

*OpenLAN TIU*  
*Getting Started Guide*  
*ND-860353.1 EN*

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This guide provides the information necessary to install an OpenLAN Terminal Interface Unit (OL TIU/200-10) and to initiate connections across the network. This guide was prepared based on the following assumptions:

- The network planner should be familiar with basic concepts of local area networks.
- The network planner should be familiar with the OpenLAN product line information provided in the *Product Line Overview*.
- The network planner should be familiar with standard procedures for installation, including the provisions for power and grounding listed in the appropriate installation guides.
- If an OL TIU/200-10 is being installed, an OL NCS is already configured to support it.





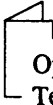
This manual is grouped into six major chapters:






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|------------------|--|
| <b>CHAPTER 1</b> | Introduction: Describes the audience and scope of this guide and provides suggestions on how to use it.  |
| <b>CHAPTER 2</b> | Preinstallation and Site Planning: Provides specific guidelines for selecting and installing the Ethernet equipment to be used with Norsk Data OpenLAN products  |
| <b>CHAPTER 3</b> | Unpacking: Provides guidelines for unpacking the Terminal Interface Unit.  |
| <b>CHAPTER 4</b> | Installation and checkout: Provides installation procedures for the OL TIU/200-10, lists checkout procedures for an individual TIU and for the network as a whole, and provides operational guidelines for the network user. |
| <b>CHAPTER 5</b> | Configuration: Summarizes the basic software configuration procedures for port parameters, rotary numbers, Internet names, and macro files.  |
| <b>CHAPTER 6</b> | Troubleshooting: Lists the most common problems in a new Terminal Interface Unit installation.   |





# OpenLAN Publications

ACTIVITY	PUBLICATION	AUDIENCE
Brief Product Overview of OpenLAN	 OpenLAN Product Family (ND 813037)	Network Planner or Supervisor
Installing and Operating an ND-Host in the Network	 OpenLAN Network Supervisor Guide (ND 830107)	Network Installer or Supervisor
Managing and Operating the Network	 OpenLAN Network Management and Operation Guide (ND 830124)	Network Supervisor
Installing and Operating the Network Control Server (NCS)	 OpenLAN NCS Installation and Operation Guide (ND 830123)	Network Installer or Supervisor
Using a Terminal connected to a TIU	 OpenLAN Terminal Interface Unit - Quick Reference Guide (ND 899137)	OpenLAN TIU terminal users

ACTIVITY	PUBLICATION	AUDIENCE
Installing a Terminal Interface Unit (TIU) for first time	 OpenLAN TIU Getting Started Guide (ND 860353)	Network Installer or Supervisor
Configuring/troubleshooting Terminal Interface Unit	 OpenLAN TIU Terminal User Guide (ND 860351)	Network Installer or Supervisor
Installing and Operating an Office Work Station (OWS)	 OWS-55 Installation Guide (ND 830093) and OWS User Guide (ND 860295)	OWS User
Installing and Troubleshooting the OpenLAN OWS Adapter Card	 OpenLAN Reference Guide for OWS Adapter (ND 830108) or Quick Reference (ND 899115)	Network Supervisor or OWS User
Installing and Operating Repeaters, Bridges, Fan-Out Units, TIU's, etc.	 Installation Guides:* MultiConnect Repeater Isolan Repeater 1120 Isolan Fiber Optic Rep. 1150 Isolan Primary Bridge Isolan Fan Out Unit Bridge IB/2 Inst.&Oper.	Network Installer or Supervisor

\* These manuals are delivered from the original manufacturers and are included in the shipping cartons.

## Table of contents

<b>1</b>	<b>INTRODUCTION</b>	<b>1</b>
1.1	Audience	1
1.2	Scope	1
1.3	How to Use This Guide	2
1.4	Conventions Used in This Guide	3
<b>2</b>	<b>PREINSTALLATION AND SITE PLANNING</b>	<b>4</b>
2.1	Ethernet Network	4
2.2	Device Cabling Considerations	5
2.2.1	Standard Device Cabling	5
<b>3</b>	<b>UNPACKING</b>	<b>6</b>
3.1	Release Memos	6
3.2	Unpacking Checklist	6
<b>4</b>	<b>INSTALLATION AND CHECKOUT</b>	<b>8</b>
4.1	OL TIU/200-10 Installation Procedure	8
4.1.1	Installing TIU/200 Hardware	9
4.1.2	Installing TIU/200 Software	10
4.2	TIU Startup and Checkout Procedures	10
4.2.1	Starting Up the Diskless TIU	11
4.2.2	Testing the Terminal Connection	12
4.2.3	Attaching Additional Devices	15
4.2.4	Making a Test Connection	21
4.2.5	Connecting to a Host Port	24
4.3	Network Checkout Procedures	27
4.3.1	Attaching a Diskless TIU to the Network	27
4.3.2	Using the Network Map Display	28
4.3.3	Making a Connection Across the Network	29
4.4	Installation of Remaining Devices	30
4.5	Additional Testing Procedures	30
4.6	Operational Guidelines for the User	31
<b>5</b>	<b>CONFIGURATION</b>	<b>32</b>
5.1	Port Configuration	32
5.2	Critical Port Parameters	33
5.3	Active Parameters and Default Parameters	33
5.4	Help Features and Shortcuts	35
5.5	Rotaries and Internet Names	36
5.6	Macros	37
5.7	Configuration Log	37



<b>6</b>	<b>TROUBLESHOOTING</b>	<b>38</b>
6.1	Self Test LED Blinking	39
6.2	Self Test LED Remains Lit	39
6.3	No Welcome Message and Prompt or Inappropriate Prompt	41
6.4	Data Received LED Remains Lit	42
6.5	Connection Request Unsuccessful	42
6.6	Station Missing from Network Map	45
	<b>INDEX</b>	<b>46</b>

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## CHAPTER 1 INTRODUCTION

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The *Getting Started Guide* contains instructions for installing and configuring the OL TIU/200-10 and for using it to make connections between devices on a network.

An OpenLAN Terminal Interface Unit interconnects devices such as terminals, hosts, and printers, through a TCP/IP network. The OL TIU/200-10 provides all of the network interface functions necessary to allow virtual connections among the attached devices.

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### 1.1 AUDIENCE

The *Getting Started Guide* has been prepared for the network manager who is installing an OL TIU/200-10 for the first time and for the network user who wants only the minimum information necessary to use it.

The network manager must use this guide in conjunction with the *OpenLAN TIU Terminal Unit User Guide* and the appropriate installation guide.

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### 1.2 SCOPE

This guide describes the OL TIU/200-10 asynchronous Terminal Interface Unit.

The guide describes the procedures for configuring the Terminal Interface Unit for use with hosts and CRT-type terminals with RS-232 connectors. Norsk Data recommends that you first attach a small number of host lines and terminals to the TIU to verify that these devices can communicate with each other. When communication is established, install all modems, printers, and other equipment.

---

## 1.3 HOW TO USE THIS GUIDE

The material in this guide is divided into chapters that represent four kinds of information:

**Site Planning:** Chapter 2 lists network hardware that is compatible with OpenLAN equipment and provides specifications for the cables connecting the Terminal Interface Unit to the terminals and hosts it supports.

**Unpacking and Installation:** Chapters 3 and 4 describe the unpacking and installation steps. Chapter 4 also provides step-by-step configuration and checkout procedures designed both to test the installation and to familiarize the network manager with the equipment. In addition, it provides guidelines for the network user.

**Configuration:** Chapter 5 describes the software configuration parameters.

**Troubleshooting:** Chapter 6 is a troubleshooting guide covering the most common installation and configuration problems.

The network manager should read Chapter 2 before starting the actual installation and configuration procedures, in order to have all equipment ready when needed for installation. The network manager should then follow the recommendations in chapters 3 through 5 for setting up, testing, and configuring the Terminal Interface Unit.

Once the TIU is installed, the network manager should attempt to make a connection across the network, using the tutorial in the *OpenLAN Terminal Interface - Quick Reference*. This tutorial can also be used for training network users who will use the TIU only for making a connection from a terminal to a host.

---

## 1.4 CONVENTIONS USED IN THIS GUIDE

To streamline the process of entering commands, the TIU recognizes the minimum unambiguous abbreviation of command names, parameter names, and parameter settings. In discussions of individual commands and parameters within the text (for example, the `SHoW ADDReSS` command), uppercase letters represent the short form of the command or parameter, and lowercase letters represent variable or optional portions of the command or parameter.

Please note that in this guide, the first time you are instructed to enter a command or parameter, it is shown in lowercase characters in the long form (for example, "show address"). Thereafter, it is shown in the short form, which contains the fewest number of characters required to issue the command (for example, "sh addr").

Also, the words shown in angle brackets (<>) in commands indicate information that you must supply. The words in square brackets ([]) indicate optional information. Do not type the brackets themselves. In the example, "bind <Ethernet address> [<number of ports>]", the Ethernet address is required, but the number of ports is optional. To issue commands, always follow them with the return key.



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## CHAPTER 2 PREINSTALLATION AND SITE PLANNING

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This chapter describes various types of networks, recommends network hardware that is compatible with OpenLAN equipment, and provides specifications for the cables connecting a TIU to the devices it supports.

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### 2.1 ETHERNET NETWORK

OL TIU/200s can be attached to Ethernet Version 1.0, Ethernet Version 2.0, or IEEE 802.3 transceivers, and also operate with Digital Equipment Corporation DELNI equipment and fiber optic Ethernet equipment.

Transceivers that have been tested successfully with TIU/200s include those from TCL for Ethernet Version 1.0 and IEEE 802.3, Codenol1 fiber optic transceivers, Interlan NT100 and BICC model 1111-1 transeceivers for IEEE 802.3, and DEC H4000 for Ethernet Versions 1.0 and 2.0.

The Ethernet cable should be installed by a qualified contractor familiar with both standard procedures and local regulations. Ensure that continuity checks have been made on the cable during and after installation. After installation of the Ethernet cable, install one tap and transceiver for each TIU, Gateway Server, or Network Control Server in the system.

#### NOTE

Improper tap and transceiver installation is one of the most common network installation problems. Make sure that the taps are clean and that the transceivers are properly tightened and well secured.

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### 2.2 DEVICE CABLING CONSIDERATIONS

This section describes terminal cable specifications for cables used to connect terminals and hosts to ports on the Terminal Interface Unit.

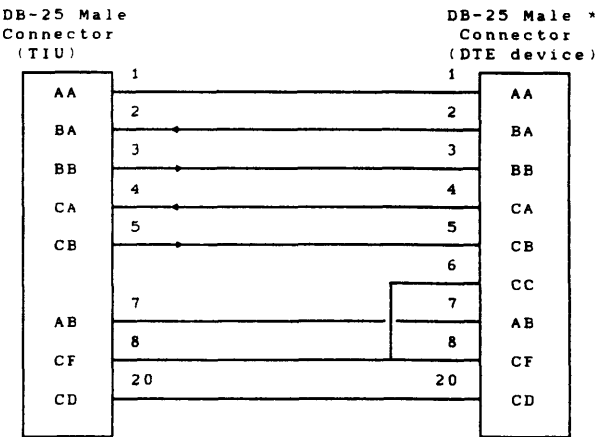
2.2 DEVICE CABLING CONSIDERATIONS

This section describes terminal cable specifications for cables used to connect terminals and hosts to ports on the Terminal Interface Unit.

2.2.1 STANDARD DEVICE CABLING

Figure 2-1 illustrates the standard asynchronous terminal cable specification. This cable is used to connect both terminals and hosts to ports on an asynchronous TIU/200.

These cables are also used to attach a terminal to the console port of any of these TIUs.



\* Deviation from EIA standard. Connector type may vary: Check requirements of device

Figure 2-1 Asynchronous Terminal Cable Specification

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## CHAPTER 3 UNPACKING

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This chapter provides guidelines for unpacking the OpenLAN Terminal Interface Unit.

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### 3.1 RELEASE MEMOS

The installation guides contain unpacking and installation procedures for each model of TIU.

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### 3.2 UNPACKING CHECKLIST

When unpacking a new Terminal Interface Unit, follow these procedures:

- 1) Inspect the carton for damage sustained during shipment.
- 2) Open the top of the carton carefully, so that it can be reused if necessary.
- 3) Remove the upper layer of protective padding, and then remove the TIU from the carton. On the TIU/200, remove the foam pad; then remove the inner box from the carton. Remove the TIU from the inner box.
- 4) Remove the polyethylene bag from around the TIU.
- 5) Inspect the TIU for shipping damage. If any shipping damage is detected, contact the transport representative to file a report. If the TIU must be returned to the factory, ship it in its original carton or a carton that provides equivalent protection.

- 6) Locate the packing slip, in an envelope taped to the outside of the carton. Verify that the carton contains all items listed on the packing slip.

Report any discrepancy to Norsk Data or an authorized service representative.

- 7) Verify that the serial number on product identification label matches the serial number.
- 8) Verify that the power specifications listed on the serial number label are appropriate for the available power source.
- 9) Locate the Ethernet address located on the product label, which is attached to the bottom of the TIU.

After the TIU is unpacked, it is ready to be installed in the network. Follow the installation procedures in Chapter 4 of this guide.



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## CHAPTER 4    INSTALLATION AND CHECKOUT

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This chapter provides installation procedures for the Series/200 and the checkout procedures for both an individual TIU and the network as a whole.

A Terminal Interface Unit is ready to be installed as soon as it is unpacked. In a few specialized applications, some adjustment of the shorting plugs in certain configuration areas may be necessary, but the default shorting plug positions are appropriate in most installations.

For descriptions of the configuration shorting plugs, refer to the appropriate installation guide.

The material in this section is presented in a tutorial format. For best results, perform the procedures in the order in which they appear.

TIUs that run TCP/IP protocols and boot from an internal diskette require system generation to specify the TIU's Internet address. For further information, refer to the *OpenLAN TIU Terminal User Guide*.

---

### 4.1 OL TIU/200-10 INSTALLATION PROCEDURE

This section describes the installation procedures for a Series/200 Terminal Interface Unit, a diskless TIU that boots from an OpenLAN Network Control Server (OL NCS). Section 4.1.1 describes the procedures for installing the hardware, and Section 4.1.2 describes the procedures for installing the software on the OL NCS.

### 4.1.1 INSTALLING TIU/200 HARDWARE

The TIU/200 may be placed horizontally on a firm flat surface, or alternatively placed in a rack mount, wall mount, or vertical stand. The optional installation procedures are described in the *Series/200 Installation Guide*.

To install a Series/200 Terminal Interface Unit, complete the following steps:

- 1) Set the TIU on a firm, level surface with at least 6 inches (approximately 15 cm) clearance for cables at the back of the unit and 3 inches (7.5 cm) clearance for air flow at the front and sides. Make sure you can reach the back of the unit to install cables.
- 2) Attach the power cable to the power receptacle in the lower left-hand corner of the TIU's back panel. Plug the cable into a grounded outlet.
- 3) Use figure 4-1 to identify a port on the TIU/200 with default parity, databit, and baud settings that meet the needs of the first terminal you plan to attach. Choose a terminal port listed in figure 4-1.

Each port is labeled with the port number surrounded by the letters "J" and "C". For example, port number 1 is labeled "J1C". Default configuration specifies even-numbered ports (for example, J0C or J2C) as host ports, which must operate at 9600 baud with no parity. Odd-numbered ports (for example, J1C or J3C) are terminal ports. Parity and baud rate are set automatically.

- 4) Install a cable with 25-pin, D-Series connectors (RS-232-C) between the terminal and the port.

When the power and terminal cables are installed, proceed to the next section to install TIU/200 software on the designated NCS.

Figure 4-1 TIU/200 Default Port Settings		
Port Number	Databits	Parity
J1C	8	AutoParity
J3C	8	AutoParity
J5C	8	AutoParity
J7C	8	AutoParity
J9C	8	AutoParity

---

### 4.1.2 INSTALLING TIU/200 SOFTWARE

This section describes the major steps for installing the TIU/200 software on the primary NCS and for Binding the TIU/200 to the primary NCS. This section also applies to any TIU that boots from an NCS.

Copy the TIU/200 software to the NCS hard disk using the software distribution diskette. If the TIU/200 runs TCP/IP protocols, Bind the TIU to the primary NCS by entering the Bind command and specifying the Ethernet address, the TCP/IP Internet address (or internet name if already stored on the NCS), and the number of ports for the client TIU/200. For example, enter the following command:

```
bind <Ethernet address><Internet address>[-f<filename>][<number of ports>]
```

The Ethernet address is found on the product identification label on the back of the TIU. Specifying the number of ports is optional.

To complete all steps, refer to the appropriate NCS installation and operation guide for a description of the installation procedure.

When the power and terminal cables and TIU/200 software are installed, verify that the TIU is working by following the checkout procedure in Section 4.3.

---

## 4.2 TIU STARTUP AND CHECKOUT PROCEDURES

Because so many individual devices and connections are involved, a newly installed TIU is tested in stages. The first step is to verify that the TIU is communicating with a single, attached terminal.

The second step is to add another terminal and verify that you can make a connection from one terminal to the other through the TIU. The final test is to attach a host to the TIU and verify that you can make a connection between a terminal and a host through the TIU.

Once communication within an individual TIU is established, testing is expanded to include other devices on the network.

This section provides checkout procedures for an individual TIU. These procedures are presented in a tutorial format intended to familiarize you with the equipment and its capabilities during the system checkout procedure.

---

### 4.2.1 STARTING UP THE DISKLESS TIU

This section describes the startup procedures for a diskless TIU equipped with an Ethernet interface. The diskless TIU must be attached to a network that includes an operational NCS configured to support that TIU.

- 1) Verify that the TIU is powered off and then complete the following steps.

**CAUTION !**

Connecting or disconnecting the cable between the TIU and the transceiver while the TIU is powered on can damage the transceiver.

For an Ethernet TIU:

- a) Connect the transceiver cable between the TIU and a transceiver. The transceiver cable is a 15-pin, D-Series, subminiature connector between a transceiver on the Ethernet and the transceiver connector on the TIU's back panel.
  - b) Attach the TIU to an Ethernet network.
  - c) Connect the power cable to a power source.
- 2) Ensure the NCS is running.
  - 3) Power on the TIU by pressing the "I" side of the power switch (located on the TIU back panel). All of the LEDs on the front panel light briefly when the TIU is first powered on. The power and Self Test LEDs on the front panel should remain lit after the others turn off. If they do not, power off the TIU by pressing the "O" side of the power switch. Verify that the power cord is properly connected to a working outlet; then power on the TIU again.



- 4) If the Self Test LED turns off in approximately 20 seconds, the TIU enters the bootstrap phase and the Boot State LED lights. Go to step 6.

If the Self Test LED remains lit longer than 20 seconds, the system has failed the self-test diagnostics; refer to the troubleshooting guide in chapter 6. A problem in the hardware is the most likely cause of the failure. The most common network installation problem is incorrectly installed taps and transceivers.

- 5) If the Self Test LED flashes on and off after the self-test diagnostics have completed, the TIU is unable to boot its software from the NCS. Verify that the NCS is properly configured and attached to the network. Press the Reset switch to try again.
- 6) The Boot State LED remains lit during bootstrap. It does not remain lit while the TIU reads the default parameter tables and the Internet directory from the NCS files.

The heavier the traffic, the more time is needed for the boot. If the LED remains lit longer than is appropriate for the NCS, contact an authorised service representative. After the Boot State LED turns off, the system is ready to be checked out.

---

### 4.2.2 TESTING THE TERMINAL CONNECTION

To test communication between the TIU and the attached terminal, start up the TIU and complete the following steps:

- 1) Power on the attached terminal and press the return key. A welcome message and prompt appear on the terminal screen. For example:

```
Welcome to OpenLAN from Norsk Data  
TIU/200
```

If a message like this appears, the TIU is communicating successfully with the terminal. If this message does not appear, refer to the troubleshooting guide in chapter 6.

- 2) Test whether the TIU can successfully interpret commands issued from the terminal by entering the following command:

```
show address
```

If some or all characters do not appear on the screen when typed verify that the terminal is attached to a port with the appropriate databits and parity settings.

- a) If communication is effective, a TIU running the TCP/IP protocols responds to the command with a display similar to the following:

```
ADDRess = !2 (Active only)
```

The digits following the exclamation point indicate the number of the port to which the terminal is attached.

- 3) To display the release number of your software, enter the following SHow Version command:

```
sh version
```

The system responds with the release numbers of your software and firmware and the time and source of the last bootstrap. If you ever have to call a Norsk Data representative for assistance, use this command to determine the release number of your software before calling.

- 4) To request a display of all available commands, enter a question mark, followed by a carriage return:

The system responds with a help screen showing all of the available commands and their syntaxes. The screen display is tailored to the port's privilege level.

Figure 4-2 illustrates a display on a TIU running TCP/IP protocols. (The illustration represents User PRivilege level with no sessions in progress.)

```
Welcome to OpenLAN from Norsk Data
TIU/200> show address
ADDRESS = '2
TIU/200> sh version
TIU/200>?
      Connect      <address> [ ECM ]
      Do           <macro-name>
      Echo         <string>
      Listen
      Pause        [(seconds)]
      SET          <param-name> = <value> ...
      SHow         <argument> ...
```

Figure 4-2 TCP/IP Screen Dialog and Help Screen

---

### 4.2.3 ATTACHING ADDITIONAL DEVICES

Each port on the TIU has a set of parameters that determine how the TIU interacts with the device attached to that port. In many cases, the default parameter settings are appropriate.

The first terminal, for example, is attached to a port whose default parameters are compatible with the terminal.

Once a single terminal is communicating with the TIU, you can, if necessary, use that terminal to adjust the parameters of other ports on the TIU for communication with different devices.

This section steps you through the process of configuring a port for communication with a second terminal.

To configure a port for a new terminal, complete the following steps:

- 1) Look at the screen of the terminal already attached to the TIU.

If the last character displayed on the screen is an "at" sign (@), the port has lapsed into an inactive state known as Listening mode. Any terminal port that remains inactive 15 minutes lapses into Listening mode.

If the last line of the screen display is the TIU prompt (TIU/200>), the port is still in Command mode. This means that the TIU is ready to accept commands typed on the terminal keyboard.

- 2) If the port is in Listening mode, pressing any key on the terminal keyboard returns the port to Command mode. The terminal screen displays a new welcome message and prompt.

In the following text, the first terminal attached is referred to as the source terminal and the port to which it is attached as the source port. Until other ports on the TIU have been configured, all interaction with the TIU takes place through commands issued at the source terminal.

- 3) Attach a second terminal to another port on the same TIU by installing a cable between the and the port. Use a cable that meets the specifications in Figure 2-1 in section 2.2.1.

Use any port for this test. You can minimize the amount of reconfiguration that is necessary by using one of the ports listed as a terminal port in figure 4-1.

In the following text, the second terminal is referred to as the destination terminal and the port to which it is attached as the destination port.

- 4) For security purposes, the TIU recognizes three different levels of system access, known as PRiVilege levels. When a terminal is first powered on, it is always at the lowest privilege level, known as User level.

Before you can issue commands that change the parameters of the destination port, you must change the PRiVilege level of the source port to Global Network Manager by resetting the PRiVilege parameter. Enter the following SET PRiVilege command on the source terminal:

```
set privilege = gnm
```

The system prompts for a password. Since you are working on a new TIU on which the passwords have not yet been altered, the password is a null string (""); enter the default password by pressing the carriage return.

However, if the TIU is diskless and boots from an NCS, there may already be a password defined on the NCS; enter the password.

Normally, the password must be entered in lowercase and followed by a carriage return. For security, the password is not displayed on the screen.

If the command is successful, the system responds with one of the following network manager prompts:

*TIU/200#*

If you make a typing mistake in the password, or if the password has been changed from the default, the system responds with the message:

*Sorry*

If the "sorry" message appears, repeat the entire step, typing the password correctly.

- 5) Compare the port parameters of the destination port with the needs of the destination terminal. The critical parameters for a terminal port are DeVice, BAud, PARity, and DataBits. Some of these parameters may already be set by default to the appropriate values.

To display the DeVice setting of the destination port, enter the following SHow command on the source port:

```
sh (!<destination port number>) dp device
```

The letters "dp" in this command stand for "DefaultParameter."

For example, if the destination terminal is attached to port number 8, enter the following SHow command:

The system displays one of these responses:

```
DeVice = ( Terminal, Glass )
```

or

```
DeVice = ( Host, Glass )
```

- 6) For interaction with a terminal, the Device parameter must be set to "Terminal, Glass". If necessary, change the device type by entering the following SETDefault command:

```
setdefault (!\destination port) dv = terminal
```

For example, if the terminal is attached to port 8, enter the following SETDefault command:

```
setd (!8) dv = terminal
```

The system responds with the message:

```
Portid !<number> default parameters saved as configuration <number>
```

- 7) Inspect the settings of the other critical parameters by entering the following SHOW commands:

```
sh (!<destination port>) dp baud
sh (!<destination port>) dp parity
sh (!<destination port>) dp databits
```

The system responds to each command by displaying the default setting of the specified parameter.

Figure 4-3 illustrates the dialog that takes place on the source terminal during the first seven steps of this procedure.

```
@
Welcome to OpenLAN from Norsk Data
TIU/200> set priv=gmm
Password:

TIU/200# sh (!8) dp device
DeVice = ( Host, Glass )
TIU/200# setd (!8) dv=terminal
Portid !8 default parameters saved as configuration '8'
TIU/200# sh (!8) dp baud
BAud = 9600
TIU/200# sh (!8) dp parity
PARity = None
TIU/200# sh (!8) dp databits
DataBits = 8
```

Figure 4-3 Sample Parameter Dialog

- 8) The TIU interface accepts multiple SHow commands on a single line. To demonstrate this feature, repeat the three SHow commands entered in step 7 (BAud, PARity and DataBits), but use the following format:

```
sh (!<destination port>) dp ba pari db
```

For example, if your destination terminal is attached to port 8, enter the following command:

```
sh (!8) dp ba pari db
```

The TIU responds by listing the values of all three parameters.

- 9) If necessary, adjust the other three key parameters to the needs of the destination terminal by entering one or more of the following commands, inserting the values appropriate for the terminal:

```
setd (!<destination port>) ba=<baud rate>  
setd (!<destination port>) pari=<parity setting>  
setd (!<destination port>) db=<databits setting>
```

For example, to set up port 8 for communication at 2400 baud, odd parity, and 7 databits, enter the following commands:

```
setd (!8) ba=2400  
setd (!8) pari=odd  
setd (!8) db=7
```

The system responds to each command with a "parameters saved" message.

You can also enter these three SETDefault commands on a single line. For example:

```
setd (!8) ba=2400 pari=odd db=7
```



- 10) To test whether the destination port parameter settings meet the needs of the terminal, power on the destination terminal and press the return key.

If the welcome message and prompt appear on the terminal screen, the TIU is communicating successfully with the terminal. If no welcome message and prompt appear, verify that the parameters are set appropriately for the requirements of the terminal. 11) To verify that communication is effective in both directions, enter the following SHow ADDRess command on the the destination terminal:

```
sh addr
```

The TIU responds with an address display similar to the one generated on the screen of the first terminal. The port number after the exclamation point is the port number of the destination terminal.

Complete the test procedures described in the rest of this section and read the background information on system configuration in chapter 5. After you have finished testing the installation, use the general procedure described in this section to set the default parameters for all ports on each TIU.

---

#### 4.2.4 MAKING A TEST CONNECTION

After you have established communication between the TIU and two attached terminals, make a test connection between the two terminals.

A connection between two terminals has little use in a working system, but it is a simple and reliable test during network installation.

To make a test connection between the source terminal and the destination terminal complete the following steps:

- 1) If necessary, press any key on the source terminal to place the port in Command mode (indicated by a TIU prompt on the screen). Do not press any keys on the destination terminal until instructed to do so in step 4.
- 2) When a connection is established through a TIU, the destination port must be in Listening mode.

If necessary, put the destination port in Listening mode by entering the following Listen command on the source terminal keyboard:

```
listen (!<destination port>)
```

For example, if the destination terminal is attached to port 8, enter the following Listen command (shown with an uppercase "L" for clarity).

```
L (!8)
```

- 3) To make the connection, do the following:

For TIUs running the TCP/IP protocols, you must set the destination port number to the Internet address before issuing the Connect command. Enter the following commands:

```
setd (!<destination port #>) ip=<Internet address>
c <Internet address of port>
```

For example, enter the following commands:

```
setd (!8) ip=192.9.200.134
c 192.9.200.134
```

**NOTE!**

The address assigned to a port using the SETDefault command must be a unique address, and it must have the same network number portion as the TIU address assigned during system generation.

As soon as you press the return key, the TIU displays this message on the source terminal:

```
Connecting . . .
```

*If the connection is successful, the TIU responds with the following message:*

```
Session 1 -- connected to <address>
```

If any other message appears, see the troubleshooting guide in chapter 6.

- 4) After the connection is established, any characters typed on the keyboard of the source terminal appear only on the screen of the destination terminal, and vice versa.

Test the connection by typing a few characters on the source keyboard and then typing a few characters on the destination keyboard. (You will probably have to press the line feed key in addition to the return key in order to start a new line.)

While communication continues between the two terminals, both ports are in a state called "Data Transfer Mode" (refer to the *OpenLAN TIU Terminal User Guide* for a complete description).

- 5) From the source terminal, suspend the transfer of data between the two ports by pressing the combination of keys necessary to generate the character "control-caret". On many keyboards, you generate this character by holding down the control key and the shift key while pressing the number key that has a caret symbol (^) as the uppercase character.

The system responds by displaying a TIU prompt on the the source terminal screen. This prompt indicates that the port is back in command mode.

- 6) To terminate the connection, enter the Disconnect command:

*disconnect*

The TIU responds with the message:

*Disconnecting . . . Session 1 disconnected from <address>*

If the procedure described here is successful, you have demonstrated that the TIU is capable of supporting communication between two attached terminals. The next step is to establish a connection between a terminal port and a host port, as described in the following section.

---

### 4.2.5 CONNECTING TO A HOST PORT

The terminal-to-terminal connection described in the previous section is useful only for testing the system. A more likely connection on a working network is a connection between a terminal attached to one port on a TIU and a host attached to another port.

If the TIU being installed can support at least one host port, follow the procedure in this section. If the TIU being installed can support only non-host devices, skip this section and follow the network checkout procedures in Section 4.3.

To attach a host to a TIU and establish a connection from a terminal to the host, complete the following steps:

- 1) Verify that the host is configured for communication with a terminal on the physical line that will be attached to the TIU.

The best way to test this is to attach a terminal directly to the host, using the same connector on the host that will be attached to the TIU. Make any necessary adjustments to the host or the terminal so that the devices interact properly with a direct connection.

- 2) Disconnect the cable between the terminal and the host.
- 3) Connect both devices to ports on a single TIU. Use cables that meet the specifications in Figure 2-1 in Section 2.2.1.

To minimize the amount of port reconfiguration that will be necessary, attach the terminal to one of the ports listed in figure 4-1 and the host to one of the ports designated as a host port.

- 4) From one of the terminals used earlier in this section configure the two ports for communication with the newly attached devices.

The critical parameters for a host port are the same as for a terminal port (DeVice, BAud, PARity, and DataBits), with the addition of three others: FlowControlFrom, FlowControlTo and UseDTRin. The DeVice parameter on the host port should be set to "Host". The settings of the other parameters depend on the needs of the host. The default settings of the FlowControlFrom, FlowControlTo, and UseDTRin parameters are appropriate for most hosts. For more information on parameters, see chapter 5.

- 5) When the ports are properly configured, enter the Connect command on the terminal:

*c <Internet address of port>*

As soon as you enter the Connect command and press the return key, the TIU displays this message on the source terminal:

*Connecting ...*

If the connection request is successful, the TIU responds with the following message:

*Session 1 connected to <address>*

- 6) When the connection is established, the host interacts with the remote terminal the same way it would interact with a terminal connected directly to it.

If necessary, press the return key to initiate communication with the host.

If the host's response appears on the terminal screen, the connection has been established.

Log in to the host or perform any other tests necessary to confirm that the two devices are communicating.

- 7) When testing is complete, suspend the transfer of data between the host and the terminal by pressing the combination of keys necessary to generate a control-caret on the terminal keyboard.
- 8) When a TIU prompt appears on the screen, enter the DisConnect command:

`dc`

The TIU responds with the following message:

*Disconnecting ... Session 1 disconnected from <address>*

The terminal-to-host connection completes the checkout of an individual TIU. If there are additional TIUs in the network, install and test the other TIUs. Then perform the network checkout procedures described in Section 4.3.

When you have verified that all network hardware is working correctly, connect all other devices to the TIUs that will support them and, if necessary, reconfigure the device ports. Refer to chapter 5 for more information on port and system configuration.

---

## 4.3 NETWORK CHECKOUT PROCEDURES

Although a single TIU can be used by itself as a data switch, most TIUs are used in conjunction with other TIUs to make connections across a network. Each new TIU added to a network must be tested with the other devices to verify that it is properly connected.

Attach the TIUs to the network one at a time and test each unit before adding another.

This section describes two test procedures. The first test verifies that the TIU is communicating with the network. The second test verifies that the TIU can support a connection across the network. If you are adding a diskless TIU to the network, see the next section.

---

### 4.3.1 ATTACHING A DISKLESS TIU TO THE NETWORK

To check out a diskless TIU, the TIU must be attached to a network that includes an operational NCS configured to support it. Verify that the TIU is bound to the NCS with the Bind command.

To attach a diskless TIU to a network, complete the following steps:

- 1) Power off the TIU if not already powered off.
- 2) Connect the TIU to the network.
- 3) Attach a terminal to a TIU port that is configured for the same parity and databits as the terminal.
- 4) Start up the TIU. If the TIU does not pass the self-test diagnostics, refer to the troubleshooting guide in chapter 6..



### 4.3.2 USING THE NETWORK MAP DISPLAY

To verify that each attached TIU is successfully communicating with the network, complete the following steps:

- 1) Enter the following SHow command on one of the terminals attached to the new TIU:

```
sh netmap
```

The system responds with a list of Internet addresses (TCP/IP) representing all TIUs (or stations) on the the network. The first address is the address of the TIU to which the terminal is attached.

Figure 4-4 illustrates a sample TCP/IP network map display.

NETWORK MAP	
0-192.009.255.104	1-192.009.255.180
2-192.009.255.184	3-192.009.255.185
4-192.009.255.186	5-192.009.255.195
6-192.009.255.182	7-192.009.255.183
***-192.009.255.113	9-192.009.255.193
10-192.009.255.102	11-192.009.255.181
12-192.009.255.71	13-192.009.255.192
14-192.009.255.197	15-192.009.255.196
16-192.009.255.112	*** 1 Inactive nodes ***

Figure 4-4 TCP/IP Network Map Display

- 2) Compare the addresses in the list with the addresses of the TIUs on the network.

If all attached TIUs appear in the list, the new TIU is communicating successfully with the network.

If more than one TIU is already attached and running, but only the address of the new TIU appears in the list, then the new TIU is not correctly attached to the network. Refer to the troubleshooting guide in chapter 6.

Repeat this procedure for each new TIU attached to the network.

---

### 4.3.3 MAKING A CONNECTION ACROSS THE NETWORK

The most common function of a TIU is to support connections across the network between two devices connected to different TIUs.

The simplest way to verify that a newly installed TIU is capable of supporting such a connection is to make a connection from a terminal on a TIU that is known to be working to a terminal on the new TIU.

To make the test connection, complete the following steps:

- 1) Determine the Ethernet or Internet address of the new TIU by entering the SHow ADDRESS command on a terminal connected to that TIU:

```
sh addr
```

Put the terminal on the new TIU in Listening mode by entering the Listen command on that terminal:

```
l
```

An "at" sign (@) appears on the terminal screen.

- 2) Form a connection from a terminal on one TIU to a terminal on another.

For TIUs running the TCP/IP protocols, enter the following command:

```
c <Internet address of port>
```

Use the whole hexadecimal number displayed in response to the SHow ADDRESS command (see step 1). The following command is an example of a connect command to a TCP/IP address.

```
c 192.009.200.007
```

- 3) Test and terminate the connection.

---

## 4.4 INSTALLATION OF REMAINING DEVICES

If you have followed all of the procedures described in this section, each TIU is now installed on the Ethernet, and at least two devices are connected to each TIU.

Once you have demonstrated that the TIUs are working, connect all other devices to the TIUs that will support them.

Follow the port configuration procedures to adjust the parameters of each port to the needs of the device supported by that port.

To simplify ongoing network maintenance, we recommend that you make a list of the devices attached to each port on each TIU, with notes about any special configuration requirements. Update the list whenever you change the network configuration. Refer to chapter 5 for more detailed recommendations.

---

---

## 4.6 OPERATIONAL GUIDELINES FOR THE USER

The system is now ready for the individual user. If the port's privilege level is not set for the user, use the following SET PRIVilege command:

```
set pri = u
```

*The network user needs only the information contained in the OpenLAN Terminal Interface Unit - Quick Reference. This guide describes important concepts and the format and syntax for the available User-level commands that allow the user to do the following:*

- Establish a connection across the network
- Disconnect from the network
- Use macros
- SET and SHOW parameters

---

## CHAPTER 5 CONFIGURATION

---

This chapter summarizes the basic software configuration procedures.

In most installations, software configuration includes three kinds of information:

- Individual port parameters
- Rotary numbers and names
- Macro files

Only the configuration of individual port parameters is absolutely necessary to the functioning of the Terminal Interface Unit.

Refer to the *OpenLAN TIU Terminal User Guide* for descriptions of other configurable options provided by the Terminal Interface Unit.

---

### 5.1 PORT CONFIGURATION

Each device supported by a TIU is attached to the TIU through one of the ports on the back panel. Since different devices have different communication requirements, the TIU must have an accurate record of the attached devices and their requirements.

To track the needs of the various devices, the TIU keeps a table of parameters for each port. The port parameters are altered through commands issued on a terminal attached to one of the terminal ports.

---

## 5.2 CRITICAL PORT PARAMETERS

Most configuration parameters are used for access control and user convenience and are not critical to the functioning of the port or the TIU. However, four of the parameters must be set appropriately before a TIU can interact successfully with any device: DeVice, BAud, PARity, and DataBits. On a TIU/200, PARity and BAud rate are set automatically. Three additional parameters are essential to successful interaction with a host: FlowControlFrom, FlowControlTo, and UseDTRin. The initial default values of these parameters, which are appropriate for most hosts, include the following:

```
FlowControlFrom = XON_XOFF
FlowControlTo = XON_XOFF
UseDTRin = Ignore
```

If you are having trouble establishing communication through the TIU to a host, adjust the settings of these three parameters.

---

## 5.3 ACTIVE PARAMETERS AND DEFAULT PARAMETERS

The Connection Service keeps a set of default configuration parameters for each port. These parameters determine how the port and the attached device interact. Some of the parameters may have to be adjusted for the local installation.

The default parameters for all ports are stored in the TIU's memory and in numbered files on the system disk. The default parameters are divided into four categories:

- Port parameters, which are dependent on the needs of the attached device and will probably remain constant for a single port.
- Session parameters, which may need to be altered when the attached device is communicating with various remote devices or running different applications.
- Editing parameters, which determine the functions of several special characters.

- Global parameters (for example, passwords or welcome messages), which apply to all ports on a TIU.

When a port becomes active, the system creates a working table for each port. The table contains port parameters, editing parameters, and global parameters, which the system copies from the default parameter file. For each new session, the system creates a new active parameter table based on the default parameter table. Use the following guidelines for altering port parameters:

- For asynchronous TIU ports, settings in both the active and default parameter tables can be altered.

For additional information on the parameters for these TIUs, please refer to the *OpenLAN TIU Terminal User Guide*.

The SET command changes the setting of an active parameter, and the SETDefault command changes the setting of a default parameter (refer to the *OpenLAN TIU Terminal User Guide* for command descriptions and examples).

Active parameters can be changed only while an active parameter table exists. The change remains in effect only as long as the active parameter table is in use (i.e., while the port remains in Command mode or while a connection exists).

Default parameters can be changed at any time. The SETDefault command changes the default parameter table stored on the disk. The change takes effect the next time the system uses the default table to create a new active parameter table.

**NOTE !**

A Global Network Manager can set default parameters remotely, but only if the destination TIU is running, not if it is powered off or running utilities from the monitor.

Chapter 4 illustrates the situations in which the SET and SETDefault commands are used. The commands and the parameters are described in the *OpenLAN TIU Terminal User Guide*.

---

## 5.4 HELP FEATURES AND SHORTCUTS

The TIU includes a hierarchical help facility that lists all available commands, parameters, and parameter values upon request. Figure 4-2 in chapter 4 illustrates how to use the help screens. The TIU also provides three different ways to alter parameter settings:

- To change a few specific parameters, use the SET and SETDefault commands.
- To review an entire default parameter table in detail, enter the SETDefault command alone, without specifying any parameter names. The TIU displays the names and current settings of all parameters, one at a time. As it displays each parameter, the TIU prompts you to accept or change the current value. This command is useful when you want to change many parameters for a single port or to review the available parameters.
- To copy an entire parameter table at once, use the ReaD command. The ReaD command reads an entire parameter table into memory and automatically saves the table from memory onto the diskette. For example, to copy the default parameters currently stored on the disk for port 2 into the in-memory default parameter table for port 7, enter the following ReaD command:

```
read (!7) dp 2
```

This command is useful when you are attaching a number of identical devices to different ports on the same TIU.



---

## 5.5 ROTARIES AND INTERNET NAMES

To simplify the process of making connections, TIUs include facilities for assigning logical names to individual ports or to groups of ports. The logical name is an internet name (on TCP/IP TIUs). Network users can then request connections to specific resources by name, without knowing the actual addresses and port numbers of the resources.

To group ports into logical sets, use the `ROtary` command; to assign a name to a port or group of ports, use the `Name` command. The `Name` command is only available on the NCS.

To assign the internet name "host1" for ports 0 through 6 (!0 through !6) on a TIU/200 running TCP/IP protocols, enter this sequence of commands at a terminal port on the TIU/100:

```
ro !130 = !0-!6
setd (!130) ip = 192.009.200.005
n host1 = 192.009.200.005
```

In this TCP/IP example, an additional command (`SETDefault`) is necessary. The `ROtary` command assigns rotary number 130 (!130) to ports 0 through 6 (!0 through !6). The `SETDefault` command sets the rotary number to the Internet address (192.009.200.005), and then the `Name` command assigns the internet name "host1" to the Internet address.

In either case, a user at a terminal port on any TIU in the network can make a connection to one of these ports by entering the following `Connect` command:

```
c host1
```

For further information on the `ROtary` and `Name` commands, refer to the *OpenLAN TIU Terminal User Guide*.

## 5.6 MACROS

You may also want to establish "macro" files for each TIU. A macro is a named file containing a sequence of commands necessary for accomplishing a specific function on the TIU. Using a predefined macro, a network user can accomplish a relatively complex task with a single, two-word command.

For example, the following text defines a simple macro named "tek" that sets two terminal characteristic parameters:

```
define tek = (
  set interaction=nolfi
  set localeediting=(nce,nde)
)
```

A user can then execute the macro by entering the following command:

```
do tek
```

Refer to the detailed description of the DEFINE command in the *OpenLAN TIU Terminal User Guide*.

## 5.7 CONFIGURATION LOG

To facilitate network maintenance after the system is installed, prepare a list of the devices supported by each port on each TIU, with notations about any special device requirements. Figure 5-1 illustrates a sample list for a TIU/200 with ten ports.

Server tiu hosts1 (02a6)				
Serial: 1222 Map code: C01				
Port	Cable	Device	Ch Name	Parameter settings
!0		local term		term
!1	25	host1 tty00	host1_lp1	host au=d
!2	26	host1 tty01	test1	host
!3	27	host1 tty02	host1_uuo	host fcf=fct=d au=d
!4	28	host1 tty03	host1_uui	host fcf=fct=d au=d
!5	29	host1 tty04	host1_async	host
!6	30	host2 ttyh0	host2_lp1	host au=d
!7	31	host2 ttyh1	host2_lp2	host au=d
!8	32	host2 ttyh2	host2_uuo	host fcf=fct=d au=d
!9	33	host2 ttyh3	host2_uui	host fcf=fct=d au=d

Figure 5-1 Sample List for a TIU with 10 ports

## CHAPTER 6 TROUBLESHOOTING

This troubleshooting guide lists the most common problems in a new OpenLAN TIU installation. To use this guide, find the symptom that most resembles your situation and follow the suggested verification and troubleshooting procedures for that symptom.

Table 6-1 summarizes the more detailed troubleshooting procedures contained in the remainder of this section.

The list is organized in approximately the same order that the symptoms are likely to arise. The bootstrap problems appear first, for example, and data transmission problems appear later in the list.

Before using this checklist, look at the TIU's front panel to see which LEDs, if any, are lit.

Table 6-1 Troubleshooting Checklist Summary			
Section	Symptom	Common Cause	Possible Solution
6.1	Self test LED blinking		Verify that NCS is properly configured and attached
6.2	Self test LED stays lit	Badly installed or dirty tap, transceiver, modem, or MAU; board failure	Tighten, clean, or replace hardware; check LEDs on boards
6.3	No welcome message and prompt; wrong prompt	Port parameters not appropriate; hardware connection may be loose; system has branched into monitor	Adjust parameters; adjust cable; reboot software; verify that NCS is properly configured and attached
6.4	Data received LED remains lit	Continuous interrupts from attached device	Adjust cable(s); remove cables one-by-one until LED goes out
6.5	Connection request fails	Address not correct; typing mistake; destination device in wrong state	Reenter command; put the destination device in Listening mode
6.6	Station missing from netmap	Badly installed tap, transceiver	Tighten or replace hardware

---

## 6.1 SELF TEST LED BLINKING

The Self Test LED on the TIU's front panel blinks during system startup when the TIU is attempting unsuccessfully to boot from NCS.

Verify that the NCS is working.

For more information, refer to the proper NCS installation and operation guide.

---

## 6.2 SELF TEST LED REMAINS LIT

The Self Test LED remains lit during system startup if the TIU has failed the automatic self-test diagnostics.

- Power off the TIU and disconnect the TIU from the transceiver (Ethernet).

### CAUTION !

Connecting or disconnecting the cable between the TIU and the transceiver while the power is on can damage the transceiver.

- Power on the TIU, reinsert the diskette, and close the drive door.

- If the TIU passes the startup diagnostics without the interface connected, then the transceiver is not working.

First, clean and tighten the transceiver and connectors. If that doesn't solve the problem, attach the TIU to a different transceiver. It may be necessary to remove and reinstall the transceiver according to the instructions in the appropriate installation guide.

- If the Self Test LED still remains lit, one of the boards has failed the self-test diagnostics. Remove the TIU's top cover and check the status of the Self Test LEDs on the individual boards. A lit LED indicates a board failure. (Refer to the appropriate installation guide for an illustration of each board and a complete description of the power-on diagnostics.)

**CAUTION !**

The unit is still powered on. Do not drop or place any object in the enclosure.

If a console terminal is attached, check the console for confirmation of the failure. Depending on where the failure occurred, the system may not be able to report the failure on the console. Report the board failure and console messages (if any) to Norsk Data.

---

### 6.3 NO WELCOME MESSAGE AND PROMPT OR INAPPROPRIATE PROMPT

If the TIU seems to boot correctly but does not communicate with an attached terminal, the problem could be in the software, the physical connection between the terminal and the TIU, or the configuration of the port to which the terminal is attached.

- If the TIU has the correct software, press a return on the terminal keyboard while watching the Data Received LED on the OpenLAN TIU's front panel. If the LED does not flicker when a key is pressed, then the TIU is not receiving the signal from the terminal. Check the cable connection between the TIU and the terminal.
- If the Data Received LED on the TIU's front panel flickers when a key is pressed on the terminal, then the physical connection is probably all right. Check the baud rate, parity, and databits requirements of the terminal and verify that the port parameters are set appropriately.

The TIU does not send a prompt to or accept commands from a port with a DeVice setting of Host.

- If the TIU is a TIU/200, verify that all terminal cables meet the specifications in Figure 2-1 in Section 2.2.1. Verify the NCS is properly configured and attached to the network.

Verify that the Data Received LED on the front panel flashes when a key on the terminal is pressed. If the LED flashes but no prompt appears, verify that the port parameters are set appropriately for the terminal. A port configured for interaction with a host does not interact appropriately with a terminal.

If the LED does not flash, verify that the I/O cable is properly attached to both the device and one TIU/200. Once the cables are attached properly, power on the terminal again and press the return key. The TIU/200 welcome message should appear on the terminal.

If the TIU/200 still does not respond, contact Norsk Data.

---

## 6.4 DATA RECEIVED LED REMAINS LIT

The Data Received LED should flicker each time data is received from one of the attached devices. If the Data Received LED flickers when no data is transmitted, then the TIU is probably receiving spurious interrupts because of faulty cable connections.

- Check the cable connections of all attached devices, at both the device end and the TIU end. If one of the cables is loose, reattach it securely.
- Verify that the cables contain no wires that are not driven by the supported devices.

All cables connecting supported devices to the TIU should meet the specifications in Figure 2-1 in Section 2.2.1.

Specifically, if the TIU is connected to a host that does not support CTS and DTR, verify that the cable connecting the TIU with the host does not have these wires. Wires in the cable that are not driven by the device at the other end can generate spurious signals.

A shorted RS-232-C cable (that is, with pin 2 shorted to ground) can also cause the Data Received LED to remain lit. This can occur with cables and connections that appear to be in perfect condition. One way to find the defective cable (or device, regardless of the cause of the problem) is to remove the cables one-by-one until the LED goes out.

---

## 6.5 CONNECTION REQUEST UNSUCCESSFUL

If a connection request is successful, the OpenLAN TIU displays this message:

*Session 1 -- connected to <address>*

This section lists the most common error messages that may appear instead and explains the likely causes.

**INVALID CONNECT  
SYNTAX**

This message usually indicates a typing mistake in the Connect command.

Compare the Connect command you entered with these examples:

```
c ND
c 192.9.255.108
```

The first example illustrates a request for a connection to a port that has been assigned the Internet name "ND". In this case, the port can be on either the same or a different Terminal Interface Unit.

The second example illustrates a TCP/IP request for a connection to an Internet address. Leading zeros can be omitted.



**REMOTE IS BUSY**

This message appears if the destination device is attached and powered on but not available as the destination of a connection

If you are trying to make a connection from a terminal to a host, this message probably means that the host port is already the destination of another connection. In this case, you cannot make a second connection until the first connection is terminated.

If you are trying to make a test connection from one terminal to another, this message probably means that the destination port is not in Listening mode. To put the destination port in Listening mode, enter the Listen command on the terminal attached to the destination port:

1

An "at" sign (@) appears on the destination terminal screen. Do not press any other keys on the terminal keyboard until after the connection is established.

**REMOTE IS  
DISABLED OR  
NONEXISTENT**

This message appears if no device is attached to the destination port or if the device attached to the destination port is powered off. This message can also appear if the remote port is being queued or if the remote is nonexistent.

If this message appears, first check the status of the device attached to the destination port.

If the device exists and is powered on, verify that the cable connecting the TIU and the device meets the specifications in Figure 2-1 in section 2.2.1. If the cable does not provide the necessary signals, the TIU cannot detect the attached device.

If the device exists, is powered on, and the cable meets all specifications, check the UseDTRin parameter.

---

## 6.6 STATION MISSING FROM NETWORK MAP

Ordinarily, the `SHoW NETMap` command displays a list of all TIUs on a network. If one TIU is not correctly attached to the network, that TIU does not appear in the network map generated on the other TIUs. Conversely, when a TIU that is not correctly attached generates a network map, the map shows only the address of the TIU itself.

If one TIU is missing from the netmap of the other TIUs, follow this procedure to verify the source of the problem:

### **CAUTION !**

Connecting or disconnecting the cable between the TIU and the transceiver, can damage the transceiver.

- 1) Power off a different TIU that is communicating successfully with the network and disconnect it from its transceiver.
- 2) Connect the first TIU to the transceiver that is known to be working.
- 3) Start up the TIU. Issue the `SHoW NETMap` command on a terminal attached to that TIU.

If the new netmap display includes the other TIUs in the network, the problem is with the original tap or transceiver. First clean and tighten the original transceiver. If that does not solve the problem, attach the TIU to a different transceiver, remove and reinstall the tap, using the procedures in the appropriate installation guide.

If the new netmap display is limited to the Ethernet or Internet address of the individual TIU, the problem is with the TIU itself. Call Norsk Data.

abbreviations . . . . .	3
active parameters . . . . .	33
additional devices . . . . .	15
additional testing . . . . .	30
assign internet name . . . . .	36
asynchronous terminal cable . . . . .	5
attach diskless TIU to network . . . . .	27
attach host to TIU . . . . .	24
available commands . . . . .	14
 Bind command . . . . .	 10
 caret symbol . . . . .	 23
change parameter settings . . . . .	35
checkout procedures . . . . .	27
command interpretation . . . . .	13
command names . . . . .	3
configuring for communication with second terminal . . . . .	15
configuration . . . . .	2
configuration log . . . . .	37
Connect command . . . . .	22, 25
connect to host port . . . . .	24
connection across the network . . . . .	29
connection request unsuccessful . . . . .	42
control caret . . . . .	23
 data received LED . . . . .	 42
default parameters . . . . .	33
default port settings . . . . .	9
device cabling . . . . .	5
Disconnect command . . . . .	23, 26
display DeVice setting . . . . .	17
 establish macro files . . . . .	 37
ethernet address . . . . .	10
ethernet installing . . . . .	4
ethernet network . . . . .	4
ethernet TIU . . . . .	11
 FlowControlFrom parameter . . . . .	 33
FlowControlTo . . . . .	33
 hardware installation . . . . .	 8, 9
help facility . . . . .	35
help features . . . . .	35
host port parameters . . . . .	25

installation checkout . . . . .	8
installing remaining devices . . . . .	30
internet names . . . . .	36
invalid connect syntax . . . . .	43
LED boot state . . . . .	12
LED self test . . . . .	11, 12
Listen command . . . . .	21
macros . . . . .	37
network maintenance . . . . .	37
network types . . . . .	4
no welcome message and prompt . . . . .	41
OL TIU/200-10 . . . . .	1
OL TIU/200-10 checkout . . . . .	10
OL TIU/200-10 startup . . . . .	10
parameter dialog . . . . .	18
parameter names . . . . .	3
password . . . . .	17
port configuration . . . . .	32
port parameters . . . . .	33
port settings . . . . .	9
preinstallation . . . . .	4
privilege command . . . . .	16, 31
privilege level . . . . .	16
prompt wrong . . . . .	41
release number . . . . .	13
remote is busy . . . . .	44
remote is disabled or nonexistent . . . . .	44
rotaries . . . . .	36
ROtary command . . . . .	36
screen dialog . . . . .	14
self test LED . . . . .	39
self test LED blinking . . . . .	39
self test LED stays lit . . . . .	39
SETDefault command . . . . .	18, 19
shortcuts . . . . .	35
SHow Address . . . . .	20
SHow Address command . . . . .	13, 29
SHow Command . . . . .	17, 28
SHow Version command . . . . .	13
site planning . . . . .	2
software configuration procedures . . . . .	32
software installation . . . . .	8, 10
standard devices cables . . . . .	5

starting diskless TIU . . . . .	11
startup checkout . . . . .	10
station missing . . . . .	45
system access . . . . .	16
system ready for user . . . . .	31
TCP/IP network map . . . . .	28
terminal connection test . . . . .	12
terminate connection . . . . .	23
test between source and destination terminal . . . . .	21
test connection . . . . .	21
test procedures . . . . .	27
TIU communicating with terminal . . . . .	12
TIU with 10 ports . . . . .	37
TIU/200 diskless . . . . .	11
transceivers . . . . .	4
transceivers tested . . . . .	4
troubleshooting . . . . .	2
troubleshooting . . . . .	38
troubleshooting checklist . . . . .	38
troubleshooting procedures . . . . .	38
unpacking . . . . .	6
unpacking and installation . . . . .	2
unpacking procedures . . . . .	6, 7
UseDTRin . . . . .	33
user guidelines . . . . .	31

