57 to 63 Hz
Output	12 VDC, 500 mA

Module

12 VDC, 5-7 Watts, 24 BTU / hr

Physical

Dimensions	2.00" (5.08 cm) high
	8.00" (20.32 cm) wide
	7.50" (19.05 cm) deep

	Weight	9.70 lbs (4.40 kg)
	Mounting	Tabletop

Environmental

	Operating Temperature	0 to 50 degrees C, 32 to 122 F
	Relative Humidity	0% to 95%, non-condensing

Appendix

B

Sample Applications

This appendix contains sample applications using the C100 and C150. Each application includes a description, an illustration and an illustrated table of switch settings.

SW3 is not used in the C100. When using a C150 for an application that can also be implemented with a C100 or only with a C150, you must set SW3 switches as indicated in the table for the corresponding sample application.

The following illustrations describe applications that can be implemented using either a C100 or C150:

- Figure B-1, Example: C100 / C150 T1 CSU / DSUs connecting two LANs together over T1 / F-T1
- Table B-2, Switches: C100 / 150 T-1 CSU / DSU to Connect to a Frame Relay Service
- Figure B-3, Using the T-1 C100 / C150 CSU / DSUs connecting two routers in LDM mode

The following illustrations describe applications that can be implemented using only a C150:

- Figure B-4, C150 T-1 CSU / DSUs connecting two PBXs over T-1 and converting D4 to ESF
- Table B-4, Switches: C150 CSU / DSUs connecting PBXs over T-1 and converting D4 to ESF
- Figure B-5, C150 CSU / DSUs connecting two PBXs and two routers over a T-1 facility
- Table B-5, Switches: C150 CSU / DSUs connecting PBXs and routers over a T-1 facility

C100T-1 Using V.35 Interfaces In Router Application

C100/C150

Figure B-1 depicts a typical router application using the CSU / DSU's to connect two LANs together over a Fractional T-1 facility.The routers have V.35 interfaces and operate at 384000 bps.

Figure B-1 illustrates the switch settings for the near and far ends.

Switch pack 4, position 2 is Off and Switch pack 4 position 3 is On in both units to make the interfaces V.35 (they could be programmed differently at each end). Switch pack 4 position 4 in both units are On enabling all selected DS0's to be 64000 bps. Switch pack 5 positions 1 through 6 are On (6 DS0s times 64000 bps = 384000). Care must be taken to ensure the DS0s selected are the same in both units and that they match the DS0's provisioned by the Fractional T-1 carrier.

Timing is left in the default setting of Network provides timing with Switch pack 2 positions 7 and 8 Off since the units are connected to a carrier-provided T-1 Network.

Table B-1 illustrates a typical application using the T-1 CSU / DSUs connecting two LANs together over a Fractional T-1 facility.

The Off position of the DIP switch is the rocker arm of the switch in its lowest position (down) on the side of the switch pack closest to the front panel.

Figure B-1 Example: C100/C150 T1 CSU/DSUs connecting two LANs together over T1/F-T1

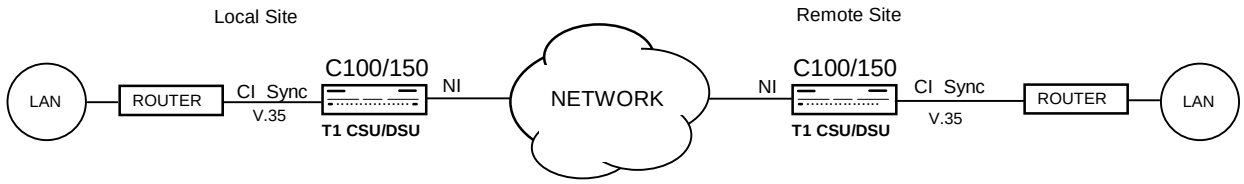


Table B-1 Switches: C100/C150 CSU/DSUs connecting two LANs over T1/F-T1

OFF	S1	ON		OFF	S1	ON	
Addr 1	OFF	Addr 1		Addr 1	OFF	Addr 1	
Addr 2	OFF	Addr 2		Addr 2	OFF	Addr 2	
Addr 4	OFF	Addr 4		Addr 4	OFF	Addr 4	
	OFF				OFF		
	OFF				OFF		
Switches	OFF	Console		Switches	OFF	Console	
	OFF	SNMP			OFF	SNMP	
R Loop	OFF	Disabled		R Loop	OFF	Disabled	
	S2				S2		
ESF	OFF	D4		ESF	OFF	D4	
B8ZS	OFF	AMI		B8ZS	OFF	AMI	
Density	OFF	Clea		Density	OFF	Clear	
54016	OFF	T1403		54016	OFF	T1403	
0 dB	OFF	-7.5 dB		0 dB	OFF	-7.5 dB	
0 dB	OFF	-7.5 dB		0 dB	OFF	-7.5 dB	
Net(8Off)	OFF	Ch(8On)		Net(8Off)	OFF	Ch(8On)	
DSX(7On)	OFF	Int(7Off)		DSX(7On)	OFF	Int(7Off)	
	S3		S3 set using C150 only		S3		
DSX IN	ON	DSX OUT		DSX IN	ON	DSX OUT	
ESF	OFF	D4		ESF	OFF	D4	
B8ZS	OFF	AMI		B8ZS	OFF	AMI	
0 dB	OFF	655 feet		0 dB	OFF	655 feet	
0 dB	OFF	655 feet		0 dB	OFF	655 feet	
0 dB	OFF	655 feet		0 dB	OFF	655 feet	
Idle	OFF	BUSY		Idle	OFF	BUSY	
	OFF				OFF		
	S4				S4		
	OFF				OFF		
RS530	OFF			RS53	OFF		
RS232	ON	V35(2Off)		RS23	ON	V35(2Off)	
56000	ON	64000		56000	ON	64000	
Carr On	OFF	Switched		Carr On	OFF	Switched	
Data	OFF	Invert		Data	OFF	Invert	
Clock	OFF	Invert		Clock	OFF	Invert	
Int TXC	OFF	Ext TXC		Int TXC	OFF	Ext TXC	
	S5		When using C100, S5-S7: Off means: Channel Not Used.		S5		
01-DSX1	ON	Channel		01-DSX1	ON	Channel	
02-DSX1	ON	Channel		02-DSX1	ON	Channel	
03-DSX1	ON	Channel		03-DSX1	ON	Channel	
04-DSX1	ON	Channel		04-DSX1	ON	Channel	
05-DSX1	ON	Channel		05-DSX1	ON	Channel	
06-DSX1	ON	Channel		06-DSX1	ON	Channel	
07-DSX1	OFF	Channel		07-DSX1	OFF	Channel	
08-DSX1	OFF	Channel		08-DSX1	OFF	Channel	
	S6				S6		
09-DSX1	OFF	Channel		09-DSX1	OFF	Channel	
10-DSX1	OFF	Channel		10-DSX1	OFF	Channel	
11-DSX1	OFF	Channel		11-DSX1	OFF	Channel	
12-DSX1	OFF	Channel		12-DSX1	OFF	Channel	
13-DSX1	OFF	Channel		13-DSX1	OFF	Channel	
14-DSX1	OFF	Channel		14-DSX1	OFF	Channel	
15-DSX1	OFF	Channel		15-DSX1	OFF	Channel	
16-DSX1	OFF	Channel		16-DSX1	OFF	Channel	
	S7				S7		
17-DSX1	OFF	Channel		17-DSX1	OFF	Channel	
18-DSX1	OFF	Channel		18-DSX1	OFF	Channel	
19-DSX1	OFF	Channel		19-DSX1	OFF	Channel	
20-DSX1	OFF	Channel		20-DSX1	OFF	Channel	
21-DSX1	OFF	Channel		21-DSX1	OFF	Channel	
22-DSX1	OFF	Channel		22-DSX1	OFF	Channel	
23-DSX1	OFF	Channel		23-DSX1	OFF	Channel	
24-DSX1	OFF	Channel		24-DSX1	OFF	Channel	

T-1 C100/C150 CSU/DSU Connecting To A Frame Relay Service

C100/C150

Figure B-2 shows the T-1 CSU / DSU in a single-ended application connected to a Frame Relay Service. The Network Interface (NI) connects to the Fractional T-1 facility and the Customer Interface (CI) which is 56000 bps with an RS232 interface in this example connects to the LAN router. The Fractional T-1 facility is ESF framing with B8ZS encoding.

Table B-2 illustrates the switch configuration. Switch pack 4 position 2 is On and position 3 is Off to select the RS232 interface. Switch pack 5 position 1 is On to allocate 1 DS0 to the Synchronous channel.

Timing is left in the default setting of Network provides timing with Switch pack 2 positions 7 and 8 Off since the units are connected to a carrier-provided T-1 Network.

The Off position of the DIP switch is the rocker arm of the switch in its lowest position (down) on the side of the switch closest to the front panel.

Figure B-2 Using the C100T-1 CSU/DSU to connect to a Frame Relay service

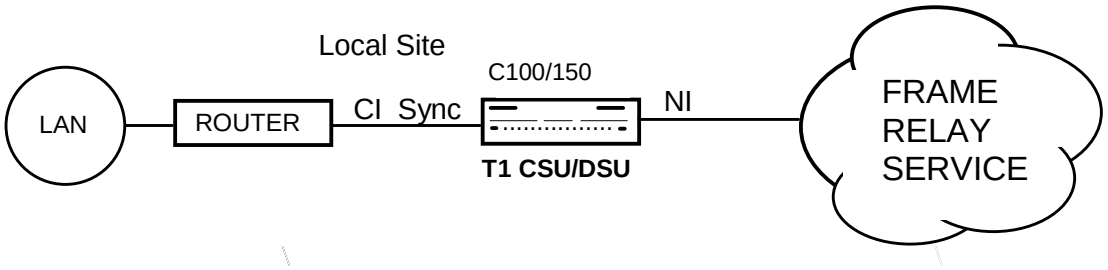


Table B-2 Switches: C100/150 T-1 CSU/DSU to Connect to a Frame Relay Service

OFF	S1	ON	N/A
Addr 1	OFF	Addr 1	
Addr 2	OFF	Addr 2	
Addr 4	OFF	Addr 4	
	OFF		
	OFF		
Switches	OFF	Console	
	OFF	SNMP	
R Loop	OFF	Disabled	

	S2	
ESF	OFF	D4
B8ZS	OFF	AMI
Density	OFF	Clea
54016	OFF	T1403
0 dB	OFF	-7.5 dB
0 dB	OFF	-7.5 dB
Net(8Off)	OFF	Ch(8On)
DSX(7On)	OFF	Int(7Off)

	S3		
DSX IN	ON	DSX OUT	USING C150 only
ESF	OFF	D4	
B8ZS	OFF	AMI	
0 dB	OFF	655 feet	
0 dB	OFF	655 feet	
0 dB	OFF	655 feet	
Idle	OFF	BUSY	
	OFF		

	S4	
	OFF	
RS530	ON	
RS232	OFF	V35(2Off)
56000	OFF	64000
Carr On	OFF	Switched
Data	OFF	Invert
Clock	OFF	Invert
Int TXC	OFF	Ext TXC

	S5		When using C100, S5-S7: Off means: Channel Not Used.
01-DSX1	ON	Channel	
02-DSX1	OFF	Channel	
03-DSX1	OFF	Channel	
04-DSX1	OFF	Channel	
05-DSX1	OFF	Channel	
06-DSX1	OFF	Channel	
07-DSX1	OFF	Channel	
08-DSX1	OFF	Channel	

	S6	
09-DSX1	OFF	Channel
10-DSX1	OFF	Channel
11-DSX1	OFF	Channel
12-DSX1	OFF	Channel
13-DSX1	OFF	Channel
14-DSX1	OFF	Channel
15-DSX1	OFF	Channel
16-DSX1	OFF	Channel

	S7	
17-DSX1	OFF	Channel
18-DSX1	OFF	Channel
19-DSX1	OFF	Channel
20-DSX1	OFF	Channel
21-DSX1	OFF	Channel
22-DSX1	OFF	Channel
23-DSX1	OFF	Channel
24-DSX1	OFF	Channel

C100/C150 T-1 CSU/DSU Connecting Two Routers in LDM mode

C100/C150

The T-1 CSU / DSU's can be used a Limited Distance Modems (LDMs) over customer owned four-wire facilities as shown in Figure B-3. The units are used as LDMs connecting two routers at two different locations which can be up to 6000 feet apart. In this example, the routers have RS530 interfaces and are operating at 768,000 bps.

Table B-3 illustrates the switch configuration. Because there is no T-1 carrier involved, ones density requirements do not have to be met so the units can be programmed for Clear channel (all DS0's set for 64000 bps). Switch pack 2 position 3 should be On at the local and remote units to invoke Clear channel. When using the CSU / DSU's as LDMs in this application, the local unit's timing is set to Internal with Switch pack 2 positions 7 Off and 8 On. Timing is left in the default setting of Network provides timing at the remote.

Switch pack 4 positions 2 and 3 are both Off for RS530 interfaces.

All positions in Switch pack 5 are On and Switch pack 6 positions 1,2, 3 and 4 are On (12 DS0's times 64000 bps = 768000 bps). Care must be taken that the selected DS0's are the same in both units.

The Off position of the DIP switch is the rocker arm of the switch in its lowest position (down) on the side of the switch closest to the front panel.

Figure B-3 Using theT-1 C100/C150 CSU/DSUs connecting two routers in LDM mode

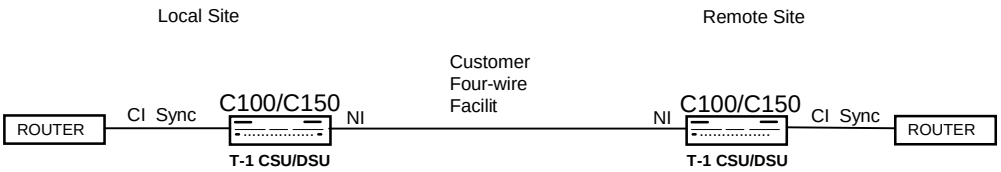


Table B-3 Switches: C100/150 T-1 CSU/DSUs Connecting Two Routers in LDM Mode

OFF	S1	ON		OFF	S1	ON
Addr 1	OFF	Addr 1		Addr 1	OFF	Addr 1
Addr 2	OFF	Addr 2		Addr 2	OFF	Addr 2
Addr 4	OFF	Addr 4		Addr 4	OFF	Addr 4
	OFF				OFF	
	OFF				OFF	
Switches	OFF	Console		Switches	OFF	Console
	OFF	SNMP			OFF	SNMP
R Loop	OFF	Disabled		R Loop	OFF	Disabled
	S2				S2	
ESF	OFF	D4		ESF	OFF	D4
B8ZS	OFF	AMI		B8ZS	OFF	AMI
Density	ON	Clea		Density	ON	Clear
54016	OFF	T1403		54016	OFF	T1403
0 dB	OFF	-7.5 dB		0 dB	OFF	-7.5 dB
0 dB	OFF	-7.5 dB		0 dB	OFF	-7.5 dB
Net(8Off)	OFF	Ch(8On)		Net(8Off)	OFF	Ch(8On)
DSX(7On)	ON	Int(7Off)		DSX(7On)	OFF	Int(7Off)
	S3		USING C150 ONLY		S3	
DSX IN	OFF	DSX OUT		DSX IN	OFF	DSX OUT
ESF	OFF	D4		ESF	OFF	D4
B8ZS	OFF	AMI		B8ZS	OFF	AMI
0 dB	OFF	655 feet		0 dB	OFF	655 feet
0 dB	OFF	655 feet		0 dB	OFF	655 feet
0 dB	OFF	655 feet		0 dB	OFF	655 feet
Idle	OFF	BUSY		Idle	OFF	BUSY
	OFF				OFF	
	S4				S4	
	OFF				OFF	
RS530	OFF			RS53	OFF	
RS232	OFF	V35(2Off)		RS23	OFF	V35(2Off)
56000	OFF	64000		56000	OFF	64000
Carr On	OFF	Switched		Carr On	OFF	Switched
Data	OFF	Invert		Data	OFF	Invert
Clock	OFF	Invert		Clock	OFF	Invert
Int TXC	OFF	Ext TXC		Int TXC	OFF	Ext TXC
	S5		When using C100, S5-S7: Off means: Channel Not Used.		S5	
01-DSX1	ON	Channel		01-DSX1	ON	Channel
02-DSX1	ON	Channel		02-DSX1	ON	Channel
03-DSX1	ON	Channel		03-DSX1	ON	Channel
04-DSX1	ON	Channel		04-DSX1	ON	Channel
05-DSX1	ON	Channel		05-DSX1	ON	Channel
06-DSX1	ON	Channel		06-DSX1	ON	Channel
07-DSX1	OFF	Channel		07-DSX1	ON	Channel
08-DSX1	OFF	Channel		08-DSX1	ON	Channel
	S6				S6	
09-DSX1	ON	Channel		09-DSX1	ON	Channel
10-DSX1	ON	Channel		10-DSX1	ON	Channel
11-DSX1	ON	Channel		11-DSX1	ON	Channel
12-DSX1	ON	Channel		12-DSX1	ON	Channel
13-DSX1	OFF	Channel		13-DSX1	OFF	Channel
14-DSX1	OFF	Channel		14-DSX1	OFF	Channel
15-DSX1	OFF	Channel		15-DSX1	OFF	Channel
16-DSX1	OFF	Channel		16-DSX1	OFF	Channel
	S7				S7	
17-DSX1	OFF	Channel		17-DSX1	OFF	Channel
18-DSX1	OFF	Channel		18-DSX1	OFF	Channel
19-DSX1	OFF	Channel		19-DSX1	OFF	Channel
20-DSX1	OFF	Channel		20-DSX1	OFF	Channel
21-DSX1	OFF	Channel		21-DSX1	OFF	Channel
22-DSX1	OFF	Channel		22-DSX1	OFF	Channel
23-DSX1	OFF	Channel		23-DSX1	OFF	Channel
24-DSX1	OFF	Channel		24-DSX1	OFF	Channel

C150T-1 CSU/DSU connecting two PBXs and converting D4 To ESF

C150 only

The T-1 CSU / DSU can be used to connect two PBXs together over a T-1 facility as shown in Figure B-4. Since some older PBXs don't support ESF framing, the CSU / DSU's can also be used to convert D4 to ESF framing as described in this example. ESF provides the user with better diagnostics, reporting and maintenance from the CSU / DSU's and the T-1carrier provider. In this mode, the Synchronous channel is not used.

Table B-4 illustrates the switch configuration. There is very little change from the factory default selection (all switches Off) in this application. The only switch setting changes are Switch pack 3 positions 2 and 3 from ESF (Off) to D4 (On) and B8ZS (Off) to AMI (On) respectively at both the local and remote sites. This sets the DSX1 channel to D4 with AMI encoding at both ends and leaves the Network Interfaces set to ESF (Switch pack 2 position 1 Off). Since the DSX1 channel is using all the DS0's in this application, Switch pack 5, 6, and 7 are all programmed Off.

Timing is left in the default setting of **Network provides timing** with Switch pack 2 positions 7 and 8 Off since the units are connected to a carrier-provided T-1 Network.

The Off position of the DIP switch is the rocker arm of the switch in its lowest position (down) on the side of the switch closest to the front panel.

Figure B-4 C150 T-1 CSU/DSUs connecting two PBXs over T-1 and converting D4 to ESF

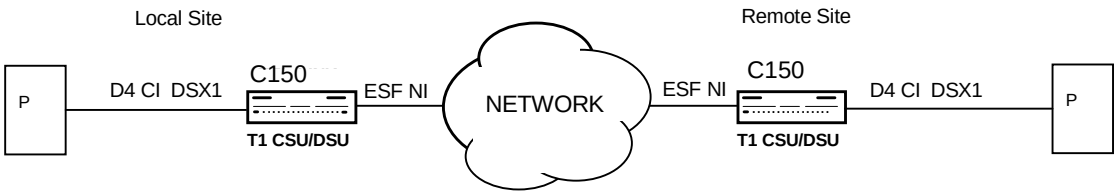


Table B-4 Switches: C150 CSU/DSUs connecting PBXs over T-1 and converting D4 to ESF

OFF	S1	ON	OFF	S1	ON
Addr 1	OFF	Addr 1	Addr 1	OFF	Addr 1
Addr 2	OFF	Addr 2	Addr 2	OFF	Addr 2
Addr 4	OFF	Addr 4	Addr 4	OFF	Addr 4
	OFF			OFF	
	OFF			OFF	
Switches	OFF	Console	Switches	OFF	Console
	OFF	SNMP		OFF	SNMP
R Loop	OFF	Disabled	R Loop	OFF	Disabled
	S2			S2	
ESF	OFF	D4	ESF	OFF	D4
B8ZS	OFF	AMI	B8ZS	OFF	AMI
Density	ON	Clea	Density	OFF	Clear
54016	OFF	T1403	54016	OFF	T1403
0 dB	OFF	-7.5 dB	0 dB	OFF	-7.5 dB
0 dB	OFF	-7.5 dB	0 dB	OFF	-7.5 dB
Net(8Off)	OFF	Ch(8On)	Net(8Off)	OFF	Ch(8On)
DSX(7On)	OFF	Int(7Off)	DSX(7On)	OFF	Int(7Off)
	S3			S3	
DSX IN	OFF	DSX OUT	DSX IN	OFF	DSX OUT
ESF	ON	D4	ESF	ON	D4
B8ZS	ON	AMI	B8ZS	ON	AMI
0 dB	OFF	655 feet	0 dB	OFF	655 feet
0 dB	OFF	655 feet	0 dB	OFF	655 feet
0 dB	OFF	655 feet	0 dB	OFF	655 feet
Idle	OFF	BUSY	Idle	OFF	BUSY
	OFF			OFF	
	S4			S4	
	OFF			OFF	
RS530	OFF		RS53	OFF	
RS232	OFF	V35(2Off)	RS23	OFF	V35(2Off)
56000	OFF	64000	56000	OFF	64000
Carr On	OFF	Switched	Carr On	OFF	Switched
Data	OFF	Invert	Data	OFF	Invert
Clock	OFF	Invert	Clock	OFF	Invert
Int TXC	OFF	Ext TXC	Int TXC	OFF	Ext TXC
	S5			S5	
01-DSX1	OFF	Channel	01-DSX1	ON	Channel
02-DSX1	OFF	Channel	02-DSX1	ON	Channel
03-DSX1	OFF	Channel	03-DSX1	ON	Channel
04-DSX1	OFF	Channel	04-DSX1	ON	Channel
05-DSX1	OFF	Channel	05-DSX1	ON	Channel
06-DSX1	OFF	Channel	06-DSX1	ON	Channel
07-DSX1	OFF	Channel	07-DSX1	ON	Channel
08-DSX1	OFF	Channel	08-DSX1	ON	Channel
	S6			S6	
09-DSX1	OFF	Channel	09-DSX1	ON	Channel
10-DSX1	OFF	Channel	10-DSX1	ON	Channel
11-DSX1	OFF	Channel	11-DSX1	ON	Channel
12-DSX1	OFF	Channel	12-DSX1	ON	Channel
13-DSX1	OFF	Channel	13-DSX1	OFF	Channel
14-DSX1	OFF	Channel	14-DSX1	OFF	Channel
15-DSX1	OFF	Channel	15-DSX1	OFF	Channel
16-DSX1	OFF	Channel	16-DSX1	OFF	Channel
	S7			S7	
17-DSX1	OFF	Channel	17-DSX1	OFF	Channel
18-DSX1	OFF	Channel	18-DSX1	OFF	Channel
19-DSX1	OFF	Channel	19-DSX1	OFF	Channel
20-DSX1	OFF	Channel	20-DSX1	OFF	Channel
21-DSX1	OFF	Channel	21-DSX1	OFF	Channel
22-DSX1	OFF	Channel	22-DSX1	OFF	Channel
23-DSX1	OFF	Channel	23-DSX1	OFF	Channel
24-DSX1	OFF	Channel	24-DSX1	OFF	Channel

When using C100, S5-S7: Off means: Channel Not Used.

C150T-1 CSU/DSU connecting two PBXs and two routers

C150 only

Figure B-5 shows a typical application with the CSU / DSU connecting two sites and using both the Synchronous and DSX1 channels over a T1 facility. The Network Interface (NI) side of each unit connects to the T1 facility and the Customer Interface (CI) side of each unit connects to the customer equipment. In this basic application, the user is using 224K bps (4 DS0's times 56000 bps) with RS530 interfaces for the router to router communications and the remaining 1280K bps (20 DS0's times 64000 bps) for PBX to PBX voice communications. The interface on the local router is RS530, the interface on the remote router is V.35 and the PBXs support D4 framing with AMI encoding. The T-1 facility is ESF with B8ZS encoding.

Table B-5 illustrates the switch configuration. Switch pack 3 positions 2 and 3 are On at both the local and remote sites because the PBXs are D4 framing with AMI framing. Switch pack 2 positions 1 and 2 are left in the default position which is ESF framing with B8ZS encoding.

Timing is left in the default setting of Network provides timing with Switch pack 2 positions 7 and 8 Off since the units are connected to a carrier-provided T-1 Network.

Switch pack 4 positions 2 and 3 are both Off for RS530 interfaces.

Switch pack 5 positions 1,3, 5 and 7 are On (4 DS0's times 56000 bps = 224000 bps). Care must be taken that the selected DS0's are the same in both units.

The Off position of the DIP switch is the rocker arm of the switch in its lowest position (down) on the side of the switch closest to the front panel.

Figure B-5 C150 CSU/DSUs connecting two PBXs and two routers overa T-1 facility

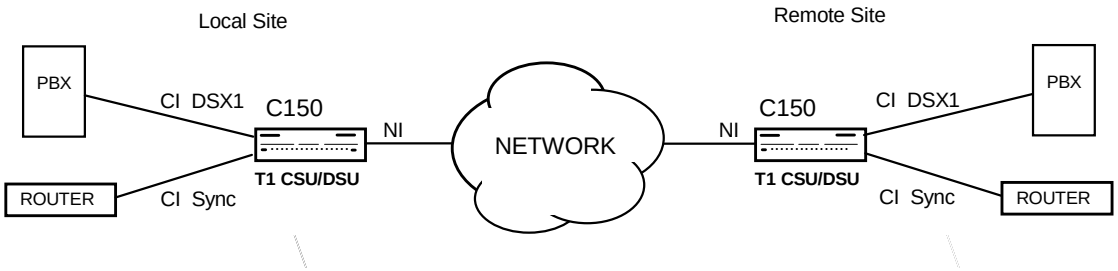


Table B-5 Switches: C150 CSU/DSUs connecting PBXs and routers over a T-1 facility

OFF	S1	ON		OFF	S1	ON
Addr 1	OFF	Addr 1		Addr 1	OFF	Addr 1
Addr 2	OFF	Addr 2		Addr 2	OFF	Addr 2
Addr 4	OFF	Addr 4		Addr 4	OFF	Addr 4
	OFF				OFF	
	OFF				OFF	
Switches	OFF	Console		Switches	OFF	Console
	OFF	SNMP			OFF	SNMP
R Loop	OFF	Disabled		R Loop	OFF	Disabled
	S2				S2	
ESF	OFF	D4		ESF	OFF	D4
B8ZS	OFF	AMI		B8ZS	OFF	AMI
Density	ON	Clea		Density	ON	Clear
54016	OFF	T1403		54016	OFF	T1403
0 dB	OFF	-7.5 dB		0 dB	OFF	-7.5 dB
0 dB	OFF	-7.5 dB		0 dB	OFF	-7.5 dB
Net(8Off)	OFF	Ch(8On)		Net(8Off)	OFF	Ch(8On)
DSX(7On)	OFF	Int(7Off)		DSX(7On)	OFF	Int(7Off)
	S3				S3	
DSX IN	OFF	DSX OUT		DSX IN	OFF	DSX OUT
ESF	ON	D4		ESF	ON	D4
B8ZS	ON	AMI		B8ZS	ON	AMI
0 dB	OFF	655 feet		0 dB	OFF	655 feet
0 dB	OFF	655 feet		0 dB	OFF	655 feet
0 dB	OFF	655 feet		0 dB	OFF	655 feet
Idle	OFF	BUSY		Idle	OFF	BUSY
	OFF				OFF	
	S4				S4	
	OFF				OFF	
RS530	OFF			RS53	OFF	
RS232	OFF	V35(2Off)		RS23	ON	V35(2Off)
56000	OFF	64000		56000	OFF	64000
Carr On	OFF	Switched		Carr On	OFF	Switched
Data	OFF	Invert		Data	OFF	Invert
Clock	OFF	Invert		Clock	OFF	Invert
Int TXC	OFF	Ext TXC		Int TXC	OFF	Ext TXC
	S5		When using C100, S5-S7: Off means: Channel Not Used.		S5	
01-DSX1	ON	Channel		01-DSX1	ON	Channel
02-DSX1	OFF	Channel		02-DSX1	OFF	Channel
03-DSX1	ON	Channel		03-DSX1	ON	Channel
04-DSX1	OFF	Channel		04-DSX1	OFF	Channel
05-DSX1	ON	Channel		05-DSX1	ON	Channel
06-DSX1	OFF	Channel		06-DSX1	OFF	Channel
07-DSX1	ON	Channel		07-DSX1	ON	Channel
08-DSX1	OFF	Channel		08-DSX1	OFF	Channel
	S6				S6	
09-DSX1	ON	Channel		09-DSX1	ON	Channel
10-DSX1	ON	Channel		10-DSX1	ON	Channel
11-DSX1	ON	Channel		11-DSX1	ON	Channel
12-DSX1	ON	Channel		12-DSX1	ON	Channel
13-DSX1	OFF	Channel		13-DSX1	OFF	Channel
14-DSX1	OFF	Channel		14-DSX1	OFF	Channel
15-DSX1	OFF	Channel		15-DSX1	OFF	Channel
16-DSX1	OFF	Channel		16-DSX1	OFF	Channel
	S7				S7	
17-DSX1	OFF	Channel		17-DSX1	OFF	Channel
18-DSX1	OFF	Channel		18-DSX1	OFF	Channel
19-DSX1	OFF	Channel		19-DSX1	OFF	Channel
20-DSX1	OFF	Channel		20-DSX1	OFF	Channel
21-DSX1	OFF	Channel		21-DSX1	OFF	Channel
22-DSX1	OFF	Channel		22-DSX1	OFF	Channel
23-DSX1	OFF	Channel		23-DSX1	OFF	Channel
24-DSX1	OFF	Channel		24-DSX1	OFF	Channel

Appendix

C

Interfaces and Cables

This appendix contains technical information on interfaces and cables.

Network Interface (NI)

The NI (Network Interface) RJ48C 8 position modular connector is wired so that a straight-through RJ48C cable may be used to connect the T-1 CSU / DSU to the RJ48C wall jack supplied by the T-1 carrier provider. A straight-through cable Part Number CB8S0002 or CB8S0003 is provided with the unit. This cable is specially designed using twisted pair wires and any replacement of this cable by the customer must use twisted pair. The interface pins on the rear of the T-1 CSU / DSU NI connector is as follows:

Table C-1 RJ48C 8 position modular connector on rear of unit labeled NI

Pin Number	Signal Name	Direction
1 R	RX (ring) Data	from Network to T-1 CSU/DSU
2 T	RX (tip) Data	from Network to T-1 CSU/DSU
4 R1	TX (ring) Data	to Network from T-1 CSU/DSU
5 T1	TX (tip) Data	to Network from T-1 CSU/DSU

DSX1 Interface

The DSX1 Interface RJ48C 8 position modular connector is wired so it appears as the RJ48C wall jack provided by the T-1 carrier provider. The interface pins on the rear of the T-1 CSU / DSU DSX1 connector is as follows:

RJ48C 8 position modular connector on rear of unit labeled Channel DSX1 Interface

Pin Number	Direction
1	from T-1 CSU / DSU to Customer Interface
2	from T-1 CSU / DSU to Customer Interface
4	to T-1 CSU / DSU from Customer Interface
5	to T-1 CSU / DSU from Customer Interface

CCITTV.35 Channel Interface

The Winchester 34 pin female connector on the rear of the unit supplies theV.35 interface. The signals on this connector appear as a DCE (modem) to the Customer Equipment. The V.35 interface connector on the rear of the unit is wired as follows:

Table C-2 The V.35 Interface 34-pin Female Connector Wiring on Rear ofUnit: V.35 Selected

Pin Number	Signal Name	Direction
P	Transmitted Data (a)	to T-1 CSU/DSU
S	Transmitted Data (b)	to T-1 CSU/DSU
R	Received Data (a)	from T-1 CSU/DSU
T	Received Data (b)	from T-1 CSU/DSU
C	Request to Send	to T-1 CSU/DSU
D	Clear to Send	from T-1 CSU/DSU
E	DCE Ready	from T-1 CSU/DSU
B	Signal Ground	both ways
F	RLSD or Carrier	from T-1 CSU/DSU
Y	DCETransmit Signal Element Timing (a)	from T-1 CSU/DSU
A	DCETransmit Signal Element Timing (b)	from T-1 CSU/DSU
V	DCE Receiver Signal Element Timing (a)	from T-1 CSU/DSU
X	DCE Receiver Signal Element Timing (b)	from T-1 CSU/DSU
H	DTE Ready	to T-1 CSU/DSU
U	DTE Transmit Signal Element Timing (a)	to T-1 CSU/DSU
W	DTE Transmit Signal Element Timing (b)	to T-1 CSU/DSU

RS232/RS530/RS422 channel interfaces

The DB25 pin female on the rear of the unit may be used for either RS232 or for RS422/RS530 interfaces based on the interface selection on the DIP switches or console. This interface will appear as a DCE (modem) to the Customer Equipment. When RS232 is selected, the interface on the rear of the unit will appear as follows:

Table C-3 DB25 Pin Female Connector Wiring on Rear of Unit When RS232 Is Selected

Pin Number	Signal Name	Direction
1	Shield	both ways
2	Transmitted Data	to T-1 CSU/DSU
3	Received Data	from T-1 CSU/DSU
4	Request to Send	to T-1 CSU/DSU
5	Clear to Send	from T-1 CSU/DSU
6	DCE Ready	from T-1 CSU/DSU
7	Signal Ground	both ways
8	Carrier	from T-1 CSU/DSU
15	Transmit Signal Element Timing	from T-1 CSU/DSU
17	Receiver Signal Element Timing	from T-1 CSU/DSU
20	Data Terminal Ready	to T-1 CSU/DSU
24	DTE Transmit Signal Element Timing	to T-1 CSU/DSU

RS530/422 interface

When RS530/422 interface is selected, the signals on the DB25 pin connector will also appear as a DCE (modem) to the Custome Equipment. The interface actually is wired for RS530. A 25 pin to 37 pin RS422 adapter cable (not supplied) must be used for RS422. wiring diagram for the RS422 cable is included at the end of this section. When RS530 is selected, the interface on the rear of the unit will appear as follows:

Table C-4 DB25-Pin Female Connector Wiring on Rear of Unit When RS530 Is Selected

Pin Number	Signal Name	Direction
1	Shield	both ways
2	Transmitted Data (a)	to T-1 CSU/DSU
14	Transmitted Data (b)	to T-1 CSU/DSU
3	Received Data (a)	from T-1 CSU/DSU
16	Received Data (b)	from T-1 CSU/DSU
4	Request to Send (a)	to T-1 CSU/DSU
19	Request to Send (b)	to T-1 CSU/DSU
5	Clear to Send (a)	from T-1 CSU/DSU
13	Clear to Send (b)	from T-1 CSU/DSU
6	DCE Ready (a)	from T-1 CSU/DSU
22	DCE Ready (b)	from T-1 CSU/DSU
7	Signal Ground	both ways
8	RLSD or Carrier (a)	from T-1 CSU/DSU
10	RLSD or Carrier (b)	from T-1 CSU/DSU
15	DCETransmit Signal Element Timing (a)	from T-1 CSU/DSU
12	DCETransmit Signal Element Timing (b)	from T-1 CSU/DSU
17	DCE Receiver Signal Element Timing (a)	from T-1 CSU/DSU
9	DCE Receiver Signal Element Timing (b)	from T-1 CSU/DSU
20	DTE Ready (a)	to T-1 CSU/DSU
23	DTE Ready (b)	to T-1 CSU/DSU
24	DTE Transmit Signal Element Timing (a)	to T-1 CSU/DSU
11	DTE Transmit Signal Element Timing (b)	to T-1 CSU/DSU

Console IN Interface

The Console IN Interface is a 6-position modular connector. This connector is used to connect the console or modem to the T-1 CSU / DSU. The 6-position modular cable with the DB25 male hood supplied with the unit is connected to the ASCII terminal. The cable and 25 pin hood are described at the end of this section. The interface pins on the 6 position modular connector are described as follows:

Table C-5 6-Position Modular Console IN Connector on Rear of Unit

Pin Number	Signal Name	Direction
1	Received Data	to T-1 CSU/DSU
2	Ground	both ways
3	RLSD or Carrier	to T-1 CSU/DSU
4	Data Terminal Ready	from T-1 CSU/DSU
5	Data Set Ready	to T-1 CSU/DSU
6	Transmitted Data	from T-1 CSU/DSU

Console OUT Interface

The Console OUT Interface is a 6-position modular connector. This connector is used to connect the Verilink T-1 CSU / DSU to another Verilink T-1 CSU / DSU. Up to eight units may be connected together in this fashion so that only one console or modem is needed. When connecting units in this way the DB25 hood to modular connector provided is only needed on the first T-1 CSU / DSU.To connect additional T-1 CSU / DSUs, connect Console OUT on the first unit to Console IN on the second unit using the cable provided. The interface pins on the 6 position modular connector marked Console OUT are described as follows.

Table C-6 6-Position Modular Console OUT Connector on Rear of Unit

Pin Number	Signal Name	Direction
1	Received Data	to next T-1 CSU/DSU
2	Ground	both ways
3	no connection	
4	no connection	
5	no connection	
6	Transmitted Data	from next T-1 CSU/DSU

Cables

Two cables and an RS232 hood come standard with the T-1 CSU / DSU:

- Part Number 458-103081-006 is used for connecting the unit to the Network
- Part Number 458-503010-001 is used for connecting the unit's modular console connector to the RS232 hood
- Part Number 458-503012-001 adapter used for connecting to the DB-9 COM port of a PC used as a terminal.

An optional cable is available for the T-1 CSU / DSU. It may obtained from Verilink or provided by the customer.

- Part Number 458-502361-015 RS530 to RS422 cable.

All of these cables and hoods are described as follows:

Part Number 458-503010-001

This cable is an RJ-11C 6-pin modular to modular 6-foot cable. It is used for connecting the C56 **and** C56^{Plus} "Console IN" port. Use it with a DB-9 adapter like the 458-503012-001 listed below.

Figure C-1 RJ-11M 6-Pin Modular Connector

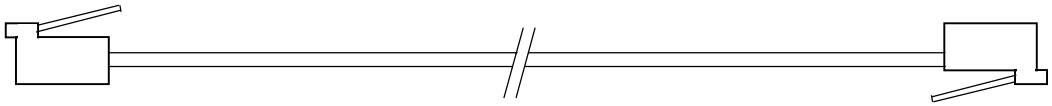


Table C-7 Pinout: RJ-11M 6-Pin to 6-Pin Modular Connector

Pin	Pin
1	1
2	2
3	3
4	4
5	5
6	6

Part Number 458-503012-001

This connector is used to connect cables from C56 and C56^{Plus} "Console IN" port to a PC com port. This part is supplied with the C56 and C56^{Plus}.

Figure C-2 Console Adapter RJ-11 Female to DB-9 Female

Table C-8 Pinout: Console Port IN Connector

6 Pin	Signal Name	DB-9 Pin Female
1	Transmit Data	3
2	Ground	5
6	Received Data	2
-	RTS to CTS to DCD	1 to 7 to 8
-	DSR to DTR	4 to 6

Part Number 458-502361-015

Optional DB25 (RS530) to DB37 (RS422) adapter 6-foot cable - used to connect RS530 channel interface to an RS422 interface.

Table C-9 Pinout: Optional DB25 (RS530) to DB37 (RS422) Adapter Cable

DB 25 pin male	Signal Name	DB 37 pin female
1	Shield	1
2	Transmitted Data (a)	4
14	Transmitted Data (b)	22
3	Received Data (a)	6
16	Received Data (b)	24
4	Request to Send (a)	7
19	Request to Send (b)	25
5	Clear to Send (a)	9
13	Clear to Send (b)	27
6	DCE Ready (a)	11
22	DCE Ready (b)	29
7	Signal Ground	19
8	RLSD or Carrier (a)	13
10	RLSD or Carrier (b)	31
15	DCETransmit Signal Element Timing (a)	5
12	DCETransmit Signal Element Timing (b)	23
17	DCE Receive Signal Element Timing (a)	8
9	DCE Receive Signal Element Timing (b)	26
20	DTE Ready (a)	12
23	DTE Ready (b)	30
24	DTE Transmit Signal Element Timing (a)	17
11	DTE Transmit Signal Element Timing (b)	35

Appendix

D

C100 and C150 SNMP MIB

This appendix contains technical specifications for the C100 and C150 SNMP MIBs.

Procedures for setting up the C150 and C100 for SNMP Management in conjunction with the MIBs are provided in Chapter 5, *Using the Console Port*.

This appendix assumes the user has a basic understanding of SNMP and MIB II objects, but not necessarily the T1 Transmission Group objects.

Overview

In addition to supporting the objects defined by MIB II, the C150 and C100 also support the DS1/E1 MIB object and a proprietary MIB object.

The sections of this appendix provide explanations of the T1 Transmission Group (DS1/E1 MIB object—RFC1406) and the Private Enterprise Group (Verilink Proprietary MIB object).

Transmission group

The C150 and C100 support the DS1/E1 MIB (RFC1406) in the transmission group. References to dsx1 in RFC1406 apply to the T1 Network Interface. References to dsx1 in the Verilink proprietary MIB apply to the T1 Customer Interface (typically a PBX).

The DS1 MIB consists of three groups: The Near End Group, the Far End Group, and the DS1 Fractional Group. Verilink does not support the Far End Group on either the C100 nor the C150 product.

Object ID prefix f the MIB

The object ID prefix for MIB is defined as follows:

```
1.3.6.1.2.10.x.y.z
```

where:

1 (iso)

3 (org)

6 (dod)

1 (internet)

2 (management)

10 (transmission)

x (specific ds1 group)

There are eight possible dsx1 groups:

- dsx1Config (x = 6)
- dsx1Current (x=7)
- dsx1Interval (x =8)
- dsx1Total (x=9)
- dsx1FarEndCurrent (x =10)
- dsx1FarEndInterval (x=11)
- dsx1FarEndTotal (x=12)
- dsx1FracFrac (x=13)

y (specific variable in group

z. (state of specific variable in group)

The “x.y.z” portions of the path are explained in further detail below.

DS1 Near End Group

The DS1 Near End Group consists of four tables:

- DS1 Configuration (ds1 6)
- DS1 Current (ds1 7)
- DS1 Interval (dsl 8)
- DS1 Total (dsl 9)

DS1 Configuration Table (x = 6)

The DS1 Configuration Table consists of 13 entries.

NOTE

dsx1ConfigEntry 1 through 4 and 10 are read-only

dsx1ConfigEntry 5 through 9 and 11 through 13 are read-write accessible.

dsx1LineIndex Object (dsx1ConfigEntry 1)

This read-only object is the identifier of a DS1 Interface on a managed device. If there is an ifEntry that is directly associated with this and only this DS1 interface, it should have the same value as ifIndex Otherwise, the value exceeds ifNumber, and is a unique identifie following this rule: inside interfaces (e.g., equipment side) with even numbers and outside interfaces (e.g., network side) with odd numbers.

dsx1IfIndex Object (dsx1ConfigEntry 2)

The value for this read-only object is equal to the value of ifIndex from the Interfaces table of MIB II (RFC 1406).

dsx1TimeElapsed Object (dsx1ConfigEntry 3)

The value for this read-only object is the number of seconds that have elapsed since the beginning of the current error-measurement period.

dsx1ValidIntervals Object (dsx1ConfigEntry 4)

The value for this read-only object is the number of previous intervals for which valid data was collected. The value will be 96 unless the interface was brought on-line within the last 24 hours, in which case the value will be the number of complete 15 minute intervals since the interface has been online.

dsx1LineType Object (dsx1ConfigEntry 5)

This read-write variable indicates the variety of DS1 Line implementing this circuit. The type of circuit affects the number of bits per second that the circuit can reasonably carry, as well as the interpretation of the usage and error statistics. The following values are supported:

dsx1ESF—Extended SuperFrame DS1

dsx1D4—AT&T D4 format DS1

dsx1LineCoding Object (dsx1ConfigEntry 6)

This read-write variable describes the variety of Zero Code Suppression used on the link, which in turn affects a number of its characteristics. The following values are supported:

dsx1B8ZS

dsx1AMI

dsx1B8ZS refers to the use of a specified pattern of normal bits and bipolar violations which are used to replace a sequence of eight zero bits.

dsx1AMI refers to a mode wherein no zero code suppression is present and the line encoding does not solve the problem directly. In this application, the higher layer must provide data which meets or exceeds the pulse density requirements, such as inverting HDLC data.

dsx1SendCode Object (dsx1ConfigEntry 7)

This read-write variable indicates what type of code is being sent across the DS1 interface by the device. The following values are supported:

dsx1SendNoCode

dsx1SendLineCode

dsx1SendPayloadCode

dsx1SendResetCode

dsx1SendOtherTestPattern

The values mean:

dsx1SendNoCode sending looped or normal data

dsx1SendLineCode sending a request for a line loopback

dsx1SendPayloadCode

sending a request for a payload loopback

dsx1SendResetCode

sending a loopback termination request

dsx1SendOtherTestPattern

sending a test pattern other than those described by this object

dsx1CircuitIdentifier Object (dsx1ConfigEntry 8)

This read-write variable contains the transmission vendor's circuit identifier, for the purpose of facilitating troubleshooting.

dsx1LoopbackConfig Object (dsxqConfigEntry 9)

This read-write variable represents the loopback configuration of the DS1 interface. Agents supporting read / write access should return badValue in response to a requested loopback state that the interface does not support. The following values are supported:

`dsx1NoLoop`

`dsx1PayloadLoop`

`dsx1LineLoop`

`dsx1OtherLoop`

The values mean:

dsx1NoLoop	Not in the loopback state. A device that is not capable of performing a loopback on the interface shall always return this as its value.
dsx1PayloadLoop	The received signal at this interface is looped through the device. Typically the received signal is looped back for re-transmission after it has passed through the device's framing function.
dsx1LineLoop	The received signal at this interface does not go through the device (minimum penetration) but is looped back out.
dsx1OtherLoop	Loopbacks that are not defined here.

dsx1LineStatus Object (dsx1ConfigEntry 10)

This read-only variable indicates the Line Status of the interface. It contains loopback, failure, received 'alarm' and transmitted 'alarm' information.

The following notes apply:

1. The dsx1LineStatus is a bit map represented as a sum; therefore, it can represent multiple failures (alarms) and a LoopbackState simultaneously.

2. dsx1NoAlarm should be set if and only if no other flag is set.

3. If the dsx1LoopbackState bit is set, the loopback in effect can be determined from the dsx1LoopbackConfig object.

   The various bit positions are:

1	dsx1NoAlar	No Alarm Present
2	dsx1RcvFarEndLOF	Far end LOF (a.k.a, Yellow Alarm)
4	dsx1XmtFarEndLOF	Near end sending LOF Indication
8	dsx1RcvAIS	Far end sending AIS
16	dsx1XmtAIS	Near end sending AIS
32	dsx1LossOfFrame	Near end LOF (a.k.a., Red Alarm)
64	dsx1LossOfSignal	Near end LOS
128	dsx1LoopbackState	Near end is looped
256	dsx1T16AIS	E1 TS16 AIS
512	dsx1RcvFarEndLOMF	Far end sending TS16 LOMF
1024	dsx1XmtFarEndLOMF	Near End Sending TS16 LOMF
2048	dsx1RcvTestCode	Near End detects a test code
4096	dsx1OtherFailure	Any line status not defined here

dsx1SignalMode Object (dsx1ConfigEntry 11)

The following value is supported:

none

'none' indicates that no bits are reserved for signaling on this channel.

dsx1TransmitClockSource Object (dsx1ConfigEntry 12)

The source of Transmit Clock. The following values are supported:

loopTiming

localTiming

throughTiming supported in proprietary MIB.

'loopTiming' indicates that the recovered receive clock is used as th transmit clock.

'localTiming' indicates that a local clock source is used.

'throughTiming' indicates that recovered receive clock from another interface is used as the transmit clock.

dsx1Fdl Object (dsx1ConfigEntry 13)

This bitmap describes the use of the facilities data link, and is the sum of the capabilities. The following values are supported:

dsx1Ansi-T1-403

dsx1Att-54016

'dsx1Ansi-T1-403' refers to the FDL exchange recommended by ANSI.

'dsx1Att-54016' refers to ESF FDL exchanges.

DS1 Current Table (x = 7)

The DS1 current table contains various statistics being collected for the current 15 minute interval. It consists of 11 read-only entries.

dsx1CurrentIndex Object - (dsx1CurrentEntry 1)

The index value which uniquely identifies the DS1 interface to which this entry is applicable. The interface identified by a particular value of this index is the same interface as identified by the same value as a dsx1LineIndex object instance.

dsx1CurrentESs Object - (dsx1CurrentEntry 2)

The number of Errored Seconds encountered by a DS1 interface in the current 15 minute interval.

dsx1CurrentSESs Object - (dsx1CurrentEntry 3)

The number of Severely Errored Seconds encountered by a DS1 interface in the current 15 minute interval.

dsx1CurrentSEFSs Object - (dsx1CurrentEntry 4)

The number of Severely Errored Framing Seconds encountered by a DS1 interface in the current 15 minute interval.

dsx1CurrentUASs Object - (dsx1CurrentEntry 4)

The number of Unavailable Seconds encountered by a DS1 interface in the current 15 minute interval.

dsx1CurrentCSSs Object - (dsx1CurrentEntry 6)

The number of Controlled Slip Seconds encountered by a DS1 interface in the current 15 minute interval.

dsx1CurrentPCVs Object - (dsx1CurrentEntry 7)

The number of Path Coding Violations encountered by a DS1 interface in the current 15 minute interval.

dsx1CurrentLESs Object - (dsx1CurrentEntry 8) - not supported

The number of Line Errored Seconds encountered by a DS1 interface in the current 15 minute interval.

dsx1CurrentBESs Object - (dsx1CurrentEntry 9)

The number of Bursty Errored Seconds (BESs) encountered by a DS1 interface in the current 15 minute interval.

dsx1CurrentDMs Object - (dsx1CurrentEntry 10) - not supported

The number of Degraded Minutes (DMs) encountered by a DS1 interface in the current 15 minute interval.

dsx1CurrentLCVs Object - (dsx1CurrentEntry 11)

The number of Line Code Violations (LCVs) encountered by a DS1 interface in the current 15 minute interval.

DS1 Interval Table (x = 8)

The DS1 Interval Table contains various statistics collected by each DS1 Interface over the previous 24 hours of operation. The past 24 hours are broken into 96 completed 15 minute intervals. The table consists of 12 read-only entries.

dsx1IntervalIndex Object - (dsx1IntervalEntry 1)

The index value which uniquely identifies the DS1 interface to which this entry is applicable. The interface identified by a particular value of this index is the same interface as identified by the same value as a dsx1LineIndex object instance.

dsx1IntervalNumber Object - (dsx1IntervalEntry 2)

A number between 1 and 96, where 1 is the most recently completed 15 minute interval and 96 is the least recently completed 15 minutes interval (assuming that all 96 intervals are valid).

dsx1IntervalESs Object - (dsx1IntervalEntry 3)

The number of Errored Seconds encountered by a DS1 interface in one of the previous 96, individual 15 minute, intervals.

dsx1IntervalSESs Object - (dsx1IntervalEntry 4)

The number of Severely Errored Seconds encountered by a DS1 interface in one of the previous 96, individual 15 minute, intervals

dsx1IntervalSEFSs Object - (dsx1IntervalEntry5)

The number of Severely Errored Framing Seconds encountered by a DS1 interface in one of the previous 96, individual 15 minute, intervals.

dsx1IntervalUASs Object - (dsx1IntervalEntry 6)

The number of Unavailable Seconds encountered by a DS1 interface in one of the previous 96, individual 15 minute, intervals.

dsx1IntervalCSSs Object - (dsx1IntervalEntry 7)

The number of Controlled Slip Seconds encountered by a DS1 interface in one of the previous 96, individual 15 minute, intervals.

dsx1IntervalPCVs Object - (dsx1IntervalEntry 8)

The number of Path Coding Violations encountered by a DS1 interface in one of the previous 96, individual 15 minute, intervals.

dsx1IntervalLESs Object - (dsx1IntervalEntry 9) - not supported

The number of Line Errored Seconds encountered by a DS1 interface in one of the previous 96, individual 15 minute, intervals.

dsx1IntervalBESs Object - (dsx1IntervalEntry 10)

The number of Bursty Errored Seconds (BESs) encountered by a DS1 interface in one of the previous 96, individual 15 minute, intervals.

dsx1IntervalDMs Object - (dsx1IntervalEntry 11) - not supported

The number of Degraded Minutes (DMs) encountered by a DS1 interface in one of the previous 96, individual 15 minute, intervals.

dsx1IntervalLCVs Object - (dsx1IntervalEntry 12)

The number of Line Code Violations (LCVs) encountered by a DS1 interface in the current 15 minute interval.

DS1 Total Table (x = 9)

The DS1 Total Table contains the cumulative sum of the various statistics for the 24 hour period preceding the current interval. Th table consists of 11 read-only entries.

dsx1TotalIndex Object- (dsx1TotalEntry 1)

The index value which uniquely identifies the DS1 interface to which this entry is applicable. The interface identified by a particular value of this index is the same interface as identified by the same value as a dsx1LineIndex object instance.

dsx1TotalESs Object - (dsx1TotalEntry 2)

The number of Errored Seconds encountered by a DS1 interface in the previous 24 hour interval.

dsx1TotalSESs Object - (dsx1TotalEntry 3)

The number of Severely Errored Seconds encountered by a DS1 interface in the previous 24 hour interval.

dsx1TotalSEFSs Object - (dsx1TotalEntry 4)

The number of Severely Errored Framing Seconds encountered by a DS1 interface in the previous 24 hour interval.

dsx1TotalUASs Object - (dsx1TotalEntry 5)

The number of Unavailable Seconds encountered by a DS1 interface in the previous 24 hour interval.

dsx1TotalCSSs Object - (dsx1TotalEntry 6)

The number of Controlled Slip Seconds encountered by a DS1 interface in the previous 24 hour interval.

dsx1TotalPCVs Object - (dsx1TotalEntry 7)

The number of Path Coding Violations encountered by a DS1 interface in the previous 24 hour interval.

dsx1TotalLESs Object - (dsx1TotalEntry 8) - not supported

The number of Line Errored Seconds encountered by a DS1 interface in the previous 24 hour interval.

dsx1TotalBESs Object - (dsx1TotalEntry 9)

The number of Bursty Errored Seconds (BESs) encountered by a DS1 interface in the previous 24 hour interval.

dsx1TotalDMs Object - (dsx1TotalEntry 10) - not supported

The number of Degraded Minutes (DMs) encountered by a DS1 interface in the previous 24 hour interval.

dsx1TotalLCVs Object - (dsx1TotalEntry 11)

The number of Line Code Violations (LCVs) encountered by a DS1 interface in the current 15 minute interval.

DS1 Far End Group

Implementation of this group is optional for all systems that attach to a DS1 Interface. Verilink does not support this group on either product.

DS1 Fractional Group (x = 13)

Implementation of this group is mandatory for those systems dividing a DS1 into channels containing different data streams that are of local interest. Systems which are indifferent to data content, such as CSUs, need not implement it.

The DS1 fractional table identifies which DS1 channels associated with a CSU are being used to support a logical interface, i.e., an entry in the interfaces table from the Internet-standard MIB.

For example, consider an application managing a North American ISDN Primary Rate link whose division is a 384 kbit/s H1 "B" Channel for Video, a second H1 for data to a primary routing peer, and 12 64-kbit/s H0 "B" Channels. Consider that some subset of the H0 channels are used for voice and the remainder are available for dynamic data calls.

We count a total of 14 interfaces multiplexed onto the DS1 interface. Six DS1 channels (for the sake of the example, channels 1..6) are used for Video, six more (7..11 and 13) are used for data, and the remaining 12 are in channels 12 and 14..24.

Let us further imagine that ifIndex 2 is of type DS1 and refers to the DS1 interface, and that the interfaces layered onto it are numbered 3..16.

We might describe the allocation of channels, in the dsx1FracTable, as follows:

```
dsx1FracIfIndex.2. 1 = 3  dsx1FracIfIndex.2.13 = 4
dsx1FracIfIndex.2. 2 = 3  dsx1FracIfIndex.2.14 = 6
dsx1FracIfIndex.2. 3 = 3  dsx1FracIfIndex.2.15 = 7
dsx1FracIfIndex.2. 4 = 3  dsx1FracIfIndex.2.16 = 8
dsx1FracIfIndex.2. 5 = 3  dsx1FracIfIndex.2.17 = 9
dsx1FracIfIndex.2. 6 = 3  dsx1FracIfIndex.2.18 = 10
dsx1FracIfIndex.2. 7 = 4  dsx1FracIfIndex.2.19 = 11
dsx1FracIfIndex.2. 8 = 4  dsx1FracIfIndex.2.20 = 12
dsx1FracIfIndex.2. 9 = 4  dsx1FracIfIndex.2.21 = 13
dsx1FracIfIndex.2.10 = 4  dsx1FracIfIndex.2.22 = 14
dsx1FracIfIndex.2.11 = 4  dsx1FracIfIndex.2.23 = 15
dsx1FracIfIndex.2.12 = 5  dsx1FracIfIndex.2.24 = 16
```

For North American (DS1) interfaces, there are 24 legal channels, numbered 1 through 24.

For G.704 interfaces, there are 31 legal channels, numbered 1 through 31. The channels (1..31) correspond directly to the equivalently numbered time-slots.

dsx1FracIndex Object - (dsx1FracEntry 1)

The index value which uniquely identifies the DS1 interface to which this entry is applicable. The interface identified by a particular value of this index is the same interface as identified by the same value an dsx1LineIndex object instance.

dsx1FracNumber Object - (dsx1FracEntry 2)

The channel number for this entry.

dsx1FracIfIndex Object - (dsx1FracEntry 3)

An index value that uniquely identifies an interface. The interface identified by a particular value of this index is the same interface as identified by the same value an ifIndex object instance. If no interface is currently using a channel, the value should be zero. If a single interface occupies more than one time slot, that ifIndex value will be found in multiple time slots.

Private Enterprise - Verilink Proprietary CSU-1-MIB

The Verilink CSU-1-MIB is a proprietary MIB used on the C100 and C150 product. It encompasses the configuration, diagnostic, and statistic information for a single T1/FT1 CSU/DSU. Although the C100 and C150 must also support MIB-II manageable elements, this MIB specifies the singular data elements that apply only to T1/FT1 CSUs. References to dsx1 in RFC1406 apply to the T1 Network Interface. References to dsx1 in the Verilink proprietary MIB apply to the T1 Customer Interface (typically a PBX).

The object ID prefix for this proprietary MIB is defined as follows:

```
1.3.6.1.4.1.2270.w.x.y.z
```

where:

1 (iso)

3 (org)

6 (dod)

1 (internet)

4 (private)

1 (enterprises)

2270 (Verilink vendor #)

w (Verilink product code)

There are six possibleVerilink product codes:

(1)	C100
(2)	C150
(3)	TL3580
(4)	TL3080
(5)	TL3452
(6)	TL3450

x (specific group in CSU-1 MIB)

There are three possible groups in the CSU-1 MIB:

sysConfig	(x = 1)
chnConfig	(x = 2)
dsx1Config	(x = 3)

y (specific variable in group)

z (state of specific variable in group)

The following notes apply:

1. For the purpose of this appendix, all information applies to both the C150 and C100 products, unless otherwise noted.
2. The “w’ portion of the path will either be (1) or (2).
3. The “x.y.z” portions of the path are explained in further detail below.

System Configuration Group (sysConfig x=1)

The sysConfig Group consists of four read-write variables:

sysLoops (y = 1)

sysDensity (y = 2)

sysLinebuildout (y = 3)

sysTiming (y = 4)

sysLoops Object (sysConfigEntry 1)

This variable is used to enable / disable the unit from recognizing most remote loop commands. When enabled, the unit will not respond to V.54 loops to the DSX1 and the Channel. The following values ar supported:

enable

disable

sysDensity Object (sysConfigEntry 2)

This variable determines whether the unit will enforce density to the Network or be Clear Channel. The following values are supported:

Enforce

Clear

sysLinebuildout Object (sysConfigEntry 3)—C150 only

This variable determines the amount of line build out in decibels. The following values are supported:

0dB

7.5dB

-15dB

-22.5dB

sysTiming Object (sysConfigEntry 4)

This variable defines the system timing options. The following values are supported:

Network

DSX1 - C150 only

Internal

Channel

Network (loop timing)

DSX1 (through timing) - C150 only

Internal (local timing)

Channel (through timing)

Channel Configuration Group (chnConfig x=2)

The chnConfig Group consists of six read-write variables:

chnInterface (y = 1)

chnRxsignal (y = 2)

chnData (y = 3)

chnClock (y = 4)

chnTiming (y = 5)

chnBandwidth (y =6)

chnInterface Object (chnConfigEntry 1)

This variable is used to select the interface on the Synchronous Channel. The following values are supported:

RS530

RS232

V.35

chnRxsignal Object (chnConfigEntry 2)

This variable selects Switched or Continuous Carrier Control. This works in conjunction with the Request-to-Send (RTS) control signal, the Carrier Detect (CD or RLSD) control signal and the 56000/64000 DS0 bandwidth selection. The following values are supported:

Continuous

Switched

chnData Object (chnConfigEntry 3)

This variable determines whether data to and from the Synchronous Channel is normal or inverted. By inverting the data, both the transmit and receive data signals at the local Synchronous Channel are inverted. The following values are supported:

Normal

Inverted

chnClock Object (chnConfigEntry 4)

This variable determines whether the External Transmit Clock from the Synchronous Channel is normal or inverted. Inverted Transmit Clock is used when the round trip delay of the Transmit Clock exceeds one half bit time. The following values are supported:

Normal

Inverted

chnTiming Object (chnConfigEntry 5)

This variable determines whether the Internal Transmit Clock from the T-1 CSU / DSU is provided to the Synchronous Channel or whether the External Transmit Clock from the terminal equipment is provided to the Synchronous Channel. The following values are supported:

Internal

External

chnBandwidth Object (chnConfig Entry 6)

This variable is used to determine whether the bandwidth of all DS0s to the Synchronous Channel is 56000 or 64000 bps. The following values are supported:

chn56000

chn64000

DSX1Configuration Group (dsx1Config x= 3) —C150 only—

The dsx1Config Group consists of six read-write variables and one read-only variable:

dsx1Enable (y = 1)

dsx1Framing (y = 2)

dsx1Coding (y = 3)

dsx1Loop (y = 4)

dsx1LineStatus (y = 5) [read-only]

dsx1LineLength (y = 6)

dsx1TrunkProcessing (y = 7)

dsx1Enable Object (dsx1ConfigEntry 1)

This variable is used to enable / disable the DSX1 interface. When DSX Out, the DSX1 interface is completely disabled. When the DSX1 is not used, the DSX1 should be disabled for proper operation of the unit. The following values are supported:

DSXIn

DSXOut

dsx1Framing Object (dsx1ConfigEntry 2)

This variable determines the dsx1 framing format.The following values are supported:

ESF

D4

dsx1Coding Object (dsx1ConfigEntry 3)

This variable describes the variety of Zero Code Suppression used on the link, which in turn affects a number of its characteristics. B8ZS refers to the use of a specified pattern of normal bits and bipola violations which are used to replace a sequence of eight zero bits. AMI refers to a mode wherein no zero code suppression is present and the line encoding does not solve the problem directly. In this application, the higher layer must provide data which meets or exceeds the pulse density requirements. The following values are supported:

B8ZS

AMI

dsx1Loop Object (dsx1ConfigEntry 4)

This variable describes the state of the DSX1 loop (off or on). The following values are supported:

off

on

dsx1LineStatus Object (dsx1Config Entry 5)

This variable indicates the LineStatus of the interface. It contains loopback, failure, received alarm and transmitted alarm information.

The following notes apply:

- The dsx1LineStatus is a bit map represented as a sum; therefore, it can represent multiple failures (alarms) and a LoopbackState simultaneously.
- dsx1NoAlarm should be set if and only if no other flag is set.
- If the dsx1LoopbackState bit is set, the loopback in effect can be determined from the dsx1LoopbackConfig object.

The following values are supported:

1	dsx1NoAlar	No Alarm Present
2	dsx1RcvFarEndLOF	Far end LOF (a.k.a, Yellow Alarm)
4	dsx1XmtFarEndLOF	Near end sending LOF Indication
8	dsx1RcvAIS	Far end sending AIS
16	dsx1XmtAIS	Near end sending AIS
32	dsx1LossOfFrame	Near end LOF (a.k.a., Red Alarm)
64	dsx1LossOfSignal	Near end LOS
128	dsx1LoopbackState	Near end is looped
256	dsx1T16AIS	E1 TS16 AIS
512	dsx1RcvFarEndLOMF	Far end sending TS16 LOMF
1024	dsx1XmtFarEndLOMF	Near End Sending TS16 LOMF
2048	dsx1RcvTestCode	Near End detects a test code
4096	dsx1OtherFailure	Any line status not defined here

dsx1LineLength Object (dsx1ConfigEntry 6)

This variable controls the output power of the T-1 driver on the DSX1 interface. The following values are supported:

133 ft/0dB

266 ft

399 ft

533 ft

655 ft

-7.5dB

-15dB

-22.5dB

dsx1TrunkProcessing Object (dsx1ConfigEntry 7)

This variable represents the trunk processing control. The following values are supported:

idle

busy

Building tomorrow into today's networks

VERILINK CORPORATION
145 BAYTECH DRIVE
SAN JOSE, CALIFORNIA 95134
TEL: (408) 945-1199
FAX: (408) 262-6260

880-502893-001-B
June 1999