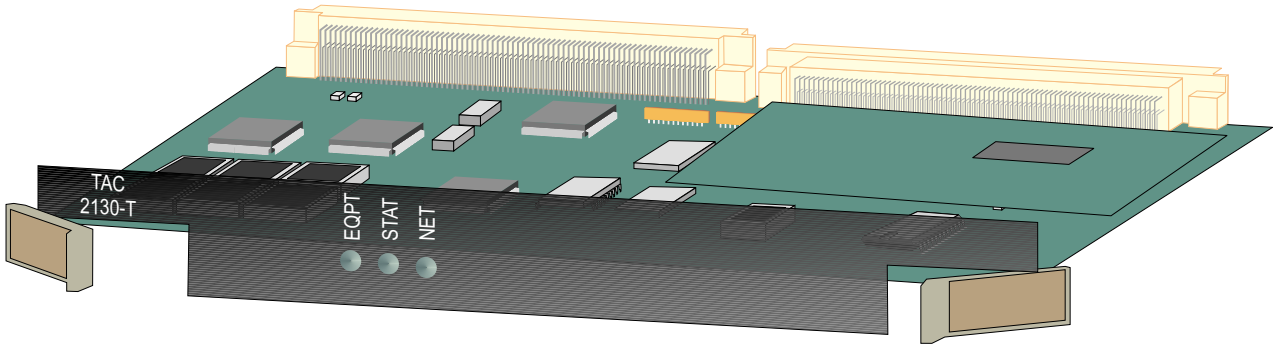
Verilink TAC 2130
User Manual

October 1999

P/N 880-503296-001-A1



VERILINK

Copyright Notice

Trademarks

FCC Requirements

This equipment has been tested and found to comply within the limits for a Class A digital device pursuant to Part 15 of the Federal Communications Commission (FCC) rules. These limits are designed to provide protection against harmful interference in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the user manual, can cause harmful interference to radio communications.

There is no guarantee that interference will not occur in a particular installation. If this equipment causes harmful interference to radio or television reception—which can be determined by turning the equipment off and on—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.

This equipment complies with Part 68 of the FCC Rules. On the rear, side or bottom of the unit is a label that contains the FCC registration number and other information. If requested, provide this information to the telephone company.

- All direct connections to the network lines must be made using standard plugs and jacks (compliant with Part 68). The following tables list the applicable registration jack universal order codes (USOCs), facility interface codes (FICs), and service order codes (SOCs). These are required to order service from the telco.

For T1 interfaces:

Port ID	REN / SOC	FIC	USOC
1.544 Mbit/s SF 1.544 Mbit/s SF, B8ZS 1.544 Mbit/s ANSI ESF 1.544 Mbit/s ANSI ESF, B8ZS	6.0N	04DU9 -BN 04DU9 -DN 04DU9 -1KN 04DU9 -1SN	RJ-48C jack

- If the unit appears to be malfunctioning, inform the telco and disconnect it from the network lines until the source of trouble is determined to be your equipment or the telephone line . If your equipment needs repair, it should not be reconnected until it is repaired.
- The unit has been designed to prevent harm to the network. If the telephone company finds that the equipment is exceeding tolerable parameters, it can temporarily disconnect service. In this case, the telephone company will provide you advance notice if possible.
- If the telephone company alters its equipment in a manner that can affect the use of this device, it must give you warning so that you have the opportunity to maintain uninterrupted service. You will be advised of your right to file a complaint with the FCC.

- No customer is authorized to repair this equipment, regardless of warranty status. All repairs must be performed by Verilink or an authorized agent. It is the responsibility of users requiring service to report the need for service to Verilink or to one of our authorized agents.

Lithium Battery

The lithium battery referred to in the following notices is contained inside the clock chip.

English

DANGER!

The battery can explode if 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/A4:1997 Section 6.2 for telecommunications network voltages (TNV) circuits.

Français

ATTENTION!

Une explosion peut se produire si la batterie est remplacée d' une façon incorrecte! Remplacez-la seulement 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 éviter choc électrique en cas de insuccès, la provision de pouvoir doit êtré installé par un installeur professionnel. Le terminal de la provision de pouvoir, marqué du symbol de terre, (⏚) doit connecté à un circuit de terre permanent.

PRUDENT!

Les circuits doivent êtré interconnectés de manière à ce que l' équipement continue a êtré en agrément avec "EN60950:1992/A4:1997, Section 6.2, pour les circuits de voltage de liaisons d' échanges (réseau) par les télécommunications (TNV)," après les connections de circuits.

Española

ATTENCION!

La bateria puede explotar si 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 con las instrucciones del manufacturero.

ATTENCION!

Para evitar contacto con circuitos que electrocutan, la fuente de alimentación debe ser instalada por un técnico profesional. La terminal de la fuente de alimentación marcada con el símbolo de tierra (⏚) debe ser conectada a un circuito de vuelta por tierra permanente.

PELIGRO!

Circuitos que se interconectan a la red de telecomunicaciones deben hacerse de tal manera que cumplan con los requisitos estipulados en las especificaciones "EN60950:1992/A4:1997, Sección 6.2, para los voltages de circuitos interconnectados a la Red de Telecomunicaciones (TNV)," despues de terminar las connecciones entre los circuitos.

Deutsch

VORSICHT!

Explosionsgefahr bei unsachgemäßem Ersetzen der Batterie! Batterie gleichen Typs und gleicher Qualität benutzen, wie vom Hersteller empfohlen. Entsorgung der 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, müssen weiterhin den Vorschriften EN60950:1992/A4:1997, Absatz 6.2 für Telecommunications Netz Spannung (TNV) Schaltkreize entsprechen.

Canadian Requirements

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

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques (de la class A) prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

The Industry Canada label indentifies CS-03 certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. Industry Canada does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

Safety Precautions

This equipment is intended to be installed only in a Restricted Access Location that meets the following criteria:

- Access can only be gained by service personnel or users who have been instructed about the reasons for the restrictions applied to the location and about any precautions that must be taken.
- Access can only be gained through the use of a lock and key or other means of security, and is controlled by the authority responsible for the location.

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 cloth slightly dampened with water.
- 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:
    - When the power supply cord or plug is damaged or frayed.
    - If liquid has been spilled into the product.
    - If the product has been exposed to rain or water.
    - If the product has been dropped or if the cabinet has been damaged.

Product Warranty

Verilink's product warranty covers repair or replacement of all equipment under normal use for a five-year period from date of shipment. Replacement products may be new or reconditioned. Any replaced or repaired product or part has a ninety (90) day warranty or the remainder of the initial warranty period, whichever is longer. Our in-house Repair Center services returns within ten working days.

Customer Service

Verilink offers the following services:

- System Engineers at regional sales offices for network design and planning assistance (800) 837-4546
- Technical Assistance Center for free 24x7 telephone support during installation, maintenance, and troubleshooting (800) 285-2755 and support@verilink.com
- To return a product, it must be assigned a Return Materials Authorization (RMA) number before sending it to Verilink for repair (800) 926-0085, ext. 2282
- Maintenance contracts and leasing plans (800) 837-4546
- Technical Training on network concepts and Verilink products (800) 282-2755 and training@verilink.com
- Web site (www.verilink.com)

Publications Staff

This manual was written and illustrated by Steve Rider. Contributing Writers and Editors: Dave Fradelis, David Gardner, Marie Metivier, and Barbara Termaat.

Table of Contents

Chapter 1 Overview

This user manual describes the TAC 2130, TAC 2130-S and TAC 2130-T Integrated T1 DSU/CSU modules, components of Verilink's Access System 2000 (AS2000) platform.

Scope

This manual assumes you are already familiar with the AS2000 product line. Where appropriate, the text refers you to a specific Access System 2000 manual for greater detail.

Product Description

The TAC 2130 series are integrated T1 CSU/DSU modules that are managed by one of five node controller modules. Because they integrate CSU and DSU functions into one module, the TAC 2130, TAC 2130-S and TAC 2130-T are also referred to as IDCSU (Integrated DSU/CSU) modules.

Unlike many other AS2000 application modules, the IDCSU does not use any shelf midplane to exchange user data with other modules. All DS0 timeslots in the T1 datastream received by the IDCSU are either routed to the single data port or not used.

The IDCSU uses industry standard methods of channellizing data into DS0 timeslots, and supports full or fractional T1 applications.

Related Verilink Documents

Refer to the following related AS2000 manuals:

- *AS2000, The Basics* for information on physical installation of shelves, modules, and power supplies.
- *Node Manager for Windows 95 User Manual*, documents the Verilink network management program designed to operate under Windows 95™ or Windows NT™.
- *Access Manager 2000 User Manual*, documents the Verilink network management program designed to operate under Windows™ 3.1 (only).

Management Options

The IDCSU must be managed by one of five Verilink node controller modules; the NCC 2020, NCC 2130, SCC 2020, SCC 2130 or NCM 2000. With any of these controllers you can configure the IDCSU through an ASCII terminal port (Craft interface).

Depending on the controller module used, you can also manage the IDCSU using one of two Verilink node management programs, or an industry standard SNMP manager. Table 1-1 lists the ways to access the IDCSU with the various controllers and programs.

Table 1-1 Node Access Methods

Node Controller Module	Craft Interface	Node Management Programs
NCM 2000	Use port labelled LOCAL.	Verilink Node Manager or any SNMP manager.
NCC 2020 NCC 2130	Use port labelled CRAFT.	Verilink Access Manager 2000 or Verilink Node Manager.
SCC 2020 SCC 2130	Use port labelled CRAFT.	Verilink Node Manager or any SNMP manager.

Types of Node Controllers

An AS2000 node requires only one node controller module. Additional applications requiring a single data port per T1 can use IDCSU modules. Verilink's family of AS2000 node controllers includes the following modules:

- The NCM 2000 is an SNMP node controller. It does not contain any type of T1 CSU. See the *NCM 2000 User Manual* for full details.
- The NCC 2020 is a TAC 2010 T1 CSU with the addition of a node controller function. See the *NCC 2020 User Manual* for full details.
- The NCC 2130 is a TAC 2130 IDCSU (Integrated T1 CSU/DSU) with the addition of a node controller function. See the *NCC 2130 User Manual* for full details.
- The SCC 2020 is a TAC 2010 T1 CSU with the addition of an SNMP node controller function. See the *SCC 2020 User Manual* for full details.
- The SCC 2130 is a TAC 2130 IDCSU (Integrated T1 CSU/DSU) with the addition of an SNMP node controller function. See the *SCC 2130 User Manual* for full details.

Module Differences

There are three different versions of the IDCSU.

- The original TAC 2130 has a bantam jack field that is not used. It supports external timing, TIU 2850 timing and tail circuit timing. The TAC 2130 supports three types of synchronous serial interfaces: V.35, EIA 530, and RS-422. The interface type is selected by choosing from among four different rear connector modules.

- The TAC 2130-S has the unused bantam jack field and modular connector removed. It can be used with the same four types of rear connector modules and supports the same interfaces. The TAC 2130-S does not support external timing, tail-circuit timing, or TIU 2850 timing.
- The TAC 2130-T has the unused bantam jack field and modular connector removed. It is used only with one of two special V.35 rear connector modules—the CDM 2035-T and CDM 2135-T. The TAC 2130-T does not support external timing, tail-circuit timing, or TIU 2850 timing.

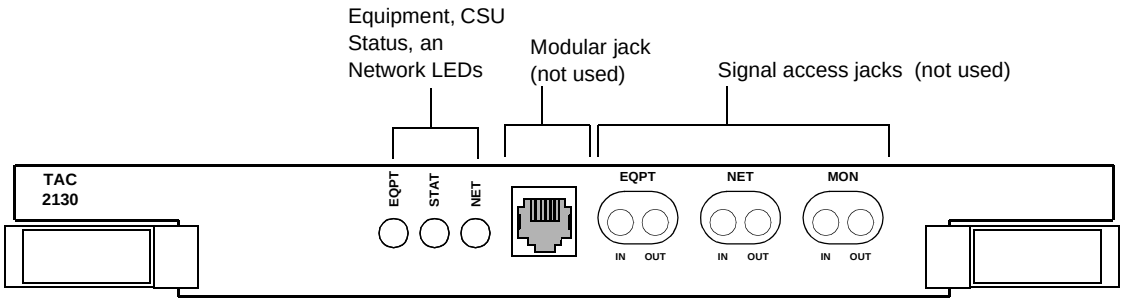
IDCSU Components

The complete IDCSU assembly consists of an application module and a rear connector module (CDM), together occupying a single shelf-slot position accessible from the front and back of the AS2000 shelf. The CDM is installed from the rear of the shelf into the backplane. The IDCSU module is installed from the front. The CDM is always installed first and removed last. The IDCSU front module is installed last and removed first.

IDCSU Front Panel

The IDCSU front panel provides LED indicators for visual alarm indication. It is equipped with dual ejector levers to aid installation and removal of the module. The following figures illustrate the front panel of the three types of IDCSU modules.

Figure 1-1 TAC 2130 Front Panel



NOTE: *The bantam-type signal access jacks are present only on the TAC 2130. They provide access to internal signals within the module. They do NOT reflect line signals. This jack field should not be used.*

Figure 1-2 TAC 2130-S Front Panel

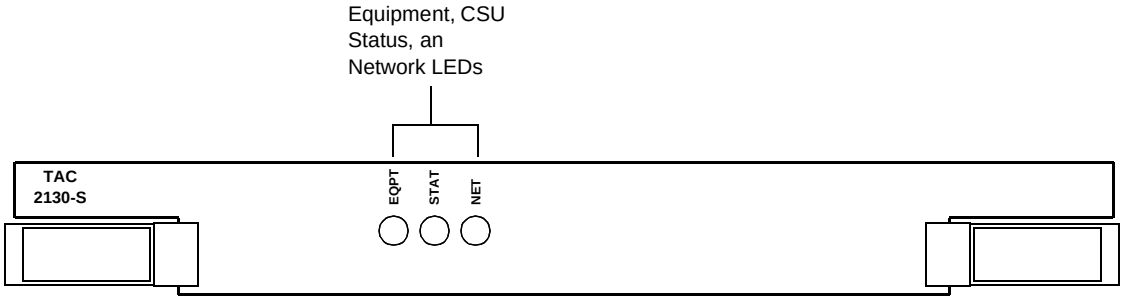
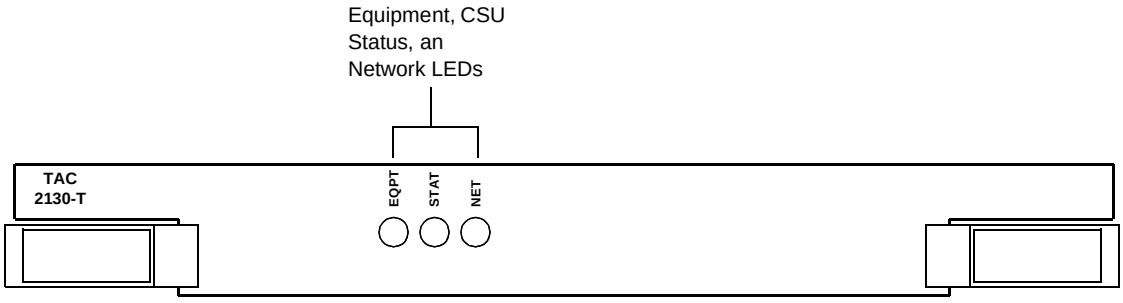


Figure 1-3 TAC 2130-T Front Panel



Rear Connector Modules

The IDCSU is installed with a rear connector module that provides ports for various interface requirements. Table 1-2 lists the connector modules that can be paired with the TAC 2130, TAC 2130-S, and TAC 2130-T front modules.

NOTE: *The TAC 2130-T front module is used only with a CDM 2035-T or CDM 2135-T rear connector module. Front and rear modules ending with "-T" are exclusively used together.*

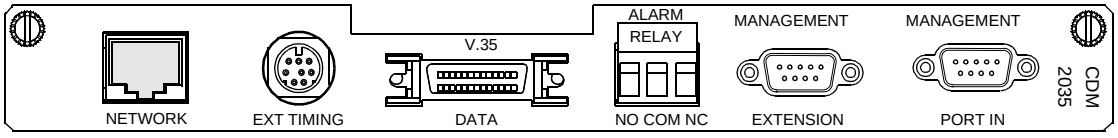
Table 1-2 IDCSU Rear Connector Modules

Front Module	Rear Connector Module	Data Port Connector / Electrical Interface	T1 Network Port Connector	Management Port In	Management Port Out
TAC 2130 or TAC 2130-S	CDM 2035	Mini D-Sub 26 : V.35	RJ-48C	not used	not used
	CDM 2049	Mini D-Sub 26 : RS-449/EIA 530	RJ-48C	not used	not used
	CDM 2135	Mini D-Sub 26 : V.35	DB-15	not used	not used
	CDM 2149	Mini D-Sub 26 : RS-449/EIA 530	DB-15	not used	not used
TAC 2130-T	CDM 2035-T	Winchester 34-pin : V.35	RJ-48C	none	none
	CDM 2135-T	Winchester 34-pin : V.35	DB-15	none	none

TAC 2130 and TAC 2130-S CDMs

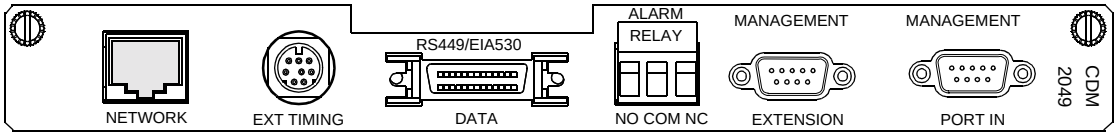
The following illustrations show the four rear connector modules used with the TAC 2130 and TAC 2130-S.

Figure 1-4 CDM 2035 Back Panel(V.35)



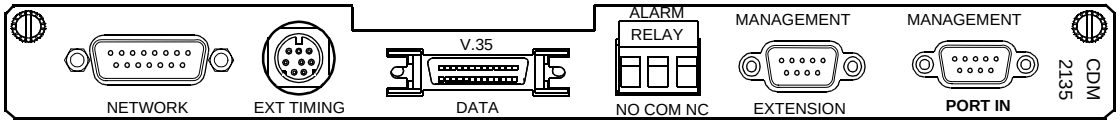
RJ-48C Female T1 Network | **DIN External Timing** | **Mini D-Sub 26-pin V.35 Data Port female** | **Alarm Relay Connector** | **DB-9 male Management Port Out (not used)** | **DB-9 male Management Port In (not used)**

Figure 1-5 CDM 2049 Back Panel (RS-449/EIA 530)



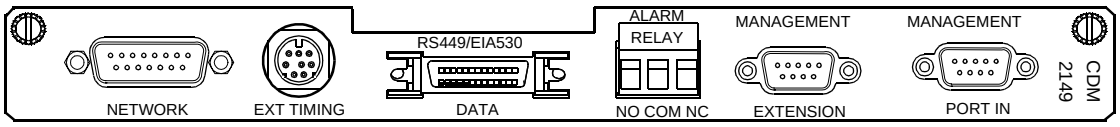
RJ-48C Female T1 Network | **DIN External Timing** | **Mini D-Sub 26-pin RS-449 Data Port female** | **Alarm Relay Connector** | **DB-9 male Management Port Out (not used)** | **DB-9 male Management Port In (not used)**

Figure 1-6 CDM 2135 Back Panel(V.35)



DB-15 Female T1 Network | **DIN External Timing** | **Mini D-Sub 26-pin V.35 Data Port female** | **Alarm Relay Connector** | **DB-9 male Management Port Out (not used)** | **DB-9 male Management Port In (not used)**

Figure 1-7 CDM 2149 Back Panel (RS-449/EIA 530)



DB-15 Female T1 Network | **DIN External Timing** | **Mini D-Sub 26-pin RS-449 Data Port female** | **Alarm Relay Connector** | **DB-9 male Management Port Out (not used)** | **DB-9 male Management Port In (not used)**

Adapter Cables

Rear connector modules for the TAC 2130 and TAC 2130-S have a mini D-Sub 26 pin connector for the data port. A short adapter cable is also provided. The adapter cable, sometimes called a pigtail cable, presents the typical connector for the specific electrical interface. See Table 1-3 for a cross reference of the adapter cables.

Table 1-3 Adapter Cables Used With TAC 2130 and TAC 2130-S

Cable P/N	Electrical Interface	Used With CDM Types	Connectors
458-501594-001	ITU V.35	CDM 2035, CDM 2135	Mini D-Sub 26 - Winchester 34-pin
458-502059-001	RS-449 (RS-422)	CDM 2049; CDM 2149	Mini D-Sub 26 - DB-37
458-502045-001	EIA 530	CDM 2049; CDM 2149	Mini D-Sub 26 - DB-25

Rear Connector Modules for TAC 2130-T

Figure 1-8 and Figure 1-9 illustrate the rear connector modules used only with a TAC 2130-T front module. Since these connector modules have Winchester 34-pin V.35 connectors, adapter cables are not required for data port connections.

TAC 2130-T front modules are used exclusively with CDM 2035-T or CDM 2135-T type rear modules. These rear modules can only be used with a TAC 2130-T.

Figure 1-8 CDM 2035-T Back Panel

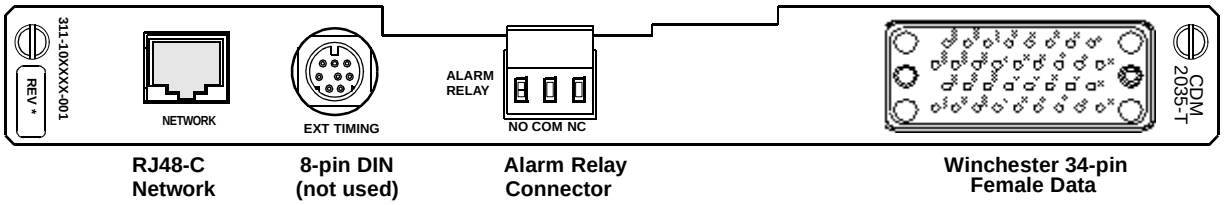
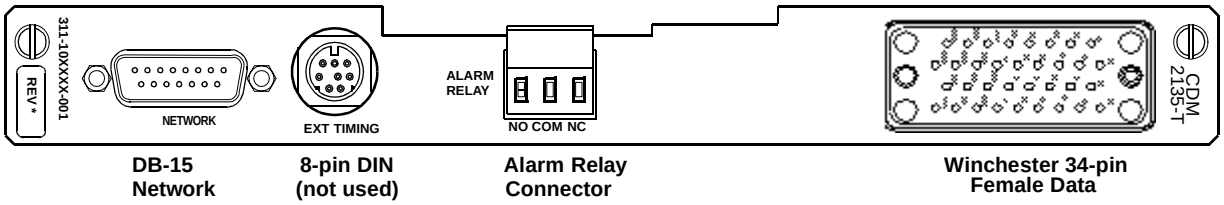


Figure 1-9 CDM 2135-T Back Panel



Port Usage

Table 1-4 describes the usage of the ports on the IDCSU front and rear modules.

Table 1-4 IDCSU Connector Ports

Port	Located	Usage
Modular	Front	The modular connector on the front of the TAC 2130 module is not used. To configure an IDCSU, connect to the controller module.
Bantam Jacks	Front	The bantam jacks are present only on the TAC 2130. They will never reflect actual signals on the T1 circuit. Do not use these bantam jacks.
Network	Rear	Connect the T1 line to this port.
Data	Rear	Connect the supplied adapter cable, which in turn connects to the customer data equipment. The DTE must support the synchronous serial interface type for which the selected CDM is designed.
Management Port In	Rear	Some of the rear connector modules have management ports which are not used when the front module is a TAC 2130 or TAC 2130-S.
Management Extension	Rear	Some of the rear connector modules have management ports which are not used when the front module is a TAC 2130 or TAC 2130-S.
Ext Timing	Rear	External timing is supported in the TAC 2130, not in the TAC 2130-S or TAC 2130-T. Connect an optional external clock source, using either a TTL level (0 to +5V) or balanced (RS-422) signal. The clock must be at 1.544 Mbit/s.
Alarm Relay	Rear	Connect an external alarm system which triggers on either a relay closure (using NO and COM leads) or open (using NC and COM leads). The relay in the IDCSU module supports Form C relay specifications.

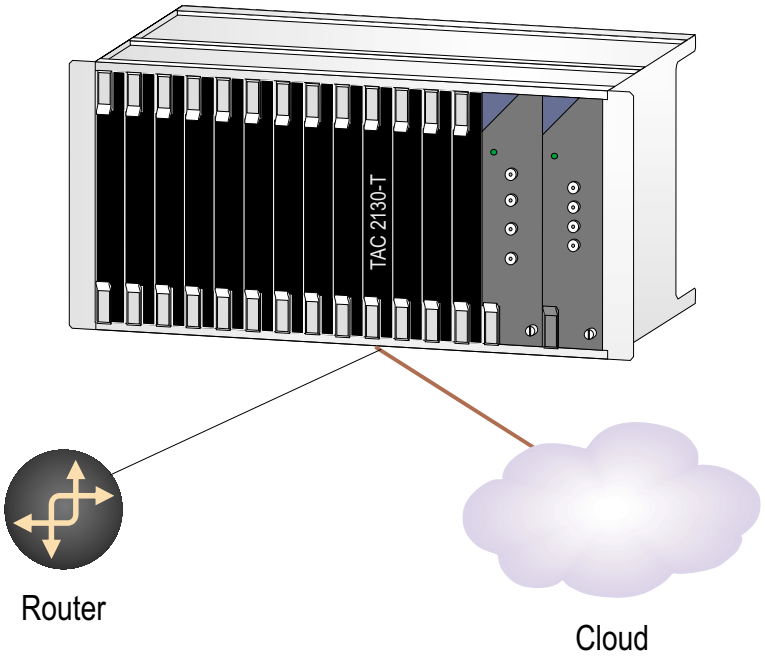
Chapter 2

Quick Set-Up

This section details a quick, step-by-step procedure for configuring the TAC 2130-T. For this quick configuration guide, the following assumptions are made:

- That you are using a TAC 2130-T with a fractional ESF/B8ZS T1 circuit.
- That you are adding the TAC 2130-T to slot 10 of an existing MLS 2200 shelf.
- That the node is controlled by an NCC 2020 module located in slot 1.
- That timeslots one through twelve are to be used for the one available data port on the TAC 2130-T.
- That you are using a Cisco™ router for a connection to the Internet.

Figure 2-1 Example Configuration



It is most likely that this procedure will not match your configuration exactly. Use this chapter as a guide to the process of installing your equipment. Chapter 3 provides complete details on configuration covering all selectable options.

Connect to Craft Port

Connect the modular (RJ-11) end of the Craft cable to the port labeled CRAFT on the front panel of the node controller module. The node controller module is usually installed in slot 1 of shelf 1. Connect the other end of the Craft cable to your PC or terminal.

Set your terminal, or terminal program, to 19.2 kbit/s, 8 data bits, no parity, one stop bit, and *no flow control.*

Log In

1. Press ENTER.
2. The prompt YOUR PASSWORD? is displayed.
3. Initially there is no password, press ENTER.
4. The **Main Menu** for the node controller module is displayed. See Figure 2-2.

Figure 2-2 NCC 2020 Main Menu

```
          -- VERILINK NCC NODE CONTROLLER at[1,1]: FW Rev 4.75 --
SITE NAME: Tech Pubs TAC 2130-T
NODE ID: 408
                                <- SLOT ->
 SHELF    1    2    3    4    5    6    7    8    9   10   11   12   13
 1 M     [C]   D    C    D    C    D    C    D    D    I
 2
 3
 4
 KEY: C=CSU, D=DIU, F=DIU/DDS, B=DIU/DBU, R = SRD, I=IDCSU, T=TU, S=SMDS, V=VCU


S) shelf/slot                      D) diagnostics
N) near element                    O) node administration
F) far element                     M) monitor alarms (OFF)
C) configuration                   A) alm to net mgr (OFF)
P) performance                     X) log off

[1,1] NEAR TAC 2010 >
```

Select the IDCSU

To configure the TAC 2130-T IDCSU you must first select it. The **Shelf/Slot** command is used to select a module.

Type “S” and press ENTER.

The prompt for selecting a module appears. Type “1,10”.

The prompt line reflects the slot selection:
[1,10] NEAR IDCSU 2130 (UPDATE)>

NOTE: *Whenever the word UPDATE appears in the command line prompt, it indicates that some information has changed since the screen was last refreshed. To refresh the screen with current information, press* ENTER.

IDCSU Configuration

Type "C" and press ENTER. The **Configuration Menu** is presented.

Figure 2-3 TAC 2130-T Configuration Menu

```
 IDCSU CONFIGURATION     FW/HW Rev..1.25/0.8
                        |-----------------------|
-------<< dte <<-------| T) alm thld    DEF    |-------<< net <<-------
 M) mode      64K      |                       | W) framing   ESF
 N) scramble  OFF      |                       | F) format    B8ZS
 C) clocking  ST       |                       | J) jitt buf  40 BITS
 G) los lead  NONE     |                       | L) lbo       0 DB
------->> dte >>-------| I) idle code   ONES   |------->> net >>-------
                        |-----------------------| Z) density   12%+80z

    lead toggles:     DTR)   DSR)   RTS)   CTS)   DCD)
    forced leads:      Y      N      N      N      N

 D) select DS-0 (1-24)                          B) timing    NET
    01 02 03 04 05 06 07 08 09 10 11 12         P) prm       NONE
    13 14 15 16 17 18 19 20 21 22 23 24         C1-C7) canned config
 O) poll far end  (ON)
 A) Alarm ENABLE
 V) Data Invert    No


[1,1] NEAR IDCSU 2130 >
```

The factory default values for the TAC 2130-T are shown in Figure 2-3. The network interface, shown at top right, is set for ESF framing and B8ZS line coding.

The DTE interface, shown at top left, is set for 64K per DS0 and LOS (Loss of Signal) detection is off.

1. Type "G" and press ENTER, the prompt for LOS lead selection appears: **los lead (1) dtr (2) rts (3) none >**. Type "2" and press ENTER to use Request To Send. This means that the IDCSU will indicate an alarm condition whenever it does not see RTS held "high" by the router. The EQPT LED begins blinking in a red, red, green pattern because the router is not connected yet.

2. By default, all 24 timeslots of the T1 are assigned to the data port. For this example, only the first twelve are used. Type "D" and press ENTER. The prompt used to select timeslots appears, **ENTER CHANNELS**. Type "1-12" and press ENTER.

3. The default value for the density enforcement selection is not correct for a B8ZS T1. Use the **Z** command, select "1" and press ENTER to change it to **NONE**. B8ZS was developed to eliminate the need for density enforcement.

NOTE: *For the remainder of this chapter you will not be instructed to press* ENTER *each time. Generally, the* ENTER *key is used after each command or value entry.*

---

4. Cisco™ routers wrap the transmit clock signal provided by the DSU back toward the DSU on the optional third clock pair, Terminal Timing. Whenever the DTE offers this feature, it should be used, since the clock on the TT pair will be perfectly in phase with the Transmit Data provided by the DTE. Use the **C** command and choose "3" for Terminal Timing.

5. There are no more changes required to the default IDCSU configuration for this example. Use the **X** command to return to the TAC 2130-T **Main Menu**.

The T1 circuit and DTE should now be connected.

When the router cable is connected to the IDCSU, the EQPT LED stops blinking and is lit steady green.

Within 15 seconds of connecting the T1 circuit, the NET LED on the TAC 2130-T should change from red to green. If it does not, the **Diagnostics Menu** can be used for troubleshooting. See Chapter 5 for more information on diagnostics.

When the IDCSU has been connected to the T1 circuit for at least fifteen minutes, performance statistics will be available under the **Performance Menu**. See Chapter 4 for more details.

The configuration of the TAC 2130-T is covered in detail in Chapter 3 of this manual.

Resetting the STAT LED

The STAT LED normally remains red for up to fifteen minutes after all alarm conditions are cleared. To force the STAT LED to assume its typical condition (off) follow these steps:

1. From the **Main Menu**, use the **P** command to select the **Performance Menu**.

2. Use the **R** command to reset the registers (all information stored in the ESF registers for the preceeding 24 hours is cleared).

3. Use the **X** command to return to the **Main Menu**.

4. Use the **D** command to select the **Diagnostics Menu**.

5. Use the **Z** command to reset alarms. The STAT LED will extinguish if there are no current alarms. If there are alarms, they will be shown on the **Diagnostics Menu**.

Chapter 3 Configuration

This chapter covers configuring the CSU/DSU portion of the TAC 2130, TAC 2130-S, and TAC 2130-T IDCSU modules. Use of the Craft interface and the front panel thumbwheel switches is documented in this chapter.

Using the Craft Interface

To access the Craft interface, connect a terminal or a computer running a terminal program to the port labeled CRAFT or LOCAL on the front panel of the node controller module.

Craft Port Terminal Setup

Set your terminal parameters to:

Data Rate : 19.2 kbit/s

Word Size : 8 bits

Parity : None

Stop Bits : One

Flow Control: None

The Verilink Craft interface does not assert any control leads.

Verilink provides two different types of Craft cable. Both versions of the Craft cable have an RJ-11 modular connector at one end. The original cable has a female DB-25 connector at the other end and a more recent version has a DB-9 female connector. Connect the RJ-11 modular connector to the port labeled CRAFT or LOCAL on the front of the node controller module.

The original Craft cable pinout is as follows:

Table 3-1 Verilink Craft Cable P/N 458-501788-008

DB-25 female	RJ-11 modular	Usage
pin 2	pin 3	Transmit Data
pin 3	pin 4	Receive Data
pin 7	pin 5	Signal Ground

An alternative Craft cable uses DB-9 and RJ-11 connectors. It is wired according to the pinout shown in Table 3-2.

Table 3-2 DB-9 Craft Cable P/N 458-102119-008

DB-9 female	RJ-11 modular	Usage
pin 3	pin 3	Transmit Data
pin 2	pin 4	Receive Data
pin 5	pin 5	Signal Ground

Log In

Log in to the node controller module. If you need details on how to log in, refer to the user manual for your NCC, SCC, or NCM module.

The top or **Main Menu** is displayed.

NOTE: *The example menus in this manual are from an NCC type node controller module. Similar screens are presented when the node controller is an NCM or SCC type.*

Figure 3-1 Main Menu

```
          -- VERILINK NCC NODE CONTROLLER at[1,1]: FW Rev 4.75 --
SITE NAME: Tech Pubs NCC 2020
NODE ID: 408
                                <- SLOT ->
 SHELF    1    2    3    4    5    6    7    8    9   10   11   12   13
 1 M     [C]   D    C    D    C    D    C    D    D    I
 2
 3
 4
 KEY: C=CSU, D=DIU, F=DIU/DDS, B=DIU/DBU, R = SRD, I=IDCSU, T=TU, S=SMDS, V=VCU


S) shelf/slot                      D) diagnostics
N) near element                    O) node administration
F) far element                     M) monitor alarms (OFF)
C) configuration                   A) alm to net mgr (OFF)
P) performance                     X) system log off

[1,1] NEAR TAC 2010 >
```

From this menu you can navigate from card to card, or choose various option menus for the current card.

The **Main Menu** commands are detailed in Table 3-3.

Table 3-3 NCC 2020 Main Menu Commands

Menu Option	Description	Instructions
S) shelf/slot	Used to navigate from module to module within a node.	Enter the shelf number and slot number of the desired module, use a comma delimiter (1,10).
N) near element	Selects the local node.	Used to return from a far element session.
F) far element	Selects the CSU at the remote end of the T1 circuit connected to the current module. Functions only if the T1 circuit is ESF and the Facilities Data Link (FDL) has continuity end-to-end.	With an NCC—only the CSU module connected to the T1 circuit is available. You can not navigate from module to module within the remote node. With an SCC running version 2.06 or newer firmware—you can navigate from slot to slot in the remote node. With an NCM controller—entire remote nodes are selected using the Node Selection menu.
C) configuration	Selects the **Configuration Menu**.	See Figure 3-2 and Table 3-4 below.
P) performance	Selects the **Performance Menu**.	See Chapter 4 of this manual.
D) diagnostics	Selects the **Diagnostics Menu**.	See Chapter 5 of this manual.
O) node administration	Selects the **Node Administration Menu**.	See the manual for the NCC, SCC or NCM node controller you are using.
M) monitor alarms	Toggles on/off the monitor alarms function.	If monitor alarms is ON, alarm messages are displayed on the Craft interface as they occur. No alarm messages are displayed if monitor alarms is OFF.
A) alm to net mgr	Enables or disables sending alarms to a network management program.	Select OFF if there is no path to a network management program. Select ON if you are using either Access Manager 2000 or Node Manager and this NCC module is to send alarms to the network manager PC.
X) log off	Exits the **Main Menu**.	The user is logged out.

The Configuration Menu

In the **Main Menu** shown in Figure 3-1, the element [C] is selected. The letter “C” is defined in the Key as a CSU. The TAC 2130, TAC 2130-S, and TAC 2130-T are all identified with the letter “I”, for IDCSU. In the example in Figure 3-1 the IDCSU is in slot 10.

Each node (group of shelves connected together) typically has only one node controller card. One type of node controller is an NCC 2130, which consists of a TAC 2130 with added node controller functions. An SCC 2130 is a TAC 2130 to which an SNMP node controller has been added.

Therefore, an “I” located in the slot 1 shelf 1 position would represent an NCC 2130 or SCC 2130, while an “I” located at some other position will represent a TAC 2130.

Select the IDCSU by using the **Shelf/Slot** command. Then use the command “C”, for the **IDCSU Configuration Menu**.

Figure 3-2 IDCSU Configuration Menu

```
 IDCSU CONFIGURATION     FW/HW Rev..1.25/0.8
                        |-----------------------|
-------<< dte <<-------| T) alm thld    DEF    |-------<< net <<-------
 M) mode      64K      |                       | W) framing   ESF
 N) scramble  OFF      |                       | F) format    B8ZS
 C) clocking  ST       |                       | J) jitt buf  40 BITS
 G) los lead  RTS      |                       | L) lbo       0 DB
------->> dte >>-------| I) idle code   ONES   |------->> net >>-------
                        |-----------------------| Z) density   12%+80z

    lead toggles:     DTR)   DSR)   RTS)   CTS)   DCD)
    forced leads:      Y      N      N      N      N

 D) select DS-0 (1-24)                          B) timing    NET
    01 02 03 04 05 06 07 08 09 10 11 12         P) prm       NONE
    13 14 15 16 17 18 19 20 21 22 23 24         C1-C7) canned config
 O) poll far end  (ON)
 A) Alarm ENABLE
 V) Data Invert    No


[1,10] NEAR IDCSU 2130 >
```

Configuration Menu Commands

Commands and current settings for the network interface are shown on the right side of the ASCII drawing on the **IDCSU Configuration Menu**. Values and options for the synchronous serial port (DTE interface) are shown on the left side.

Table 3-4 below describes the **IDCSU Configuration Menu** options:

Table 3-4 IDCSU Configuration Commands

Menu Option	Description	Instructions
W) framing	Selects T1 framing mode for the network port. Must match the type of T1 installed by the network service provider.	1(SF)—a D4 T1. 2(ESF)—an ESF T1. 3(ZBTSI)—a Zero Bit Time Slot Insertion T1 (there are no ZBTSI T1 circuits, do not use this option).
F) format	Selects the T1 network line code. Must match the T1 being connected.	1(AMI)—an AMI T1. 2((B8ZS)—a B8ZS T1.
J) jitt buf	Selects the size of the jitter buffer, in bits, on the network side of the IDCSU.	1(16)—Sets the jitter buffer to 16-bit depth. 2(40)—Sets the default value of 40-bit jitter buffer. Larger buffers are more resistant to a jittery signal, smaller buffers introduce less delay.
L) lbo	Line build out is used to reduce the signal strength being sent to the T1 network. New T1 circuits installed by a telephone company in the USA will have a “smart jack”.	(1) 0 db—Use this value if a smart jack (network termination device) has been installed by the telephone carrier, or if the first active device on the T1 is between 2,000 and 3,000 feet away. (2) 7.5 db—Use this value only if there is no smart jack and the first repeater is 1,000 to 2,000 feet away. (3) 15 db—Use this value only if there is no smart jack and the first repeater is zero to 1,000 feet away.
Z) density	Selects density enforcement technique. Density should always be set to “NONE” on a B8ZS T1, B8ZS allows a full 64K per DS0. Never set density to “NONE” on an AMI T1.	(1)NONE—No density enforcement, use this value only and always on a B8ZS T1. (2)12—The IDCSU begins stuffing ones into the user datastream after 12 consecutive zeroes. (3)62411—The IDCSU enforces AT&T publication 62411 density restrictions (average 12.5% minimum ones density). (4)80 0's—The IDCSU begins stuffing ones into the user datastream after 80 consecutive zeroes (recommended). (5)15 0's—The IDCSU begins stuffing ones into the user datastream after 15 consecutive zeroes.
M) mode	Selects data rate per DS0 (timeslot).	When connecting to an AMI T1 facility, use 56K only. Use 56K or 64K, as preferred, on a B8ZS T1 facility.
N) scramble	Selects a mathematical algorithm intended to increase ones density.	If enabled, user data is sent through an algorithm [(Xor)*55] intended to maximize ones density. If disabled, user data is not altered. If used at one end of a T1, this option must be used at both ends. This option is unrelated to encryption or security issues.

Menu Option	Description	Instructions
C) clocking	Sets the source of the clock signal used to control the sampling of Transmit Data by the DSU, and the phase relationship of that clock signal to Transmit Data. Use TT whenever the IDCSU is connected through a crossover cable to another DCE device, such as another CSU/DSU (tail circuit timing). TT cannot be used on a TAC 2130-S or TAC 2130-T to support tail circuit timing.	ST—The data port samples the transmit data lead during the negative going transition of the transmit clock signal provided by the IDCSU. This is the default setting, which is most often the best selection. INV ST—The data port samples the transmit data lead during the positive going transition of the transmit clock signal provided by the IDCSU. This setting can be helpful if sampling errors occur because of a long cable between the DTE and the DSU, and/or when the data rate is very high. TT—The data port samples the transmit data lead during the negative going transition of an external clock signal provided by the DTE. This external clock is usually the transmit clock signal which the DSU provides, simply fed down the cable to the DTE, which wraps it back to the IDCSU. This is done to control the phase relationship between the transmit data and the sampling of the data port. Most types of DTE do not wrap clock back to the DCE, and with most DTE this feature will not operate. When the DTE does wrap clock back to the IDCSU, use this feature, as sampling errors caused by cable-induced phase angles are prevented.
G) los lead	Selects a DTE control lead to be monitored for a "loss of signal" condition.	Select DTR to monitor Data Terminal Ready, RTS to monitor Request To Send or NONE to disable LOS detection. When enabled, an alarm is declared and the EQPT LED blinks red, red, green whenever the selected lead is not high (on).
T) alm thld	Selects enabling or disabling thresholds.	(1)disable—Alarm threshold function is shut off. (2)default—Default values for alarm thresholds are enabled.
I) idle code	Selects idle pattern to be sent in 4K FDL. Used for ESF circuits only, no effect on SF.	1(flag's)—Idle code of 01111110 is sent in Facilities Data Link when no other traffic is present 2(one's)—Idle code of 11111111 is sent in Facilities Data Link when no other traffic is present
DTR)	Selects normal or forced mode for DTR. Type "DTR" to change.	When DTR=Y, (default) the true state of Data Terminal Ready is ignored and the IDCSU returns DSR. When DTR=N, the IDCSU returns DSR only when DTR is asserted by the DTE.
DSR)	Selects normal or forced mode for DSR. Type "DSR" to change.	When DSR=Y, Data Set Ready is forced on. When DSR=N (default), DSR is asserted by the IDCSU only when the DTE asserts DTR.
RTS)	Selects normal or forced mode for RTS. Type "RTS" to change.	When RTS=Y, the true state of Request To Send is ignored and the IDCSU transmits data and returns CTS to the DTE. When RTS=N, (default) the IDCSU transmits data but returns CTS as a high only when RTS is asserted by the DTE.
CTS)	Selects normal or forced mode for CTS. Type "CTS" to change.	When CTS=Y, the true state of RTS is ignored and the IDCSU transmits data and returns Clear To Send to the DTE. When CTS=N, (default) the IDCSU transmits data but returns CTS as a high only when RTS is asserted by the DTE.

Menu Option	Description	Instructions
DCD)	Selects normal or forced mode for DCD. Type "DCD" to change.	When DCD=Y, the IDCSU asserts Data Carrier Detect at all times. When DCD=N, (default) the IDCSU asserts DCD when it is receiving a valid framed signal.
D) select DS-0 (1-24)	Selects the timeslots (DS0s) to use.	Enter a range separated by a hypen (1-24) or individual timeslots separated by commas (1,3,5,7,9,10,11,12,21).
B) timing	Selects the source of the Transmit Clock used by the IDCSU to transmit data toward the T1 network. TIU timing, external timing and DTE timing are supported in the TAC 2130, SCC 2130, and NCC 2130. TIU timing, external timing, and DTE timing are not supported in TAC 2130-S modules or TAC 2130-T modules. When connecting to a T1 facility provided by an interexchange carrier (long distance company) NET timing is usually required.	(1)INT—The IDCSU uses an internal oscillator to generate a 1.544 MHz clock. Used only at one end of a T1 on which the carrier uses no DACS. (2)EXT 422—The IDCSU uses a balanced clock signal provided by an external source through the DIN connector on the rear connector module. (3)EXT TTL—The IDCSU uses an unbalanced (0V to +5V) clock signal provided by an external clock source through the DIN connector on the rear connector module. (4)NET—The IDCSU uses the clock recovered from receive data on the T1 network port for the transmit clock. This is most often the desired option and is required if the network provides a clock (uses a DACS). (5)TIU—The IDCSU uses a clock on data bus C produced by an optional TIU 2850 module installed in the same shelf. (6)DTE—The IDCSU uses an external clock provided by the DTE on the lead pair designated as Terminal Timing (TT) in RS-422/RS-449/EIA 530 or Serial Clock Transmit External (SCTE) in V.35. Use of this option requires the TT selection for clocking. Together, TT clocking and DTE timing establish tail-circuit timing.
P) prm	Performance Response Messages can optionally be sent in the 4K FDL portion of an ESF framed T1.	1(NO)—Performance response messages received from the network are ignored. No messages are sent 2(USER)—Performance response messages are allowed responses and information stored in the user ESF registers is made available. Used by pro-active carriers.
C1-C7) canned config	Allows selection of any of seven configurations which all have in common: Framing = ESF Line Coding = B8ZS Density = 12% + 80 zeroes Timing = NET DTE Clocking = ST Mode = 64K	Canned Configurations C1 through C7 use these data rate and timeslot assignments: C1—1.536 Mbit/s using DS0s 1-24 C2—768 kbit/s using DS0s 1-12 C3—512 kbit/s using DS0s 1-8 C4—384 kbit/s using DS0s 1-6 C5—256 kbit/s using DS0s 1-4 C6—128 kbit/s using DS0s 1-2 C7—1.472 Mbit/s using DS0s 1-23
O) poll far end	If enabled on a point-to-point ESF T1, far end polling can monitor alarms at a remote CSU.	(1) yes—Far end polling is used. Requires FDL continuity from end to end. A DACS in the T1 usually terminates the FDL making this unusable. Note that ESF is required to use this option. (2) no—Far end polling is not supported.

Menu Option	Description	Instructions
G) Alarm	Determines whether or not alarm messages are presented onscreen.	0(Disable)—Alarm reporting is turned off. 1(Enable)—Alarm reporting is enabled. Messages will appear on the Craft terminal as alarms occur and clear.
V) Data Invert	Sends ones as zeroes and zeroes as ones. If used at one end of a T1, must be used at both ends of the T1.	Data inversion is sometimes used to manipulate ones density. If it is known that the data from a particular DTE will always have more zeroes than ones, data inversion will make it have more ones than zeroes. Use of this option to attempt 64K per DS0 bandwidth over an AMI facility is not recommended.
X) exit menu	Exit this menu.	Returns to the IDCSU **Main Menu**.

Firmware Upgrade Procedures

Firmware upgrades to an IDCSU can be done in three ways:

- Replacing the integrated circuits which hold the CSU firmware.
- Using either Access Manager 2000 or Node Manager to download new code to the module.
- Using an NCM 2000 to broadcast new code.

Replacing Firmware ICs

The firmware in a TAC 2130 or TAC 2130-S resides in an EEPROM in socket U11.

The firmware in a TAC 2130-T resides in a Flash IC in socket U29.

Contact Verilink Technical Support (800-837-4546 extension 333) if you require a firmware upgrade kit.

Network Management Programs

Both Access Manager 2000 and Node Manager offer download procedures which can be used to upgrade the IDCSU.

For details on using Access Manager 2000 to upgrade an IDCSU, refer to the *Access Manager 2000 User Manual*.

For details on using Node Manager to upgrade an IDCSU, refer to the *Node Manager User Manual*.

If you are using an NCM 2000 as the node controller, see the *NCM 2000 User Manual* for a detailed firmware upgrade procedure.

Thumbwheel Switches

Thumbwheel switches are provided on the front panel of the NCC and SCC node controllers as a measure of last resort for configuring the application modules.

Whenever possible, use the Craft interface or a network management program instead of the thumbwheels.

Thumbwheel Procedure

A four-step procedure is used for each thumbwheel command:

1. Set the thumbwheel to the number, 01 through 30, equal to the slot number of the module to be configured. If a node consists of multi-line shelves, the first slot in shelf two would be numbered as 14 and the last slot 26. In a node consisting of all dual-line shelves, the first (left-hand) slot of the second shelf is slot number 03.

2. Rapidly press the EXE pushbutton twice, as if double-clicking a mouse. If the NCC or SCC accepts your double-click, the STAT LED on the selected module will begin to blink green to off. If the STAT LED does not begin to blink, try double clicking again at a slightly faster or slower rate. Do not proceed to step 3 until the STAT LED on the desired module begins to blink. Once the STAT LED does begin to blink, steps 3 and 4 must be completed within 60 seconds or the thumbwheel command procedure will time-out.

3. Set the thumbwheel switches to the command value to be used, per Table 3-5 below.

4. Double-click the EXE pushbutton again. If the NCC or SCC module accepts your double-click, the STAT LED on the selected module will stop blinking green to off and will return to some other state. If the STAT LED on the module continues to blink green to off, the NCC or SCC did not accept your double-click. Try double-clicking again, at a faster or slower rate. If you are not successful within 60 seconds of the time you selected the module in step 2, the module will timeout and return to its normal state. If this happens, start over with step 1 of this procedure.

Thumbwheel Commands

Table 3-5 lists the commands available through the front panel thumbwheels.

Table 3-5 Thumbwheel Switch Commands

Code	Applies to	Description
01 to 30	Any of first 30 modules	Selects a module in the indicated slot, up to slot 30. A node controlled by an NCC module can contain a maximum of 30 modules. A node controlled by an SCC can have up to 52 modules, but only the first 30 modules can be selected with the thumbwheel switches.
31	NCC 2020 NCC 2130 SCC 2020 SCC 2130	Accesses the controller functionality of the NCC or SCC node controller (not the T1 CSU portion). For an NCC or SCC in slot 1 of shelf 1, use address 01 to set CSU options.
32	NCC 2020 NCC 2130 SCC 2020 SCC 2130	Resets the modem interface by sending the configured modem initialization string to the DB-9 modem port.
40	NCC 2020 SCC 2020 TAC 2010	Canned configuration #1, EQPT=SF/AMI NET=ESF/AMI.
41	NCC 2020 SCC 2020 TAC 2010	Canned configuration #2, EQPT=ESF/AMI NET=ESF/AMI.
42	NCC 2020 SCC 2020 TAC 2010	Canned configuration #3, EQPT=SF/AMI NET=ESF/B8ZS.
43	NCC 2020 SCC 2020 TAC 2010	Canned configuration #4, EQPT=SF/B8ZS NET=ESF/B8ZS.
44	NCC 2020 SCC 2020 TAC 2010	Canned configuration #5, EQPT=ESF/B8ZS NET=ESF/B8ZS.
45	NCC 2020 NCC 2130	The configuration of the selected module—having been previously stored—is restored to the module from the NCC. Not supported by SCC modules.
46	NCC 2020 NCC 2130	The configuration of the module selected in steps 1 and 2 of this thumbwheel command sequence is stored in the NCC. If the module is replaced or loses configuration later, command 45 can be used to restore it. Not supported by SCC modules
47	NCC 2020 NCC 2130 SCC 2020 SCC 2130 TAC 2010 TAC 2130	Network LBO = 0 dB; Typical value —use when a T1 installed by a local Bell carrier is terminated in a “smart jack” (network termination device), or the first repeater is 2000 to 3000 feet away.
48	NCC 2020 NCC 2130 SCC 2020 SCC 2130 TAC 2010 TAC 2130	Network LBO = 7.5 dB; Attenuates transmit signal by 7.5db. *USE ONLY IF NO SMART JACK IS PRESENT*. Implies that the first active device (repeater, T3 mux, far CSU) is 1000 to 2000 feet away.

Code	Applies to	Description
49	NCC 2020 NCC 2130 SCC 2020 SCC 2130 TAC2010 TAC 2130	Network LBO = 15 dB; Attenuates transmit signal by 15db. *USE ONLY IF NO SMART JACK IS PRESENT*. Implies that the first active device (repeater, T3 mux, far CSU) is 0 to 1000 feet away.
50	NCC 2020 SCC 2020 TAC 2010	Selects DSX-1 Equipment cable length of 0-132 ft.
51	NCC 2020 SCC 2020 TAC 2010	Selects DSX-1 Equipment cable length of 133-265 ft.
52	NCC 2020 SCC 2020 TAC 2010	Selects DSX-1 Equipment cable length of 266-398 ft.
53	NCC 2020 SCC 2020 TAC 2010	Selects DSX-1 Equipment cable length of 399-532 ft.
54	NCC 2020 SCC 2020 TAC 2010	Selects DSX-1 Equipment cable length of 533-655 ft.
55	NCC 2020 SCC 2020 TAC 2010 DIU 2140	Sets data bus to NONE (CSU mode) [default].
56	NCC 2020 SCC 2020 TAC 2010 DIU 2140	Sets data bus to A (Mux mode).
57	NCC 2020 SCC 2020 TAC 2010 DIU 2140	Sets data bus to B (Mux mode).
58	NCC 2020 SCC 2020 TAC 2010 DIU 2140	Sets data bus to C (Mux mode).
59	NCC 2020 NCC 2130 SCC 2020 SCC 2130 TAC2010 TAC 2130	Sends in-band CSU loop-up code to far-end CSU, this should cause the far end CSU to enter a Line Loopback condition.

Code	Applies to	Description
60	NCC 2020 NCC 2130 SCC 2020 SCC 2130 TAC 2010 TAC 2130	Sends framed QRSS to far end.
61	NCC 2020 NCC 2130 SCC 2020 SCC 2130 TAC 2010 TAC 2130	Stops QRSS pattern and sends inband CSU loop-down code to far end.
62	DIU 2140	Uses timeslot 24 on the assigned CSU. Sets all 5 data ports to 9.6 kbit/s.
63	DIU 2140	Selects split timing (RX clock ~ TX clock); typical value.
64	DIU 2140	Selects single source timing (RX clock = TX clock).
65	DIU 2140	Sets DTE timing option for all synchronous data ports to ST.
66	DIU 2140	Sets DTE timing option for all synchronous data ports to $\overline{\text{ST}}$.
67	DIU 2140	Sets DTE timing option for all synchronous data ports to TT.
68	DIU 2140	Sets RTS to normal operation. For synchronous data ports, data is transmitted ONLY if the DTE asserts RTS (ignored in Async) [default].
69	DIU 2140	Sets RTS to forced on (requires version 1.1 DIU 2140 firmware), data is sent regardless of actual state of RTS from DTE. This behavior always applies to Async ports.
80	DIU 2130 NCC 2130 SCC 2130 TAC 2130	Sets Data Port 1 to tail-circuit timing. Note that TAC 2130-T and TAC 2130-S modules do not support tail-circuit timing, external timing, or TIU 2850 timing.
81	DIU 2130 NCC 2130 SCC 2130 TAC 2130	Canned configuration #1—assigns all 24 timeslots to data port #1.
82	DIU 2130 NCC 2130 SCC 2130 TAC 2130	Canned configuration #2—assigns timeslots 1-12 to data port #1 and timeslots 13-24 to data port #2 (data port #2 ignored by TAC 2130).
83	DIU 2130 NCC 2130 SCC 2130 TAC 2130	Canned configuration #3—assigns timeslots 1-8 to data port #1 and timeslots 9-16 to data port #2 (data port #2 ignored by TAC 2130).
84	DIU 2130 NCC 2130 SCC 2130 TAC 2130	Canned configuration #4—assigns timeslots 1-6 to data port #1 and timeslots 7-12 to data port #2 (data port #2 ignored by TAC 2130).

Code	Applies to	Description
85	DIU 2130 NCC 2130 SCC 2130 TAC 2130	Canned configuration #5—assigns timeslots 1-4 to data port #1 and timeslots 5-8 to data port #2 (data port #2 ignored by TAC 2130).
86	DIU 2130 NCC 2130 SCC 2130 TAC 2130	Canned configuration #6—assigns timeslots 1-2 to data port #1 and timeslots 3-4 to data port #2 (data port #2 ignored by TAC 2130).
87	DIU 2130 NCC 2130 SCC 2130 TAC 2130	Canned configuration #7—assigns timeslots 1-23 to data port #1 and timeslot 24 to data port #2 (data port #2 ignored by TAC 2130).
88	DIU 2130 NCC 2130 SCC 2130 TAC 2130 DIU 2131	Sets DTE port(s) clock to TT. The data port samples Transmit Data during the negative going transition of a clock received from the DTE (on the pair Terminal Timing in RS-422, SCTE in V.35, or XTC in RS-232).
89	DIU 2130 NCC 2130 SCC 2130 TAC 2130 DIU 2131	Sets DTE port(s) clock to inverted ST ($\overline{ST}$). The data port samples Transmit Data during the positive going transition of the transmit clock signal.
90	DIU 2130 NCC 2130 SCC 2130 TAC 2130 DIU 2131	Sets DTE ports to $n \times 56$ kbit/s (as required for an AMI T1).
91	DIU 2130 NCC 2130 SCC 2130 TAC 2130 DIU 2131	Unassigns Port 1 timeslot(s).
92	DIU 2130 DIU2131	Unassigns Port 2 timeslot(s).
99	NCC 2020 NCC 2130 SCC 2020 SCC 2130	Resets password for the Craft interface to the default condition (no password).
00	ALL	Clears the address command. Releases currently selected module. Use this command if you change your mind after selecting a module in step two, or if you select the wrong module accidentally, or to practice double-clicking.

Chapter 4

Performance Monitoring

After the IDCSU is installed, the Performance Monitoring routines enable you to monitor the performance of the T1 circuit.

The IDCSU maintains a history of the T1 circuit performance for the previous 24 hours and offers the ability to examine various tables.

Performance statistics can be viewed in a Craft interface session.

As described by the various technical publications which define ESF (Extended SuperFrame), the IDCSU maintains performance records in 15-minute intervals. After an IDCSU has been operating for 24 hours, there are 96 of these 15-minute intervals stored in the CSU registers.

Performance Menu

Most of the information accessible under the **Performance Menu** is only available when the CSU is used on a T1 implemented with ESF framing. CRC error checking, used to detect errored seconds, is only present on an ESF T1.

The **Performance Menu** is accessed by typing “P” while at the IDCSU **Main Menu.**

Performance Menu Display

The **Performance Menu** offers six options to display information and a Reset Registers command to clear all stored information.

Figure 4-1 Performance Menu

```
            --- PERFORMANCE MONITORING ---

        N)    1 hour network
        E)    24 hour es
        B)    24 hour bes
        S)    24 hour ses
        U)    24 hour uas
        L)    24 hour lofc
        R)    reset registers
        X)    exit menu

[1,10] NEAR IDCSU 2130 >
```

Definitions

The acronyms shown on the **Performance Menu** are described in Table 4-1 below

Table 4-1 Performance Menu Acronyms

Acronym	Meaning
ES	Errored Second—Any second during which one or more bit errors have been detected.
BES	Bursty Errored Seconds—A second having between 2 and 319 CRC-6 error events. Bursty errored seconds are not counted when an SES or UAS is counted.
SES	Severely Errored Second—A second with 320 or more CRC-6 error events, or one or more OOF (Out Of Frame) events.
UAS	Unavailable Second—Any second during which an Unavailable Signal State occurs. An Unavailable Signal State condition is declared after ten consecutive SES and clears only after ten consecutive seconds that are not Severely Errored Seconds.
LOFC	Loss Of Frame Count—An accumulated value equal to the number of times that a Loss Of Frame has been declared. Loss of frame is declared when either LOS (Loss Of Signal) or OOF (Out Of Frame) is true for two to three seconds. LOF is cleared only after 10 seconds with LOS and OOF clear.

One Hour Network

The One Hour Network function (Figure 4-2) produces screen output listing a 24-Hour summary for each of the parameters described in Table 4-1 above. Also shown are counts for each of the same alarm conditions for the preceeding hour, in four 15-minute intervals.

Figure 4-2 One Hour Network Report

```
 ONE HOUR PERFORMANCE DATA
5-14-98  14:10:44
Site Name: Tech Pubs TAC 2130
                              ELEMENT ID  1, 1
Valid Intervals  96       Seconds in Current Interval 464

ES      UAS     BES     SES     LOFC
0       0       0       0       0       24 Hour Total
0       0       0       0       0       Current Interval
0       0       0       0       0       Interval 1
0       0       0       0       0       Interval 2
0       0       0       0       0       Interval 3
0       0       0       0       0       Interval 4

[1,10] NEAR IDCSU 2130 >
```

24-Hour Errored Seconds

The 24-Hour Errored Seconds selection on the **Performance Menu** produces a screen showing the errored second counts for each of the last 96 fifteen-minute intervals. Errored seconds are the least serious of the error conditions tracked by the CSU. A typical errored seconds display is shown in Figure 4-3.

Figure 4-3 24-Hour Errored Seconds

```
24 HOUR ES PERFORMANCE DATA  5-14-98  14:25:26
Site Name: Tech Pubs TAC 2130
                              1, 1
Valid Intervals  96       Seconds in Current Interval 627
ES   in 24 Hours  23      ES   in Current Interval     0

 1: 0     17: 0     33: 0     49: 0     65: 0     81: 0
 2: 0     18: 0     34: 0     50: 0     66: 0     82: 0
 3: 0     19: 3     35: 0     51: 0     67: 0     83: 0
 4: 0     20: 0     36: 0     52: 0     68: 0     84: 0
 5: 0     21: 0     37: 0     53: 0     69: 0     85: 0
 6: 0     22: 0     38: 0     54: 0     70: 0     86: 0
 7: 0     23: 0     39: 0     55: 0     71: 0     87: 0
 8: 0     24: 0     40: 0     56: 0     72: 0     88: 0
 9: 0     25: 0     41: 0     57: 0     73: 0     89: 0
10: 0     26: 0     42: 0     58: 0     74: 0     90: 0
11: 0     27: 0     43: 0     59: 0     75: 0     91: 0
12: 0     28: 0     44: 5     60: 0     76: 0     92: 0
13: 0     29: 0     45: 0     61: 0     77: 0     93: 0
14: 0     30: 0     46: 0     62: 0     78: 15    94: 0
15: 0     31: 0     47: 0     63: 0     79: 0     95: 0
16: 0     32: 0     48: 0     64: 0     80: 0     96: 0

[1,10] NEAR IDCSU 2130 >
```

24-Hour Bursty Errored Seconds

Bursty errored seconds are more severe than errored seconds and can cause some applications to lose sessions or suffer excessive retransmissions.

A typical 24-Hour Bursty Errored Seconds display is shown in Figure 4-4.

Figure 4-4 24-Hour Bursty Errored Seconds

```
24 HOUR BES PERFORMANCE DATA  5-14-98  14:43:46
Site Name: Tech Pubs TAC 2130
                              1, 1
Valid Intervals  96       Seconds in Current Interval 829
BES  in 24 Hours  0       BES  in Current Interval     0

 1: 0     17: 0     33: 0     49: 0     65: 0     81: 0
 2: 0     18: 0     34: 0     50: 0     66: 0     82: 0
 3: 0     19: 0     35: 0     51: 0     67: 0     83: 0
 4: 0     20: 0     36: 0     52: 0     68: 0     84: 0
 5: 0     21: 0     37: 0     53: 0     69: 0     85: 0
 6: 0     22: 0     38: 0     54: 0     70: 0     86: 0
 7: 0     23: 0     39: 0     55: 0     71: 0     87: 0
 8: 0     24: 0     40: 0     56: 0     72: 0     88: 0
 9: 0     25: 0     41: 0     57: 0     73: 0     89: 0
10: 0     26: 0     42: 0     58: 0     74: 0     90: 0
11: 0     27: 0     43: 0     59: 0     75: 0     91: 0
12: 0     28: 0     44: 0     60: 0     76: 0     92: 0
13: 0     29: 0     45: 0     61: 0     77: 0     93: 0
14: 0     30: 0     46: 0     62: 0     78: 0     94: 0
15: 0     31: 0     47: 0     63: 0     79: 0     95: 0
16: 0     32: 0     48: 0     64: 0     80: 0     96: 0

[1,10] NEAR IDCSU 2130 >
```

24-Hour Severely Errored Seconds

Severely Errored Seconds pose a serious threat to the integrity of your data. Since a T1 offers a maximum of 1.536 Mbit/s, an error rate over 320 per second is significant. Severely errored seconds can also result from Out Of Frame (OOF) conditions. During an OOF event all user data is lost.

A typical 24-Hour Severely Errored Seconds Report is shown below in Figure 4-5.

Figure 4-5 24-Hour Severely Errored Seconds

```
24 HOUR SES PERFORMANCE DATA  5-14-98  14:48:46
Site Name: Tech Pubs TAC 2130
                              1, 1
Valid Intervals  96       Seconds in Current Interval 231
SES  in 24 Hours  0       SES  in Current Interval     0

 1: 0     17: 0     33: 0     49: 0     65: 0     81: 0
 2: 0     18: 0     34: 0     50: 0     66: 0     82: 0
 3: 0     19: 0     35: 0     51: 0     67: 0     83: 0
 4: 0     20: 0     36: 0     52: 0     68: 0     84: 0
 5: 0     21: 0     37: 0     53: 0     69: 0     85: 0
 6: 0     22: 0     38: 0     54: 0     70: 0     86: 0
 7: 0     23: 0     39: 0     55: 0     71: 0     87: 0
 8: 0     24: 0     40: 0     56: 0     72: 0     88: 0
 9: 0     25: 0     41: 0     57: 0     73: 0     89: 0
10: 0     26: 0     42: 0     58: 0     74: 0     90: 0
11: 0     27: 0     43: 0     59: 0     75: 0     91: 0
12: 0     28: 0     44: 0     60: 0     76: 0     92: 0
13: 0     29: 0     45: 0     61: 0     77: 0     93: 0
14: 0     30: 0     46: 0     62: 0     78: 0     94: 0
15: 0     31: 0     47: 0     63: 0     79: 0     95: 0
16: 0     32: 0     48: 0     64: 0     80: 0     96: 0

[1,10] NEAR IDCSU 2130 >
```

24-Hour Unavailable Seconds

After ten Severely Errored Seconds in a row, the CSU begins to count Unavailable Seconds. As the name suggests, the error rate in this condition is considered to be so high that the T1 circuit should be treated as though it were not available.

Once a CSU begins counting Unavailable Seconds it continues to do so until ten consecutive seconds pass, all of which are error free or have a lower error rate than a Severely Errored Second.

A typical 24-Hour Unavailable Seconds display is shown below in Figure 4-6:

Figure 4-6 24-Hour Unavailable Seconds

```
24 HOUR UAS PERFORMANCE DATA  5-14-98  15:13:03
Site Name: Tech Pubs TAC 2130
                              1, 1
Valid Intervals  96       Seconds in Current Interval 786
UAS  in 24 Hours  0       UAS  in Current Interval     0

 1: 0     17: 0     33: 0     49: 0     65: 0     81: 0
 2: 0     18: 0     34: 0     50: 0     66: 0     82: 0
 3: 0     19: 0     35: 0     51: 0     67: 0     83: 0
 4: 0     20: 0     36: 0     52: 0     68: 0     84: 0
 5: 0     21: 0     37: 0     53: 0     69: 0     85: 0
 6: 0     22: 0     38: 0     54: 0     70: 0     86: 0
 7: 0     23: 0     39: 0     55: 0     71: 0     87: 0
 8: 0     24: 0     40: 0     56: 0     72: 0     88: 0
 9: 0     25: 0     41: 0     57: 0     73: 0     89: 0
10: 0     26: 0     42: 0     58: 0     74: 0     90: 0
11: 0     27: 0     43: 0     59: 0     75: 0     91: 0
12: 0     28: 0     44: 0     60: 0     76: 0     92: 0
13: 0     29: 0     45: 0     61: 0     77: 0     93: 0
14: 0     30: 0     46: 0     62: 0     78: 0     94: 0
15: 0     31: 0     47: 0     63: 0     79: 0     95: 0
16: 0     32: 0     48: 0     64: 0     80: 0     96: 0

[1,10] NEAR IDCSU 2130 >
```

24-Hour Loss of Frame Count

A loss of frame synchronization on a T1 circuit causes a loss of *all user data* as long as the Out of Frame condition continues.

The 24-Hour Loss of Frame Count indicates how many seconds, per fifteen-minute interval, were during an Out of Frame condition. These are seconds during which you can be certain that no user data passed. Since there are 900 seconds in a fifteen minute period, the value for any one interval will never exceed 900.

A typical 24-Hour LOFC display is shown below in Figure 4-7.

Figure 4-7 24-Hour Loss Of Frame Count

```
24 HOUR LOFC PERFORMANCE DATA  5-14-98  15:28:48
Site Name: Tech Pubs TAC 2130
                              1, 1
Valid Intervals  96       Seconds in Current Interval 830
LOFC in 24 Hours  0       LOFC in Current Interval     0

 1: 0     17: 0     33: 0     49: 0     65: 0     81: 0
 2: 0     18: 0     34: 0     50: 0     66: 0     82: 0
 3: 0     19: 0     35: 0     51: 0     67: 0     83: 0
 4: 0     20: 0     36: 0     52: 0     68: 0     84: 0
 5: 0     21: 0     37: 0     53: 0     69: 0     85: 0
 6: 0     22: 0     38: 0     54: 0     70: 0     86: 0
 7: 0     23: 0     39: 0     55: 0     71: 0     87: 0
 8: 0     24: 0     40: 0     56: 0     72: 0     88: 0
 9: 0     25: 0     41: 0     57: 0     73: 0     89: 0
10: 0     26: 0     42: 0     58: 0     74: 0     90: 0
11: 0     27: 0     43: 0     59: 0     75: 0     91: 0
12: 0     28: 0     44: 0     60: 0     76: 0     92: 0
13: 0     29: 0     45: 0     61: 0     77: 0     93: 0
14: 0     30: 0     46: 0     62: 0     78: 0     94: 0
15: 0     31: 0     47: 0     63: 0     79: 0     95: 0
16: 0     32: 0     48: 0     64: 0     80: 0     96: 0

[1,10] NEAR IDCSU 2130 >
```

Reset Registers

The Reset Registers command on the **Performance Menu** is used to clear all accumulated information held in the ESF registers. All of the values in the displays available from the **Performance Menu** are reset to zero, and the number of valid intervals is reset to zero.

A typical use of this option would be at the end of an installation. If a T1 facility has been serviced and it is believed that any problems have been corrected, reset the registers so that any errors reported are known to be new.

Chapter 5 Diagnostics

While installing your IDCSU, or after it has been placed into service, the Diagnostic routines allow you to troubleshoot or verify the T1 circuit and Verilink equipment.

Light Emitting Diodes (LEDS) on the IDCSU front panel provide a visual indication of alarm and status conditions. The **Diagnostics Menu** provides current information about possible alarm conditions and offers command options which can be used to establish and terminate loopbacks and test patterns.

Using Diagnostics

A typical way to use the **Diagnostics Menu** might involve the following steps:

1. Establish a loopback somewhere in the circuit path.
2. Start transmitting a test pattern.
3. Observe the test error counter to see if the test pattern is received as it was sent.
   a. If no errors are observed, move the point of loopback further away to test more of the circuit path, or
   b. If errors are observed, move the point of loopback closer to determine the source of the problem.
4. Stop the test pattern, drop all loopbacks, then:
   a. Place the T1 circuit back into service if all tests passed, or
   b. Contact the appropriate vendor if a problem was found.

Alarm Status

In addition to offering the ability to put up and take down loopbacks and test patterns, the **Diagnostics Menu** also offers information about the current status of the DTE interface and the T1 network interface.

The top area of the **Diagnostics Menu** includes a drawing made up of ASCII characters representing the operation of the CSU. The equipment interface is shown on the left and the network interface is shown on the right. In the area to the left and right of the line drawing of a framer, status information is represented by words displayed in upper case characters.

Diagnostics Menu

A sample of the **Diagnostics Menu** is shown below in Figure 5-1.

In this example the word **PULSES** appears on both the DTE (left hand) and network (right hand) sides of the display. When the word **PULSES** appears alone, that interface has no alarms.

Figure 5-1 Diagnostics Menu

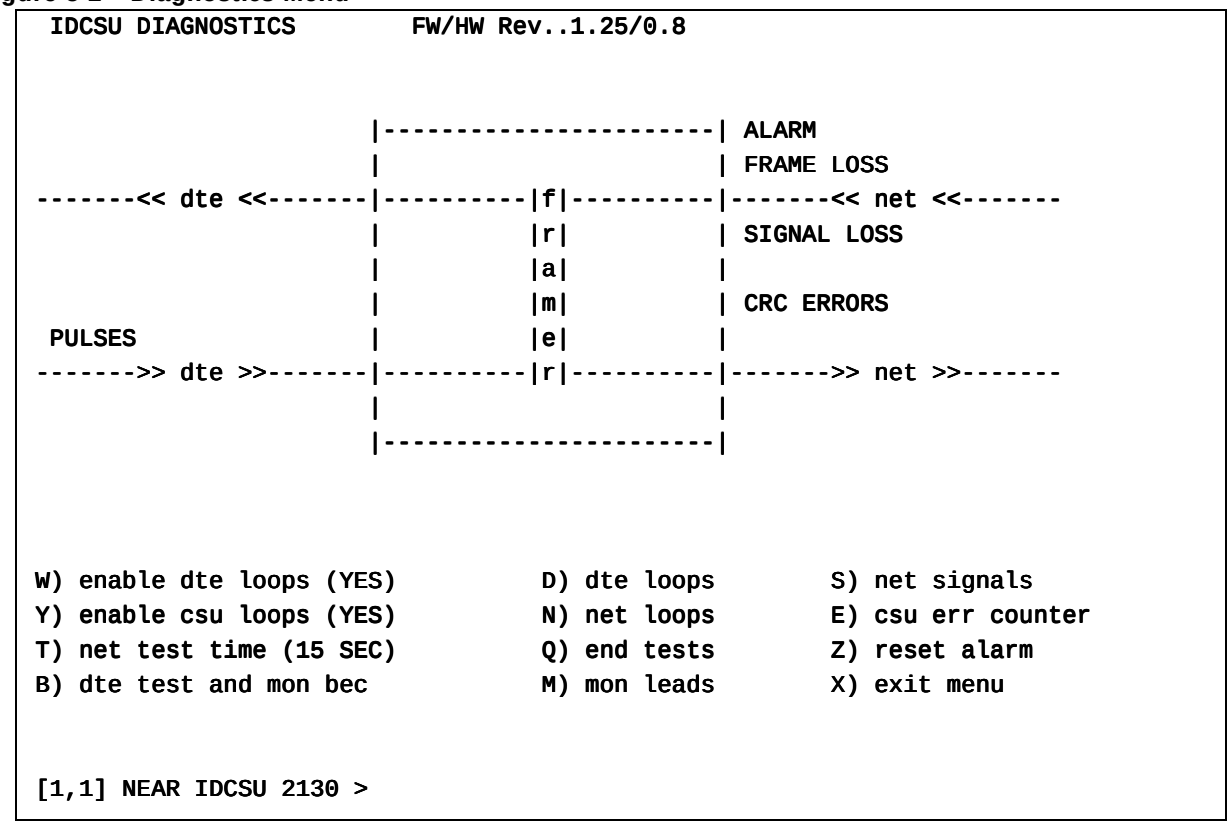
```
 IDCSU DIAGNOSTICS        FW/HW Rev..1.25/0.8


                      |-----------------------|
                      |                       |
-------<< dte <<-------|----------|f|----------|-------<< net <<-------
                      |          |r|          | PULSES
                      |          |a|          |
                      |          |m|          |
 PULSES               |          |e|          |
------->> dte >>-------|----------|r|----------|------->> net >>-------
                      |                       |
                      |-----------------------|



W) enable dte loops (YES)          D) dte loops        S) net signals
Y) enable csu loops (YES)          N) net loops        E) csu err counter
T) net test time (15 SEC)          Q) end tests        Z) reset alarm
B) dte test and mon bec            M) mon leads        X) exit menu


[1,1] NEAR IDCSU 2130 >
```

Since a T1 circuit operates by sending pulses to represent a logical one, the indication **PULSES** means that the IDCSU sees pulses on the network (right side) interface. Therefore, of all the messages which might appear on this menu in upper case characters, **PULSES** is the only one which does not represent an alarm condition. Pulses are the logical opposite of a Loss of Signal (LOS) condition.

Figure 5-2 below shows the result of disconnecting the T1 circuit from an IDCSU module. The word **PULSES** no longer appears on the right side where network status is indicated. Instead, alarm conditions are reported, including **ALARM**, **FRAME LOSS**, **CRC ERRORS**, and **SIGNAL LOSS**.

NOTE: *Whenever an IDCSU reports Signal Loss, it will report other alarms as well. The other alarms are caused by the signal loss condition. Ignore the other alarms and find the cause of the Signal Loss to restore the T1 to service.*

Figure 5-2 Diagnostics Menu



Status Messages

The status messages which can appear on the **Diagnostics Menu** are listed in Table 5-1.

Table 5-1 Diagnostic Menu Status Messages

Message	Meaning
ALARM	Yellow Alarm (RAI)—The IDCSU is receiving a Remote Alarm Indication Signal on the port. This signal is sent by a device in a red alarm condition, such as AIS, LOS or LOF.
FRAME LOSS	Out Of Frame (OOF)—The IDCSU does not detect a valid framed signal on the port. If pulses are also present. Can indicate receipt of unframed all ones—Alarm Indication Signal (AIS)—which is often used as a Keep Alive signal on T1 circuits.
SIGNAL LOSS	Loss Of Signal (LOS)—The IDCSU does not detect any pulses on the port. This is the worst possible alarm condition on a T1 port. Ignore other alarms and resolve the cause of the LOS first. For a DTE port reporting LOS, it means the LOS option is configured to expect RTS or DTR from the DTE and that signal is not present.
CRC ERRORS	Cyclic Redundancy Check errors (CRC-6)—the IDCSU detects errors using the CRC-6 feature of ESF framing. Applies only to T1 circuits using ESF framing.
BPV	The IDCSU is detecting bipolar violations on the port. Two or more pulses in a row were of the same polarity, violating the Alternating Mark Inversion requirement.
EXT CLK LOSS	The IDCSU is configured to use an external clock signal and that signal is not detected. External clock is supported in the TAC 2130—not in the TAC 2130-S or TAC 2130-T.
PULSES	Not an alarm condition. The IDCSU does see valid pulses on the port. PULSES should always be displayed on the DTE side of the menu.

Diagnostic Commands

There are twelve command options available on the IDCSU **Diagnostics Menu**. Table 5-2 lists all of these commands in right to left order:

Information about the various loopbacks can be found in the manual *AS2000, The Basics*.

Table 5-2 Diagnostic Commands

Menu Option	Description	Instructions
W) enable dte loops	Determines whether the IDCSU will respond to loop requests from the DTE and the Craft interface.	If DTE loops are enabled, the operator can establish a loopback using the DTE loop command and the DTE can establish a loop using the LL or RL leads on the synchronous serial interface. If DTE loops are disabled, the DTE cannot establish any loop. The operator will not be able to establish a near loop, but will be able to use repeater loop.
D) dte loops	Presents a prompt line used to establish near end equipment (DTE) loops, far-end DTE loops, or a local repeater loop.	(1) near on—Turns on a bidirectional loopback at the local synchronous serial interface. Both local and far-end DTE should "see" this loop. (2) far on—Sends a Verilink proprietary loop-up command toward the far-end CSU. If successful, this loop should be detected by both local and far-end DTE. (3) near off—Turns off a near loop. (4) far off—Sends a Verilink proprietary loop-down command toward the far-end CSU. (5) repeater loop—Starts a local-only loopback of transmit data to the receive circuitry. Local DTE will receive its own data while the far-end receives a keep-alive pattern.
S) net signals	Begins transmitting selected test pattern to the T1 network. Typically, a loopback is established first. Received data is compared to the pattern transmitted to determine if errors are occurring on the T1.	(1) qrss—The IDCSU sends a Quasi-Random Signal Sequence. This test is widely supported by telephone carriers. (2) 3 in 24—The IDCSU sends a bit pattern which has a minimum of 3 ones per 24 bits. This low-density pattern will find some T1 problems not detected by other tests. (3) 1 in 8—The IDCSU sends a pattern with seven zeroes followed by a single one. This pattern is suggested for all T1 circuits, since it will never violate ones density requirements. (4) all 1s—The IDCSU sends a framed pattern of all ones. This test produces maximum current on the T1 and can reveal marginal repeaters or resistive connections.
Y) enable csu loops	Selects response to CSU loop requests. CSU loops face the T1 circuit only. The local DTE does not "see" any CSU loops.	If CSU loops are enabled, the IDCSU will enter a Line Loop or a Payload Loop when either is requested by a received loop-up code or an operator command. If CSU loops are disabled, the IDCSU will not enter a Line Loop or a Payload Loop, whether a loop-up code is received or an operator requests a loop. All Net Loop requests are ignored.
N) net loops	Presents a prompt line used to select a local CSU loop; or to send a CSU loop-up or loop-down code toward the far-end CSU. If Inband Up is used to establish a remote CSU Line Loop, **Inband Down** must be used later to end that loop.	(1) line—Establishes a Line Loop, which faces the T1 circuit only. This same loop is established when an IDCSU receives a standard loop-up code. (2) payload—Establishes a Payload Loop, which faces the T1 circuit only. Data looped passes through more of the IDCSU circuitry than in a Line Loop. (3) inband up—Sends a standard loop-up code toward the far-end CSU. If successful, this will place the far-end CSU into a Line Loop. (4) inband down—Sends a standard loop-up code toward the far-end CSU, which should end a remote Line Loop.

Menu Option	Description	Instructions
E) csu err counter	Selects display of error counter or clearing the value and then displaying the error counter. The ESF errors are a cumulative counter of all ESF error events since power-up.	(1) display—The error counter is displayed and updated about once per second. A display is produced like: **2532 ESF Errors 0 TEST Errors PRESS ENTER TO EXIT** (2) clear and display—The error counter is reset to zero, the ESF errors are unaffected. The error counter report is displayed and updated about once per second. To terminate the display of the error counter, press ENTER.
T) net test time	Sets the length of time tests and loopbacks will be allowed to run. FOREVER is suggested by Verilink.	**ENTER INTERVAL (DEFAULT, x SEC, x MIN, x HR, FOREVER):** Type "FOREVER" or type a numeric value followed by "SEC" for seconds, "MIN" for minutes, "HR" for hours. example "45MIN"
Q) end tests	Ends tests and *LOCAL* loopbacks. Does not send any loop-down codes.	Stops any locally initiated test patterns, drops any loops in the local IDCSU, stops monitoring test results. Restores normal operation in the *local* IDCSU (only).
Z) reset alarm	Removes history of any alarms in the last 15 minutes.	When used with the "Reset Registers" command on the **Performance Menu**, this command will extinguish a red STAT LED if the original alarm cause is cleared.
B) dte test and mon bec	Establishes a local DTE loop and sends a test pattern to it.	A display prompt appears and continues to refresh. The IDCSU generates a test pattern and compares it to the pattern it receives. Errors indicate a problem inside the IDCSU. Press the ENTER key to end this test.
M) mon leads	The screen is redrawn with 2 lines added at the bottom. The first new line represents a number of leads on the synchronous serial (DTE) interface. For each data or control lead listed, ON or OFF appears on the line below. Data leads show ON if there are transitions occurring; control leads show ON if they are in a HIGH, ON, or TRUE condition. The screen refreshes every second until ENTER is pressed to stop monitoring leads.	TXD—ON if transitions are detected in transmit data, OFF if the DTE is not transmitting data (idle condition). RXD—ON if transitions are detected in receive data, OFF if the IDCSU is not outputting receive data.). DTR—ON if the DTE is asserting Data Terminal Ready, OFF if DTR is not asserted by the DTE. DSR—ON if the IDCSU is asserting Data Set Ready, OFF if the IDCSU is holding DSR low. RTS—ON if the DTE is asserting Request To Send, OFF if RTS is not high. CTS—ON if the IDCSU is asserting Clear To Send, OFF if the IDCSU is holding CTS low. DCD—ON if the IDCSU is asserting Data Carrier Detect, OFF if the IDCSU is holding DCD low. LL—ON if the DTE is requesting a Local Loopback by asserting the designated lead on the synchronous serial interface, OFF if the DTE is not requesting a test. RL—ON if the DTE is requesting a Remote Loopback by asserting the designated lead on the synchronous serial interface, OFF if the DTE is not requesting a test. TM—ON when the IDCSU is in any Test Mode, OFF if the IDCSU is not in any test.
X) exit menu	Exits this menu.	Returns to IDCSU **Main Menu**.

Front Panel LEDs

This section describes the function of the IDCSU LED indicators.

EQPT LED

The EQPT (equipment) LED is a tri-color indicator with six states, as follows:

Table 5-3 Equipment LED States

State	Meaning
Solid Green	Typical, no DTE related alarms.
Solid Yellow	The IDCSU is in a loop which faces the Equipment port (Repeater Loopback or Equipment Loopback).
Flashing Red Twice, to Green	LOS detection is enabled and the DTE is not asserting the lead that the IDCSU is optioned to require; DTR (Data Terminal Ready) or RTS (Request To Send).
Flashing Red to Off	Hardware error, can indicate incorrect rear module is detected.
Flashing Red to Yellow	The IDCSU is looped toward the equipment (RLB, ELB) and errors are detected.
Not Lit	The IDCSU has no power or, if other LEDS are lit, the IDCSU is defective.

STAT LED

The STAT (status) LED is a three-color indicator with six possible states, as follows:

Table 5-4 Stat LED States

State	Meaning
Solid Green	Access Manager 2000 has been used to download Test System 2000 software to the module.
Solid Yellow	A test is in progress and no errors are detected (a test signal is currently being transmitted to the circuit by the CSU and the received pattern matches the transmitted pattern).
Solid Red	Some alarm condition has occurred within the last fifteen minutes on either the Network or Equipment interface.
Flashing Red to Off	Power up self test has failed—verify that the rear module is of a correct type. TAC 2130-T front modules require a rear connector module which of a “-T” type.
Flashing Red to Yellow	Errors have been received during a test (a test signal is being transmitted and the pattern received does not match the pattern which was sent).
Not Lit	No alarms have occurred within the last fifteen minutes. This is the normal state for the STAT LED.

NET LED

The NET (network) LED is a tri-color indicator with six states, as follows:

Table 5-5 Net LED States

State	Meaning
Solid Green	A normal signal is being received from the network (all OK).
Solid Yellow	The TAC is looped toward the network via a line loopback (LLB) or payload loopback (PLB) and no errors are being received from the network.
Solid Red	Continuous errors are being received on the network interface (e.g., LOS, LOF, RAI, AIS).
Flashing Red to Green	Bipolar violations or CRC-6 errors are being received on the network interface.
Flashing Red to Yellow	The CSU is looped toward the network and errors are being received (BPV or CRC-6).
Not Lit	The TAC has no power or, if other LEDS are lit, the TAC is defective.

Test Procedures

Testing can be divided into two categories, tests which are conducted to verify an installation where no known problems exist; and tests which result from an effort to troubleshoot a problem known to exist. Two procedures are described below.

- First, in the section "Verifying a T1", a method is described to test a T1 circuit when it is expected that no trouble will be found.
- Then, in the section "Troubleshooting", a suggested method for finding T1 problems is detailed.

Verifying a T1

For this procedure, a pattern is sent from a local CSU, through the entire transmit path of the T1 circuit, to a loopback in a far-end CSU, then back through the other direction of the T1 circuit.

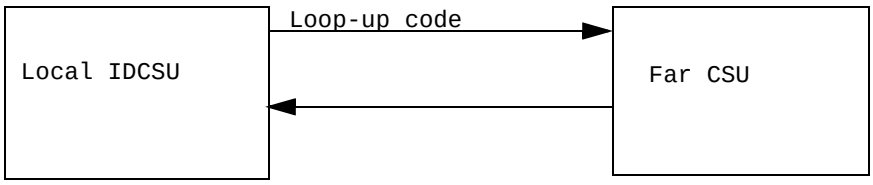
A loop-up code is sent, then a test pattern is transmitted.

The data received from the T1 circuit is compared to the data transmitted. If the data received is identical to the data transmitted, the T1 is good and can be placed into service.

Far-End Loop

To begin the verification, use the **Inband Up** command on the **Diagnostics Menu.** This causes the local CSU to transmit a loop-up code in the direction of the far-end CSU.

Figure 5-3 Sending Loop-up Code.



If the loop-up code reaches the far CSU and it is optioned to respond to loop-up codes, then the far CSU enters a line loop condition. Now the local CSU receives whatever it is sending.

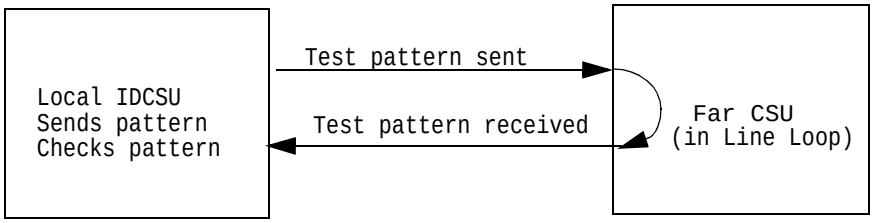
NOTE: *Whenever the* **Inband Up** *command is used to send a loop-up code to a far-end CSU, the* **Inband Down** *command must be used later to send the loop-down code. Otherwise, the far-end CSU will be left in a looped condition.*

Sending a Pattern

Begin transmitting a test pattern by using the **qrss** command.

Verify the pattern received matches the pattern transmitted by using the **show cntr** command.

Figure 5-4 Sending and Receiving Pattern



If the QRSS pattern is received with no errors, the Test Error Counter will not increment.

If the Test Error Counter does increment, one of the following applies:

- The far-end CSU never went into a loopback and therefore the test pattern being transmitted is not being received at all. This would cause the Test Error Counter to increment at a rapid and steady rate.
- The far-end CSU did go into a loopback, but the pattern received at the local IDCSU does not match the pattern transmitted. In this case the Test Error Counter might increment in uneven amounts at virtually any rate.

Results

If the test passes, consider doing the same test with a different pattern. Some patterns can fail on a T1 which passes other test patterns. See Table 5-2 for details on the various patterns.

Test Failures

If the test fails consider one of these alternatives:

- Use a loopback closer to the local CSU. The telephone carrier is able to put up loopbacks at various locations along the path of the T1 circuit. Start far away and work your way back to the local CSU.
- If the local CSU seems defective, try using a repeater loopback. Send a test pattern while the local CSU is in repeater loopback. The test pattern never leaves the CSU because it is receiving what it is sending. If this test passes, the CSU is probably OK.
- If a problem is identified but not resolved by this procedure, go on to the next section, “Troubleshooting”.

Troubleshooting

When a problem exists in a T1 network application, a different approach is suggested. In the verification procedure above the initial test passed data through the entire T1 circuit, including both local and far-end CSUs. This was done because no trouble was expected.

With trouble known to exist, begin by establishing what is good.

Start with a repeater loopback test in the local CSU.

Repeater Loopback

The repeater loopback test takes the transmit data just as it is about to leave the network port of the CSU, and feeds it directly into the receive circuitry of the CSU. If the CSU is transmitting bad data, it will now receive bad data and the problem will be located (the CSU). If the CSU is transmitting good data but the receive circuitry is defective, the signal received fails and the CSU declares an alarm.

Use the “R” command on the **Diagnostics Menu** to initiate a repeater loopback. A warning message appears:

Service Affecting, Are you sure ? (Y/N)

Press “y” because you are sure. During a repeater loopback test the NET LED on the CSU should be green and the EQPT LED should be amber. The STAT LED will usually turn red because of a transient bit error condition which occurs when the test begins. Ignore the STAT LED when conducting loopback tests on a CSU.

If the EQPT LED blinks amber to red during a repeater loopback, errors are being detected in the DSX-1 data presented by the local equipment. Verify cabling and option compatibility.

If the NET LED is not green during a repeater loopback test, contact Verilink Technical Support for assistance.

Tips

If the repeater loopback test passes, the CSU is not defective. For troubleshooting tips related to non-CSU problems, see Table 5-6 below:

Table 5-6 Troubleshooting Tips

Trouble	Suggestion
Signal loss	Verify that a T1 circuit is connected to the network port. Verify that a proper cable is used. T1 circuits use pins 1,2,4 and 5 when presented in an RJ-45 connector. Use a straight through cable (1 to 1, 2 to 2, etc.) on the network side of the CSU. Use a crossover cable on the DSX-1 equipment side. The smart jack (network termination device) might be in a loopback.
Frame loss	In a new installation, T1 circuits are often patched out at a carrier's DACS or switch until completely turned up. In this case, a pattern of unframed all ones (AIS) is kept on the T1 as a keep-alive signal. Contact the carrier and request that they "normal up" the circuit. The CSU must be optioned for the same type of framing as the T1 carrier is providing. Framing can not be changed arbitrarily by the user. Contact the carrier and verify the type of framing used on the T1.
CRC errors and BPVs reported on a new installation	When a T1 presents symptoms of CRC errors and BPVs, with no other alarms, it often is traced to problems with wiring inside the customer premise. When the smart jack is a considerable distance from the CSU (over 50 feet), there is the risk that the high level (hot) signals in the transmit pair will induce echo into the lower level (long) signals in the receive pair. This condition is called crosstalk and is a *leading cause of T1 problems.* As telephone carriers move toward a policy of housing all smart jacks in one location within commercial buildings, crosstalk-related complaints are becoming more common. To prevent crosstalk-related issues, the transmit pair and the receive pair must be isolated from each other. The recommended cable for T1 uses individually shielded, twisted pairs; each pair has shielding around it—the cable therefore has two shields inside it, one for each pair. If shielded twisted pair cable is not available, try to route the transmit pair and the receive pair in different cables as they traverse the building. If the transmit and receive pairs must be routed through a multi-pair cable, such as the 25-pair or 50-pair cables found in large office buildings, select pairs which are not near each other in the cable. Many smart jacks offer an option "regeneration". This causes the smart jack to increase the amplitude of the signal received from the network before handing it off to the CSU. Try to get the carrier to turn on this option.
CRC errors	ESF T1 circuits offer CRC-6 error checking as a means of detecting changes in data which occur on the T1 circuit. If CRC errors are reported, the errors are occurring at some point between the two CSUs. Verify the in-house wiring as indicated above. Contact the carrier and request they monitor the circuit. Carriers can monitor an ESF T1 circuit for CRC errors without disrupting user data.

Trouble	Suggestion
Alarm	When a Verilink AS2000 CSU reports “ALARM” in the Craft interface, it is receiving a yellow alarm (RAIS) on that port. T1 devices send a yellow alarm to alert the far-end device when they are in a red alarm condition such as: Loss Of Signal (LOS), Loss Of Frame (LOF), or Alarm Indication Signal (AIS)—received all ones keep-alive. To resolve a problem with received yellow alarms, find the trouble in the transmit path of the CSU which is receiving the yellow alarm.
BPV	A bipolar violation is a sequence of two or more consecutive pulses of the same polarity. If a T1 is designed to support B8ZS, but some portion of the facility is configured for AMI in error, the AMI portion of the T1 will attempt to “fix” the intentional bipolar violations used to represent 8 or more zeroes on a B8ZS T1. This can manifest as BPVs or BPVs with CRC-6 errors. To verify that a T1 that is intended to be B8ZS is actually configured properly, test the facility with a pattern of all zeroes.
CSU reports no errors but DTE reports errors	In some data applications using DSU functions, a condition is reported in which the CSU does not report errors, but the customer Data Terminal Equipment (DTE) does report errors. This usually results from transmit data sampling errors at a DSU interface at the opposite end of the circuit from the DTE reporting the errors. If a CSU/DSU samples a zero when the DTE actually presented a one, the transmitting CSU creates CRC checksum data based on the improperly sampled bit(s). The data does not change on the T1 facility, and the receiving CSU detects no error. These types of errors are caused by a broken phase relationship between the transmit clock provided by the DSU and the transmit data provided by the DTE. If errors of this type are reported, try changing the ST vs INV-ST selection for DSU clocking in the DSU at the *opposite end* of the circuit.

Loopback Plug

For a completely reliable test of a CSU, make a T1 loopback plug and plug it in to the network port. The CSU now receives the signals it is sending.

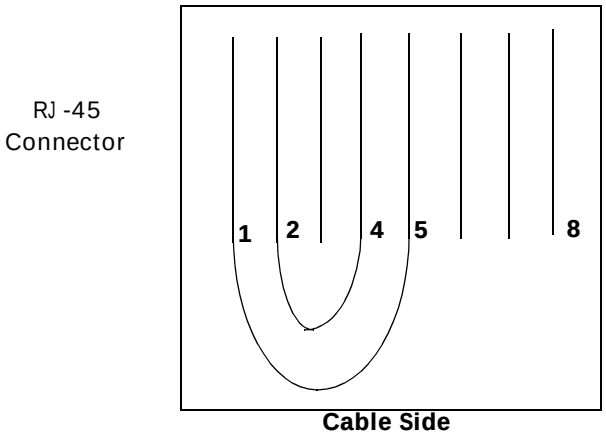
If the CSU is sending a defective signal, it will receive a defective signal and declare an alarm. If the receive circuitry is defective, such that it cannot decode a good signal, it will be unable to decode the signal it is transmitting and will declare an alarm. Thus, if a T1 CSU does not declare any alarms with a loopback plug in lieu of the T1 circuit, the CSU is not defective. This does not rely on any tests built in to the product, thereby producing a higher confidence level in the results of the test.

With a loopback plug in the network port, any customer equipment connected to the IDCSU should see a loopback condition. If the customer equipment can report errors, it should indicate that no errors are being received.

A T1 loopback plug can be made by taking a male RJ-45 connector and placing two short jumper wires where a cable would normally go. One jumper is placed from pin 1 to pin 5, the other jumper connects pin 2 to pin 4. See Figure 5-5 for a drawing of a T1 loopback plug.

NOTE: *When using a T1 loopback plug it might be necessary to temporarily change the timing selection in the IDCSU. If the IDCSU is set to recover network clock, it will be trying to recover a clock it is trying to recover. The clock frequency will drift. For this test, set the IDCSU clock source to Internal. Remember to change it back after the test.*

Figure 5-5 T1 Loopback Plug



RJ-45 plug held with plastic latching tab unseen at bottom

Index

M

N

O

P

Q

R

S

T

U

V

October 1999

P/N 880-503296-001-A1

VERILINK CORPORATION
127 JETPLEX CIRCLE,
MADISON, ALABAMA 35758
TEL: (800) 837-4546